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0CAN051302

May 14, 2013

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

SUBJECT: Annual Radiological Environmental Operating Report for 2012
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

REFERENCE: Entergy letter dated April 26, 2013, "Annual Radioactive Effluent Release Report for 2012" (0CAN041207) (ML13116A215)

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 2012 is enclosed.

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

The radionuclides detected by the radiological environmental monitoring program during 2012 were significantly below the regulatory limits. The operation of the ANO station during 2012 had no harmful 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 submitted as part of the referenced Annual Radioactive Effluents Release Report.

This letter contains no new commitments.

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

Sincerely,

Original signed by Stephenie L. Pyle

SLP/rwc

Enclosure: Annual Radiological Environmental Operating Report for 2012

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Enclosure to

0CAN051302

Annual Radiological Environmental Operating Report for 2012

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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, 2012, through December 31, 2012. This report fulfills the requirements of ANO Unit 1 Technical Specification (TS) 5.6.2 and Unit 2 TS 6.6.2.

During 2012, 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 2012, ANO personnel collected environmental samples for radiological analysis. They 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 2012 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 2012. 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, 2012 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 2012 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 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)

- Missed Samples

  First quarter environmental TLD Station # 148 missing. CR-ANO-C-2012-00914

  Fourth quarter environmental TLD Station # 127 missing. CR-ANO-C-2013-00102

  Fourth quarter environmental TLD Stations # 148 and 150 missing. CR-ANO-C-2013-00119

- Unavailable Results

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

Program Modifications

No revisions were made to OP-1608.005, “Radiological Environmental Monitoring Program (REMP)” in 2012.

Attachments

Attachment 1 contains results of air, TLD, water, sediment, fish, and food product samples collected in 2012. TLDs were analyzed by a vendor (Stanford Dosimetry). All remaining samples were analyzed by River Bend Station’s (RBS) Environmental Laboratory and GEL Laboratories, LLC (GEL).

Attachment 2 contains RBS’, GEL’s and Stanford Dosimetry’s participation in the interlaboratory comparison program during 2012.

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.

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 2012 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 2011. 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 8 km 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	1 sample location 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). South of Outside Fab-Shop, west side of access road	Once per 92 days	Control, Tritium and Gamma Isotopic, once per 92 days.
	3 sample locations of Groundwater from indicator locations down gradient from the protected area.	**Station 59 (GWM-2, 185° - 0.1 miles)** – South of Protected Area on OCA. Near Security barriers and discharge canal.	Once per 92 days	Indicator, Tritium and Gamma Isotopic, once per 92 days.
		Station 60 (GWM-3, 206° - 0.1 miles) – South of Protected area on OCA. West of Station number 59 near wood line.	Once per 92 days	Indicator, Tritium and Gamma Isotopic, once per 92 days.
		Station 61 (GWM-4, 245° - 0.1 miles) – West of Protected Area on OCA. Edge of parking lot, east of equipment laydown area	Once per 92 days	Indicator, Tritium and Gamma Isotopic, once per 92 days.

FIGURE 1-1

SAMPLE COLLECTION SITES – NEAR FIELD

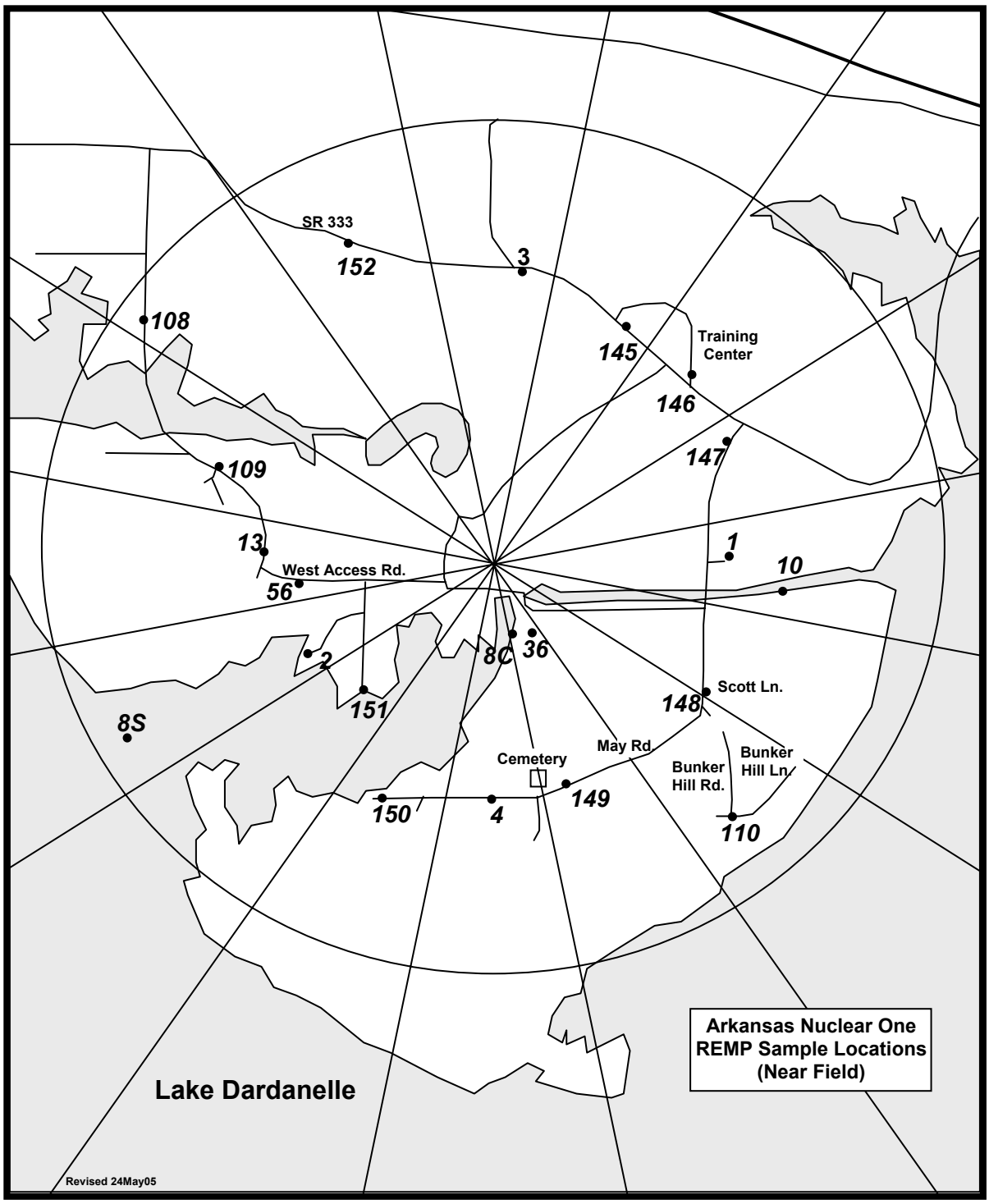


FIGURE 1-2

SAMPLE COLLECTION SITES – FAR FIELD

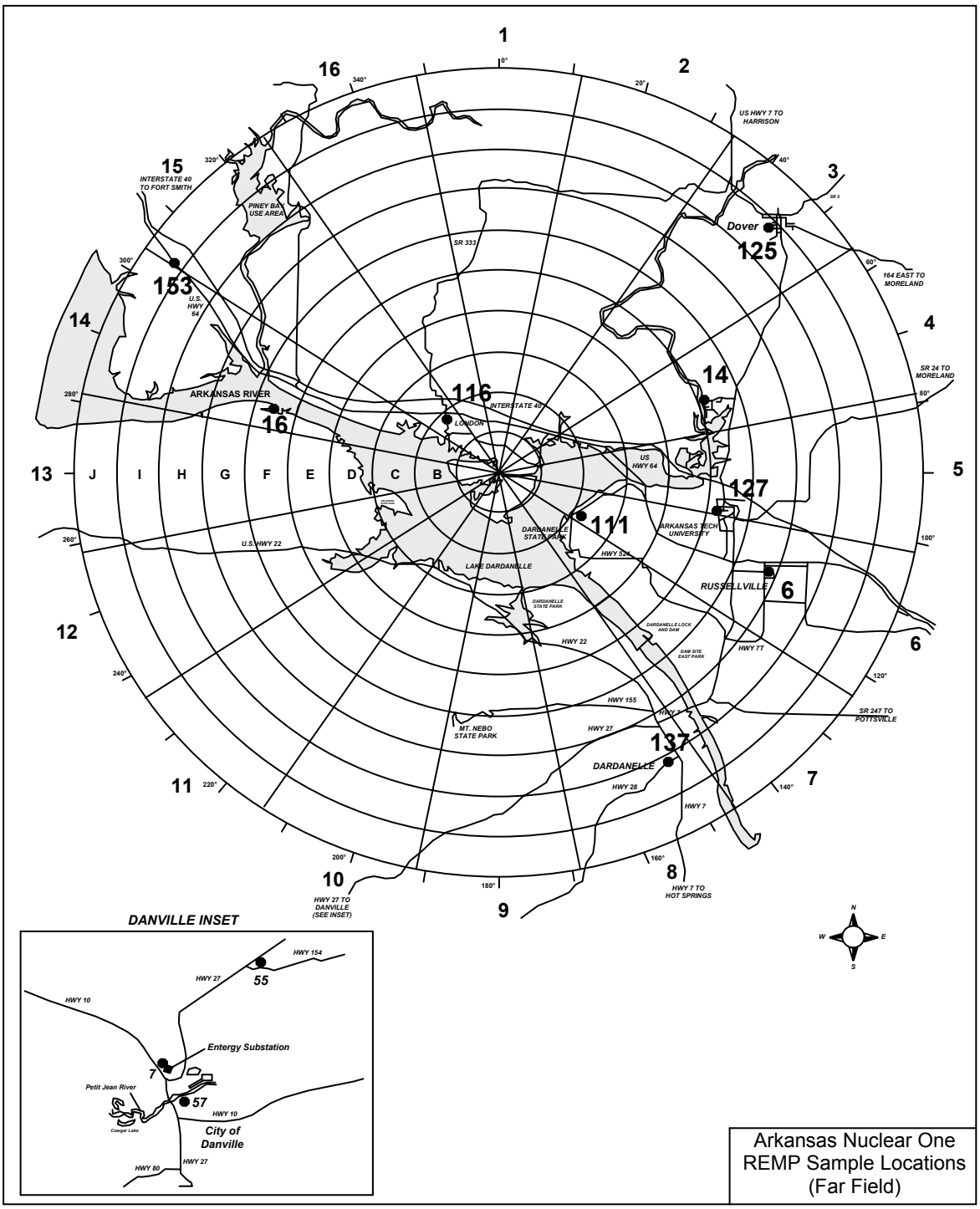
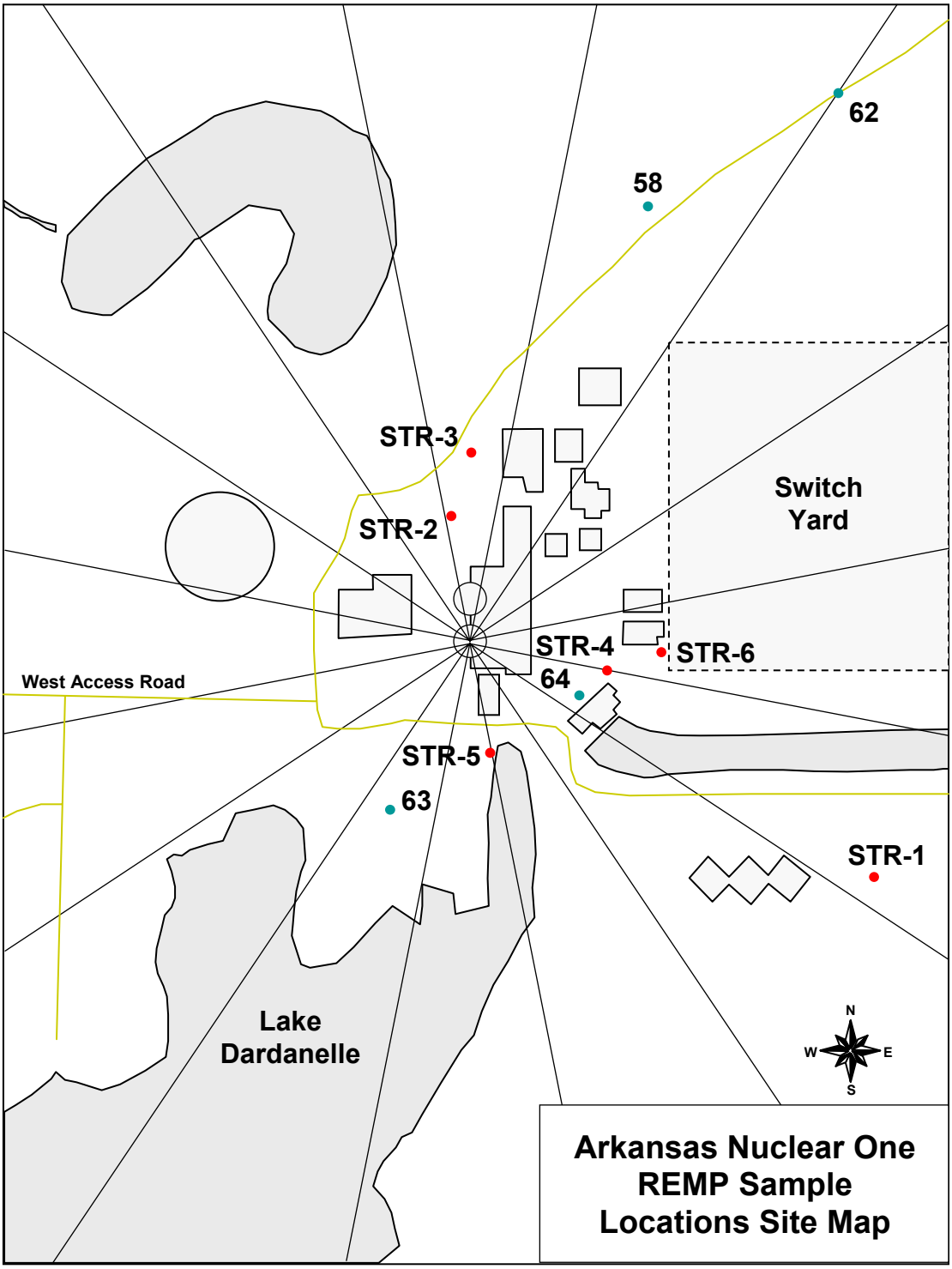


FIGURE 1-3

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 2012 were within the range of levels obtained in previous years of the operational REMP and well below preoperational levels as seen below. Results are reported as annual average picocuries per cubic meter (pCi/m^3).

Monitoring Period	Result
2000 – 2011 (Minimum Value)	0.020
2012 Value	0.018
2000 – 2011 (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 8.0 millirem (mrem) shown in Table 3.1 is within the historical bounds of 2000 – 2011 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 2012 surface water and drinking water samples were similar to those reported in previous years.

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 are consistent with concentrations that would typically be seen at this location as shown below. Results are reported as annual average picocurie per liter (pCi/l).

Monitoring Period	Result
2000 – 2011 (Minimum Value)	272.0
2012 Value	916
2000 – 2011 (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 2012 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 2012 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 2012 indicator results to preoperational and operational years. Results are reported as annual average pCi/l.

Radionuclide	2012	2000 – 2011	Preoperational
Gross Beta	2.52	2.78	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 2012 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 2012 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	2012	2006 – 2011
Iodine-131	< LLD	< LLD
Gamma	< LLD	< LLD
Tritium	< LLD	< LLD

2.4 Sediment Sample Results

Sediment samples were collected from two locations in 2012 and analyzed for gamma radionuclides. Listed below is a comparison of 2012 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 – 2011 (Minimum Value)	41.79
2012 Value	< LLD
2000 – 2011 (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 2012 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 2012, 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 2012, food product samples were collected when available from two locations and analyzed for Iodine-131 and gamma radionuclides. The 2012 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

RBS' Environmental Laboratory and 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 2011) 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 2011, 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

2011 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 2012 Program Results Summary

Table 3.1 summarizes the 2012 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 2012

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	0.032 (81 / 81) [0.013 – 0.055]	Station 1 (88°, 0.5 mi)	0.032 (27 / 27) [0.017 - 0.049]	0.029 (54 / 54) [0.014 - 0.050]	0
Airborne Iodine (pCi/ m^3)	I-131 / 135	0.07	< LLD	N/A	N/A	< LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma / 61	(f)	8.0 (61 / 64) [4.6 – 10.1]	Station 56 (264°, 0.4 mi)	9.4 (4 / 4) [8.5 – 10.1]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma / 27	(f)	7.2 (27 / 28) [3.6 – 9.6]	Station 137 (151°, 8.2 mi)	8.7 (4 / 4) [6.8 – 9.4]	N/A	0
Control TLD (mR/Qtr)	Gamma / 4	(f)	N/A	N/A	N/A	7.0 (4 / 4) [5.8 – 7.8]	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	916 (1* / 4) [916– 916]	Station 8 (166°, 0.2 mi)	916 (1* / 4) [916 – 916]	< 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	2.49 (3* / 4) [1.55 – 3.84]	Station 14 (70°, 5.1 mi)	2.49 (3* / 4) [1.55 – 3.84]	3.01 (3* / 4) [2.61 – 3.75]	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		< 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 2012

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**
12/20/2011	01/03/2012	0.033	0.031	0.031	0.026	0.031
01/03/2012	01/17/2012	0.030	0.053	0.026	0.023	0.029
01/17/2012	01/31/2012	0.030	0.027	0.029	0.023	0.029
01/31/2012	02/14/2012	0.028	0.028	0.025	0.022	0.026
02/14/2012	02/28/2012	0.029	0.028	0.029	0.023	0.029
02/28/2012	03/13/2012	0.021	0.020	0.020	0.018	0.021
03/13/2012	03/27/2012	0.017	0.018	0.016	0.014	0.016
03/27/2012	04/10/2012	0.025	0.023	0.022	0.021	0.024
04/10/2012	04/24/2012	0.026	0.026	0.013	0.022	0.023
04/24/2012	05/08/2012	0.025	0.025	0.024	0.020	0.024
05/08/2012	05/22/2012	0.033	0.033	0.031	0.028	0.034
05/22/2012	06/05/2012	0.027	0.025	0.027	0.023	0.027
06/05/2012	06/19/2012	0.025	0.023	0.022	0.020	0.022
06/19/2012	07/03/2012	0.035	0.033	0.032	0.028	0.032
07/03/2012	07/17/2012	0.025	0.023	0.024	0.019	0.024
07/17/2012	07/31/2012	0.026	0.027	0.027	0.020	0.026
07/31/2012	08/14/2012	0.033	0.032	0.031	0.027	0.031
08/14/2012	08/28/2012	0.036	0.037	0.037	0.031	0.033
08/28/2012	09/11/2012	0.027	0.027	0.029	0.024	0.030
09/11/2012	09/25/2012	0.033	0.031	0.033	0.026	0.032
09/25/2012	10/09/2012	0.044	0.041	0.043	0.036	0.045
10/09/2012	10/23/2012	0.035	0.036	0.035	0.029	0.031
10/23/2012	11/06/2012	0.043	0.040	0.041	0.034	0.042
11/06/2012	11/20/2012	0.046	0.042	0.043	0.036	0.043
11/20/2012	12/04/2012	0.048	0.045	0.046	0.036	0.047
12/04/2012	12/18/2012	0.040	0.037	0.039	0.034	0.039
12/18/2012	12/27/2012	0.049	0.047	0.050	0.041	0.050

* 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**
12/20/2011	01/03/2012	< 0.014	< 0.015	< 0.025	< 0.016	< 0.023
01/03/2012	01/17/2012	< 0.019	< 0.032	< 0.012	< 0.016	< 0.016
01/17/2012	01/31/2012	< 0.014	< 0.016	< 0.015	< 0.014	< 0.014
01/31/2012	02/14/2012	< 0.012	< 0.013	< 0.014	< 0.009	< 0.012
02/14/2012	02/28/2012	< 0.016	< 0.014	< 0.012	< 0.017	< 0.013
02/28/2012	03/13/2012	< 0.011	< 0.010	< 0.011	< 0.012	< 0.012
03/13/2012	03/27/2012	< 0.012	< 0.012	< 0.013	< 0.010	< 0.013
03/27/2012	04/10/2012	< 0.018	< 0.017	< 0.014	< 0.021	< 0.015
04/10/2012	04/24/2012	< 0.014	< 0.018	< 0.013	< 0.013	< 0.012
04/24/2012	05/08/2012	< 0.016	< 0.018	< 0.017	< 0.016	< 0.020
050/8/2012	05/22/2012	< 0.027	< 0.032	< 0.030	< 0.023	< 0.033
05/22/2012	06/05/2012	< 0.019	< 0.016	< 0.020	< 0.019	< 0.011
06/05/2012	06/19/2012	< 0.016	< 0.016	< 0.017	< 0.019	< 0.018
06/19/2012	07/03/2012	< 0.009	< 0.012	< 0.014	< 0.013	< 0.013
07/03/2012	07/17/2012	< 0.013	< 0.015	< 0.016	< 0.020	< 0.015
07/17/2012	07/31/2012	< 0.019	< 0.017	< 0.020	< 0.017	< 0.017
07/31/2012	08/14/2012	< 0.017	< 0.017	< 0.019	< 0.017	< 0.016
08/14/2012	08/28/2012	< 0.016	< 0.025	< 0.023	< 0.022	< 0.021
08/28/2012	09/11/2012	< 0.016	< 0.017	< 0.019	< 0.019	< 0.019
09/11/2012	09/25/2012	< 0.016	< 0.016	< 0.014	< 0.017	< 0.018
09/25/2012	10/09/2012	< 0.018	< 0.014	< 0.021	< 0.011	< 0.017
10/09/2012	10/23/2012	< 0.013	< 0.015	< 0.018	< 0.015	< 0.016
10/23/2012	11/06/2012	< 0.018	< 0.015	< 0.016	< 0.016	< 0.019
11/06/2012	11/20/2012	< 0.018	< 0.021	< 0.019	< 0.021	< 0.018
11/20/2012	12/04/2012	< 0.015	< 0.017	< 0.022	< 0.022	< 0.025
12/04/2012	12/18/2012	< 0.023	< 0.025	< 0.023	< 0.018	< 0.020
12/18/2012	12/27/2012	< 0.047	< 0.033	< 0.039	< 0.037	< 0.036

* Station with highest annual mean.

Table 2.1

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

Inner Ring (Indicators)					
Station	**1st Qtr '12 (mrem)**	**2nd Qtr '12 (mrem)**	**3rd Qtr '12 (mrem)**	**4th Qtr '12 (mrem)**	**Annual Mean '12 (mrem)**
1	7.3	9.1	8.0	8.9	**8.3**
2	6.3	9.2	9.7	8.2	**8.4**
3	4.6	6.0	6.3	5.9	**5.7**
4	6.4	8.8	9.3	8.6	**8.3**
***56**	**8.5**	**10.1**	**9.5**	**9.5**	**9.4**
108	7.5	8.5	8.4	8.8	**8.3**
109	8.2	9.4	9.2	9.8	**9.1**
110	6.7	9.2	8.2	8.5	**8.2**
145	6.9	8.4	7.1	8.1	**7.6**
146	7.2	7.8	8.4	8.9	**8.1**
147	5.7	7.4	7.1	7.2	**6.9**
148	**LOST**	8.5	8.0	**LOST**	**8.3**
149	6.1	8.5	8.3	7.9	**7.7**
150	7.7	9.1	7.4	**LOST**	**8.1**
151	7.3	8.7	8.3	8.8	**8.3**
152	5.6	8.1	6.8	7.1	**6.9**

* 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 '12 (mrem)**	**2nd Qtr '12 (mrem)**	**3rd Qtr '12 (mrem)**	**4th Qtr '12 (mrem)**	**Annual Mean '12 (mrem)**
6	6.4	7.4	7.6	7.6	**7.3**
111	4.8	6.0	6.1	6.2	**5.8**
116	6.6	8.8	8.3	8.3	**8.0**
125	3.6	5.4	5.0	5.7	**4.9**
127	6.3	9.3	9.6	**LOST**	**8.4**
***137**	**6.8**	**9.2**	**9.4**	**9.2**	**8.7**
153	6.2	8.4	8.2	7.9	**7.7**

* Stations with highest annual mean.

Special Interest Areas – (Control)					
Station	**1st Qtr '12 (mrem)**	**2nd Qtr '12 (mrem)**	**3rd Qtr '12 (mrem)**	**4th Qtr '12 (mrem)**	**Annual Mean '12 (mrem)**
7	5.8	7.4	7.0	7.8	**7.0**

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)	12/31/2011	01/31/2012	<5.67	<5.09	<10.80	<3.60	<10.10	<6.84	<9.65	<6.78	<3.92	<6.37	<25.00	<8.24
Station 10 (Control)	12/31/2011	01/31/2012	<4.63	<5.76	<9.01	<5.98	<10.50	<5.53	<8.95	<8.25	<4.73	<4.53	<23.90	<7.81
Station 8 (Indicator)	01/31/2012	02/29/2012	<5.99	<4.15	<8.26	<5.26	<10.10	<5.47	<6.24	<6.97	<4.21	<5.16	<21.80	<6.30
Station 10 (Control)	01/31/2012	02/29/2012	<4.62	<4.33	<3.34	<4.23	<9.42	<9.83	<5.85	<6.26	<4.25	<5.75	<24.10	<9.74
Station 8 (Indicator)	02/29/2012	03/31/2012	<6.06	<6.39	<11.60	<4.72	<6.28	<5.76	<9.67	<9.06	<3.65	<5.08	<21.80	<10.80
Station 10 (Control)	02/29/2012	03/31/2012	<5.52	<4.17	<12.80	<5.67	<12.00	<7.35	<6.31	<9.78	<5.13	<5.96	<35.40	<2.79
Station 8 (Indicator)	03/31/2012	04/30/2012	<4.78	<4.41	<9.13	<5.64	<11.80	<3.90	<10.70	<5.69	<5.54	<4.70	<19.30	<2.04
Station 10 (Control)	03/31/2012	04/30/2012	<4.12	<5.19	<9.29	<4.71	<11.00	<5.41	<9.41	<7.22	<4.39	<5.63	<15.80	<6.37
Station 8 (Indicator)	04/30/2012	05/31/2012	<5.55	<6.47	<14.30	<5.47	<11.80	<6.63	<11.10	<9.69	<3.35	<4.98	<25.00	<10.60
Station 10 (Control)	04/30/2012	05/31/2012	<6.04	<4.72	<7.65	<4.73	<9.14	<6.16	<8.90	<9.47	<4.18	<5.90	<29.10	<10.20
Station 8 (Indicator)	05/31/2012	06/30/2012	<5.47	<6.41	<14.20	<4.68	<12.60	<6.73	<8.86	<11.70	<4.88	<5.62	<35.40	<10.80
Station 10 (Control)	05/31/2012	06/30/2012	<4.43	<6.12	<12.3	<4.29	<12.30	<5.95	<9.96	<12.2	<4.87	<6.27	<31.00	<13.70
Station 8 (Indicator)	06/30/2012	07/31/2012	<6.93	<5.56	<12.80	<4.01	<15.10	<8.06	<7.42	<6.67	<4.61	<6.22	<29.80	<13.10
Station 10 (Control)	06/30/2012	07/31/2012	<4.35	<4.90	<12.80	<4.68	<11.60	<4.10	<9.23	<8.78	<4.87	<5.62	<24.90	<7.90
Station 8 (Indicator)	07/31/2012	08/31/2012	<2.67	<2.96	<5.57	<2.60	<6.22	<3.42	<5.12	<12.90	<2.29	<2.85	<24.00	<8.40
Station 10 (Control)	07/31/2012	08/31/2012	<3.10	<3.05	<7.48	<2.46	<5.68	<4.26	<6.53	<14.40	<2.32	<3.16	<19.90	<8.17
Station 8 (Indicator)	08/31/2012	09/30/2012	<4.87	<4.43	<2.34	<3.19	<7.87	<7.67	<7.80	<14.60	<3.57	<5.30	<30.30	<12.80
Station 10 (Control)	08/31/2012	09/30/2012	<5.83	<4.75	<11.30	<6.28	<12.40	<7.45	<11.00	<11.40	<4.58	<6.59	<33.90	<3.42
Station 8 (Indicator)	09/30/2012	10/31/2012	<5.83	<4.29	<8.77	<4.69	<10.90	<6.52	<7.57	<14.70	<5.35	<4.26	<23.10	<14.70
Station 10 (Control)	09/30/2012	10/31/2012	<4.43	<4.45	<9.60	<3.17	<8.16	<5.60	<7.85	<12.90	<3.40	<4.97	<24.00	<8.45
Station 8 (Indicator)	10/31/2012	11/30/2012	<7.69	<7.01	<12.80	<5.41	<15.30	<7.43	<11.40	<8.74	<5.63	<6.59	<23.20	<9.02
Station 10 (Control)	10/31/2012	11/30/2012	<5.74	<4.89	<12.00	<4.68	<8.23	<8.08	<13.10	<12.10	<5.27	<6.67	<29.80	<7.83
Station 8 (Indicator)	11/30/2012	12/31/2012	<4.43	<4.03	<13.40	<7.95	<14.50	<6.39	<9.11	<12.10	<4.25	<6.27	<32.30	<10.60
Station 10 (Control)	11/30/2012	12/31/2012	<6.10	<7.06	<11.40	<4.02	<2.59	<7.08	<10.70	<10.80	<6.56	<6.50	<36.20	<14.20

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)	12/31/2011	03/31/2012	< 718
Station 10 (Control)	12/31/2011	03/31/2012	< 670
Station 8 (Indicator)	03/31/2012	06/30/2012	< 641
Station 10 (Control)	03/31/2012	06/30/2012	< 643
Station 8 (Indicator)	06/30/2012	09/30/2012	916
Station 10 (Control)	06/30/2012	09/30/2012	< 599
Station 8 (Indicator)	09/30/2012	12/31/2012	< 623
Station 10 (Control)	09/30/2012	12/31/2011	< 624

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)	03/15/2012	< 2.76	< 0.66	< 1.51	< 1.44	< 3.03	< 1.66	< 3.11	< 1.61	< 2.71	< 1.97	< 1.81	< 2.36	< 2.36
Station 57 (Control)	03/15/2012	< 3.65	< 0.784	< 1.93	< 2.07	< 4.30	< 2.34	< 4.29	< 2.40	< 3.57	< 2.21	2.34	< 3.63	< 3.63
Station 14 (Indicator)	06/14/2012	2.06	< 0.97	< 5.62	< 3.54	< 10.80	< 3.27	< 10.50	< 5.80	< 8.60	< 4.24	< 4.83	< 25.70	< 3.02
Station 57 (Control)	06/14/2012	3.75	< 0.87	< 6.84	< 5.07	< 9.40	< 4.67	< 9.12	< 6.81	< 11.50	< 5.37	< 7.55	< 38.70	< 13.60
Station 14 (Indicator)	09/25/2012	3.84	< 1.00	< 6.58	< 6.28	< 12.20	< 5.43	< 11.60	< 6.14	< 10.50	< 4.10	< 3.81	< 23.50	< 8.27
Station 57 (Control)	09/25/2012	2.68	< 1.00	< 4.92	< 7.41	< 9.21	< 6.93	< 9.49	< 7.91	< 12.40	< 3.89	< 5.58	< 27.70	< 12.40
Station 14 (Indicator)	12/18/2012	1.55	< 0.83	< 5.21	< 5.43	< 8.99	< 4.40	< 5.27	< 6.60	< 8.71	< 4.79	< 5.57	< 32.80	< 13.90
Station 57 (Control)	12/18/2012	2.61	< 0.93	< 4.93	< 3.86	< 12.20	< 3.66	< 10.00	< 6.04	< 8.24	< 4.61	< 5.27	< 34.60	< 9.68

Table 4.2

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

Location	Collection Date	H-3
	Required LLD ➔	**2000**
Station 14 (Indicator)	03/15/2012	< 314
Station 57 (Control)	03/15/2012	< 310
Station 14 (Indicator)	06/14/2012	< 660
Station 57 (Control)	06/14/2012	< 641
Station 14 (Indicator)	09/25/2012	< 570
Station 57 (Control)	09/25/2012	< 571
Station 14 (Indicator)	12/18/2012	< 627
Station 57 (Control)	12/18/2012	< 627

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)	10/18/2012	< 20.30	< 27.10	N/A
Station 16 (Control)*	10/18/2012	< 21.60	< 26.60	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)	10/21/2012	< 9.47	< 8.00	< 22.70	< 10.40	< 25.20	< 8.34	< 7.61
Station 16 (Control)	10/06/2012	< 9.70	< 8.04	< 28.60	< 11.90	< 29.90	< 8.05	< 10.40

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)	06/14/2012	< 55.10	< 28.00	< 29.80
Station 55 (Control)	06/14/2012	< 59.30	< 21.50	< 26.40
Station 13 (Indicator)	07/24/2012	< 59.80	< 16.30	< 20.90
Station 55 (Control)	07/24/2012	< 56.80	< 14.20	< 23.20
Station 13 (Indicator)	08/28/2012	< 53.40	< 20.90	< 23.20
Station 55 (Control)	08/28/2012	< 59.90	< 17.80	< 21.80

Table 8.1

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

Sample #	Collection Date	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 ➔		15	15	15	30	15	30	15	30	15	18	60	15
58*	03/13/2012	< 7.13	< 1.47	< 1.56	< 3.51	< 1.67	< 3.07	< 1.78	< 2.98	< 1.90	< 1.80	< 4.51	< 4.51
59	03/13/2012	< 7.15	< 1.56	< 1.77	< 3.63	< 1.68	< 3.31	< 1.85	< 3.11	< 1.98	< 1.71	< 4.87	< 4.87
60	03/14/2012	< 6.61	< 1.57	< 1.85	< 3.92	< 1.84	< 3.75	< 1.93	< 3.51	< 2.05	< 1.88	< 4.70	< 4.70
61	03/13/2012	< 6.31	< 1.40	< 1.56	< 3.33	< 1.42	< 2.87	< 1.63	< 2.81	< 1.73	< 1.89	< 3.99	< 3.99
58*	06/05/2012	< 3.54	< 1.48	< 1.51	< 3.57	< 1.75	< 2.96	< 1.71	< 2.88	< 1.62	< 1.58	< 2.88	< 2.88
59	06/05/2012	< 4.68	< 2.20	< 2.07	< 4.47	< 2.65	< 4.93	< 2.51	< 4.34	< 2.33	< 2.24	< 4.73	< 4.73
60	06/05/2012	< 4.33	< 1.85	< 1.93	< 3.94	< 1.83	< 3.84	< 2.23	< 3.36	< 2.09	< 2.00	< 3.82	< 3.82
61	06/05/2012	< 3.76	< 1.42	< 1.38	< 3.32	< 1.50	< 3.06	< 1.56	< 2.69	< 1.56	< 1.57	< 3.06	< 3.06
58*	08/14/2012	< 5.41	< 1.50	< 1.58	< 3.71	< 1.76	< 3.27	< 1.70	< 2.74	< 1.62	< 1.57	< 3.66	< 3.66
59	08/16/2012	< 5.28	< 1.69	< 1.64	< 3.78	< 1.82	< 3.89	< 1.80	< 3.09	< 1.91	< 1.95	< 3.88	< 3.88
60	08/15/2012	< 4.63	< 1.39	< 1.62	< 3.41	< 1.51	< 3.21	< 1.65	< 3.09	< 1.69	< 1.63	< 3.83	< 3.83
61	08/16/2012	< 4.96	< 1.62	< 1.66	< 3.83	< 1.52	< 3.21	< 1.91	< 3.35	< 1.76	< 1.85	< 3.73	< 3.73
58*	10/30/2012	< 7.90	< 1.33	< 1.49	< 3.38	< 1.40	< 2.96	< 1.66	< 2.76	< 1.42	< 1.35	< 4.08	< 4.08
59	10/30/2012	< 7.22	< 1.69	< 1.91	< 4.65	< 1.71	< 3.66	< 2.16	< 3.66	< 1.96	< 1.94	< 4.57	< 4.57
60	10/30/2012	< 7.89	< 1.34	< 1.54	< 3.66	< 1.42	< 2.95	< 1.73	< 2.99	< 1.66	< 1.40	< 4.65	< 4.65
61	10/30/2012	< 6.75	< 1.58	< 1.73	< 3.67	< 1.48	< 3.73	< 1.87	< 3.14	< 1.75	< 1.74	< 4.98	< 4.98

* 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)	03/13/2012	< 270
Station 59 (Indicator	03/13/2012	< 322
Station 60 (Indicator)	03/14/2012	< 322
Station 61 (Indicator)	03/13/2012	< 326
Station 58 (Control)	06/05/2012	< 395
Station 59 (Indicator)	06/05/2012	< 394
Station 60 (Indicator)	06/05/2012	< 394
Station 61 (Indicator)	06/05/2012	< 394
Station 58 (Control)	08/14/2012	< 309
Station 59 (Indicator)	08/16/2012	< 310
Station 60 (Indicator)	08/15/2012	< 302
Station 61 (Indicator)	08/16/2012	< 309
Station 58 (Control)	10/30/2012	< 340
Station 59 (Indicator)	10/30/2012	< 370
Station 60 (Indicator)	10/30/2012	< 338
Station 61 (Indicator)	10/30/2012	< 373

Annual Radiological Environmental Operating Report for 2012

ATTACHMENT 2

INTERLABORATORY COMPARISON PROGRAM

River Bend Nuclear Station

Sample Type: Interlaboratory Comparison
Calendar Year: 2012

Analysis: Iodine-131, Gamma Isotopic
2nd Quarter dated June 14, 2012

Analytics E7481-125			Gross Beta in Water			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/L**	**RBS 1-s pCi/L**	**Ref Lab Value pCi/L**	**Ref Lab uncertainty pCi/L**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
Cs-137	227	1	273	4.57	60	0.83	Pass

Analytics E7480-125			Gamma in Water			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/L**	**RBS 1-s pCi/L**	**Ref Lab Value pCi/L**	**Ref Lab Uncertainty pCi/L**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
I-131	102	27.0	99.4	1.66	60	1.03	Pass
Ce-141	112	9.00	112	1.87	60	1.00	Pass
Cr-51	538	67.0	548	9.14	60	0.98	Pass
Cs-134	219	11.0	238	3.97	60	0.92	Pass
Cs-137	279	9.00	289	4.82	60	0.97	Pass
Co-58	117	12.0	126	2.10	60	0.93	Pass
Mn-54	192	20.0	180	3.01	60	1.06	Pass
Fe-59	198	24.0	174	2.91	60	1.14	Pass
Zn-65	300	40.0	272	4.54	60	1.10	Pass
Co-60	485	25.0	484	8.09	60	1.00	Pass

Analysis: Iodine-131, Gamma Isotopic
2nd Quarter dated June 14, 2012

Analytics E7483-125			Gamma in Milk				Range of 0.80 to 1.25
Nuclide	**RBS Mean pCi/L**	**RBS 1-s pCi/L**	**Ref Lab Value pCi/L**	**Ref Lab uncertainty pCi/L**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
I-131	67.0	25.0	99.7	1.66	60	0.67	**Fail**
Ce-141	85.0	13.0	82.2	1.37	60	1.03	Pass
Cr-51	399	82.0	402	6.71	60	0.99	Pass
Cs-134	150	7.00	174	2.91	60	0.86	Pass
Cs-137	197	11.0	212	3.54	60	0.93	Pass
Co-58	89.0	10.0	92.3	1.54	60	0.96	Pass
Mn-54	139	13.0	132	2.21	60	1.05	Pass
Fe-59	132	11.0	128	2.13	60	1.03	Pass
Zn-65	207	27.0	199	3.33	60	1.04	Pass
Co-60	346	9.00	355	5.93	60	0.97	Pass

Analytics E7482-125			I-131 cartridge				Range of 0.80 to 1.25
Nuclide	**RBS Mean pCi/each**	**RBS 1-s pCi/each**	**Ref Lab Value pCi/each**	**Ref Lab uncertainty pCi/each**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ ail**
I-131	94.0	6.00	96.4	1.61	60	0.97	Pass

3rd Quarter dated Sept. 13, 2012

Analytics E8137-125			Gross Beta filter			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/filter**	**RBS 1-s pCi/filter**	**Ref Lab Value pCi/filter**	**Ref Lab uncertainty pCi/filter**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
Cs-137	88.3	0.210	90.5	1.51	60	0.98	Pass

Analytics E8136-125			H-3 in water			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/L**	**RBS 1-s pCi/L**	**Ref Lab Value pCi/L**	**Ref Lab uncertainty pCi/L**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
H-3	13500	103	13000	217	60	1.03	Pass

Analytics E8138-125			Gamma Filter			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/filter**	**RBS 1-s pCi/filter**	**Ref Lab Value pCi/filter**	**Ref Lab Uncertainty pCi/filter**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
Ce-141	134	8	134	2.23	60	1.00	Pass
Cs-134	78.9	1.6	88.3	1.47	60	0.89	Pass
Cs-137	143	2.0	142	2.37	60	1.01	Pass
Co-58	77.8	3.6	82.0	1.37	60	0.95	Pass
Mn-54	169	9.5	160	2.67	60	1.06	Pass
Fe-59	133	12.8	124	2.07	60	1.07	Pass
Zn-65	161	8.5	157	2.62	60	1.02	Pass
Co-60	127	2.6	124	2.07	60	1.03	Pass

Analytics E8139-125			Gamma Soil			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/g**	**RBS 1-s pCi/g**	**Ref Lab Value pCi/g**	**Ref Lab Uncertainty pCi/g**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
Ce-141	0.471	0.108	0.419	0.00699	60	1.12	Pass
Cs-134	0.256	0.013	0.277	0.00462	60	0.92	Pass
Cs-137	0.529	0.022	0.536	0.00895	60	0.99	Pass
Co-58	0.240	0.030	0.257	0.00429	60	0.93	Pass
Mn-54	0.515	0.009	0.501	0.00836	60	1.03	Pass
Fe-59	0.444	0.035	0.389	0.00649	60	1.14	Pass
Zn-65	0.508	0.050	0.492	0.00822	60	1.03	Pass
Co-60	0.388	0.014	0.389	0.00649	60	1.00	Pass

2nd sample of Gamma in Milk

Analytics E10513			Gamma in Milk			Range of 0.80 to 1.25	
Nuclide	**RBS Mean pCi/L**	**RBS 1-s pCi/L**	**Ref Lab Value pCi/L**	**Ref Lab uncertainty pCi/L**	**Resolution**	**RBS/Ref Lab Ratio**	**Pass/ Fail**
I-131	105	9	100	1.67	60	1.05	Pass
Ce-141	196	13	187	3.13	60	1.05	Pass
Cr-51	495	74	472	7.88	60	1.05	Pass
Cs-134	215	17	214	3.57	60	1.01	Pass
Cs-137	272	17	266	4.44	60	1.02	Pass
Co-58	218	14	208	3.47	60	1.05	Pass
Mn-54	218	11	208	3.48	60	1.05	Pass
Fe-59	257	9	252	4.21	60	1.02	Pass
Zn-65	316	23	301	5.02	60	1.05	Pass
Co-60	396	8	400	6.68	60	0.99	Pass

One result was outside the control limits for accuracy in the 2012 Interlaboratory Comparison program studies. The I-131 in milk had a River Bend (RBS) to Reference Lab (EZA) ratio of 0.67 with the passing lower limit being 0.80 (Ratio for Agreement range of 0.80 – 1.25). The mean for RBS was 67 pCi/L while EZA's mean was 99.7 pCi/L.

Review of the data results for I-131 in milk shows consistently low values whereas the other isotopes did not and were well within the passing range. Analytics was contacted to see if there was a low bias of reporting I-131 in milk by other participants. All other participant results looked normal with no low bias responses with the sample.

A mixed gamma in water sample was also counted in the same time period as the mixed gamma in milk. The I-131 in the water sample had a RBS to EZA ratio of 1.03 indicating that RBS had a slightly higher result than the known EZA value. Data review of the weekly system background and daily background checks were performed and showed nothing out of the ordinary. There are no anomalies to explain the low reporting value of I-131 in milk. The technician that counted the sample is no longer with the lab so he cannot be questioned as to his thoughts on the low I-131 results. A new milk sample was ordered. The I-131 ratio results for the new sample were 1.05 which is well within the passing range. There are no sample preparation procedures or techniques to change in order to eliminate the low sample results in the future.

Environmental samples are analyzed and reported with a ninety-five percent confidence level. A known standard is counted daily prior to any samples and must read within the control limits of the decay corrected activity; therefore, there is no impact accessed on previously reported data due to these results.

CHEMISTRY SURVEILLANCE PROGRAM
RADIOCHEMISTRY QUALITY CONTROL ACCEPTANCE CRITERIA

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgment limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated uncertainty. As that ratio, referred to in this program as "Resolution", increases the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement must be considered acceptable as the resolution decreases.

RESOLUTION[1]	RATIO FOR AGREEMENT[2]
<4	No Comparison
4 to 7	0.5 to 2.0
8 to 15	0.6 to 1.66
16 to 50	0.75 to 1.33
51 to 200	0.80 to 1.25
>200	0.85 to 1.18

(1) Resolution = (NRC Reference Value/Reference Uncertainty)

(2) Ratio = (Licensee Value/NRC Reference Value)

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 2012. 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 2012.
- Inter-laboratory QC results analyzed during 2012 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 Florida/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, revision 1. 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
- A2LA, American Association for Laboratory Accreditation
- DOD ELAP, US Department of Defense Environmental Accreditation Program
- NUPIC, Nuclear Procurement Issues Committee
- South Carolina Department of Heath and Environmental Control (SC DHEC)

The annual radiochemistry laboratory internal audit (12-RAD-001) was conducted in March 2012. Two (2) findings, three (3) observations, and three (3) recommendations resulted from this assessment. In May, 2012, each finding was closed and appropriate laboratory staff addressed each observation and recommendation.

The Nuclear Procurement Issues Committee (NUPIC) follow up verification audit was conducted on October 16, 2012 through October 17, 2012. This Duke Energy/NUPIC QA audit was performed to verify that the six audit findings identified in the 2011 NUPIC audit had been successfully implemented.

The audit confirmed that the actions taken to the six findings have been adequately addressed by GEL. The Audit Report # 22837-A for Supplier Number 5644 has been posted on the NUPIC website.

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 2012, forty-three (43) 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 forty-four (444) total results reported, 98% (433 of 444) were found to be acceptable. The list below contains the type of matrix evaluated by GEL.

Air Filter	Water	Soil	Vegetation
Cartridge	Milk	Liquid	

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 nintety-two (92) 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 25, 26 and 27 were analyzed by the laboratory. Of the one hundred twenty-nine (129) analyses, 94% (121 out of 129) of all results fell within the PT provider's acceptance criteria. Eight analytical failures occurred: Cobalt-57 in soil, Uranium-234/235 in filter, Strontium-90 in vegetation, Uranium 234/235 in vegetation, Strontium-90 in soil, Uranium-234/235 in filter, Uranium-238 in filter and Gross Alpha in Filter.

For the corrective actions associated with MAPEP Series 26 and 27, refer to CARR120711-694, CARR120711-698, CARR121127-742, CARR121127-743, and CARR121127-744 please see Table 8.

10. Summary of Participation in the ERA MRaD PT Program

The ERA MRad program provided samples (MRAD-16 and MRAD-17) for one hundred seventy-nine individual environmental analyses. All results (100%) fell within the PT provider's acceptance criteria.

11. Summary of Participation in the ERA PT Program

The ERA program provided samples (RAD-88, RAD-89, RAD-90 and RAD-91) for forty-four (44) individual environmental analyses. Of the 44 analyses, 93% (41 out of 44) of all results fell within the PT provider's acceptance criteria. Three analytical failures occurred: Barium-133 in water, Zinc-65 in soil, and I-131 in water.

For the corrective actions associated with RAD-88, and RAD-90, refer to corrective actions CARR120306-667 and CARR120831-715 (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 2012. **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. MARLAP, Multi-Agency Radiological Laboratory Analytical Protocols
12. 10 CFR Part 21, Reporting of Defects and Noncompliance
13. 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
14. 10 CFR Part 61, Licensing Requirements for Land Disposal and Radioactive Waste
15. NRC REG Guide 4.15 and NRC REG Guide 4.8

TABLE 1

2012 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
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Barium-133	58.2	57.1	47.3-63.0	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cesium-134	63.5	64	52.0-70.4	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cesium-137	89.5	91.2	82.1-103	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cobalt-60	49.5	48.9	44.0-56.4	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Zinc-65	75	71.8	64.2-86.7	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Alpha	31.0	35.7	18.4-45.9	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Beta	27.3	28.8	18.3-36.6	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Alpha	29.8	35.7	18.4-45.9	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-226	8.89	8.73	6.55-10.2	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-228	5.9	5.78	3.53-7.60	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Uranium (Nat)	31.6	32.5	26.2-36.3	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	ug/L	Uranium (Nat) mass	49.9	47.5	38.3-53.1	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-226	8.80	8.73	6.55-10.2	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-228	4.8	5.78	3.53-7.60	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Uranium (Nat)	27.6	32.5	26.2-36.3	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	ug/L	Uranium (Nat) mass	41.2	47.5	38.3-53.1	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Tritium	16200	19200	16800-21100	Not Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-89	38.4	42.5	32.7-49.6	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-90	23.5	24.2	17.4-28.3	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-89	42.2	42.5	32.7-49.6	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-90	24.2	24.2	17.4-28.3	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Iodine-131	28.4	25.7	21.3-30.3	Acceptable
ERA	1st/2012	03/06/12	RAD - 88	Water	pCi/L	Iodine-131	28.4	25.7	21.3-30.3	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2012	02/08/12	E8197-278	Cartridge	pCi	Iodine-131	9.52E+01	8.92E+01	1.07	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Strontium-89	8.78E+01	8.96E+01	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Strontium-90	1.51E+01	1.48E+01	1.02	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Iodine-131	9.36E+01	9.02E+01	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Chromium-51	5.53E+02	5.66E+02	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-134	1.59E+02	1.71E+02	0.93	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-137	2.27E+02	2.10E+02	1.08	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cobalt-58	2.18E+02	2.21E+02	0.99	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Manganese-54	2.52E+02	2.41E+02	1.05	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Iron-59	1.90E+02	1.83E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Zinc-65	3.19E+02	2.91E+02	1.09	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cobalt-60	2.82E+02	2.70E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-141	1.00E+01	Not spiked	None	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Iodine-131	8.44E+01	8.87E+01	0.95	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Chromium-51	5.32E+02	5.66E+02	0.94	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-134	1.56E+02	1.71E+02	0.91	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-137	2.06E+02	2.10E+02	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cobalt-58	2.02E+02	2.21E+02	0.92	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Manganese-54	2.50E+02	2.41E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Iron-59	1.81E+02	1.83E+02	0.99	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Zinc-65	2.95E+02	2.91E+02	1.01	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cobalt-60	2.58E+02	2.70E+02	0.96	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-141	-9.60E+01	Not spiked	None	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Iodine-131	1.01E+02	9.38E-01	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cerium-141	2.64E+00	2.60E+00	1.01	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Chromium-51	3.34E+02	3.09E+02	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cesium-134	9.90E-01	1.13E+02	0.94	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cesium-137	1.26E+02	1.13E+02	1.12	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cobalt-58	9.55E-01	9.34E-01	1.02	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Manganese-54	1.49E+02	1.38E+02	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Iron-59	1.40E+02	1.19E+02	1.18	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Zinc-65	2.58E+02	2.35E+02	1.1	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cobalt-60	2.14E+02	1.97E+02	1.09	Acceptable
EZA	1st/2012	03/15/12	E10041	Milk	pCi/L	Strontium-89	7.94E-01	7.99E-01	0.99	Acceptable
EZA	1st/2012	03/15/12	E10041	Milk	pCi/L	Strontium-90	1.12E+01	1.14E+01	0.98	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Iodine-131	1.02E+02	1.54E+02	1.10	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cerium-141	2.64E+02	2.60E+02	1.01	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Chromium-51	4.46E+02	4.36E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cesium-134	1.31E+02	1.49E+02	0.88	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cesium-137	1.62E+02	1.59E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cobalt-58	1.28E+02	1.32E+02	0.97	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Manganese-54	1.99E+02	1.95E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Iron-59	1.96E+02	1.68E+02	1.17	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Zinc-65	3.50E+02	3.33E+02	1.05	Acceptable
EZA	1st/2012	03/15/12	E10040	Milk	pCi/L	Cobalt-60	2.90E+02	2.79E+02	1.04	Acceptable
EZA	1st/2012	03/15/12	E7465-278	Cartridge	pCi	Iodine-131	8.93E+01	9.42E+01	0.95	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Actinium-228	1330	1570	110-2180	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Americium-241	900	938	549-1220	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Bismuth-212	1540	1550	413-2280	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Bismuth-214	1100	1100	665-1590	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cesium-134	2380	2180	1420-2620	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cesium-137	10700	8770	6720-11300	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cobalt-60	4060	3500	2370-4820	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Lead-212	1380	1510	992-2110	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Lead-214	1350	1110	647-1650	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Manganese-54	<37.2	<1000	0-1000	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Plutonium-238	842	984.00	592-1360	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Plutonium-239	793	879.00	575-1210	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Potassium-40	10400	11600	8470-15600	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Strontium-90	7370	8800	3360-13900	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Thorium-234	2360	2000	632-3760	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Zinc-65	4540	3650	2910-4850	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Strontium-90	7370	8800	3360-13900	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-234	2250	1960	1200-2510	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-238	1620	2000	1240-2540	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-Total	4220	4030	2190-5320	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Soil	ug/kg	Uranium-Total (mass)	5070	5880	3240-7400	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Americium-241	4270	4540	2780-6040	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Curium-244	829	812	400 - 1260	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Plutonium-238	2300	2570	1400-3220	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Plutonium-239	2480	2570	1580-3540	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Uranium-234	3310	3610	2370-4640	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Uranium-238	3540	3580	2390-4550	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Uranium-Total	7025	7350	4980-9150	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	ug/kg	Uranium-Total (mass)	10600	10700	7170-13600	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Americium-241	4270	4540	2780-6040	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Cesium-134	2840	2920	1880-3790	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Cesium-137	1330	1340	972-1860	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Cobalt-60	2380	2210	1520-3090	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Manganese-54	<68.8	<300	0.00-300	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Potassium-40	33700	28600	20700-40100	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Zinc-65	2570	2310	1670-3240	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Veg	pCi/kg	Strontium-90	7000	8520	4860-11300	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Americium-241	72.4	68.8	42.4-93.1	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Plutonium-238	57.3	63.2	43.3-83.1	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Plutonium-239	58.8	63	45.6-82.4	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-234	42.5	47.5	29.4-71.6	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-238	44.5	47.4	30.4-65.1	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-Total	89.4	96.7	53.5-147	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	ug/Filter	Uranium-Total (mass)	134	141	90.2-198	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Americium-241	72.4	68.8	42.4-93.1	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cesium-134	260	279	182 - 345	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cesium-137	1210	1130	849-1480	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cobalt-60	942	880	681-1100	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Manganese-54	<7.68	<50.0	0-50.0	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Zinc-65	1040	897	642-1240	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Strontium-90	87	89.6	43.8-134	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Iron-55	776	739	229-1440	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	ug/Filter	Uranium-Total (mass)	147	141	90.2-198	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Gross Alpha	93.9	77.8	26.1-121	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Gross Beta	57.3	52.5	33.2-76.5	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-234	92.6	105	78.9-135	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-238	94.9	104	79.3-128	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-Total	192.6	214	157-277	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	ug/L	Uranium-Total (mass)	285	312	249-377	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Americium-241	132	135	91.0-181	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Plutonium-238	127	135	99.9-168	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Plutonium-239	107	112	86.9-141	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cesium-134	580	609	447-700	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cesium-137	1290	1250	1060-1500	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cobalt-60	910	875	760-1020	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Manganese-54	<5.0	<100	0.00-100	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Zinc-65	822	749	624-945	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Strontium-90	970	989	644-1310	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Iron-55	987	863	514-1170	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Gross Alpha	95.9	103	36.6-160	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Gross Beta	50	43.7	25.0-64.7	Acceptable
ERA	2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Tritium	8740	9150	6130-13000	Acceptable
ERA	2nd/2012	05/24/12	RAD-89	Water	pCi/L	Tritium	1700	15800	13800-17400	Acceptable
MAPEP	2nd/2012	05/03/12	MAPEP-11-GrF24	Filter	Bq/sample	Gross Alpha	0.000	0.000	False Pos. Test	Acceptable
MAPEP	2nd/2012	05/03/12	MAPEP-11-GrF24	Filter	Bq/sample	Gross Beta	0.000	0.000	False Pos. Test	Acceptable
EZA	2nd/2012	06/14/12	E10175	Cartridge	pCi	Iodine-131	9.67E+01	9.72E+01	0.99	Acceptable
EZA	2nd/2012	06/14/12	E10176	Milk	pCi/L	Strontium-89	1.11E+02	9.98E+01	1.11	Acceptable
EZA	2nd/2012	06/14/12	E10176	Milk	pCi/L	Strontium-90	1.06E+02	1.27E+01	0.83	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Iodine-131	9.94E+01	9.97E+01	1.00	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cerium-141	8.62E+01	8.22E+01	1.05	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Chromium-51	3.76E+02	4.02E+02	0.94	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cesium-134	1.63E+02	1.74E+02	0.93	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cesium-137	2.08E+02	2.12E+02	0.98	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cobalt-58	8.94E+01	9.23E+01	0.97	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Manganese-54	1.27E+02	1.32E+02	0.96	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Iron-59	1.46E+02	1.28E+02	1.14	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Zinc-65	2.22E+02	1.99E+02	1.11	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cobalt-60	3.52E+02	3.55E+02	0.99	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Iodine-131	9.94E+01	9.94E+01	1.00	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cerium-141	1.31E+02	1.12E+02	1.17	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Chromium-51	5.51E+02	5.48E+02	1.01	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cesium-134	2.22E+02	2.38E+02	0.93	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cesium-137	2.91E+02	2.89E+02	1.01	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cobalt-58	1.35E+02	1.26E+02	1.07	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Manganese-54	1.83E+02	1.80E+02	1.02	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Iron-59	2.00E+02	1.74E+02	1.15	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Zinc-65	2.94E+02	2.72E+02	1.08	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cobalt-60	5.04E+02	4.84E+02	1.04	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Americium-241	152	159	111-207	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cesium-134	754	828	580-1076	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cesium-137	0	0	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cobalt-57	1430.0	1179	825-1533	Warning
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cobalt-60	0.97	1.56	Sens. Eval.	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Iron-55	1456	1370	959-1781	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Manganese-54	596	558	391-725	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Nickel-63	888.0	862	603-1121	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Plutonium-238	127.0	136	95-177	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Plutonium-239/240	61.13	65.8	46.1-85.5	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Potassium-40	1495	1491	1044-1938	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Strontium-90	391.7	392	274-510	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Technetium-99	345.3	374	262-486	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Americium-241	1.5067	1.630	1.14-2.12	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cesium-134	0.09	0.0	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cesium-137	41.2	39.9	27.9-51.9	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cobalt-57	34.45	32.9	23.0-42.8	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cobalt-60	23.90	23.7	16.60-30.84	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Hydrogen-3	481.7	437	306-568	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Iron-55	88.10	81.9	57.3-106.5	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Manganese-54	33.3	31.8	22.3-41.3	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Nickel-63	59.6	60.0	42.0-78.0	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Plutonium-238	0.555	0.629	0.110-0.818	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Plutonium-239/240	1.230	1.340	0.94-1.74	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Potassium-40	156.5	142	99-185	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Strontium-90	0.01	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Technetium-99	26.3	27.90	19.5-36.3	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Uranium-234/233	0.381	0.39	0.270-0.510	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Uranium-238	2.537	2.76	1.93-3.59	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Zinc-65	-0.220	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-GrW26	Water	Bq/L	Gross Alpha	2.043	2.140	0.64-3.64	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-GrW26	Water	Bq/L	Gross Beta	6.820	6.36	3.18-9.54	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-235	0.200	0.019	0.0131-0.243	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-238	9.5	10.0	7.0-13.0	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-Total	9.98	10.0	7.0-13.0	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Americium-241	0.660	0.073	0.051-0.095	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cesium-134	2.29	2.38	1.67-3.09	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cesium-137	1.910	1.79	1.25-2.33	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cobalt-57	0.008	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cobalt-60	2.235	2.18	1.527-2.837	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Manganese-54	3.440	3.24	2.27-4.21	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Plutonium-238	0.004	0.002	Sens. Eval.	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Plutonium-239/240	0.088	0.0970	0.068-0.126	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Strontium-90	0.012	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Uranium-234/233	0.010	0.0188	0.0132-0.0244	Not Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Uranium-238	0.111	0.124	0.087-0.161	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Zinc-65	3.460	2.99	2.09-3.89	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Gross Alpha	0.780	1.200	0.4-2.0	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Gross Beta	2.59	2.40	1.2-3.6	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Americium-241	0.005	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Cesium-134	7.655	8.43	5.90-10.96	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Cesium-137	-0.025	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Cobalt-57	11.950	12.00	8.4-15.6	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Cobalt-60	6.255	6.05	4.24-7.87	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Manganese-54	0.029	0.00	False Pos Test	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Plutonium-238	0.194	0.219	0.153-0.285	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Plutonium-239/240	0.1226	0.152	0.106-0.198	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Strontium-90	1.613	2.11	1.48-2.74	Warning
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Uranium-234/233	0.030	0.411	0.0288-0.0534	Warning
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Uranium-238	0.224	0.278	0.195-0.361	Acceptable
MAPEP	3rd/2012	07/26/12	MAPEP-12-RdV26	Vegetation	Bq/sample	Zinc-65	9.720	8.90	6.23-11.57	Acceptable
EZA	3rd/2012	11/06/12	E10281	Cartridge	pCi	Iodine-131	1.02E+02	9.64E+01	1.06	Acceptable
EZA	3rd/2012	11/06/12	E10283	Milk	pCi/L	Strontium-89	9.87E+01	9.96E+01	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10283	Milk	pCi/L	Strontium-90	1.44E+01	1.60E+01	0.9	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Iodine-131	9.69E+01	9.96E+01	0.97	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cerium-141	1.61E+02	1.64E+02	0.98	Acceptable

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EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Chromium-51	2.92E+02	2.48E+02	1.18	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cesium-134	9.85E+01	1.08E+02	0.91	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cesium-137	1.76E+02	1.74E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cobalt-58	9.72E+01	1.00E+02	0.97	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Manganese-54	1.98E+02	1.96E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Iron-59	1.62E+02	1.52E+02	1.07	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Zinc-65	2.08E+02	1.92E+02	1.08	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cobalt-60	1.59E+02	1.52E+02	1.05	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Iodine-131	1.10E+02	9.99E+01	1.1	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cerium-141	2.49E+02	2.51E+02	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Chromium-51	3.75E+02	3.80E+02	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cesium-134	1.51E+02	1.66E+02	0.91	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cesium-137	2.72E+02	2.67E+02	1.02	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cobalt-58	1.56E+02	1.54E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Manganese-54	3.16E+02	3.00E+02	1.05	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Iron-59	2.65E+02	2.33E+02	1.14	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Zinc-65	3.20E+02	2.95E+02	1.09	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cobalt-60	2.42E+02	2.33E+02	1.04	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Americium-241	106.67	111	78-144	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cesium-134	839.5	939	657-1221	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cesium-137	1230.0	1150	805-1495	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cobalt-57	1605	1316	921-1711	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cobalt-60	551.5	531	372-690	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Iron-55	459.3	508	356-660	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Manganese-54	1015	920	644-1196	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Plutonium-238	104.6	106	74.1-137.5	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Plutonium-239/240	132.33	134	94-174	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Potassium-40	723	632	442-822	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Strontium-90	476.7	508	356-660	Warning
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Technetium-99	385.3	469	328-610	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Uranium-234/233	51.6	60	42.2-78.4	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Uranium-238	238.33	263	184-342	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Zinc-65	721.5	606	424-788	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Americium-241	0.9407	1.06	0.74-1.38	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cesium-134	20.6	23.2	16.2-30.2	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cesium-137	17.05	16.7	11.7-21.7	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cobalt-57	29.45	29.3	20.5-38.1	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cobalt-60	0.03	0.0	False Positive	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Hydrogen-3	334	334	234-434	Acceptable

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MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Manganese-54	18.4	17.8	12.5-23.1	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Nickel-63	66.2	66.3	46.4-86.2	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Plutonium-238	0.0088	0.0	Sensitivity Eval.	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Plutonium-239/240	1.44	1.61	1.13-2.09	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Potassium-40	140.5	134	94-174	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Strontium-90	11.13	12.2	8.5-15.9	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Technetium-99	4.5	4.58	3.21-5.95	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Uranium-234/233	0.414	0.451	0.316-0.586	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Uranium-238	2.96	3.33	2.33-4.33	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Zinc-65	28.15	25.9	18.1-33.7	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-GrW27	Water	Bq/L	Gross Alpha	1.737	1.79	0.54-3.04	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-GrW27	Water	Bq/L	Gross Beta	8.893	9.1	4.6-13.7	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-XaW27	Water	Bq/L	Iodine-129	6.229	6.82	4.77-8.87	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-235	0.0154	0.0148	0.0104-0.0192	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-238	7.77	8	5.6-10.4	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-Total	7.785	8.1	5.7-10.5	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Americium-241	0.0716	0.078	0.0546-0.1014	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cesium-134	2.795	2.74	1.92-3.56	Acceptable

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MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cesium-137	-0.016	0	False Positive	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cobalt-57	2.265	1.91	1.34-2.48	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cobalt-60	1.865	1.728	1.210-2.246	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Manganese-54	2.465	2.36	1.65-3.07	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Plutonium-238	0.061	0.0625	0.0438-0.0813	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Plutonium-239/240	-0.002	0.00081	Sensitivity Eval.	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Strontium-90	0.914	1.03	0.72-1.34	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-234/233	0.009	0.0141	0.0099-0.0183	Not Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-238	0.087	0.1	0.070-0.130	Not Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Zinc-65	-0.154	0	False Positive	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-GrF27	Filter	Bq/sample	Gross Alpha	0.2253	0.97	0.29-1.65	Not Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-GrF27	Filter	Bq/sample	Gross Beta	1.93	1.92	0.96-2.88	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Americium-241	0.142	0.163	0.114-0.212	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Cesium-134	6.355	6.51	4.56-8.46	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Cesium-137	4.575	4.38	3.07-5.69	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Cobalt-57	6.04	5.66	3.96-7.36	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Cobalt-60	5.44	5.12	3.58-6.66	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Manganese-54	3.565	3.27	2.29-4.25	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Plutonium-238	0.176	0.187	0.131-0.243	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Plutonium-239/240	0.12	0.123	0.086-0.160	Acceptable

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MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Strontium-90	0.0018	0	False Positive	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Uranium-234/233	0.024	0.0257	0.0180-0.0334	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Uranium-238	0.143	0.158	0.111-0.205	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Uranium-Total	11.1	12.7	8.9-16.5	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-12-RdV27	Vegetation	Bq/sample	Zinc-65	-0.04	0	False Positive	Acceptable
MAPEP	4th/2012	11/26/12	MAPEP-11-XaW25	Water	Bq/sample	Iodine-129	8.723	9.5	6.7 - 12.4	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	4310	4310	2830-5540	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	4330	4280	2860-5440	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	4849	5190	2960 - 7010	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	8860	8790	5960-10900	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	3720	3400	2080-4360	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	3350	3420	2120-4340	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	7232	6970	3780-9200	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	10400	10200	5620-12800	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Actinium-228	1400	1240	795-1720	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Americium-241	847	728	426-946	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Bismuth-212	1300	1240	330-1820	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Bismuth-214	1310	1290	777-1860	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-134	2210	1980	1290-2380	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-137	4140	3470	2660-4460	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cobalt-60	5270	4310	2910-5930	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Lead-212	1250	1240	812-1730	Acceptable

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ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Lead-214	1580	1290	753-1920	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Manganese-54	< 35	< 1000	0.00 - 1000	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-238	1250	981	590-1350	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-239	1110	871	569-1200	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Potassium-40	11000	12300	8980-16500	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Thorium-234	5120	3420	1080-6430	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Zinc-65	3770	2880	2290-3830	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Strontium-90	6670	6860	2620-10800	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	2640	2530	1600 - 3140	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	2450	2560	1560 - 3250	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	5200	5190	2960 - 7010	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7286	7570	4160 - 9520	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7430	7570	4160 - 9520	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Americium-241	3040	2980	1700 - 4090	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Curium-244	697	642	316 - 1000	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-238	3000	2880	1560 - 4220	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-239	2910	2980	1850 - 4060	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	2580	2420	1660 - 3210	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	2660	2400	1690 - 3030	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	5356	4920	3330 - 6120	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7970	7180	4810 - 9120	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-134	1480	1380	790 - 1910	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-137	1570	1270	932 - 1760	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cobalt-60	1800	1500	1010 - 2160	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Manganese-54	< 44.0	< 300	0.00 - 300	Acceptable

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ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Potassium-40	32100	28800	20700 - 40800	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Zinc-65	3470	2770	2000 - 3790	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Strontium-90	6320	5440	3040 - 7220	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Americium-241	3780	3540	2160-4710	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Curium-244	1910	1850	906-2880	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Plutonium-238	2360	2250	1340-3080	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Plutonium-239	2270	2170	1330-2990	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-234	4310	4310	2830-5540	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-238	4330	4280	2860-5440	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-Total	8860	8790	5960-10900	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	ug/kg	Uranium-Total (mass)	13000	12800	8580-16200	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	ug/kg	Uranium-Total (mass)	11900	12800	8580-16200	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cesium-134	2240	2350	1510-3050	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cesium-137	2190	2070	1500-2880	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cobalt-60	2360	2030	1400-2840	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Manganese-54	< 38.6	< 300	0.00 - 300	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Potassium-40	36000	29600	21400-41500	Acceptable

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ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Zinc-65	2500	1970	1420-2760	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Strontium-90	9040	10000	5700-13300	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Americium-241	64.7	67.1	41.4-90.8	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Plutonium-238	50.3	55	37.7-72.3	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Plutonium-239	53.8	56.8	41.1-74.2	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-234	49.1	55.2	34.2-83.2	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-238	55	54.7	35.3-75.6	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total	106.6	112	62.0-170	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	ug/Filter	Uranium-Total (mass)	165	164	105-231	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cesium-134	393	429	273-532	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cesium-137	810	793	596-1040	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cobalt-60	532	521	403-651	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Manganese-54	< 3.97	< 50.0	0.00 - 50.0	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Zinc-65	765	692	496-955	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Strontium-90	167	166	81.1-249	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total (mass)	152	164	105-231	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total (mass)	160	164	105-231	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Gross Alpha	110	87	30.3 - 87.8	Acceptable
ERA	4th /2012	12/12/12	MRAD-17	Filter	pCi/Filter	Gross Beta	71.2	62.7	39.6-91.4	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	155	159	119-205	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	161	158	120-194	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	323.6	324	238-419	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	ug/L	Uranium-Total (mass)	482	473	337-572	Acceptable

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ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Americium-241	96.3	91.8	61.8-123	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Plutonium-238	98	97.7	72.3-122	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Plutonium-239	82.5	85.8	66.6-108	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	155	159	119-205	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	161	158	120-194	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	312.6	324	238-419	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	ug/L	Uranium-Total (mass)	482	473	377-572	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cesium-134	786	876	643-1010	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cesium-137	2050	2040	1730-2440	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cobalt-60	1270	1260	1090-1470	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Manganese-54	< 7.27	< 100	0.00 - 100	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Zinc-65	950	879	733-1110	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Strontium-90	577	681	444-900	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	158	159	119-205	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	162	158	120-194	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	327.7	324	238-419	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	485	473	337-572	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	156	159	119-205	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	162	158	120-194	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	318	324	238-419	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	482	473	337-572	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	463	473	337-572	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Iron-55	673	548	327-743	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Gross Alpha	62.1	76.9	27.3-119	Acceptable
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Gross Beta	57.4	62.6	35.8-92.7	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2012	12/12/12	MRAD-17	Water	pCi/L	Tritium	17900	18700	12500-26700	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Barium-133	72.7	65.0	54.1-71.5	Not Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cesium-134	87.5	92.5	76.0-102	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cesium-137	219	216	194-239	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cobalt-50	55.6	51.3	46.2-59.0	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Zinc-65	108	98.9	89.0-118	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Alpha	38.8	48.2	25.1-60.8	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Beta	34.4	36.8	24.2-44.4	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Alpha	40.9	48.2	25.1-60.6	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-226	14.4	12.6	9.40-14.5	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-226	14.6	12.6	9.40-14.5	Not Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-228	4.3	5.01	2.99-6.72	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Uranium (Nat)	49.4	49.7	40.3-55.2	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	ug/L	Uranium (Nat) mass	73.4	72.5	58.8-80.6	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Tritium	7290	6790	5860-7470	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-89	55	47.9	37.5-55.2	Acceptable

PT Provider	Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-90	27.1	28.7	20.9-33.4	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-89	48.3	47.9	37.5-55.2	Acceptable
ERA	3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-90	28.9	28.7	20.9-33.4	Acceptable
ERA	3rd/2012	8/31/2012	RAD-91	Water	pCi/L	Barium-133	84.9	84.8	71.3-93.3	Acceptable
ERA	3rd/2012	8/31/2012	RAD-91	Water	pCi/L	Radium-226	12.8	15	11.2-17.2	Acceptable

TABLE 2

2012 ECKERT & ZIEGLER ANALYTICS PERFORMANCE EVALUATION RESULTS

PT Provider	Quarter / Year	Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2012	02/08/12	E8197-278	Cartridge	pCi	Iodine-131	9.52E+01	8.92E+01	1.07	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Strontium-89	8.78E+01	8.96E+01	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Strontium-90	1.51E+01	1.48E+01	1.02	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Iodine-131	9.36E+01	9.02E+01	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Chromium-51	5.53E+02	5.66E+02	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-134	1.59E+02	1.71E+02	0.93	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-137	2.27E+02	2.10E+02	1.08	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cobalt-58	2.18E+02	2.21E+02	0.99	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Manganese-54	2.52E+02	2.41E+02	1.05	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Iron-59	1.90E+02	1.83E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Zinc-65	3.19E+02	2.91E+02	1.09	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cobalt-60	2.82E+02	2.70E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Milk	pCi/L	Cesium-141	1.00E+01	Not spiked	None	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Iodine-131	8.44E+01	8.87E+01	0.95	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Chromium-51	5.32E+02	5.66E+02	0.94	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-134	1.56E+02	1.71E+02	0.91	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-137	2.06E+02	2.10E+02	0.98	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cobalt-58	2.02E+02	2.21E+02	0.92	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Manganese-54	2.50E+02	2.41E+02	1.04	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Iron-59	1.81E+02	1.83E+02	0.99	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Zinc-65	2.95E+02	2.91E+02	1.01	Acceptable

PT Provider	Quarter / Year	Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cobalt-60	2.58E+02	2.70E+02	0.96	Acceptable
EZA	1st/2012	02/08/12	E8197-278	Water	pCi/L	Cesium-141	-9.60E+01	Not spiked	None	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Iodine-131	1.01E+02	9.38E-01	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cerium-141	2.64E+00	2.60E+00	1.01	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Chromium-51	3.34E+02	3.09E+02	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cesium-134	9.90E-01	1.13E+02	0.94	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cesium-137	1.26E+02	1.13E+02	1.12	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cobalt-58	9.55E-01	9.34E-01	1.02	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Manganese-54	1.49E+02	1.38E+02	1.08	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Iron-59	1.40E+02	1.19E+02	1.18	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Zinc-65	2.58E+02	2.35E+02	1.1	Acceptable
EZA	1st/2012	03/15/12	E10043	Water	pCi/L	Cobalt-60	2.14E+02	1.97E+02	1.09	Acceptable
EZA	1st/2012	03/15/12	E10041	Milk	pCi/L	Strontium-89	7.94E-01	7.99E-01	0.99	Acceptable
EZA	1st/2012	03/15/12	E10041	Milk	pCi/L	Strontium-90	1.12E+01	1.14E+01	0.98	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Iodine-131	1.02E+02	1.54E+02	1.10	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cerium-141	2.64E+02	2.60E+02	1.01	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Chromium-51	4.46E+02	4.36E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cesium-134	1.31E+02	1.49E+02	0.88	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cesium-137	1.62E+02	1.59E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Cobalt-58	1.28E+02	1.32E+02	0.97	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Manganese-54	1.99E+02	1.95E+02	1.02	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Iron-59	1.96E+02	1.68E+02	1.17	Acceptable
EZA	1st/2012	03/15/12	E10042	Milk	pCi/L	Zinc-65	3.50E+02	3.33E+02	1.05	Acceptable
EZA	1st/2012	03/15/12	E10040	Milk	pCi/L	Cobalt-60	2.90E+02	2.79E+02	1.04	Acceptable

PT Provider	Quarter / Year	Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2012	03/15/12	E7465-278	Cartridge	pCi	Iodine-131	8.93E+01	9.42E+01	0.95	Acceptable
EZA	2nd/2012	06/14/12	E10175	Cartridge	pCi	Iodine-131	9.67E+01	9.72E+01	0.99	Acceptable
EZA	2nd/2012	06/14/12	E10176	Milk	pCi/L	Strontium-89	1.11E+02	9.98E+01	1.11	Acceptable
EZA	2nd/2012	06/14/12	E10176	Milk	pCi/L	Strontium-90	1.06E+02	1.27E+01	0.83	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Iodine-131	9.94E+01	9.97E+01	1.00	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cerium-141	8.62E+01	8.22E+01	1.05	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Chromium-51	3.76E+02	4.02E+02	0.94	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cesium-134	1.63E+02	1.74E+02	0.93	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cesium-137	2.08E+02	2.12E+02	0.98	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cobalt-58	8.94E+01	9.23E+01	0.97	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Manganese-54	1.27E+02	1.32E+02	0.96	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Iron-59	1.46E+02	1.28E+02	1.14	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Zinc-65	2.22E+02	1.99E+02	1.11	Acceptable
EZA	2nd/2012	06/14/12	E10177	Milk	pCi/L	Cobalt-60	3.52E+02	3.55E+02	0.99	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Iodine-131	9.94E+01	9.94E+01	1.00	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cerium-141	1.31E+02	1.12E+02	1.17	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Chromium-51	5.51E+02	5.48E+02	1.01	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cesium-134	2.22E+02	2.38E+02	0.93	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cesium-137	2.91E+02	2.89E+02	1.01	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cobalt-58	1.35E+02	1.26E+02	1.07	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Manganese-54	1.83E+02	1.80E+02	1.02	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Iron-59	2.00E+02	1.74E+02	1.15	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Zinc-65	2.94E+02	2.72E+02	1.08	Acceptable
EZA	2nd/2012	06/14/12	E10178	Water	pCi/L	Cobalt-60	5.04E+02	4.84E+02	1.04	Acceptable

PT Provider	Quarter / Year	Report Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	3rd/2012	11/06/12	E10281	Cartridge	pCi	Iodine-131	1.02E+02	9.64E+01	1.06	Acceptable
EZA	3rd/2012	11/06/12	E10283	Milk	pCi/L	Strontium-89	9.87E+01	9.96E+01	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10283	Milk	pCi/L	Strontium-90	1.44E+01	1.60E+01	0.9	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Iodine-131	9.69E+01	9.96E+01	0.97	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cerium-141	1.61E+02	1.64E+02	0.98	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Chromium-51	2.92E+02	2.48E+02	1.18	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cesium-134	9.85E+01	1.08E+02	0.91	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cesium-137	1.76E+02	1.74E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cobalt-58	9.72E+01	1.00E+02	0.97	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Manganese-54	1.98E+02	1.96E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Iron-59	1.62E+02	1.52E+02	1.07	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Zinc-65	2.08E+02	1.92E+02	1.08	Acceptable
EZA	3rd/2012	11/06/12	E10284	Milk	pCi/L	Cobalt-60	1.59E+02	1.52E+02	1.05	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Iodine-131	1.10E+02	9.99E+01	1.1	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cerium-141	2.49E+02	2.51E+02	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Chromium-51	3.75E+02	3.80E+02	0.99	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cesium-134	1.51E+02	1.66E+02	0.91	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cesium-137	2.72E+02	2.67E+02	1.02	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cobalt-58	1.56E+02	1.54E+02	1.01	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Manganese-54	3.16E+02	3.00E+02	1.05	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Iron-59	2.65E+02	2.33E+02	1.14	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Zinc-65	3.20E+02	2.95E+02	1.09	Acceptable
EZA	3rd/2012	11/06/12	E10285	Water	pCi/L	Cobalt-60	2.42E+02	2.33E+02	1.04	Acceptable

TABLE 3

2012 DEPARTMENT OF ENERGY MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) RESULTS

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
2nd/2012	05/03/12	MAPEP-11-GrF24	Filter	Bq/sample	Gross Alpha	0.000	0.000	False Pos. Test	Acceptable
2nd/2012	05/03/12	MAPEP-11-GrF24	Filter	Bq/sample	Gross Beta	0.000	0.000	False Pos. Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Americium-241	152	159	111-207	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cesium-134	754	828	580-1076	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cesium-137	0	0	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cobalt-57	1430.0	1179	825-1533	Warning
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Cobalt-60	0.97	1.56	Sens. Eval.	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Iron-55	1456	1370	959-1781	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Manganese-54	596	558	391-725	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Nickel-63	888.0	862	603-1121	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Plutonium-238	127.0	136	95-177	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Plutonium-239/240	61.13	65.8	46.1-85.5	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Potassium-40	1495	1491	1044-1938	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Strontium-90	391.7	392	274-510	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaS26	Soil	mg/kg	Technetium-99	345.3	374	262-486	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Americium-241	1.5067	1.630	1.14-2.12	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cesium-134	0.09	0.0	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cesium-137	41.2	39.9	27.9-51.9	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cobalt-57	34.45	32.9	23.0-42.8	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Cobalt-60	23.90	23.7	16.60-30.84	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Hydrogen-3	481.7	437	306-568	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Iron-55	88.10	81.9	57.3-106.5	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Manganese-54	33.3	31.8	22.3-41.3	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Nickel-63	59.6	60.0	42.0-78.0	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Plutonium-238	0.555	0.629	0.110-0.818	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Plutonium-239/240	1.230	1.340	0.94-1.74	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Potassium-40	156.5	142	99-185	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Strontium-90	0.01	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Technetium-99	26.3	27.90	19.5-36.3	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Uranium-234/233	0.381	0.39	0.270-0.510	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Uranium-238	2.537	2.76	1.93-3.59	Acceptable
3rd/2012	07/26/12	MAPEP-12-MaW26	Water	Bq/L	Zinc-65	-0.220	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-GrW26	Water	Bq/L	Gross Alpha	2.043	2.140	0.64-3.64	Acceptable
3rd/2012	07/26/12	MAPEP-12-GrW26	Water	Bq/L	Gross Beta	6.820	6.36	3.18-9.54	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-235	0.200	0.019	0.0131-0.243	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-238	9.5	10.0	7.0-13.0	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Uranium-Total	9.98	10.0	7.0-13.0	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	ug/sample	Americium-241	0.066	0.073	0.051-0.095	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cesium-134	2.29	2.38	1.67-3.09	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cesium-137	1.910	1.79	1.25-2.33	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cobalt-57	0.008	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Cobalt-60	2.235	2.18	1.527-2.837	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Manganese-54	3.440	3.24	2.27-4.21	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Plutonium-238	0.004	0.002	Sens. Eval.	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Plutonium-239/240	0.088	0.0970	0.068-0.126	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Strontium-90	0.012	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Uranium-234/233	0.010	0.0188	0.0132-0.0244	Not Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Uranium-238	0.111	0.124	0.087-0.161	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Zinc-65	3.460	2.99	2.09-3.89	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Gross Alpha	0.780	1.200	0.4-2.0	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Gross Beta	2.59	2.40	1.2-3.6	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdF26	Filter	Bq/sample	Americium-241	0.005	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Cesium-134	7.655	8.43	5.90-10.96	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Cesium-137	-0.025	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Cobalt-57	11.950	12.00	8.4-15.6	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Cobalt-60	6.255	6.05	4.24-7.87	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Manganese-54	0.029	0.00	False Pos Test	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Plutonium-238	0.194	0.219	0.153-0.285	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Plutonium-239/240	0.1226	0.152	0.106-0.198	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Strontium-90	1.613	2.11	1.48-2.74	Warning
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Uranium-234/233	0.030	0.411	0.0288-0.0534	Warning
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Uranium-238	0.224	0.278	0.195-0.361	Acceptable
3rd/2012	07/26/12	MAPEP-12-RdV26	Veg.	Bq/sample	Zinc-65	9.720	8.90	6.23-11.57	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Americium-241	106.67	111	78-144	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cesium-134	839.5	939	657-1221	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cesium-137	1230.0	1150	805-1495	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cobalt-57	1605	1316	921-1711	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Cobalt-60	551.5	531	372-690	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Iron-55	459.3	508	356-660	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Manganese-54	1015	920	644-1196	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Plutonium-238	104.6	106	74.1-137.5	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Plutonium-239/240	132.33	134	94-174	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Potassium-40	723	632	442-822	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Strontium-90	476.7	508	356-660	Warning
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Technetium-99	385.3	469	328-610	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Uranium-234/233	51.6	60	42.2-78.4	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Uranium-238	238.33	263	184-342	Acceptable
4th/2012	11/26/12	MAPEP-12-MaS27	Soil	Bq/kg	Zinc-65	721.5	606	424-788	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Americium-241	0.9407	1.06	0.74-1.38	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cesium-134	20.6	23.2	16.2-30.2	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cesium-137	17.05	16.7	11.7-21.7	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cobalt-57	29.45	29.3	20.5-38.1	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Cobalt-60	0.03	0.0	False Positive	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Hydrogen-3	334	334	234-434	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Manganese-54	18.4	17.8	12.5-23.1	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Nickel-63	66.2	66.3	46.4-86.2	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Plutonium-238	0.0088	0.0	Sensitivity Eval.	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Plutonium-239/240	1.44	1.61	1.13-2.09	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Potassium-40	140.5	134	94-174	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Strontium-90	11.13	12.2	8.5-15.9	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Technetium-99	4.5	4.58	3.21-5.95	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Uranium-234/233	0.414	0.451	0.316-0.586	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Uranium-238	2.96	3.33	2.33-4.33	Acceptable
4th/2012	11/26/12	MAPEP-12-MaW27	Water	Bq/L	Zinc-65	28.15	25.9	18.1-33.7	Acceptable
4th/2012	11/26/12	MAPEP-12-GrW27	Water	Bq/L	Gross Alpha	1.737	1.79	0.54-3.04	Acceptable
4th/2012	11/26/12	MAPEP-12-GrW27	Water	Bq/L	Gross Beta	8.893	9.1	4.6-13.7	Acceptable
4th/2012	11/26/12	MAPEP-12-XaW27	Water	Bq/L	Iodine-129	6.229	6.82	4.77-8.87	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-235	0.0154	0.0148	0.0104-0.0192	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-238	7.77	8	5.6-10.4	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-Total	7.785	8.1	5.7-10.5	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Americium-241	0.0716	0.078	0.0546-0.1014	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cesium-134	2.795	2.74	1.92-3.56	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cesium-137	-0.016	0	False Positive	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cobalt-57	2.265	1.91	1.34-2.48	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Cobalt-60	1.865	1.728	1.210-2.246	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Manganese-54	2.465	2.36	1.65-3.07	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Plutonium-238	0.061	0.0625	0.0438-0.0813	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Plutonium-239/240	-0.002	0.00081	Sensitivity Eval.	Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Strontium-90	0.914	1.03	0.72-1.34	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-234/233	0.009	0.0141	0.0099-0.0183	Not Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Uranium-238	0.087	0.1	0.070-0.130	Not Acceptable
4th/2012	11/26/12	MAPEP-12-RdF27	Filter	uq/sample	Zinc-65	-0.154	0	False Positive	Acceptable
4th/2012	11/26/12	MAPEP-12-GrF27	Filter	Bq/sample	Gross Alpha	0.2253	0.97	0.29-1.65	Not Acceptable
4th/2012	11/26/12	MAPEP-12-GrF27	Filter	Bq/sample	Gross Beta	1.93	1.92	0.96-2.88	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Americium-241	0.142	0.163	0.114-0.212	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Cesium-134	6.355	6.51	4.56-8.46	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Cesium-137	4.575	4.38	3.07-5.69	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Cobalt-57	6.04	5.66	3.96-7.36	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Cobalt-60	5.44	5.12	3.58-6.66	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Manganese-54	3.565	3.27	2.29-4.25	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Plutonium-238	0.176	0.187	0.131-0.243	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Plutonium-239/240	0.12	0.123	0.086-0.160	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Strontium-90	0.0018	0	False Positive	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Uranium-234/233	0.024	0.0257	0.0180-0.0334	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Uranium-238	0.143	0.158	0.111-0.205	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Uranium-Total	11.1	12.7	8.9-16.5	Acceptable
4th/2012	11/26/12	MAPEP-12-RdV27	Veg	Bq/sample	Zinc-65	-0.04	0	False Positive	Acceptable
4th/2012	11/26/12	MAPEP-11-XaW25	Water	Bq/sample	Iodine-129	8.723	9.5	6.7 - 12.4	Acceptable

TABLE 4

2012 ERA PROGRAM PERFORMANCE EVALUATION RESULTS

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Barium-133	58.2	57.1	47.3-63.0	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cesium-134	63.5	64	52.0-70.4	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cesium-137	89.5	91.2	82.1-103	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Cobalt-60	49.5	48.9	44.0-56.4	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Zinc-65	75	71.8	64.2-86.7	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Alpha	31.0	35.7	18.4-45.9	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Beta	27.3	28.8	18.3-36.6	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Gross Alpha	29.8	35.7	18.4-45.9	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-226	8.89	8.73	6.55-10.2	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-228	5.9	5.78	3.53-7.60	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Uranium (Nat)	31.6	32.5	26.2-36.3	Acceptable
1st/2012	03/06/12	RAD - 88	Water	ug/L	Uranium (Nat) mass	49.9	47.5	38.3-53.1	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-226	8.80	8.73	6.55-10.2	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Radium-228	4.8	5.78	3.53-7.60	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Uranium (Nat)	27.6	32.5	26.2-36.3	Acceptable
1st/2012	03/06/12	RAD - 88	Water	ug/L	Uranium (Nat) mass	41.2	47.5	38.3-53.1	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Tritium	16200	19200	16800-21100	Not Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-89	38.4	42.5	32.7-49.6	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-90	23.5	24.2	17.4-28.3	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-89	42.2	42.5	32.7-49.6	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Strontium-90	24.2	24.2	17.4-28.3	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Iodine-131	28.4	25.7	21.3-30.3	Acceptable
1st/2012	03/06/12	RAD - 88	Water	pCi/L	Iodine-131	28.4	25.7	21.3-30.3	Acceptable
2nd/2012	05/24/12	RAD-89	Water	pCi/L	Tritium	1700	15800	13800-17400	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Barium-133	72.7	65.0	54.1-71.5	Not Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cesium-134	87.5	92.5	76.0-102	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cesium-137	219	216	194-239	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Cobalt-50	55.6	51.3	46.2-59.0	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Zinc-65	108	98.9	89.0-118	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Alpha	38.8	48.2	25.1-60.8	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Beta	34.4	36.8	24.2-44.4	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Gross Alpha	40.9	48.2	25.1-60.6	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-226	14.4	12.6	9.40-14.5	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-226	14.6	12.6	9.40-14.5	Not Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Radium-228	4.3	5.01	2.99-6.72	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Uranium (Nat)	49.4	49.7	40.3-55.2	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	ug/L	Uranium (Nat) mass	73.4	72.5	58.8-80.6	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Tritium	7290	6790	5860-7470	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-89	55	47.9	37.5-55.2	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-90	27.1	28.7	20.9-33.4	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-89	48.3	47.9	37.5-55.2	Acceptable
3rd/2012	8/31/2012	RAD-90	Water	pCi/L	Strontium-90	28.9	28.7	20.9-33.4	Acceptable
3rd/2012	8/31/2012	RAD-91	Water	pCi/L	Barium-133	84.9	84.8	71.3-93.3	Acceptable
3rd/2012	8/31/2012	RAD-91	Water	pCi/L	Radium-226	12.8	15	11.2-17.2	Acceptable

TABLE 5

2012 ERA PROGRAM (MRAD) PERFORMANCE EVALUATION RESULTS

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Actinium-228	1330	1570	110-2180	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Americium-241	900	938	549-1220	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Bismuth-212	1540	1550	413-2280	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Bismuth-214	1100	1100	665-1590	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cesium-134	2380	2180	1420-2620	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cesium-137	10700	8770	6720-11300	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Cobalt-60	4060	3500	2370-4820	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Lead-212	1380	1510	992-2110	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Lead-214	1350	1110	647-1650	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Manganese-54	<37.2	<1000	0-1000	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Plutonium-238	842	984.00	592-1360	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Plutonium-239	793	879.00	575-1210	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Potassium-40	10400	11600	8470-15600	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Strontium-90	7370	8800	3360-13900	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Thorium-234	2360	2000	632-3760	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Zinc-65	4540	3650	2910-4850	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Strontium-90	7370	8800	3360-13900	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-234	2250	1960	1200-2510	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-238	1620	2000	1240-2540	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	pCi/kg	Uranium-Total	4220	4030	2190-5320	Acceptable
2nd/2012	05/18/12	MRAD-16	Soil	ug/kg	Uranium-Total(mass)	5070	5880	3240-7400	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Americium-241	4270	4540	2780-6040	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Curium-244	829	812	400 - 1260	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Plutonium-238	2300	2570	1400-3220	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Plutonium-239	2480	2570	1580-3540	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Uranium-234	3310	3610	2370-4640	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Uranium-238	3540	3580	2390-4550	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Uranium-Total	7025	7350	4980-9150	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	ug/kg	Uranium-Total(mass)	10600	10700	7170-13600	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Americium-241	4270	4540	2780-6040	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Cesium-134	2840	2920	1880-3790	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Cesium-137	1330	1340	972-1860	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Cobalt-60	2380	2210	1520-3090	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Manganese-54	<68.8	<300	0.00-300	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Potassium-40	33700	28600	20700-40100	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Zinc-65	2570	2310	1670-3240	Acceptable
2nd/2012	05/18/12	MRAD-16	Vegetation	pCi/kg	Strontium-90	7000	8520	4860-11300	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Americium-241	72.4	68.8	42.4-93.1	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Plutonium-238	57.3	63.2	43.3-83.1	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Plutonium-239	58.8	63	45.6-82.4	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-234	42.5	47.5	29.4-71.6	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-238	44.5	47.4	30.4-65.1	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Uranium-Total	89.4	96.7	53.5-147	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	ug/Filter	Uranium-Total(mass)	134	141	90.2-198	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Americium-241	72.4	68.8	42.4-93.1	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cesium-134	260	279	182 - 345	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cesium-137	1210	1130	849-1480	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Cobalt-60	942	880	681-1100	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Manganese-54	<7.68	<50.0	0-50.0	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Zinc-65	1040	897	642-1240	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Strontium-90	87	89.6	43.8-134	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Iron-55	776	739	229-1440	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	ug/Filter	Uranium-Total(mass)	147	141	90.2-198	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Gross Alpha	93.9	77.8	26.1-121	Acceptable
2nd/2012	05/18/12	MRAD-16	Filter	pCi/Filter	Gross Beta	57.3	52.5	33.2-76.5	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-234	92.6	105	78.9-135	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-238	94.9	104	79.3-128	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Uranium-Total	192.6	214	157-277	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	ug/L	Uranium-Total(mass)	285	312	249-377	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Americium-241	132	135	91.0-181	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Plutonium-238	127	135	99.9-168	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Plutonium-239	107	112	86.9-141	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cesium-134	580	609	447-700	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cesium-137	1290	1250	1060-1500	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Cobalt-60	910	875	760-1020	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Manganese-54	<5.0	<100	0.00-100	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Zinc-65	822	749	624-945	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Strontium-90	970	989	644-1310	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Iron-55	987	863	514-1170	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Gross Alpha	95.9	103	36.6-160	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Gross Beta	50	43.7	25.0-64.7	Acceptable
2nd/2012	05/18/12	MRAD-16	Water	pCi/L	Tritium	8740	9150	6130-13000	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	4310	4310	2830-5540	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	4330	4280	2860-5440	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	4849	5190	2960 - 7010	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	8860	8790	5960-10900	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	3720	3400	2080-4360	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	3350	3420	2120-4340	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	7232	6970	3780-9200	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	10400	10200	5620-12800	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Actinium-228	1400	1240	795-1720	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Americium-241	847	728	426-946	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Bismuth-212	1300	1240	330-1820	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Bismuth-214	1310	1290	777-1860	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-134	2210	1980	1290-2380	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-137	4140	3470	2660-4460	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cobalt-60	5270	4310	2910-5930	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Lead-212	1250	1240	812-1730	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Lead-214	1580	1290	753-1920	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Manganese-54	< 35	< 1000	0.00 - 1000	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-238	1250	981	590-1350	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-239	1110	871	569-1200	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Potassium-40	11000	12300	8980-16500	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Thorium-234	5120	3420	1080-6430	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Zinc-65	3770	2880	2290-3830	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Strontium-90	6670	6860	2620-10800	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	2640	2530	1600 - 3140	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	2450	2560	1560 - 3250	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	5200	5190	2960 - 7010	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7286	7570	4160 - 9520	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7430	7570	4160 - 9520	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Americium-241	3040	2980	1700 - 4090	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Curium-244	697	642	316 - 1000	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-238	3000	2880	1560 - 4220	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Plutonium-239	2910	2980	1850 - 4060	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-234	2580	2420	1660 - 3210	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-238	2660	2400	1690 - 3030	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Uranium-Total	5356	4920	3330 - 6120	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	ug/kg	Uranium-Total (mass)	7970	7180	4810 - 9120	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-134	1480	1380	790 - 1910	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cesium-137	1570	1270	932 - 1760	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Cobalt-60	1800	1500	1010 - 2160	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Manganese-54	< 44.0	< 300	0.00 - 300	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Potassium-40	32100	28800	20700 - 40800	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Zinc-65	3470	2770	2000 - 3790	Acceptable
4th/2012	12/12/12	MRAD-17	Soil	pCi/kg	Strontium-90	6320	5440	3040 - 7220	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Americium-241	3780	3540	2160-4710	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Curium-244	1910	1850	906-2880	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Plutonium-238	2360	2250	1340-3080	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Plutonium-239	2270	2170	1330-2990	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-234	4310	4310	2830-5540	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-238	4330	4280	2860-5440	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Uranium-Total	8860	8790	5960-10900	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	ug/kg	Uranium-Total (mass)	13000	12800	8580-16200	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	ug/kg	Uranium-Total (mass)	11900	12800	8580-16200	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cesium-134	2240	2350	1510-3050	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cesium-137	2190	2070	1500-2880	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Cobalt-60	2360	2030	1400-2840	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Manganese-54	< 38.6	< 300	0.00 - 300	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Potassium-40	36000	29600	21400-41500	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Zinc-65	2500	1970	1420-2760	Acceptable
4th/2012	12/12/12	MRAD-17	Vegetation	pCi/kg	Strontium-90	9040	10000	5700-13300	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Americium-241	64.7	67.1	41.4-90.8	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Plutonium-238	50.3	55	37.7-72.3	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Plutonium-239	53.8	56.8	41.1-74.2	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-234	49.1	55.2	34.2-83.2	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-238	55	54.7	35.3-75.6	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total	106.6	112	62.0-170	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	ug/Filter	Uranium-Total (mass)	165	164	105-231	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cesium-134	393	429	273-532	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cesium-137	810	793	596-1040	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Cobalt-60	532	521	403-651	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Manganese-54	< 3.97	< 50.0	0.00 - 50.0	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Zinc-65	765	692	496-955	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Strontium-90	167	166	81.1-249	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total (mass)	152	164	105-231	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Uranium-Total (mass)	160	164	105-231	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Gross Alpha	110	87	30.3 - 87.8	Acceptable
4th/2012	12/12/12	MRAD-17	Filter	pCi/Filter	Gross Beta	71.2	62.7	39.6-91.4	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	155	159	119-205	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	161	158	120-194	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	323.6	324	238-419	Acceptable
4th/2012	12/12/12	MRAD-17	Water	ug/L	Uranium-Total (mass)	482	473	337-572	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Americium-241	96.3	91.8	61.8-123	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Plutonium-238	98	97.7	72.3-122	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Plutonium-239	82.5	85.8	66.6-108	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	155	159	119-205	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	161	158	120-194	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	312.6	324	238-419	Acceptable
4th/2012	12/12/12	MRAD-17	Water	ug/L	Uranium-Total (mass)	482	473	377-572	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cesium-134	786	876	643-1010	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cesium-137	2050	2040	1730-2440	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Cobalt-60	1270	1260	1090-1470	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Manganese-54	< 7.27	< 100	0.00 - 100	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Zinc-65	950	879	733-1110	Acceptable

Quarter / Year	Analytical Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Strontium-90	577	681	444-900	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	158	159	119-205	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	162	158	120-194	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	327.7	324	238-419	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	485	473	337-572	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-234	156	159	119-205	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-238	162	158	120-194	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total	318	324	238-419	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	482	473	337-572	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Uranium-Total (mass)	463	473	337-572	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Iron-55	673	548	327-743	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Gross Alpha	62.1	76.9	27.3-119	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Gross Beta	57.4	62.6	35.8-92.7	Acceptable
4th/2012	12/12/12	MRAD-17	Water	pCi/L	Tritium	17900	18700	12500-26700	Acceptable

FIGURE 1

COBALT-60 PERFORMANCE EVALUATION RESULTS AND % BIAS

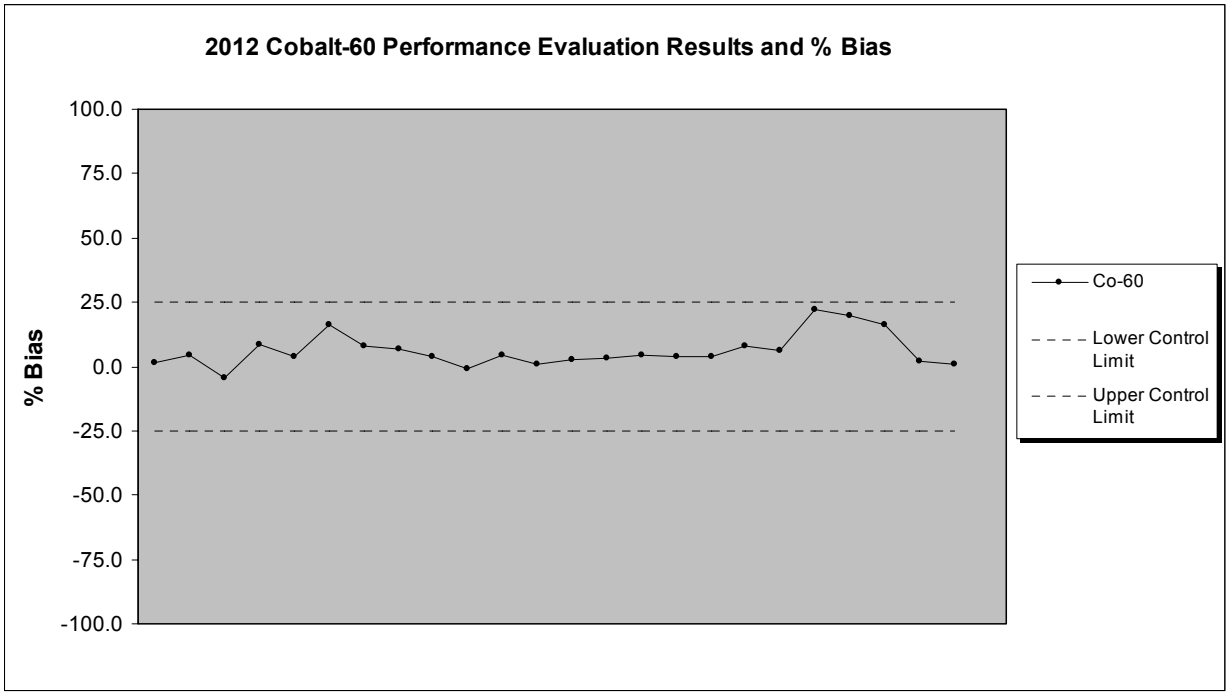


FIGURE 2

CESIUM-137 PERFORMANCE EVALUATION RESULTS AND % BIAS

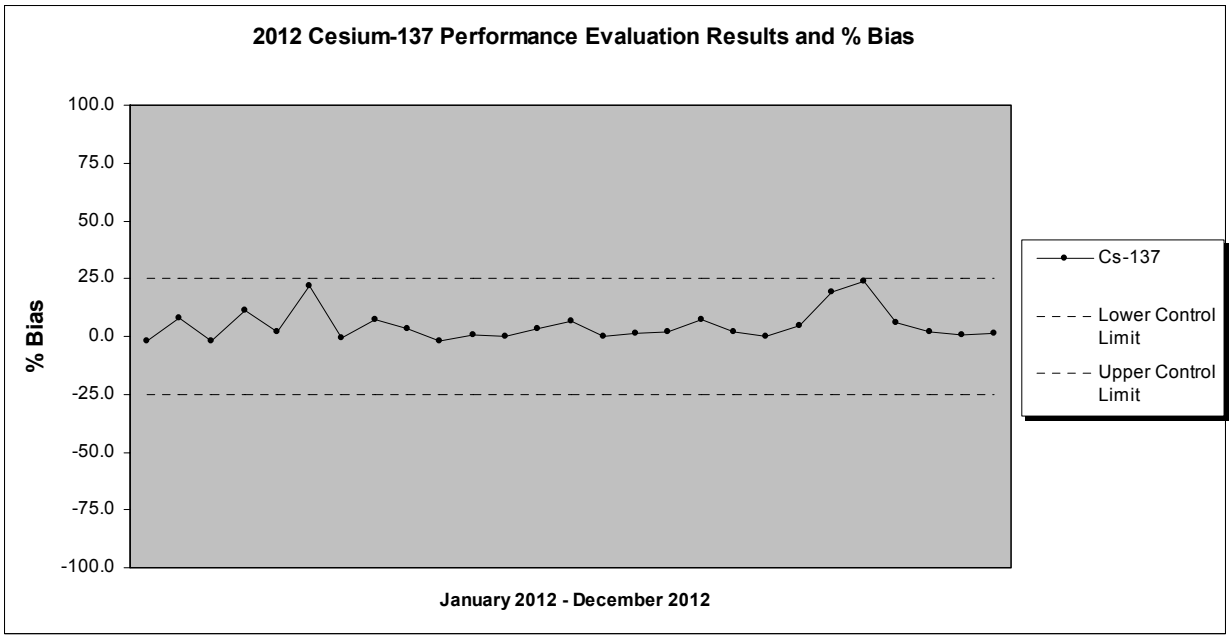


FIGURE 3

TRITIUM PERFORMANCE EVALUATION RESULTS AND % BIAS

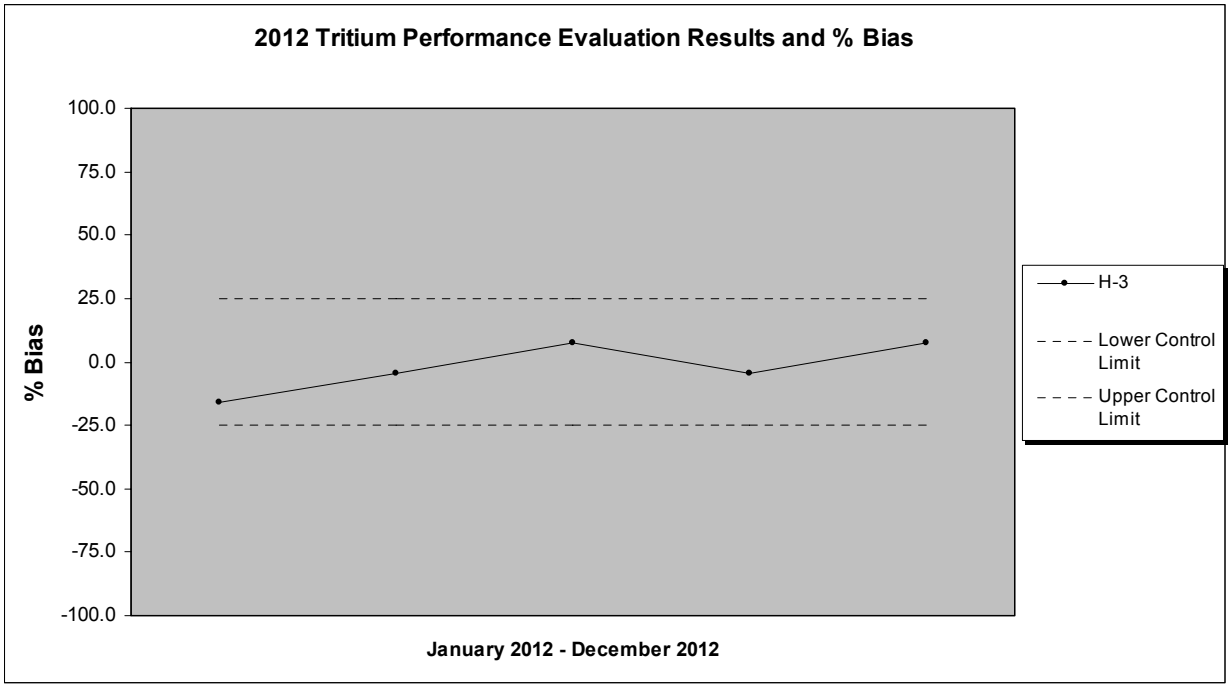


FIGURE 4

STRONTIUM-90 PERFORMANCE EVALUATION RESULTS AND % BIAS

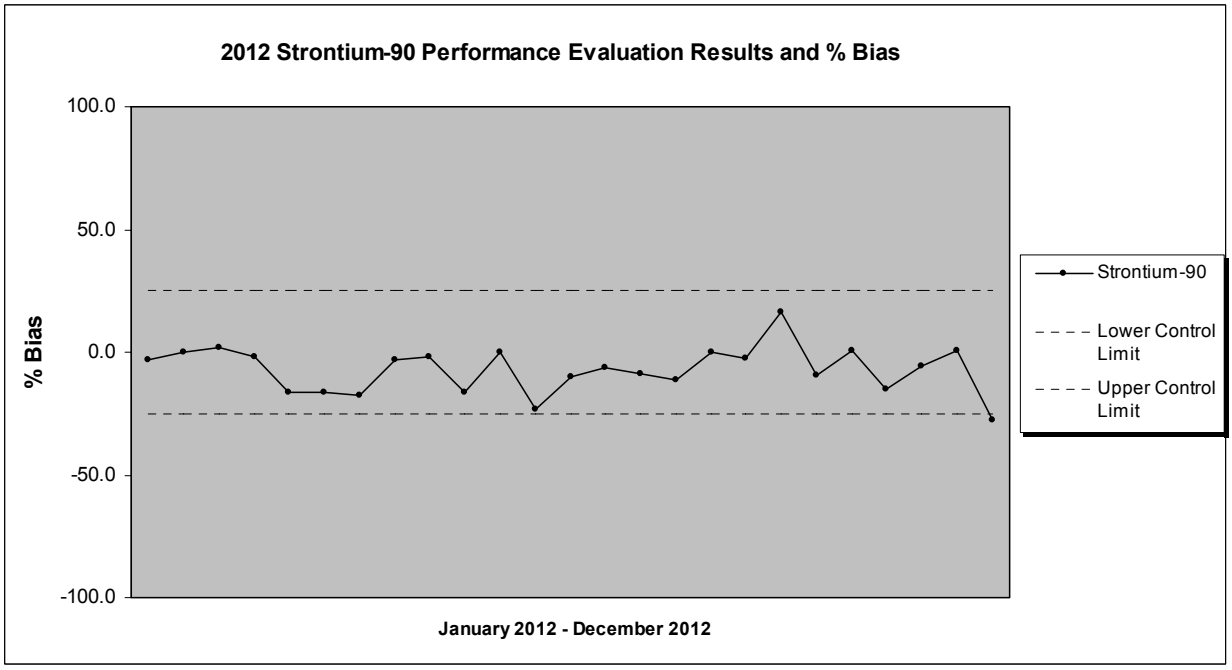


FIGURE 5

GROSS ALPHA PERFORMANCE EVALUATION RESULTS AND % BIAS

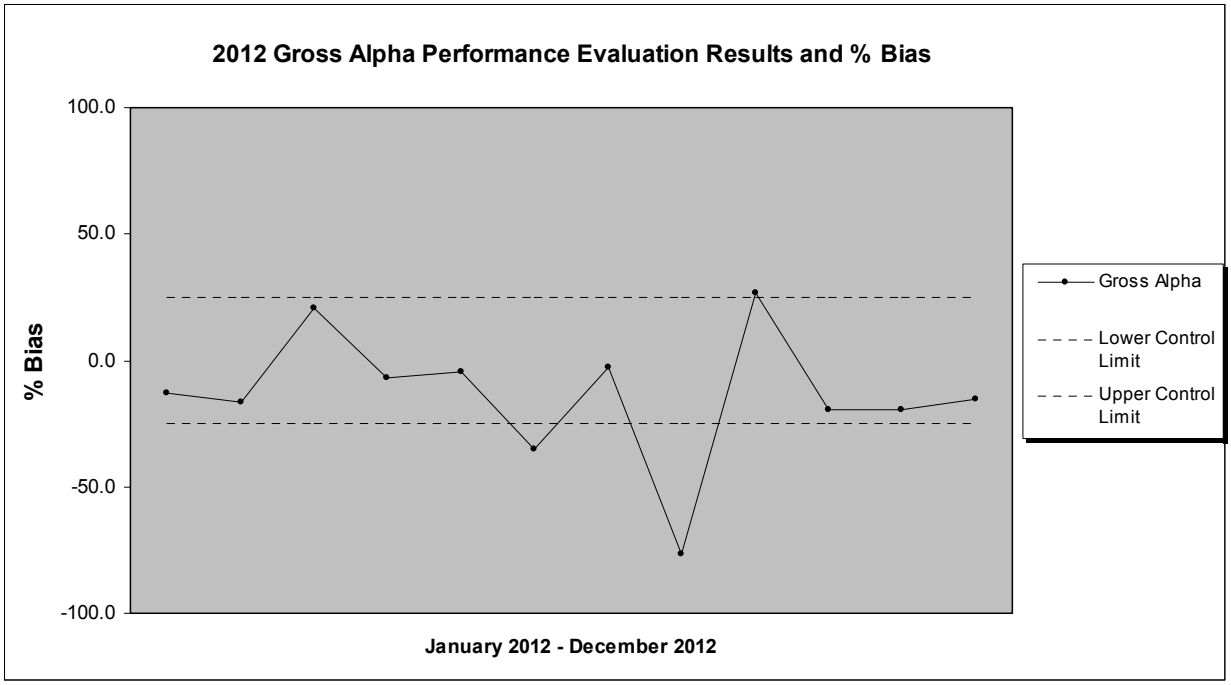


FIGURE 6

GROSS BETA PERFORMANCE EVALUATION RESULTS AND % BIAS

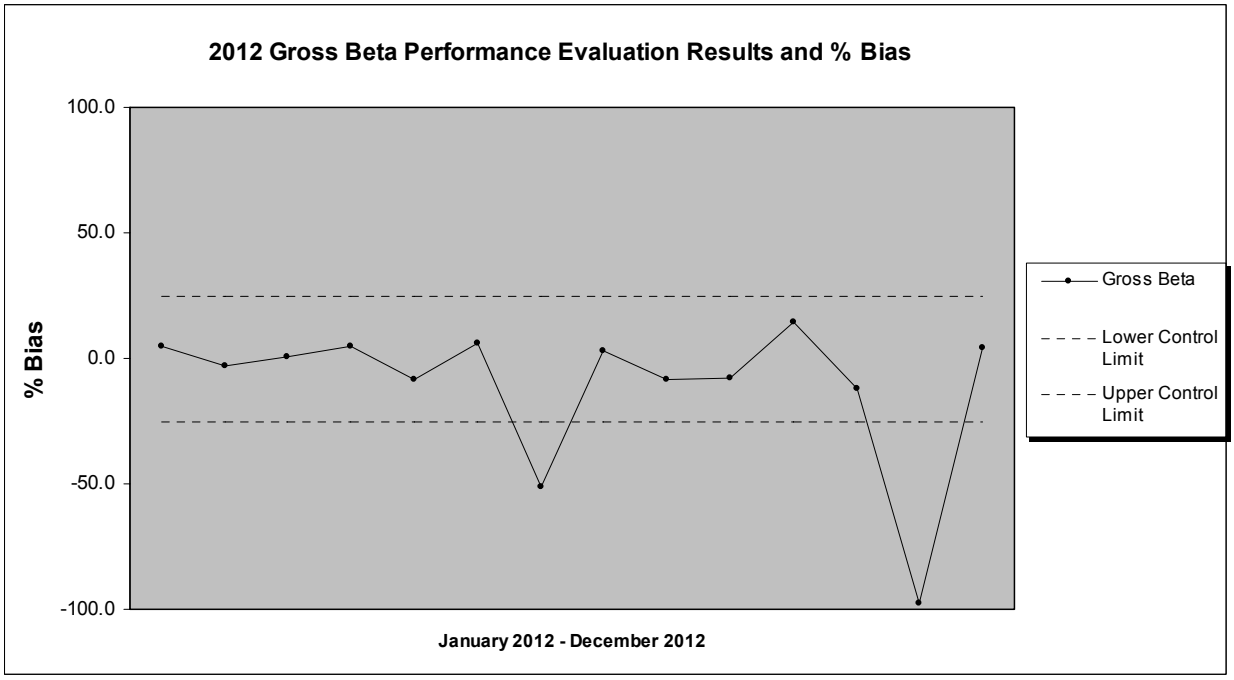


FIGURE 7

IODINE-131 PERFORMANCE EVALUATION RESULTS AND % BIAS

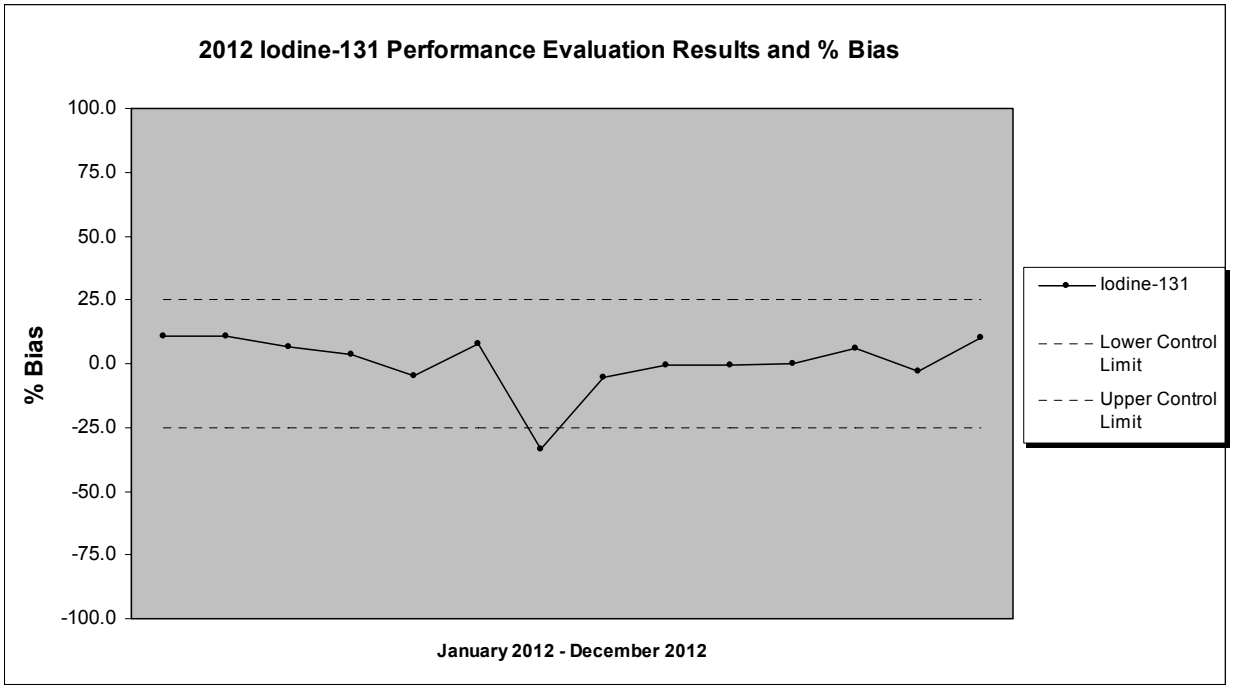


FIGURE 8

AMERICIUM-241 PERFORMANCE EVALUATION RESULTS AND % BIAS

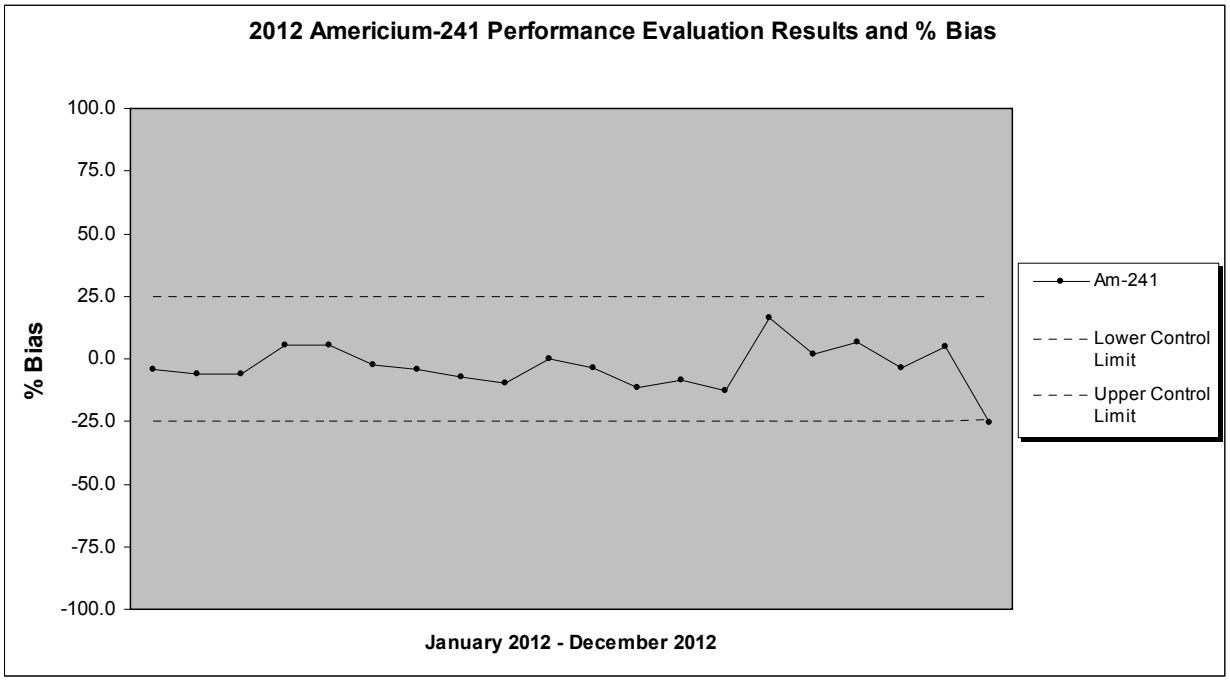


FIGURE 9

PLUTONIUM-238 PERFORMANCE EVALUATION RESULTS AND % BIAS

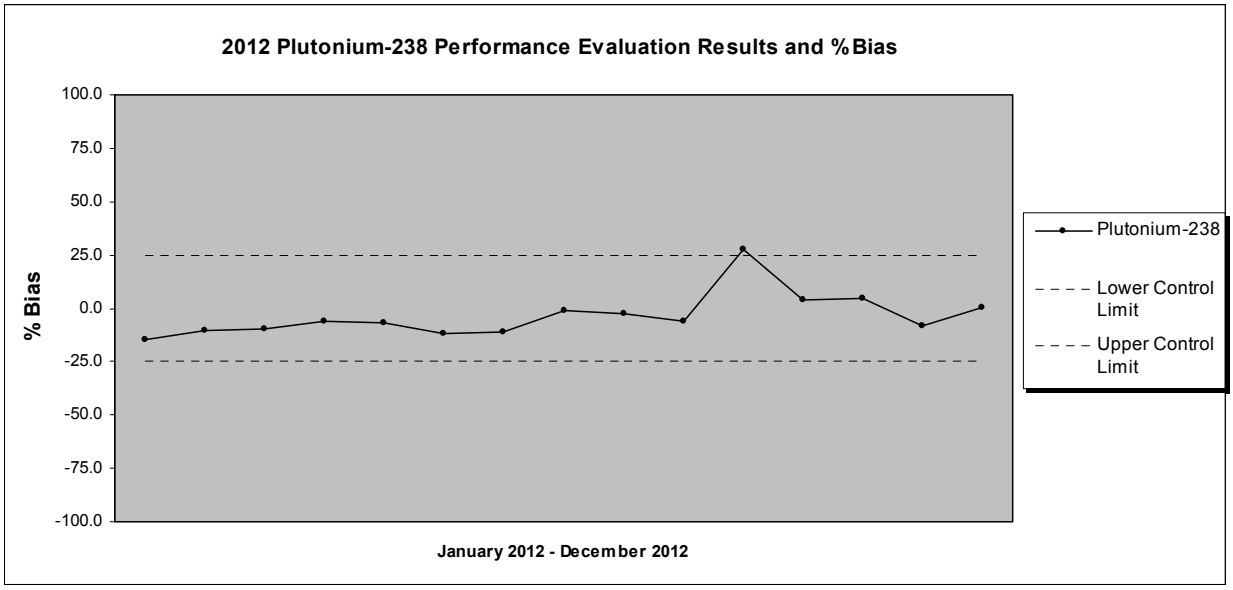


TABLE 6

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

2012	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
MILK				
Gas Flow Sr 2nd count	42	0	43	0
Gas Flow Total Strontium	29	0	29	0
Gamma Spec Liquid RAD A-013 with Ba, La	74	0	147	0
SOLID				
Gamma Spec Solid RAD A-013	21	0	31	0
LSC Nickel 63	9	0	9	0
Gas Flow Sr 2nd count	5	0	5	0
Gas Flow Strontium 90	3	0	3	0
Gas Flow Total Strontium	11	0	11	0
Gamma Spec Solid RAD A-013 with Ba, La	8	0	13	0
Gamma Spec Solid RAD A-013 with Iodine	5	0	6	0
FILTER				
Gamma Spec Filter RAD A-013	8	0	8	0
Gas Flow Sr 2nd Count	5	0	5	0
Alpha Spec Am241Curium	5	0	5	0
Gas Flow Total Strontium	5	0	5	0
Gross A & B	528	0	543	0
Gas Flow Sr-90	1	0	1	0
Gamma Spec Filter	51	0	52	0
LIQUID				
Alpha Spec Uranium	15	0	18	0
Tritium	331	0	333	0
LSC Iron-55	67	0	65	0
LSC Nickel 63	65	2	65	0
Gamma Spec Liquid RAD A-013	33	0	33	0
Gamma Iodine-131	34	0	36	0
Alpha Spec Plutonium	18	0	18	0
Gas Flow Sr 2nd count	41	0	41	0
Alpha Spec Am241 Curium	23	0	23	0
Gas Flow Total Strontium	153	0	153	0
Gross Alpha Non Vol Beta	106	0	110	0

2012	Bias Criteria (+ / - 25%		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
LIQUID (continued)				
Gamma Spec Liquid RAD A-013 with Ba, La	102	0	192	0
Gamma Spec Liquid RAD A-013 with Iodine	54	0	98	0
TISSUE				
Gamma Spec Solid RAD A-013	47	0	48	0
LSC Nickel 63	7	0	7	0
Gas Flow Sr 2nd count	21	0	21	0
Gas Flow Total Strontium	26	0	26	0
Gamma Spec Solid RAD A-013 with Ba, La	9	0	9	0
Gamma Spec Solid RAD A-013 with Iodine	24	0	24	0
VEGETATION				
Gamma Spec Solid RAD A-013	6	0	6	0
Gas Flow Sr 2nd count	13	0	13	0
Gamma Spec Solid RAD A-013 with Iodine	87	0	90	0
AIR CHARCOAL				
Gamma Iodine 131 RAD A-013	549	0	552	0
DRINKING WATER				
Alpha Spec Uranium	2	0	2	0
Tritium	42	0	42	0
LSC Iron-55	18	0	20	0
LSC Nickel 63	18	0	20	0
Gamma Iodine-131	32	0	34	0
Alpha Spec Thorium	2	0	2	0
Gas Flow Sr 2nd count	17	0	17	0
Gas Flow Total Strontium	21	0	21	0
Gross Alpha Non Vol Beta	94	0	93	0
Gamma Spec Liquid RAD A-013 with Ba, La	53	0	93	0
Gamma Spec Liquid RAD A-013 with Iodine	1	0	1	0
Total	**2941**		**3242**	

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. All not applicable results are revised to 0.

TABLE 7

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

2012	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	0	0	1	0
Gamma Iodine-131	44	0	154	0
Gas Flow Sr 2nd count	51	0	48	0
Gas Flow Strontium 90	7	0	7	0
Gas Flow Total Strontium	29	0	29	0
Gross Alpha Non Vol Beta	1	0	1	0
Gamma Spec Liquid RAD A-013 with Ba, La	74	0	147	0
Gamma Spec Liquid RAD A-013 with Iodine	6	0	5	0
SOLID				
Gas Flow Radium 228	16	0	20	0
Tritium	368	0	402	0
Carbon-14	274	0	358	0
LSC Iron-55	203	0	215	0
Alpha Spec Polonium Solid	90	0	148	0
Gamma Nickel 59 RAD A-022	184	0	240	0
LSC Chlorine-36 in Solids	13	0	24	0
Gamma Spec Ra226 RAD A-013	142	0	178	0
Gamma Spec Solid RAD A-013	815	0	1181	1
LSC Nickel 63	263	0	312	0
LSC Plutonium	268	0	285	2
Technetium-99	429	0	458	0
Gamma Spec Liquid RAD A-013	5	0	5	0
ICP-MS Technetium-99 in Soil	95	0	92	0
LSC Selenium 79	4	0	4	0
Total Activity,	10	0	11	0
Tritium	4	0	4	0
Alpha Spec Am243	42	0	74	0
Gamma Iodine-129	215	0	228	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
SOLID (continued)				
Gas Flow Lead 210	41	0	38	0
Total Uranium KPA	7	0	10	0
Alpha Spec Uranium	451	0	614	0
LSC Promethium 147	26	0	37	0
LSC, Rapid Strontium 89 and 90	116	0	129	0
Alpha Spec Polonium	2	0	2	0
Alpha Spec Thorium	257	0	392	0
ICP-MS Uranium-233, 234 in Solid	11	0	8	0
LSC Sulfur 35	2	0	2	0
Alpha Spec Plutonium	309	0	448	3
ICP-MS Technetium-99 Prep in Soil	88	0	85	0
Alpha Spec Neptunium	293	0	321	1
Alpha Spec Plutonium	157	0	206	0
Alpha Spec Radium 226	12	0	15	1
Gamma Spec Solid with Ra226, Ra228	7	0	13	0
Gas Flow Sr 2nd count	15	0	17	0
Gas Flow Strontium 90	239	0	312	0
Gas Flow Total Radium	2	0	2	0
Lucas Cell Radium 226	43	0	55	0
Total Activity Screen	8	0	48	0
Alpha Spec Am241 Curium	402	0	536	0
LSC Phosphorus-32	3	0	3	0
Gas Flow Total Strontium	88	0	90	0
Gross Alpha Non Vol Beta	2	0	2	0
ICP-MS Uranium-233, 234 Prep in Solid	13	0	8	0
ICP-MS Uranium-235, 236, 238 in Solid	15	0	12	0
Gamma Spec Solid RAD A-013 with Ba, La	8	0	13	0
Gamma Spec Solid RAD A-013 with Iodine	5	0	6	0
Organically Bound Tritium	7	0	16	0
GFC Chlorine-36 in Solids	3	0	2	0
Gamma Spec Solid RAD A-013 (pCi/Sample)	3	0	8	0
Technetium-99	0	0	1	0
Tritium	4	0	4	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
SOLID (continued)				
Alpha Spec Am241 (pCi/Sample)	0	0	1	0
ICP-MS Uranium-234, 235, 236, 238 in Solid	290	0	281	0
ICP-MS Uranium-235, 236, 238 Prep in Solid	11	0	7	0
Carbon-14	2	0	2	0
Gross Alpha/Beta	299	0	456	1
Alpha Spec Neptunium	0	0	1	0
Gross Alpha/Beta (Americium Calibration) Solid	1	0	1	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Solid	139	0	147	0
Lucas Cell Radium 226 by DOE HASL 300 Ra-04 Solid	1	0	2	0
FILTER				
Alpha Spec Uranium	11	0	20	0
Alpha Spec Polonium	5	0	15	0
Gamma I-131, filter	5	0	5	0
LSC Plutonium Filter	133	0	158	0
Tritium	123	0	181	0
Carbon-14	88	0	151	0
Nickel-63	0	0	6	0
LSC Iron-55	136	0	154	0
Gamma Nickel 59 RAD A-022	132	0	151	0
Gamma Iodine 131 RAD A-013	4	0	4	0
Gamma Spec Solid RAD A-013	1	0	1	0
LSC Nickel 63	136	0	181	0
LSC Plutonium	1	0	1	0
Technetium-99	90	0	136	0
Gamma Spec Filter RAD A-013	217	0	288	0
LSC Chlorine-36 in Filters	0	0	1	0
Alphaspec Np Filter per Liter	32	0	40	0
Alphaspec Pu Filter per Liter	22	0	32	0
Gamma Iodine-125	11	0	0	0
Gamma Iodine-129	110	0	128	0
Gross Alpha/Beta	0	0	76	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
FILTER (continued)				
Alpha Spec Am243	16	0	30	0
Gas Flow Lead 210	0	0	3	0
LSC Plutonium Filter per Liter	36	0	42	0
Total Uranium KPA	7	0	10	0
Alpha Spec Uranium	61	0	79	0
LSC Promethium 147	1	0	6	0
LSC, Rapid Strontium 89 and 90	128	0	170	0
Alpha Spec Thorium	35	0	48	0
Alpha Spec Plutonium	85	0	106	0
Alpha Spec Neptunium	108	0	135	0
Alpha Spec Plutonium	134	0	181	0
Alpha Spec Polonium,(Filter/Liter)	0	0	17	0
Gas Flow Sr 2nd Count	86	0	92	0
Gas Flow Strontium 90	50	0	61	0
Lucas Cell Radium-226	0	0	1	0
Alpha Spec Am241Curium	157	0	189	0
Gas Flow Total Strontium	6	0	12	0
Total Activity in Filter,	2	0	7	0
Alphaspec Am241 Curium Filter per Liter	36	0	43	0
Tritium	127	0	127	0
GFC Chlorine-36 in Filters	1	0	2	0
Gamma Spec Filter RAD A-013 Direct Count	3	0	3	0
Carbon-14	52	0	60	0
Direct Count-Gross Alpha/Beta	67	0	0	0
Gross Alpha/Beta	73	0	93	0
ICP-MS Uranium-234, 235, 236, 238 in Filter	4	0	10	0
Alpha Spec U	28	0	66	0
Gross A & B	649	0	603	0
Gross Alpha/Beta	1	0	1	0
LSC Iron-55	44	0	55	0
Technetium-99	32	0	38	0
Gas Flow Sr-90	36	0	41	0
LSC Nickel 63	40	0	47	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
FILTER (continued)				
Gas Flow Pb-210	24	0	45	0
Gas Flow Ra-228	27	0	36	0
Gamma Iodine 129	50	0	51	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Filter	2	0	6	0
Gamma Spec Filter	172	0	215	0
Lucas Cell Ra-226	30	0	43	0
Alpha Spec Thorium	37	0	52	0
LIQUID				
Alpha Spec Uranium	523	0	802	0
Alpha Spec Polonium	2	0	6	0
Electrolytic Tritium	21	0	35	0
Tritium	1377	0	1465	0
Carbon-14	263	0	300	0
Chlorine-36 in Liquids	1	0	3	0
Iodine-131	10	0	18	6
LSC Iron-55	298	0	363	0
Gamma Nickel 59 RAD A-022	26	0	41	0
Gamma Iodine 131 RAD A-013	3	0	4	0
LSC Nickel 63	359	0	402	0
LSC Plutonium	83	0	102	2
LSC Radon 222	9	0	31	0
Technetium-99	364	0	458	0
Gamma Spec Liquid RAD A-013	879	0	941	0
Total Activity,	4	0	4	0
Alpha Spec Am243	10	0	16	0
Gamma Iodine-129	103	0	160	0
Gamma Iodine-131	34	0	36	0
ICP-MS Technetium-99 in Water	4	0	28	0
ICP-MS Uranium-238 in Liquid	0	0	43	0
Gas Flow Lead 210	102	0	101	0
Total Uranium KPA	96	0	249	0
LSC Promethium 147	3	0	11	0
LSC, Rapid Strontium 89 and 90	15	0	18	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
LIQUID (continued)				
Alpha Spec Polonium	1	0	1	0
Alpha Spec Thorium	257	0	384	0
Gas Flow Radium 228	286	0	333	0
Gas Flow Radium 228	12	0	12	0
Alpha Spec Plutonium	319	0	407	0
ICP-MS Uranium-238 Prep in Liquid	0	0	41	0
Alpha Spec Neptunium	118	0	160	0
Alpha Spec Plutonium	60	0	77	0
Alpha Spec Radium 226	0	0	14	0
Gas Flow Sr 2nd count	337	0	359	0
Gas Flow Strontium 90	482	0	517	0
Gas Flow Strontium 90	1	0	1	0
Gas Flow Strontium 90	2	0	3	0
Gas Flow Total Radium	83	0	112	0
ICP-MS Technetium-99 Prep in Water	4	0	28	0
ICP-MS Uranium-233, 234 in Liquid	4	0	5	0
Lucas Cell Radium 226	335	0	406	0
Lucas Cell Radium-226	15	0	15	0
Total Activity Screen	0	0	2	0
Chlorine-36 in Liquids	8	0	14	0
Alpha Spec Am241 Curium	327	0	426	0
Gas Flow Total Strontium	240	0	253	0
Gross Alpha Non Vol Beta	1289	0	1521	6
Lucas Cell Radium 226 by Method Ra-04	2	0	0	0
ICP-MS Uranium-233, 234 Prep in Liquid	4	0	5	0
Tritium in Drinking Water by EPA 906.0	16	0	17	0
Gamma Spec Liquid RAD A-013 with Ba, La	104	0	194	0
Gamma Spec Liquid RAD A-013 with Iodine	165	0	230	0
Gas Flow Strontium 89 & 90	7	0	3	0
ICP-MS Uranium-235, 236, 238 in Liquid	8	0	8	0
Gas Flow Total Alpha Radium	2	0	2	0
Gross Alpha Co-precipitation	14	0	13	0
ICP-MS Uranium-235, 236, 238 Prep in Liquid	4	0	5	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
LIQUID (continued)				
ICP-MS Uranium-234, 235, 236, 238 in Liquid	52	0	146	0
Gross Alpha Beta (Americium Calibration) Liquid	21	0	24	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Liquid	23	0	68	0
TISSUE				
Tritium	5	0	6	0
LSC Iron-55	7	0	7	0
Gamma Spec Solid RAD A-013	100	0	105	0
LSC Nickel 63	7	0	7	0
Tritium	2	0	2	0
Alpha Spec Uranium	7	0	8	0
Alpha Spec Plutonium	10	0	11	0
Gas Flow Sr 2nd count	21	0	21	0
Gas Flow Strontium 90	26	0	33	0
Lucas Cell Radium 226	2	0	2	0
Alpha Spec Am241 Curium	3	0	3	0
Gas Flow Total Strontium	26	0	26	0
Gamma Spec Solid RAD A-013 with Ba, La	9	0	9	0
Gamma Spec Solid RAD A-013 with Iodine	24	0	24	0
Organically Bound Tritium	1	0	1	0
Gross Alpha/Beta	4	0	5	0
VEGETATION				
Carbon-14	6	0	6	0
Gamma Nickel 59 RAD A-022	4	0	4	0
Gamma Spec Solid RAD A-013	25	0	30	0
LSC Nickel 63	4	0	4	0
LSC Plutonium	5	0	4	0
Technetium-99	7	0	7	0
Tritium	16	0	16	0
Gamma Iodine-129	4	0	3	0
Gas Flow Lead 210	4	0	4	0
Total Uranium KPA	2	0	2	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
VEGETATION (continued)				
Alpha Spec Uranium	25	0	27	0
Alpha Spec Thorium	7	0	8	0
Alpha Spec Plutonium	12	0	9	0
Alpha Spec Neptunium	1	0	1	0
Alpha Spec Plutonium	1	0	1	0
Gas Flow Sr 2nd count	13	0	13	0
Gas Flow Strontium 90	16	0	14	0
Gas Flow Total Radium	0	0	1	0
Alpha Spec Am241 Curium	9	0	6	0
Gamma Spec Solid RAD A-013 with Iodine	87	0	90	0
Gamma Spec Solid RAD A-013 (pCi/Sample)	2	0	2	0
Alpha Spec Am241 (pCi/Sample)	4	0	2	0
ICP-MS Uranium-234, 235, 236, 238 in Solid	6	0	3	0
Alpha Spec Uranium	2	1	2	0
Gross Alpha/Beta	7	2	9	0
Alpha Spec Plutonium	2	2	2	0
Gas Flow Strontium 90	4	0	2	0
ICP-MS Uranium-234, 235, 236, 238 Prep in Solid	4	0	2	0
AIR CHARCOAL				
Gamma I-131, filter	4	0	4	0
Gamma Iodine 131 RAD A-013	549	0	552	0
Carbon-14	8	0	6	0
DRINKING WATER				
Alpha Spec Uranium	7	0	8	0
Tritium	44	0	44	0
Iodine-131	0	0	18	6
LSC Iron-55	18	0	20	0
LSC Nickel 63	22	0	24	0
LSC Radon 222	78	1	99	0
Gamma Spec Liquid RAD A-013	16	0	46	0
Gamma Iodine-129	2	0	7	0
Gamma Iodine-131	32	0	34	0
Total Uranium KPA	19	0	38	0

2012	Bias Criteria (+ / - 25%)		Precision Criteria (Note 1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
DRINKING WATER				
Alpha Spec Thorium	2	0	2	0
Gas Flow Radium 228	174	0	143	0
Gas Flow Sr 2nd count	17	0	17	0
Gas Flow Strontium 90	18	0	18	0
LSC Calcuim 45	4	0	4	0
Lucas Cell Radium-226	158	0	169	0
Gas Flow Total Strontium	21	0	21	0
Gross Alpha Non Vol Beta	393	0	327	0
LSC Phosphorus-32	5	0	25	0
Tritium in Drinking Water by EPA 906.0	35	0	35	0
Gamma Spec Liquid RAD A-013 with Ba, La	53	0	93	0
Gamma Spec Liquid RAD A-013 with Iodine	2	0	2	0
Gas Flow Strontium 89 & 90	19	0	12	0
Gas Flow Total Alpha Radium	4	0	4	0
Gross Alpha Co-precipitation	109	0	107	0
Alpha/Beta (Americium Calibration) Drinking Water	13	0	14	0
ECLS-R-GA NJ 48 Hr Rapid Gross Alpha	9	0	9	0
Total	**22305**		**27436**	

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. All not applicable results are revised to 0.

TABLE 8

2012 CORRECTIVE ACTION REPORT SUMMARY

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR120306-667 ISO Documentation of PT Failures in RAD-88 Study – Tritium in Water	The low bias associated with the tritium result for RAD-88 initiated an investigation of the liquid scintillation detector used for the original reported result after the original vials were recounted on a different detector and met acceptance criteria. The tritium efficiency for the detector was reviewed and a slight low bias was observed. A service call was initiated. Tritium and carbon-14 efficiencies were calculated on all liquid scintillation detectors to ensure that service was not required. No other deficiencies were noted. The data reported using this detector was also reviewed and were deemed acceptable as originally reported. In the future, the efficiency of each detector will be monitored monthly in order to rapidly identify any change that may require service. **A second PT was successfully analyzed for this matrix.**
CARR120831-715 ISO Documentation of PT Failures in RAD-90 Study - Barium-133 and Radium-226	**Barium-133** All data were reviewed and it appears that the cause of the high bias was due to the calibration standard. The reported result was counted on a detector that omitted the Hg-203 nuclide from the efficiency calibration due to its short half-life and an inability to accumulate 10,000 counts in a reasonable amount of time. The duplicate sample in the batch counted on a detector that had the Hg-203 point included in its efficiency calibration and generated a result of 64.83 pCi/L. This result compares well with the assigned value of 65 pCi/L. **Radium-226** After a review of the data, an apparent reason for this discrepancy could not be determined. Multiple steps were taken to prove that this high bias was an isolated occurrence and that our overall process is within control. Two sample duplicates were also prepared and counted along with the reported result. Both results fell well within the acceptance range.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR120831-715 (continued)	**Actions to Prevent Potential Occurrence or Recurrence:** **Barium-133** In the future additional points will be included in the efficiency curve to better estimate the efficiencies across the entire energy spectrum. **Radium-226** 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.
CARR120711-694 and 698 For Failures of MAPEP 26 Study for Uranium 234/233 in Filters and Vegetation	**MAPEP-12-RdF26** **Uranium-234/233** After a thorough review of the data, the root cause of the low bias on the reported values was due to a high counting uncertainty. The counting uncertainty achieved for the U-233/4 results was approximately 100% of the reported results. Since the Relative Error Ratio between the result and the true value was 1.72, this indicates that the measured result is within the uncertainty of the measurement. **Update January 2013** Originally, it was suspected that the failure of the low bias on the reported values was due to a high counting uncertainty. The counting uncertainty achieved for the U-233/4 results was approximately 100% of the reported results. However, after the receipt of a similar failure in MAPEP 27 and a conversation with Mr. David Sill of the RESL Laboratory, it is certain that the aliquot used to analyze the sample was insufficient to detect the Uranium-234/233 spiked onto the filter (which is directly related to the high counting uncertainty).

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR120711-694 and 698 (continued)	**MAPEP-12-RdV26** **Uranium-234/233** After a thorough review of the data, the root cause of the low bias on the reported values was due to a high counting uncertainty. The counting uncertainty achieved for the U-233/4 results was approximately 60% of the reported results. Since the Relative Error Ratio between the result and the true value was 1.14, this indicates that the measured result is within the uncertainty of the measurement. **Permanent Corrective/Preventive Actions or Improvements**: Since guidance on acceptable uncertainties or Action Levels are not provided, to avoid potential warnings and failures due to high counting uncertainty in the future, our internal review process has been adjusted. If the result has measurable activity but a low count rate, the count time will be extended and the sample re-analyzed with a larger aliquot to achieve better counting statistics.
CARR121127-742 MAPEP 27 Unacceptable and Warning – Selinium, Gross Alpha	**Root Cause Analysis of MAPEP-12-MaS27** **Selenium** After a review of the data, a definitive reason for this discrepancy could not be determined. However, it is suspected that something occurred during the digestion of the batch to produce the lower recovery. The following steps were taken to ensure that this was an isolated occurrence and that our overall process is within control. **Actions Taken: MAPEP-12-MaS27** **Selenium** The laboratory must assume an unidentified random error caused the lower result. However, closer attention must be paid to the matrix QC failures. In the future, the samples should be re-extracted to confirm results prior to reporting.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR121127-742 (continued)	**MAPEP-12-GrF27** **Gross Alpha** Prior to counting, this filter was taken through the opening and labeling procedures specified in CARR120118-659. It is not suspected that previous Gross Alpha MAPEP issues contributed to this failure. While reviewing results from previous studies, a low bias was observed. It was suspected that this bias was due to a difference in instrument efficiency due to the filter media. To investigate further, a previous MAPEP filter containing activity was counted and used to establish an efficiency. When applied to the counts of MAPEP 27, the result were acceptable but the low bias was still observed. Source standards were then created using blank filter media from previous MAPEP studies. The blank filters were spiked with Th-230 and counted to determine an average efficiency. When this efficiency was applied to the MAPEP 27 count, the result fell well within the acceptance range. Using the blank filter to create an instrument efficiency is part of the study instructions as an option. This efficiency is much more accurate than what was used and will be used for future MAPEP studies. **Actions taken : MAPEP-12-GrF27** **Gross Alpha** Since using the blank filter to create an instrument efficiency is part of the study instructions, it will be used for future MAPEP studies. GEL found that this efficiency is much more accurate than the one previously used.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR 121127-743 MAPEP 27 Study Unacceptable and Warning ratings for U234/233 in Filter	**MAPEP-12-RdF27** **Uranium-234/233** Upon notification of the failures, the data were reviewed again for accuracy. Investigations on quality control checks and trending were preformed to ensure that the low bias was isolated to the MAPEP sample procedure and not indicative of a systematic failure. Also, an additional MAPEP-12-RdF27 filter was obtained and prepared per standard protocol. Based on the recommendations from Mr. David Sill of the RESL laboratory, the entire filter was used for analysis. The U-233/234 and U-238 results for this analysis were 98% of the known values. The cause of the failure was the limited sample amount used to prepare the initial sample. Multiple aliquots had been removed from the digested filter for other analyses, the RESL Laboratory had had prepared this sample as a single analysis. **Action Taken: MAPEP-12-RdF26 and MAPEP-12-RdF27** **Uranium-234/233** Since guidance on acceptable uncertainties or Action Levels are not provided, to avoid potential warnings and failures due to high counting uncertainty in the future, our internal review process has been adjusted. If the result has measurable activity but a low count rate, the count time will be extended and/or the sample re-analyzed using a larger sample aliquot to achieve better counting statistics. Although the MAPEP instructions are written such that the laboratory should have confidence in using smaller aliquots and still attain sufficiently low counting uncertainties, it is now our understanding that the design of the MAPEP filter program requires the analysis of a complete filter aliquot for each parameter analyzed. GEL will procure from MAPEP a filter for each parameter, analyze the entire filter for each parameter, and no longer perform batch duplicates for filter analysis of MAPEP samples.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR121109-744 MAPEP 27 Study for biased high trends of Cobalt-57	**MAPEP-12-MaS26 & MAPEP-12-MaS27** **Co-57** GEL received warnings for Co-57 results in the soil matrix in the past two testing rounds of the MAPEP. While Co-57 received warning flags all other gamma emitting isotopes in the soil matrix had acceptable results. Due to a potential trend, a corrective action was opened. After receiving the results from MAPEP-27 and a second biased high result for Co-57, a thorough review of our process was conducted. This review indicated an issue associated with the calibration correction factors (absorption factors or density corrections) applied to results due to differing densities between the sample and the calibration standard. A potential 20% positive bias for Co-57 (122 keV) was observed. **Note:** This bias was within the acceptable uncertainty of the method (+/- 25%) for duplicate results. Results for Am-241(59.5 keV) were also reviewed to ensure that biases were not observed. **Action Taken: MAPEP-12-MaS26** & **MAPEP-12-MaS27** **Co-57** The reported results compared very well to the reference values for both MAPEP-26 and MAPEP-27 (~97% and 101%, respectively). Since absorption factors (or density corrections) are only applied to our 100 ml aluminum can geometry for soils, no other matrices were impacted. **A review of the annual analytical data for this isotope indicated that the reported data to clients were not impacted by this bias.**

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.

Two assessments were performed in 2012, one internal and one external. All findings were closed out in September of 2012.

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 4). 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:

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

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 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 i^{th} dosimeter is:

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

where:

H_i' = the corresponding 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.

III. DATA SUMMARY FOR ISSUANCE PERIOD JANUARY-DECEMBER 2012

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 Appendix A – 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 Appendix A – 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 Appendix A – Figures 3.

Table 3 presents the independent blind spike results for dosimeters processed during this annual period. All results passed the performance acceptance criterion. Appendix A – 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)

During this annual period, one EDC Condition Report was issued. CR 1-2012 was issued to document the findings from the DTE Energy Audit 12-006.

V. STATUS OF AUDITS/ASSESSMENTS

A. Internal

EDC Internal Quality Assurance Assessment was conducted during the fourth quarter 2012. There were not any findings as a result of this assessment.

B. External

The DTE Energy Audit 12-006 was conducted on June 5, 2012. Two findings were issued as a result of this audit. The EDC responded to these findings and they were closed on September 6, 2012.

VI. PROCEDURES AND MANUALS REVISED DURING JANUARY - DECEMBER 2012

Manual 1 was revised on August 1, 2012.

Procedure 700 was revised on August 31, 2012.

Procedure 750 was revised on February 15, 2012.

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, 2012.

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 2012[(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 2012[(1), (2)]

Process Date	Mean Bias %	Standard Deviation %	Tolerance Limit ± 15%
4/18/2012	7.7	1.7	Pass
4/21/2012	11.6	1.4	Pass
5/1/2012	1.1	1.4	Pass
6/5/2012	-0.5	1.3	Pass
7/19/2012	2.3	1.6	Pass
7/23/2012	-4.0	0.8	Pass
11/1/2012	2.5	2.2	Pass
11/4/2012	1.5	0.9	Pass
11/26/2012	-2.3	2.6	Pass
1/23/2013	-3.2	1.1	Pass
1/28/2013	4.4	1.3	Pass
2/2/2013	-0.1	1.2	Pass

(1) This table summarizes results of tests conducted by EDC for TLDs issued in 2012.

(2) Environmental dosimeter results are free in air.

TABLE 3

**SUMMARY OF INDEPENDENT DOSIMETER TESTING
JANUARY – DECEMBER 2012[(1), (2)]**

Issuance Period	Client	Mean Bias %	Standard Deviation %	Pass / Fail
1st Qtr.2012	Millstone	-10.4	2.6	Pass
2nd Qtr.2012	Millstone	-4.7	1.6	Pass
2nd Qtr.2012	Seabrook	-0.8	1.5	Pass
3rd Qtr. 2012	Millstone	-13.9	2.6	Pass
4th Qtr.2012	Millstone	4.3	1.5	Pass
4th Qtr.2012	Seabrook	-5.2	1.3	Pass

(1) Performance criteria are ± 30%.

(2) Blind spike irradiations using Cs-137

APPENDIX A

DOSIMETRY QUALITY CONTROL TRENDING GRAPHS

ISSUE PERIOD JANAURY - DECEMBER 2012

FIGURE 1

INDIVIDUAL ACCURACY ENVIRONMENTAL

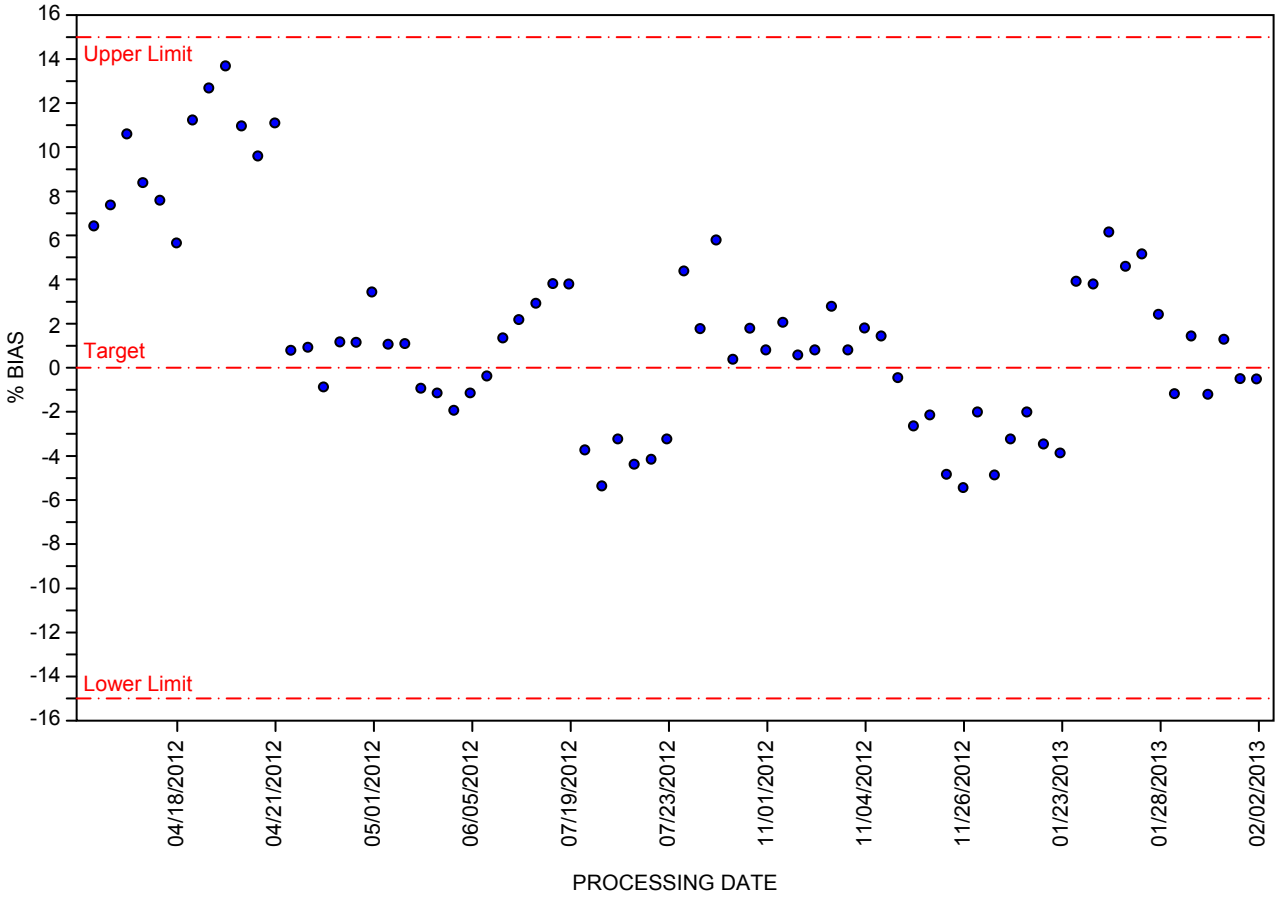


FIGURE 2

INDIVIDUAL PRECISION ENVIRONMENTAL

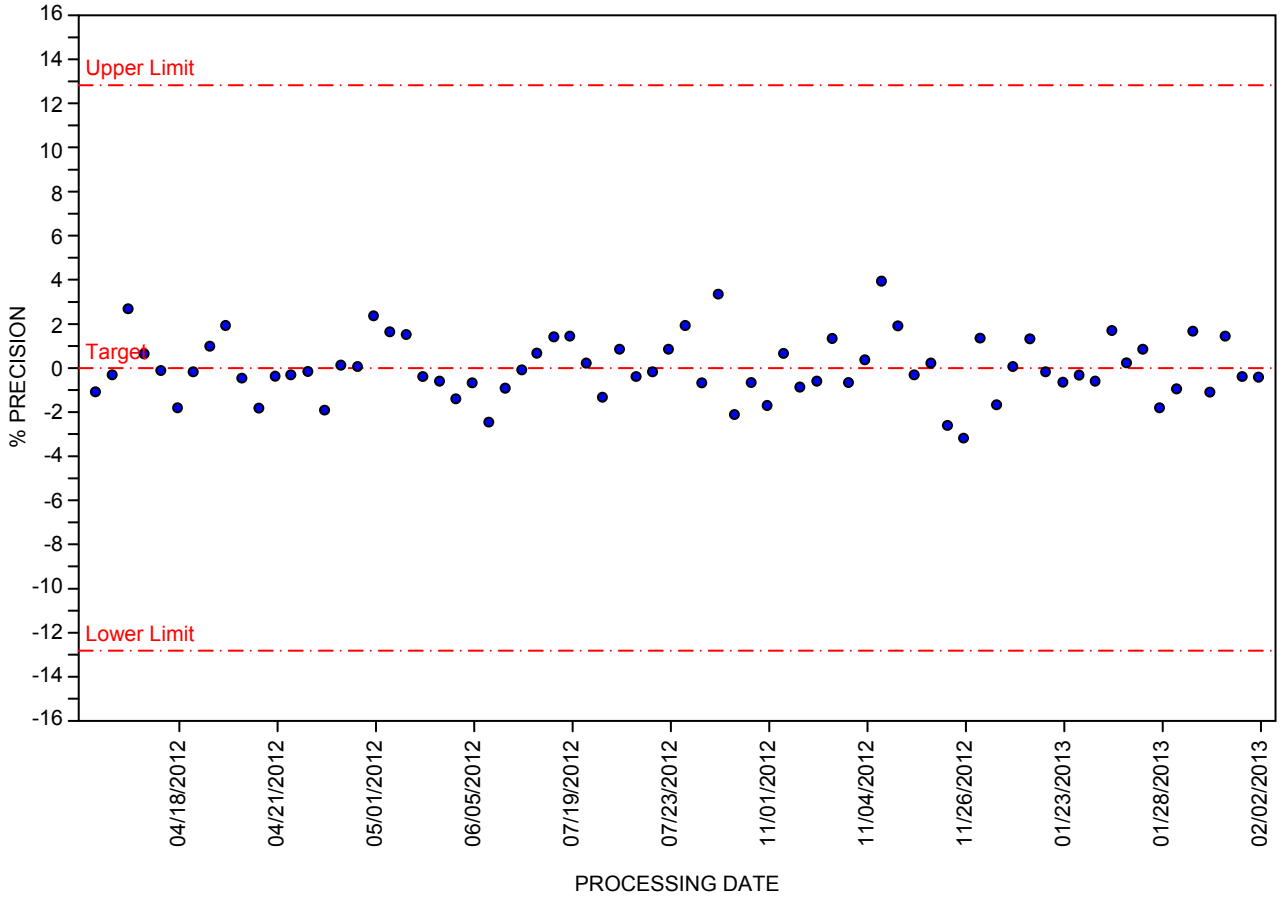


FIGURE 3

MEAN ACCURACY ENVIRONMENTAL

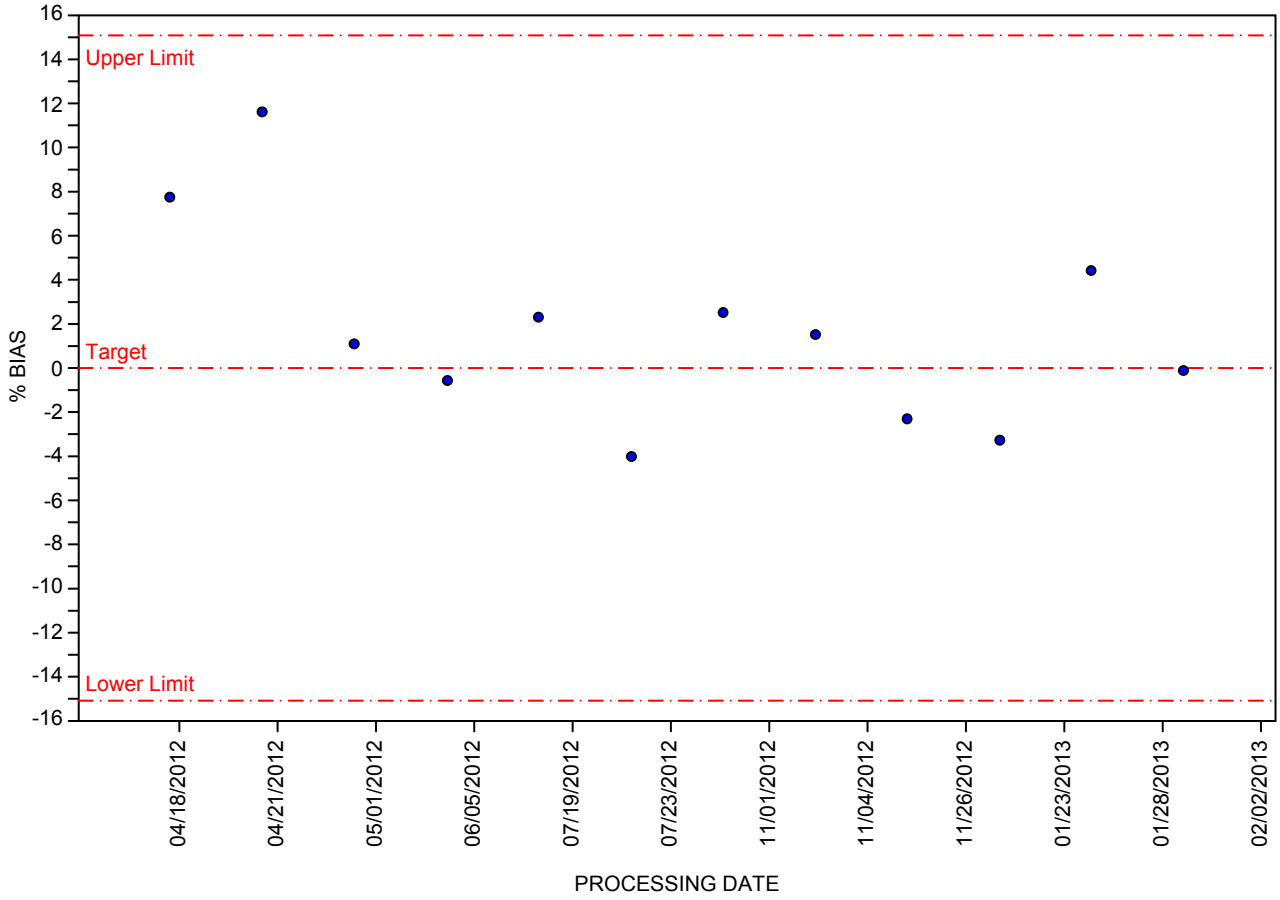
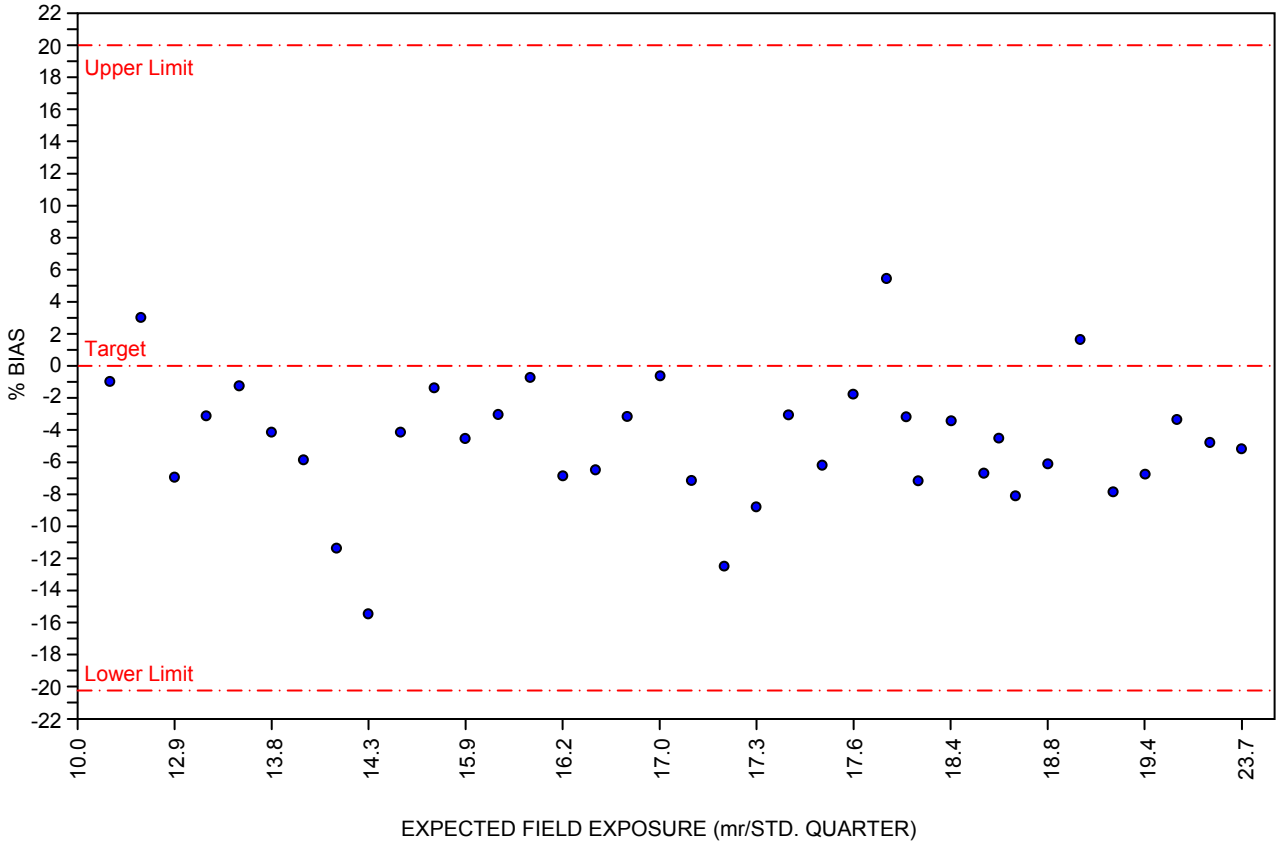


FIGURE 4

SEABROOK STATION CO-LOCATED ACCURACY



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ATTACHMENT 3

SEDIMENT DOSE CALCULATIONS

Sediment Sample Results

Sediment samples were collected from two locations in 2012 and analyzed for gamma radionuclides. Although Cesium-137 has been detected in previous years, all gamma radionuclides were below detectable limits in 2012. 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.