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May 14, 2007

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Annual Radiological Environmental Operating Report for 2006
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Dear Sir or Madam:

Arkansas Nuclear One (ANO), Units 1 and 2, Technical Specifications 5.6.2 and 6.6.2, respectively, require the submittal of an annual radiological environmental operating report for the previous year by May 15 of each year. Attached is the annual radiological environmental operating report for ANO for the year 2006. The radionuclides detected by the radiological environmental monitoring program during 2006 were significantly below regulatory limits; therefore, ANO plant operations during 2006 had no harmful effects nor resulted in any irreversible damage to the environment. This report fulfills the reporting requirements referenced above. Should you have any questions regarding this submittal, please contact Richard Scheide at (479) 858-4618.

This submittal contains no commitments.

Sincerely,

Richard H Scheide for

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DEJ/rhs
Attachment

IE25

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ARKANSAS NUCLEAR ONE - UNITS 1 AND 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2006

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Summary

The Annual Radiological Environmental Operating Report 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, 2006 through December 31, 2006. This report fulfills the requirements of ANO Unit 1 Technical Specification 5.6.2 and Unit 2 Technical Specification 6.9.4.

During 2006 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

- Cesium-137 levels in the sediment media are not demonstrating any consistent increase in comparison to previous years. Review indicates that results for 2006 were within the range of previous operational levels as discussed in Section 2.4 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 approximately 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 2006, 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 2006 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 2006. 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 Units 1 and 2 Offsite Dose Calculation Manual (ODCM) Table 2.6-3, when averaged over any calendar quarter. Therefore, 2006 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.

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) 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. A comparison of the 2006 results will be made when available.

Sample Deviations

- **Milk**

The REMP did not include milk sampling within five miles (8 km) of ANO in 2006 due to unavailability. ANO Units 1 and 2 ODCM require collection of milk samples if available commercially within 8 km (5 miles) of the plant. ANO personnel collected vegetation samples to monitor the ingestion pathway, as specified in the ODCM, because of milk unavailability.

- **Required Lower Limit of Detection (LLD) Values**

LLDs during this reporting period were within the acceptable limits required by Table 2.6-2 of the ANO Units 1 and 2 ODCM.

- **Air Samples**

Listed below are air sampler deviations that occurred during 2006 due to electrical power outages and equipment failure. These deviations did not result in the exceedance of the LLD values specified in the ODCM. As described in footnote (a) to ANO Units 1 and 2 ODCM Table 2.6-1, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

Station	Sampling Period	Comment
1	03/07/06 – 03/21/06	Pump found not running. Out of service pump was replaced with a new pump.
1	04/18/06 – 05/02/06	Air sample station power isolated due to maintenance on meteorological tower.
2	04/18/06 – 05/02/06	Loss of electrical power.
1	05/02/06 – 05/16/06	Volume totalizer failed. Volume totalizer was replaced.
2	10/17/06 – 10/31/06	Pump found not running. Out of service pump was replaced with a new pump.

- **Missed Samples**

One first quarter TLD (Station 127) was missed during 2006 due to vandalism. This loss was an isolated instance that did not recur during the year and was replaced with a new TLD by ANO personnel once discovered. The recovery rate for TLDs during 2006 was 99% (95 of 96).

- **Surface Water**

  Electrical power to the outlet that powers the composite surface water sampler at Station 8 was temporarily lost during the third quarter sampling period. Daily grab samples were taken as a compensatory measure until electrical power was restored to the composite sampler. This deviation did not result in a missed sample and as described in footnote (a) to ANO Units 1 and 2 ODCM Table 2.6-1, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

- **Unavailable Results**

  ANO received analytical results in adequate time for inclusion in this report. In addition, ANO's review identified no missing results.

Program Modifications

ANO made no modifications to the REMP during 2006.

Attachments

Attachment 1 contains results of air, TLD, water, sediment, fish, and food product samples collected in 2006. TLDs were analyzed by Waterford-3 Dosimetry. All remaining samples were analyzed by River Bend Station's (RBS) Environmental Laboratory. Attachment 1 also contains RBS' participation in the interlaboratory comparison program during 2006. Attachment 2 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."

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 important 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 ANO 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 and 1-2.

Section 2.0 of this report provides a discussion of 2006 sampling results and Section 3.0 provides a summary of results for the monitored exposure pathways.

1.3 Land Use Census

ANO personnel conduct a land use census biannually (once every two years) as required by ANO Units 1 and Unit 2 ODCM Section 2.6.2. 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 broadleaf vegetation *

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

- ANO personnel conduct door-to-door field surveys and/or aerial surveys in each meteorological sector out to five miles in order to locate the nearest resident and milk animal.
- Consultation with local agricultural authorities is used in instances when personal contact cannot be made.
- 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.

*	ANO personnel do not perform a garden census since ODCM Section 2.6.2 allows the routine sampling of broadleaf vegetation in the highest D/Q sector near the site boundary in lieu of the garden census.

Table 1.1

Radiological Environmental 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 groundlevel 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 groundlevel D/Q.	**Station 6 (111° - 6.8 miles)** - Entergy local office in Russellville (305 South Knoxville Avenue).		
	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 1 (88° - 0.5 miles)** - Near the meteorology tower.		
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 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)	Once per 92 days.	Gamma Dose – Once per 92 days.

Table 1.1

Radiological Environmental 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 4 (181° - 0.5 miles)** – West of May Cemetery entrance on south side of the road. **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

Radiological Environmental 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 (157° - 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 (337° - 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

Radiological Environmental 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 (92° - 0.6 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

Radiological Environmental 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 8 km distance if commercially available. 1 control sample location at a distance of >8 km, 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.

Table 1.1

Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Ingestion	<u>Food Products</u> 1 sample of broadleaf (edible or non-edible) near the Site Boundary from one of the highest anticipated annual average groundlevel 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 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.

FIGURE 1-1

SAMPLE COLLECTION SITES – NEAR FIELD

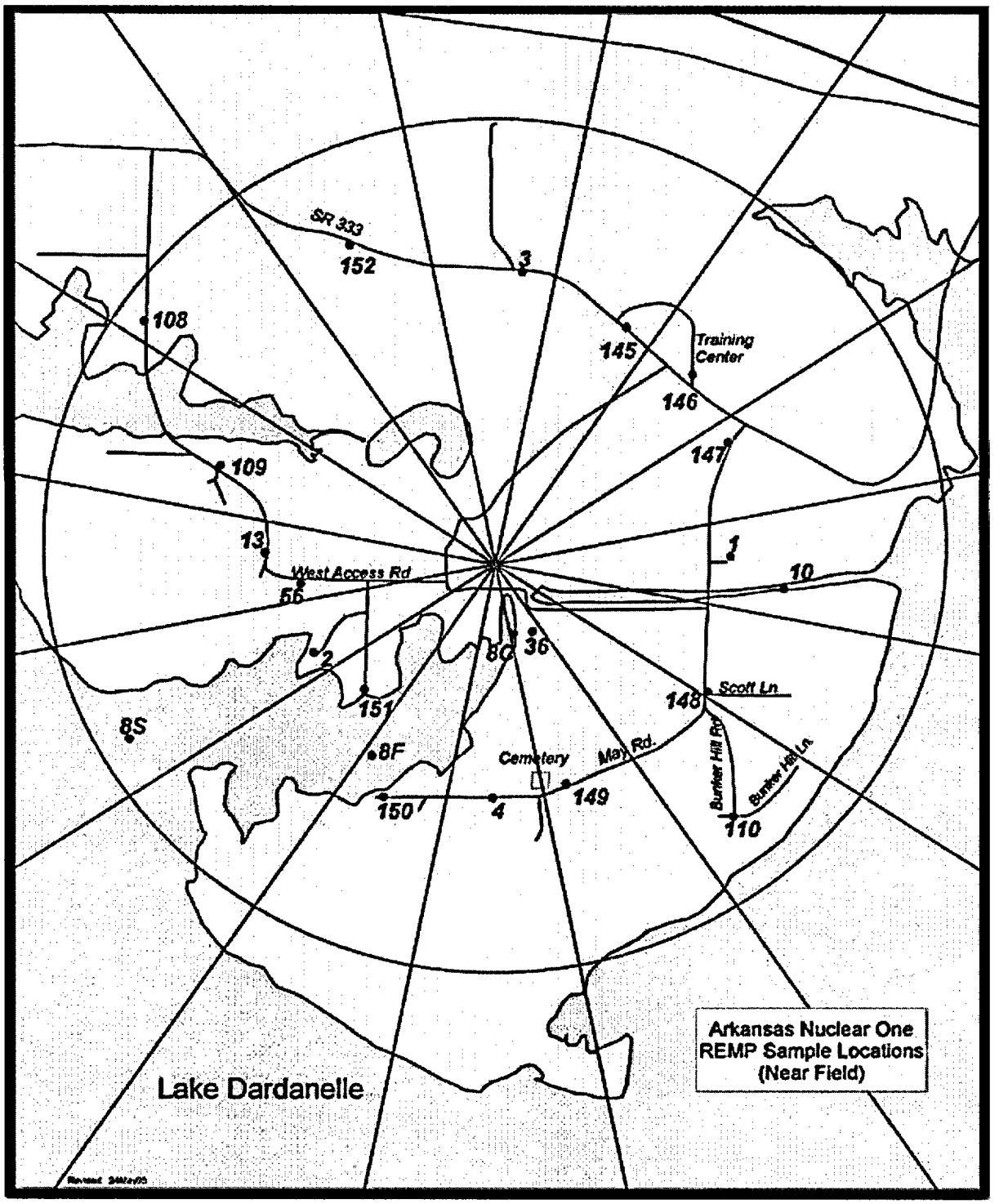
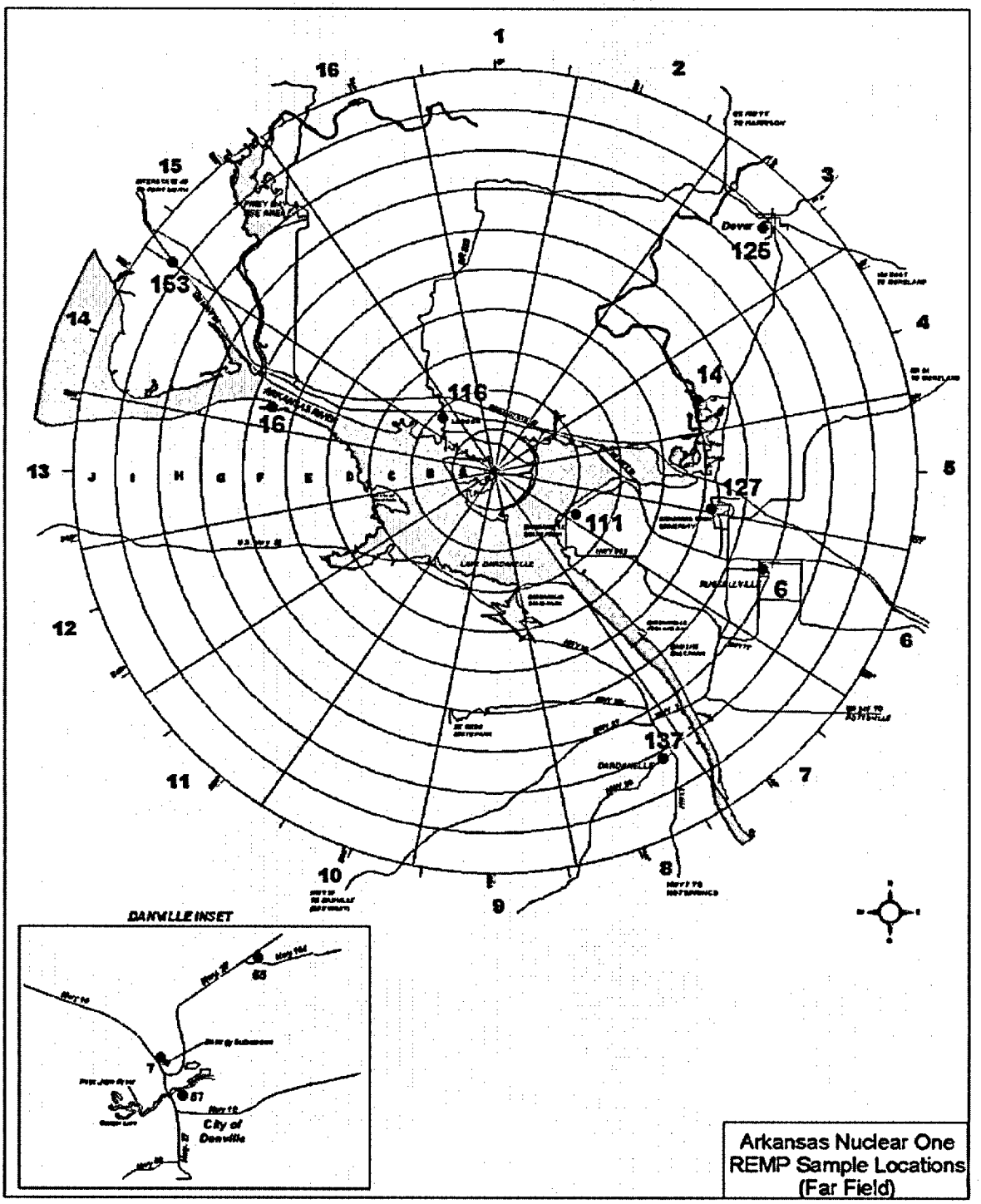


FIGURE 1-2

SAMPLE COLLECTION SITES – FAR FIELD



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 and the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986.

During 2006, Iodine-131 was not detected in the radioiodine cartridges, as has been the case in previous years. In addition, indicator gross beta air particulate results for 2006 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 pCi/m^3.

Monitoring Period	Result
2000 – 2005 (Minimum Value)	0.020
2006 Value	0.027
2000 – 2005 (Maximum Value)	0.030
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 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 7.2 mrem shown in Table 3.1 is within the historical bounds of 1997 – 2005 annual average results, which have ranged from 6.9 to 9.6 mrem.

Gamma radiation dose in the reporting period was further compared to historical control location readings for previous years as shown in Figure 2-1. ANO's comparison of the results to the control indicates that the ambient radiation levels are unaffected by plant operations. As shown in Figure 2-1, results from the indicator locations were within the upper (+) three standard deviation range for the control. Therefore, levels continue to remain at or near background.

Based on the above comparisons, ANO concluded that the ambient radiation levels are not being affected by plant operations.

2.3 Water Sample Results

Analytical results for 2006 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 pCi/l.

Monitoring Period	Concentration
2000 – 2005 (Minimum Value)	272.0
2006 Value	702.8
2000 – 2005 (Maximum Value)	876.3
Preoperational Value	200.0

ANO personnel have noted no definable increasing trends associated with the tritium levels at the discharge location. Levels detected during 2006 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 2006 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 detectable 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 2006 indicator results to preoperational and operational years. Results are reported as annual average pCi/l.

Radionuclide	2006	2000 – 2005	Preoperational
Gross Beta	5.58	3.20	2.0
Iodine-131	<LLD	<LLD	<LLD
Gammas	<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 2006 and levels of radionuclides remain similar to those obtained in previous operational years.

2.4 Sediment Sample Results

Sediment samples were collected from two locations in 2006 and analyzed for gamma radionuclides. As in previous years, Cesium-137 attributable to ANO was detected in the discharge sediment 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.. Although it is anticipated that radionuclides would be detected at this location since sediment particles provide a natural binding mechanism, ANO personnel have noted no definable consistent trends associated with this radionuclide at the discharge location. Cesium-137 results for 2006 were within the range of previous operational levels as seen below. Results are reported as annual average pCi/kg.

Monitoring Period	Concentration
2000 – 2005 (Minimum Value)	200.3
2006 Value	97.78
2000 – 2005 (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 2. The annual maximum dose from Cesium-137 to the skin and total body was calculated to be <0.01 millirem.

Design objectives given in 10CFR50, Appendix I for liquid effluents are annual doses of ≤3 millirem total body and ≤10 millirem any organ. The values of <0.01 millirem for the skin and total body are well within the design objective criteria. Therefore, the level of Cesium-137 detected in 2006 had no significant impact on the environment or public by this waterborne pathway.

2.5 Milk Sample Results

Milk samples were not collected during 2006 due to the unavailability of indicator locations within 8-km of ANO. Since there are no dairies within five miles of the ANO site, it is concluded ANO's operation had no impact on this pathway in 2006.

2.6 Fish Sample Results

Fish samples were collected from two locations and analyzed for gamma radionuclides. In 2006, 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 2006, food product samples were collected when available from two locations and analyzed for Iodine-131 and gamma radionuclides. The 2006 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 Land Use Census Results

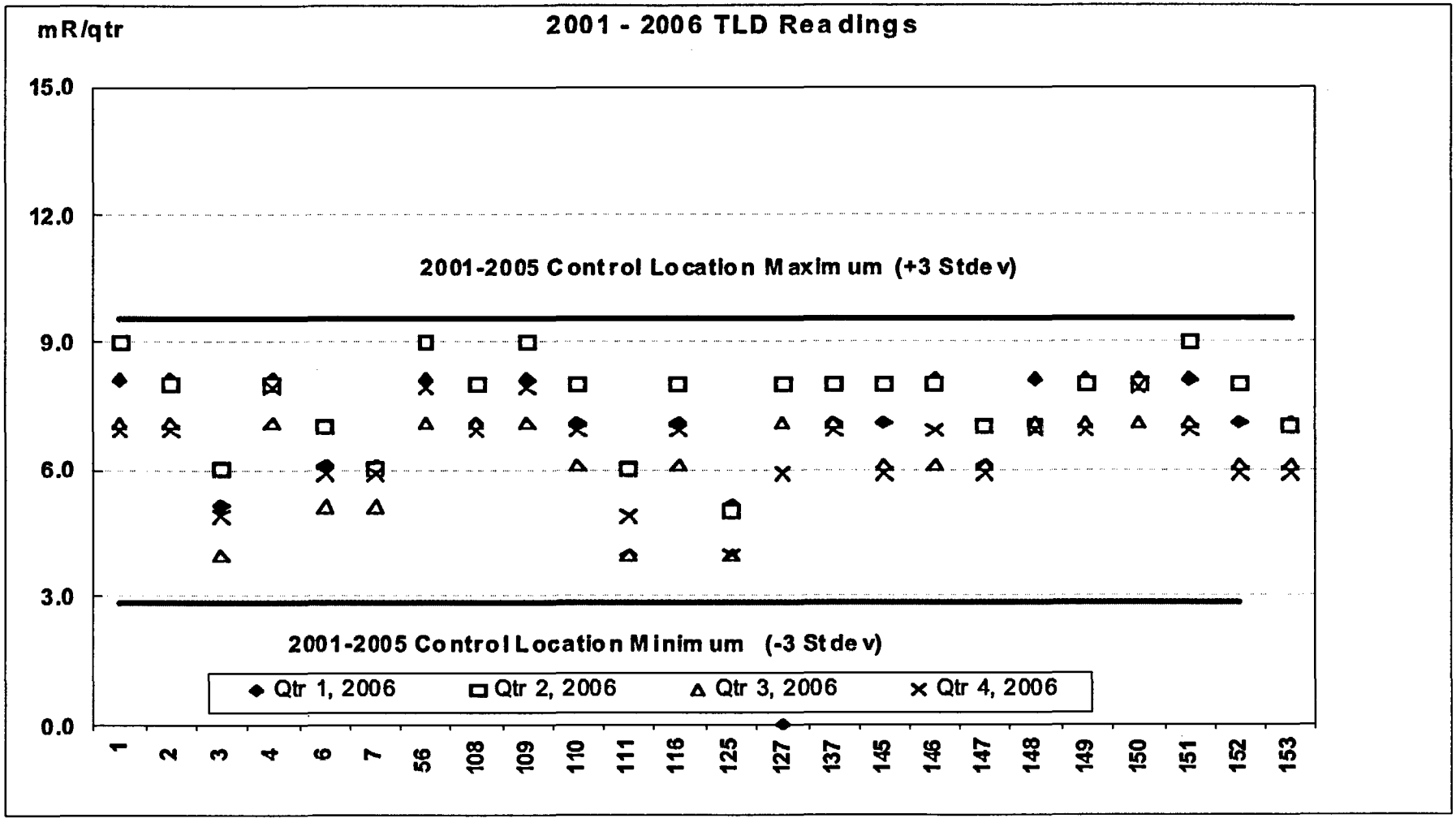
ANO personnel conduct a land use census biannually (once every two years). The most recent land use census was conducted in 2005. Therefore, a census was not required for this reporting year.

2.9 Interlaboratory Comparison Results

RBS' Environmental Laboratory analyzed interlaboratory comparison samples for ANO to fulfill the requirements of ANO Units 1 and 2 ODCM Section 2.6.3. Attachment 1, 2006 Radiological Environmental Monitoring Report, contains these results. ANO's review of RBS' interlaboratory comparison indicated that 98% of the sample results for accuracy and precision were within the acceptable control limits of the three normalized deviations. For the one sample result (Beta in water sample prepared June 8, 2006) outside the acceptable control limits, ANO's and RBS's review indicated no impact on previously reported data. Attachment 1 provides additional discussion regarding the sample result outside the acceptable control limit.

FIGURE 2-1

TLD RADIATION DOSE



3.0 Radiological Environmental Monitoring Program Summary

3.1 2006 Program Results Summary

Table 3.1 summarizes the 2006 REMP results. ANO personnel did not use values reported as less than the lower limit of detection (<LLD) when determining ranges and means for indicator and control locations.

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 2006

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 Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Air Particulates (pCi/m^3)	GB 135	0.01	0.027 (81 / 81) [0.007 – 0.045]	Station 56 (264°, 0.4 mi)	0.027 (27 / 27) [0.018 - 0.044]	0.024 (54 / 54) [0.013 - 0.045]	0
Airborne Iodine (pCi/m^3)	I-131 135	0.07	<LLD	N/A	N/A	<LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma 64	(f)	7.2 (64 / 64) [4.0 – 9.0]	Station 56 (264°, 0.4 mi)	8.0 (4 / 4) [7.1 – 9.0]	N/A	0
				Station 109 (291°, 0.6 mi)	8.0 (4 / 4) [7.1 – 9.0]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma 27	(f)	6.1 (27 / 27) [4.0 – 8.0]	Station 137 (151°, 8.2 mi)	7.3 (4 / 4) [6.9 – 8.0]	N/A	0
Control TLD (mR/Qtr)	Gamma 4	(f)	N/A	N/A	N/A	5.8 (4 / 4) [5.1 – 6.1]	0

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 2006

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Location Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Surface Water (pCi/l)	H-3 8	3000	702.8 (4 / 4) [289.0 – 1,250.0]	Station 8 (166°, 0.2 mi)	702.8 (4 / 4) [289.0 – 1,250.0]	<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

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 2006

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 Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Drinking Water (pCi/1)	GB 8	4	5.58 (3 / 4) [1.80 – 8.23]	Station 14 (70°, 5.1 mi)	5.58 (3 / 4) [1.80 – 8.23]	5.61 (4 / 4) [1.84 – 12.75]	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	N/A	<LLD	0
	Cs-137	180	97.78 (1 / 1) [N/A]	Station 8 (243°, 0.9 mi)	97.78 (1 / 1) [N/A]	<LLD	0

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 2006

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Location Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine 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 Tables 2.6-2.

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 Tables 2.6-2.

Attachment 1

2006 Radiological Monitoring Report

Summary of Monitoring Results

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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**
12/22/2005	01/04/2006	0.035	0.035	0.034	0.027	0.032
01/04/2006	01/10/2006	0.033	0.031	0.034	0.025	0.033
01/10/2006	01/24/2006	0.021	0.022	0.021	0.016	0.019
01/24/2006	02/07/2006	0.022	0.021	0.023	0.017	0.021
02/07/2006	02/21/2006	0.026	0.027	0.023	0.020	0.024
02/21/2006	03/07/2006	0.030	0.031	0.029	0.025	0.029
03/07/2006	03/21/2006	0.016	0.023	0.022	0.018	0.022
03/21/2006	04/04/2006	0.019	0.018	0.018	0.015	0.017
04/04/2006	04/18/2006	0.022	0.024	0.023	0.017	0.023
04/18/2006	05/02/2006	0.022	0.025	0.025	0.021	0.026
05/02/2006	05/16/2006	0.015	0.018	0.018	0.013	0.017
05/16/2006	05/30/2006	0.021	0.022	0.023	0.017	0.024
05/30/2006	06/13/2006	0.027	0.026	0.029	0.023	0.027
06/13/2006	06/27/2006	0.022	0.022	0.020	0.018	0.020
06/27/2006	07/11/2006	0.025	0.027	0.030	0.022	0.024
07/11/2006	07/25/2006	0.031	0.029	0.031	0.024	0.028
07/25/2006	08/08/2006	0.020	0.019	0.020	0.016	0.017
08/08/2006	08/22/2006	0.025	0.025	0.026	0.021	0.025
08/22/2006	09/05/2006	0.027	0.025	0.028	0.022	0.024
09/05/2006	09/19/2006	0.029	0.029	0.031	0.025	0.028
09/19/2006	10/03/2006	0.029	0.028	0.031	0.020	0.025
10/03/2006	10/17/2006	0.034	0.031	0.033	0.025	0.031
10/17/2006	10/31/2006	0.028	0.007	0.029	0.021	0.024
10/31/2006	11/14/2006	0.035	0.033	0.035	0.026	0.031
11/14/2006	11/28/2006	0.028	0.028	0.027	0.023	0.027
11/28/2006	12/12/2006	0.032	0.031	0.033	0.027	0.030
12/12/2006	12/19/2006	0.045	0.045	0.044	0.037	0.045

*** 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**
12/22/2005	01/04/2006	<0.022	<0.020	<0.029	<0.022	<0.022
01/04/2006	01/10/2006	<0.032	<0.036	<0.027	<0.033	<0.031
01/10/2006	01/24/2006	<0.017	<0.020	<0.020	<0.013	<0.016
01/24/2006	02/07/2006	<0.020	<0.023	<0.013	<0.017	<0.016
02/07/2006	02/21/2006	<0.019	<0.020	<0.015	<0.018	<0.018
02/21/2006	03/07/2006	<0.018	<0.014	<0.018	<0.019	<0.019
03/07/2006	03/21/2006	<0.021	<0.015	<0.018	<0.016	<0.020
03/21/2006	04/04/2006	<0.019	<0.017	<0.016	<0.019	<0.014
04/04/2006	04/18/2006	<0.015	<0.016	<0.022	<0.019	<0.017
04/18/2006	05/02/2006	<0.003	<0.016	<0.014	<0.012	<0.016
05/02/2006	05/16/2006	<0.015	<0.019	<0.018	<0.020	<0.018
05/16/2006	05/30/2006	<0.017	<0.016	<0.017	<0.017	<0.020
05/30/2006	06/13/2006	<0.014	<0.022	<0.018	<0.021	<0.022
06/13/2006	06/27/2006	<0.019	<0.016	<0.018	<0.017	<0.018
06/27/2006	07/11/2006	<0.022	<0.018	<0.017	<0.017	<0.021
07/11/2006	07/25/2006	<0.015	<0.014	<0.015	<0.013	<0.015
07/25/2006	08/08/2006	<0.017	<0.016	<0.015	<0.020	<0.021
08/08/2006	08/22/2006	<0.019	<0.017	<0.020	<0.016	<0.020
08/22/2006	09/05/2006	<0.016	<0.013	<0.017	<0.017	<0.017
09/05/2006	09/19/2006	<0.020	<0.020	<0.018	<0.015	<0.017
09/19/2006	10/03/2006	<0.024	<0.021	<0.018	<0.020	<0.020
10/03/2006	10/17/2006	<0.018	<0.017	<0.017	<0.014	<0.018
10/17/2006	10/31/2006	<0.020	<0.020	<0.020	<0.020	<0.020
10/31/2006	11/14/2006	<0.025	<0.027	<0.020	<0.025	<0.026
11/14/2006	11/28/2006	<0.020	<0.015	<0.013	<0.017	<0.018
11/28/2006	12/12/2006	<0.013	<0.014	<0.014	<0.018	<0.019
12/12/2006	12/19/2006	<0.034	<0.035	<0.026	<0.029	<0.025

Table 2.1
Sample Type: **Thermoluminescent Dosimeters**
Analysis: Gamma Dose
Units: mrem/Qtr

Inner Ring (Indicators)					
Station	**1st Qtr '06 (mrem)**	**2nd Qtr '06 (mrem)**	**3rd Qtr '06 (mrem)**	**4th Qtr '06 (mrem)**	**Annual Mean '06 (mrem)**
3	5.1	6.0	4.0	4.9	**5.0**
145	7.1	8.0	6.1	5.9	**6.8**
146	8.1	8.0	6.1	6.9	**7.3**
147	6.1	7.0	6.1	5.9	**6.3**
1	8.1	9.0	7.1	6.9	**7.8**
148	8.1	7.0	7.1	6.9	**7.3**
110	7.1	8.0	6.1	6.9	**7.0**
149	8.1	8.0	7.1	6.9	**7.5**
4	8.1	8.0	7.1	7.9	**7.8**
150	8.1	8.0	7.1	7.9	**7.8**
151	8.1	9.0	7.1	6.9	**7.8**
2	8.1	8.0	7.1	6.9	**7.5**
56 *	8.1	9.0	7.1	7.9	**8.0**
109 *	8.1	9.0	7.1	7.9	**8.0**
108	7.1	8.0	7.1	6.9	**7.3**
152	7.1	8.0	6.1	5.9	**6.8**

*** Stations 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 '06 (mrem)**	**2nd Qtr '06 (mrem)**	**3rd Qtr '06 (mrem)**	**4th Qtr '06 (mrem)**	**Annual Mean '06 (mrem)**
6	6.1	7.0	5.1	5.9	**6.0**
111	4.0	6.0	4.0	4.9	**4.7**
116	7.1	8.0	6.1	6.9	**7.0**
125	5.1	5.0	4.0	4.0	**4.5**
127	Missing	8.0	7.1	5.9	**7.0**
137 *	7.1	8.0	7.1	6.9	**7.3**
153	7.1	7.0	6.1	5.9	**6.5**

*** Station with highest annual mean.**

Special Interest Areas – (Control)					
Station	**1st Qtr '06 (mrem)**	**2nd Qtr '06 (mrem)**	**3rd Qtr '06 (mrem)**	**4th Qtr '06 (mrem)**	**Annual Mean '06 (mrem)**
7	6.1	6.0	5.1	5.9	**5.8**

Table 3.1
Sample Type: **Surface Water**
Analysis: Gamma Isotopic
Units: pCi/l

Location	Start Date	End Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	Required LLD →		**15**	**30**	**15**	**15**	**30**	**30**	**15**	**15**	**15**	**18**	**60**	**15**
Station 8 (Indicator)	12/31/2005	01/31/2006	<3.44	<8.12	<4.49	<2.74	<9.60	<5.32	<3.88	<6.03	<3.26	<3.59	<15.66	<8.20
Station 10 (Control)	12/31/2005	01/31/2006	<4.14	<5.32	<4.25	<3.09	<7.09	<6.07	<2.90	<5.77	<3.33	<3.25	<12.88	<6.45
Station 8 (Indicator)	01/31/2006	02/28/2006	<4.29	<6.10	<3.35	<3.02	<6.95	<6.78	<4.11	<8.46	<3.82	<4.08	<22.22	<5.65
Station 10 (Control)	01/31/2006	02/28/2006	<3.52	<7.65	<3.63	<3.42	<6.68	<5.39	<3.73	<6.52	<2.74	<3.24	<18.05	<4.07
Station 8 (Indicator)	02/28/2006	03/31/2006	<3.19	<7.71	<3.62	<3.20	<6.60	<6.31	<3.45	<9.27	<3.39	<3.82	<19.52	<6.23
Station 10 (Control)	02/28/2006	03/31/2006	<2.95	<6.47	<3.44	<3.22	<4.52	<5.63	<3.91	<6.64	<2.90	<3.52	<17.12	<5.73
Station 8 (Indicator)	03/31/2006	04/30/2006	<3.89	<7.86	<3.97	<3.08	<6.95	<6.87	<3.98	<6.16	<3.57	<3.51	<14.21	<4.36
Station 10 (Control)	03/31/2006	04/30/2006	<3.58	<6.08	<2.59	<3.24	<6.32	<5.75	<2.67	<4.89	<3.35	<3.13	<14.81	<3.79
Station 8 (Indicator)	04/30/2006	05/31/2006	<3.57	<6.40	<3.50	<3.44	<5.22	<5.44	<3.26	<5.19	<2.95	<2.98	<11.63	<4.56
Station 10 (Control)	04/30/2006	05/31/2006	<3.02	<6.25	<2.84	<2.05	<6.97	<4.35	<3.29	<5.51	<3.31	<3.88	<13.24	<3.97
Station 8 (Indicator)	05/31/2006	06/30/2006	<4.08	<10.94	<3.48	<4.22	<9.04	<8.15	<3.68	<11.28	<3.99	<3.87	<22.58	<8.12
Station 10 (Control)	05/31/2006	06/30/2006	<3.86	<8.84	<3.93	<3.38	<7.63	<7.09	<4.77	<12.05	<4.44	<3.71	<24.54	<9.88

Table 3.1
Sample Type: **Surface Water**
Analysis: Gamma Isotopic
Units: pCi/l

Location	Start Date	End Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	Required LLD →		**15**	**30**	**15**	**15**	**30**	**30**	**15**	**15**	**15**	**18**	**60**	**15**
Station 8 (Indicator)	06/30/2006	07/31/2006	<3.62	<7.63	<2.90	<2.78	<7.30	<6.84	<4.52	<7.67	<4.04	<3.41	<19.03	<7.15
Station 10 (Control)	06/30/2006	07/31/2006	<3.31	<8.58	<3.34	<3.47	<6.01	<5.84	<4.02	<5.21	<4.34	<3.36	<14.62	<6.06
Station 8 (Indicator)	07/31/2006	08/31/2006	<5.92	<9.67	<4.07	<3.06	<11.08	<10.86	<5.41	<13.64	<5.97	<4.02	<34.12	<9.94
Station 10 (Control)	07/31/2006	08/31/2006	<4.32	<8.95	<4.23	<4.19	<8.61	<8.56	<6.39	<11.28	<3.91	<5.00	<23.33	<9.58
Station 8 (Indicator)	08/31/2006	09/30/2006	<3.15	<6.70	<3.55	<3.61	<7.80	<7.02	<3.97	<7.61	<3.85	<3.90	<18.68	<4.93
Station 10 (Control)	08/31/2006	09/30/2006	<2.48	<6.19	<3.24	<3.03	<6.29	<6.67	<4.14	<6.07	<3.46	<3.73	<17.83	<6.69
Station 8 (Indicator)	09/30/2006	10/31/2006	<2.84	<6.72	<3.37	<2.69	<6.78	<5.50	<3.85	<5.18	<2.33	<2.95	<15.35	<5.89
Station 10 (Control)	09/30/2006	10/31/2006	<3.87	<9.14	<3.37	<2.76	<7.11	<4.83	<3.72	<7.44	<4.72	<4.11	<17.05	<6.71
Station 8 (Indicator)	10/31/2006	11/30/2006	<3.73	<8.14	<2.75	<3.98	<7.94	<8.60	<6.46	<12.57	<4.26	<3.88	<25.29	<10.21
Station 10 (Control)	10/31/2006	11/30/2006	<3.37	<4.99	<3.65	<2.99	<7.44	<6.34	<5.12	<14.25	<3.23	<3.77	<30.97	<6.77
Station 8 (Indicator)	11/30/2006	12/31/2006	<3.84	<7.06	<3.18	<3.18	<7.10	<6.37	<4.02	<7.03	<3.72	<4.33	<22.05	<5.98
Station 10 (Control)	11/30/2006	12/31/2006	<3.62	<7.74	<3.69	<3.36	<6.46	<6.89	<5.03	<7.77	<3.67	<3.66	<15.67	<8.56

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)	12/31/2005	03/31/2006	531
Station 10 (Control)	12/31/2005	03/31/2006	<587
Station 8 (Indicator)	03/31/2006	06/30/2006	289
Station 10 (Control)	03/31/2006	06/30/2006	<578
Station 8 (Indicator)	06/30/2006	09/30/2006	1,250
Station 10 (Control)	06/30/2006	09/30/2006	<571
Station 8 (Indicator)	09/30/2006	12/31/2006	741
Station 10 (Control)	09/30/2006	12/31/2006	<571

Table 4.1
Sample Type: **Drinking Water**
Analysis: Gross Beta, Iodine-131 and Gamma Isotopic
Units: pCi/l

Location	Collection Date	Gross Beta	I-131	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
Required LLD →		**4.0**	**1.0**	**15**	**30**	**15**	**15**	**30**	**30**	**15**	**15**	**18**	**60**	**15**
Station 14 (Indicator)	03/24/2006	6.71	<0.89	<6.31	<12.79	<4.16	<5.46	<7.13	<8.57	<5.04	<3.23	<5.89	<21.30	<8.66
Station 57 (Control)	03/21/2006	3.12	<0.89	<5.14	<5.69	<6.28	<4.95	<8.97	<8.64	<4.16	<4.72	<4.36	<32.37	<7.89
Station 14 (Indicator)	07/06/2006	8.23	<0.81	<3.17	<6.78	<3.57	<3.35	<5.97	<6.10	<3.69	<3.06	<3.03	<14.77	<6.03
Station 57 (Control)	07/06/2006	12.75	<0.87	<3.00	<7.79	<3.35	<4.38	<6.86	<7.69	<4.13	<3.15	<3.94	<19.81	<5.63
Station 14 (Indicator)	09/20/2006	1.80	<0.85	<5.80	<10.81	<6.54	<5.17	<10.01	<9.64	<4.82	<6.47	<6.88	<22.20	<8.95
Station 57 (Control)	09/20/2006	4.71	<0.90	<3.98	<6.67	<4.37	<5.14	<9.87	<8.67	<5.25	<4.72	<2.71	<21.35	<9.87
Station 14 (Indicator)	12/19/2006	<1.95	<0.90	<4.73	<8.62	<4.72	<3.44	<12.80	<8.75	<5.74	<4.89	<6.79	<27.99	<8.14
Station 57 (Control)	12/19/2006	1.84	<0.90	<2.98	<9.16	<3.39	<3.55	<10.05	<6.63	<5.68	<3.68	<5.11	<23.92	<9.39

Table 4.2
Sample Type: **Drinking Water**
Analysis: Tritium
Units: pCi/l

Location	Collection Date	H-3
	Required LLD →	**2000**
Station 14 (Indicator)	03/24/2006	<574
Station 57 (Control)	03/21/2006	<579
Station 14 (Indicator)	07/06/2006	<570
Station 57 (Control)	07/06/2006	<576
Station 14 (Indicator)	09/20/2006	<568
Station 57 (Control)	09/20/2006	<574
Station 14 (Indicator)	12/19/2006	<580
Station 57 (Control)	12/19/2006	<573

Table 5.1
Sample Type: Sediment
Analysis: Gamma Isotopic
Units: pCi/kg

Location	Collection Date	Cs-134	Cs-137
	Required LLD →	150	180
Station 8 (Indicator)	10/04/2006	<134.54	97.78
Station 16 (Control)	10/17/2006	<71.70	<66.18

Table 6.1
Sample Type: **Fish**
Analysis: Gamma Isotopic
Units: pCi/kg

Location	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Cs-134	Cs-137
	Required LLD →	**130**	**260**	**130**	**130**	**260**	**130**	**150**
Station 8 (Indicator)	09/28/2006	<15.83	<180.87	<49.18	<25.22	<68.34	<15.56	<13.46
Station 16 (Control)	09/07/2006	<17.80	<242.69	<50.95	<19.00	<47.22	<14.00	<14.20

Table 7.1
Sample Type: **Food Products**
Analysis: Iodine-131 and Gamma Isotopic
Units: pCi/kg

Location	Collection Date	I-131	Cs-134	Cs-137
	Required LLD →	60	60	80
Station 13 (Indicator)	06/15/2006	<47.32	<27.55	<21.93
Station 55 (Control)	06/13/2006	<57.87	<38.05	<55.45
Station 13 (Indicator)	07/26/2006	<57.57	<50.01	<37.87
Station 55 (Control)	07/25/2006	<45.20	<48.04	<39.32
Station 13 (Indicator)	08/22/2006	<55.03	<38.96	<33.32
Station 55 (Control)	08/22/2006	<59.65	<32.82	<32.28

Table 8.1
Sample Type: **Interlaboratory Comparison**
Analysis: Gross Beta, Iodine-131 and Gamma Isotopic

Sample Type (units)	Study	Date	Analysis	Known Value [a]	RBS Value	RBS N-Dev [b]	RBS N-Range [c]
Charcoal Cartridge (pCi/cartridge)	E5008-125	06/08/2006	I-131	66.4	73	1.15	0.297
Water (pCi/liter)	E5007-125	06/08/2006	Beta	169	125	-3.01 [d]	0.093
	E5006-125	06/08/2006	Cr-51	210	222	0.64	0.544
			Mn-54	119	129.0	0.97	0.199
			Co-58	81.2	82.0	0.11	0.436
			Fe-59	75.8	77.3	0.23	0.779
			Co-60	104	105	0.15	0.227
			Zn-65	150	157	0.56	0.394
			I-131	74.7	79.7	0.77	0.211
			Cs-134	103	101	-0.22	0.153
			Cs-137	95.1	104	1.12	0.248
			Ce-141	149.00	157	0.62	0.159
	E5083-125	09/13/2006	H-3	11000	10926	-0.08	0.142
Milk (pCi/liter)	E5009-125	06/08/2006	Cr-51	259	243	-0.70	0.395
			Mn-54	146	150.0	0.32	0.135
			Co-58	100	101.0	0.12	0.118
			Fe-59	93.6	104.0	1.28	0.463
			Co-60	104	128	2.63	0.189
			Zn-65	185	183.0	-0.12	0.170
			I-131	63.2	60.7	-0.46	0.187
			Cs-134	127	122.7	-0.39	0.062
			Cs-137	117	115	-0.20	0.067

Table 8.1
Sample Type: **Interlaboratory Comparison**
Analysis: Tritium and Gamma Isotopic

Sample Type (units)	Study	Date	Analysis	Known Value [a]	RBS Value	RBS N-Dev [b]	RBS N-Range [c]
Air Filter (pCi/Filter)	E5081-125	09/13/2006	Beta	88.4	99.2	1.41	0.058
	E5237-125	02/12/2007	Cr-51	145	141	-0.33	0.277
			Mn-54	171	185.3	0.97	0.104
			Co-58	77.9	79.6	0.26	0.369
			Fe-59	50.2	54.6	1.01	0.745
			Co-60	491.0	493.9	0.07	0.030
			Zn-65	243	277.6	1.64	0.107
			Cs-134	248.0	243.1	-0.23	0.094
			Cs-137	423	443	0.54	0.028
			Ce-141	145.0	125	-1.56	0.065
Sediment (pCi/gram)	E5082-125	09/13/2006	Cr-51	0.423	0.421	-0.05	0.465
			Mn-54	0.169	0.169	0.02	0.163
			Co-58	0.164	0.155	-0.61	0.600
			Fe-59	0.066	0.062	-0.64	0.776
			Co-60	0.201	0.182	-1.11	0.196
			Zn-65	0.218	0.210	-0.42	0.578
			Cs-134	0.128	0.126	-0.15	0.185
			Cs-137	0.362	0.378	0.51	0.174
			Ce-141	0.129	0.119	-0.90	0.275

NOTES:

(a) The "known" value as determined by Analytics.

(b) The normalized deviation from the "known" value is computed from the deviation and the standard error of the mean; ±2.0 is the warning limit and ±3.00 is the control limit. This is a measure of accuracy of the analytical methods.

(c) The normalized range is computed from the mean range, the control limit and the standard error of the range; +2.00 is the warning limit and +3.00 is the control limit. This is a measure of precision of the analytical methods.

(d) The results reported were outside the acceptable control limits.

Interlaboratory Comparison Program Exceptions

There was one result outside the control limits for accuracy in the 2006 Interlaboratory Comparison Program studies. The gross beta in water was 0.006% outside the lower control limit.

In October 2006, a new gross beta in water sample was prepared using the same source material. The results were within the acceptance criteria for the test. This same sample was counted on a new alpha/beta counter and was also within the control limits.

Review of trending information of gross beta in water results shows a fluctuation of high and low values. In 2000 there was another occurrence of gross beta in water below the control limit of 3.0. Analytics was contacted to see if there was a low bias of reporting gross beta in water by other participants. All other participant results looked normal with no low bias responses with the sample.

The most probable cause of the low value was sample preparation error. The low result could also have been due to machine age or an intermittent issue, but other samples counted on the same machine were within the control level. The new sample that was counted lends the most logical conclusion that a preparation error could have occurred during mixing, transfer or evaporation of the sample media.

There is no impact accessed on previously reported data due to these results. Environmental samples are analyzed and reported with a ninety-five percent confidence level. A known standard is counted with each group of samples and must read within 10 percent of the decay corrected activity. Ninety-eight percent of RBS environmental crosscheck results were within control limits for accuracy and 100% for precision during 2006.

ATTACHMENT 2

Sediment Dose Calculations

Sediment Dose Calculations

Dose calculation for the discharge sediment was performed using generalized equation found in Regulatory Guide 1.109, Appendix A as follows:

R = (40) × (C) × (U) × (D) × (W)

R = Annual dose to skin or total body in mrem/year;

40 = Area-mass conversion factor given in Appendix A of Regulatory Guide 1.109 in Kg/m^2;

C = 2006 maximum radionuclide concentration in pCi/kg;

U = Maximum exposure time given in Table E-5 of Regulatory Guide 1.109 (67 hours for teenager);

D = External dose conversion factor for standing on contaminated ground given in Table E-6 of Regulatory Guide 1.109 in mrem/hr per pCi/m^2, and

W = Shore-width factor (0.1) given in Table A-2 of Regulatory Guide 1.109.

(Dose from Sediment in Millirem/Year)

Radionuclide	2006 Maximum Concentration	Conversion Factor For Skin	Total Skin Dose	Conversion Factor For Total Body	Total Body Dose
Cs-137	97.98	4.90 E-09	1.29 E-04	4.20 E-09	1.10 E-04
TOTAL			**1.29 E-04**		**1.10 E-04**