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May 15, 2006

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

Subject: Annual Radiological Environmental Operating Report for 2005
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 2005. The radionuclides detected by the radiological environmental monitoring program during 2005 were significantly below regulatory limits; therefore, ANO plant operations during 2005 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,

Dale E. James
Manager, Licensing

DEJ/rhs
Attachment

IE25

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ARKANSAS NUCLEAR ONE - UNITS 1 AND 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2005

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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, 2005 through December 31, 2005. This report fulfills the requirements of ANO Unit 1 Technical Specification 5.6.2 and Unit 2 Technical Specification 6.6.2.

During 2005 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 2005 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 2005, 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 2005 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 2005. 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, 2005 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.

Sample Deviations

- **Milk**

The REMP did not include milk sampling within five miles (8 km) of ANO in 2005 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 2005 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
56	05/03/06 – 05/17/06	Pump running, however total run time was reduced due to possible thunderstorm electrical outages.
56	05/17/06 – 05/31/06	Pump running at 30 lpm but volume totalizer not advancing. Volume totalizer was replaced.
6	11/15/05 – 11/29/05	Volume totalizer failed. Volume totalizer was replaced.
7	11/29/06 – 12/12/06	Pump found not running and totalizer indicates the pump was off for approximately one hour. Out of service pump was replaced with a new pump.

- **Missed Samples**

There were no missed samples in the reporting period.

- **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 2005.

Attachments

Attachment 1 contains results of air, TLD, water, sediment, fish, and food product samples collected in 2005. 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 2005. 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 2005 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 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 (136° - 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 (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 (335° - 0.8 miles)** – North side of State Highway 333 on a London City limit 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 (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

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	**Food Products** 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

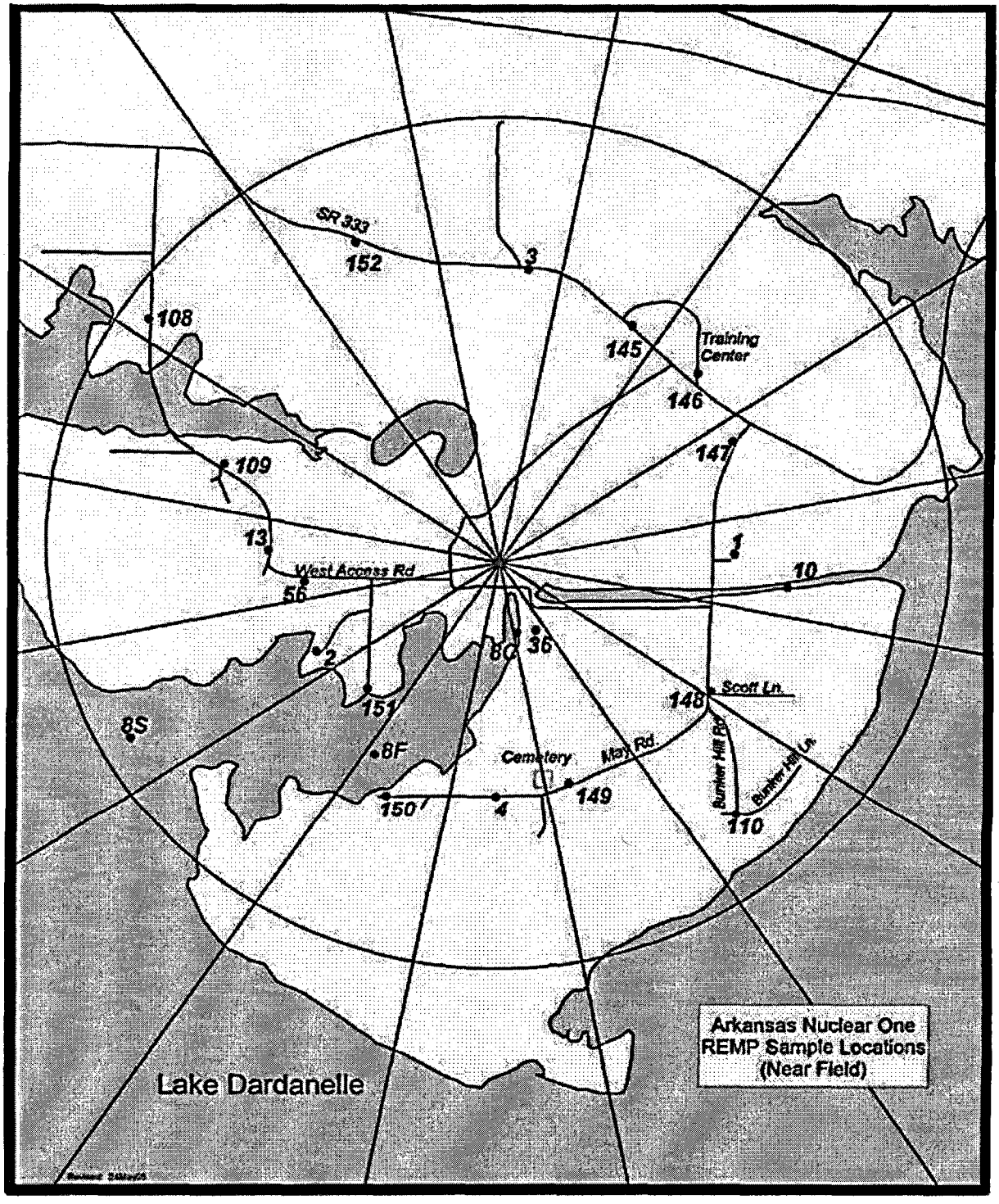
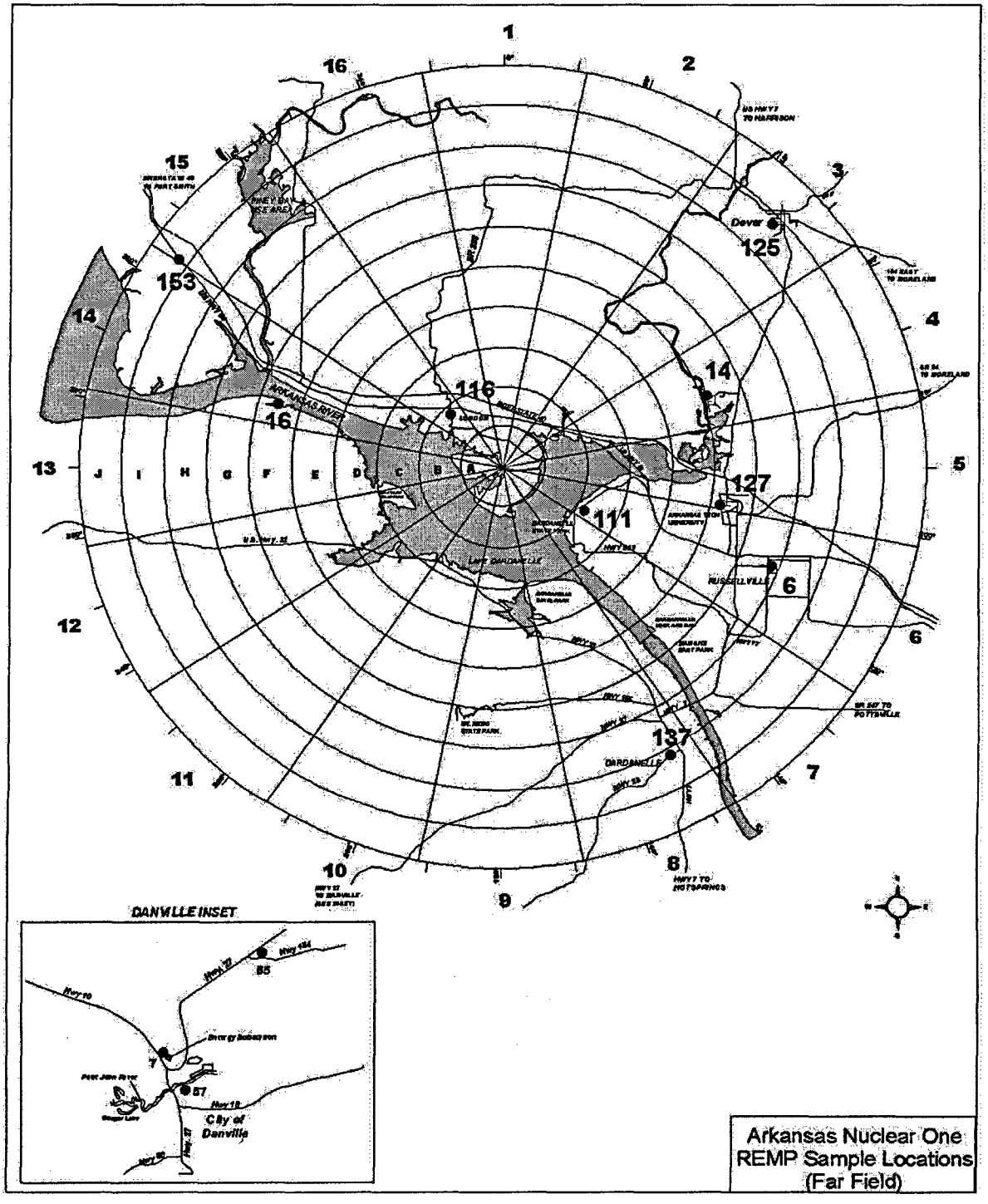


FIGURE 1-2

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 2005, 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 2005 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 – 2004 (Minimum Value)	0.020
2005 Value	0.026
2000 – 2004 (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 6.9 mrem shown in Table 3-1 is within the historical bounds of 1997 – 2004 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. Although the second quarter reading for TLD Station 1 shown in Figure 2-1 was slightly above the upper (+) three standard deviation range value of 10.4 mrem for the historical maximum control location, ANO considers the difference to be insignificant since there has been no identifiable trends associated with this station.

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 2005 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 – 2004 (Minimum Value)	272.0
2005 Value	876.3
2000 – 2004 (Maximum Value)	870.3
Preoperational Value	200.0

ANO personnel have noted no definable increasing trends associated with the tritium levels at the discharge location. Levels detected during 2005 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 2005 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 2005 indicator results to preoperational and operational years. Results are reported as annual average pCi/l.

Radionuclide	2005	2000 – 2004	Preoperational
Gross Beta	1.91	3.45	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 2005 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 2005 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 2005 were within the range of previous operational levels as seen below. Results are reported as annual average pCi/kg.

Monitoring Period	Concentration
2000 – 2004 (Minimum Value)	200.3
2005 Value	666.8
2000 – 2004 (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 2005 had no significant impact on the environment or public by this waterborne pathway.

2.5 Milk Sample Results

Milk samples were not collected during 2005 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 2005.

2.6 Fish Sample Results

Fish samples were collected from two locations and analyzed for gamma radionuclides. In 2005, gamma radionuclides were below detectable limits which is 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 2005, food product samples were collected when available from two locations and analyzed for Iodine-131 and gamma radionuclides. The 2005 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

Minor adjustments were made to three of the nearest residence mileage distances as compared to the 2003 census. However, the land use census did not identify any new locations during the September 2005 survey 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 2005, which is allowed by ANO Units 1 and 2 ODCM Section 2.6.2, in lieu of broadleaf vegetation sampling in the meteorological sector (Sector 13) with the highest "D/Q".

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, 2005 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 (Mn-54 in sediment) 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 limits.

TABLE 2.1

2005 Land Use Census

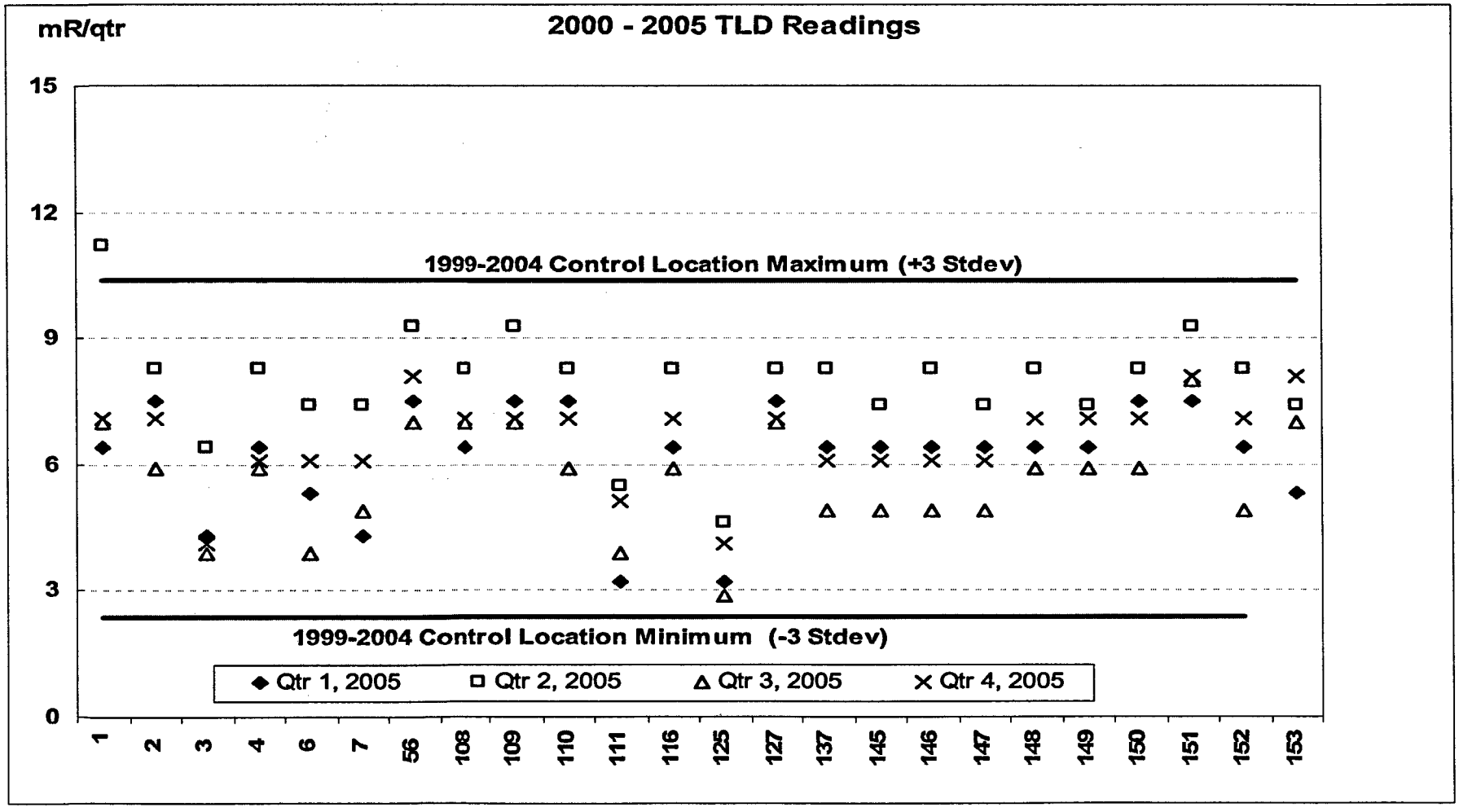
Nearest Residence Within Five Miles

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

* Minor adjustments to residence mileage distance made as compared to 2003.

FIGURE 2-1

TLD RADIATION DOSE



3.0 Radiological Environmental Monitoring Program Summary

3.1 2005 Program Results Summary

Table 3.1 summarizes the 2005 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 2005

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 130	0.01	0.026 (78 / 78) [0.014 – 0.064]	Station 56 (273°, 0.4 mi)	0.029 (26 / 26) [0.017 - 0.064]	0.025 (52 / 52) [0.016 - 0.043]	0
Airborne Iodine (pCi/m^3)	I-131 130	0.07	<LLD	N/A	N/A	<LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma 64	(f)	6.9 (64 / 64) [3.9 – 11.2]	Station 151 (210°, 0.4 mi)	8.2 (4 / 4) [7.5 – 9.3]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma 28	(f)	5.9 (28 / 28) [2.9 – 8.3]	Station 127 (97°, 5.2 mi)	7.5 (4 / 4) [7.0 – 8.3]	N/A	0
Control TLD (mR/Qtr)	Gamma 4	(f)	N/A	N/A	N/A	5.7 (4 / 4) [4.3 – 7.4]	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 2005

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	876.3 (3 / 4) [666.0 – 1121.0]	Station 8 (180°, 0.1 mi)	876.3 (3 / 4) [666.0 – 1121.0]	<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 2005**

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	1.91 (3/4) [1.13 – 2.34]	Station 14 (70°, 5.3 mi)	1.91 (3/4) [1.13 – 2.34]	1.70 (3/4) [1.62 – 1.77]	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	666.8 (1/1) [N/A]	Station 8 (245°, 0.7 mi)	666.8 (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 2005

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

2005 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**
12/28/2004	01/11/2005	0.019	0.019	0.020	0.019	0.020
01/11/2005	01/25/2005	0.035	0.029	0.038	0.032	0.031
01/25/2005	02/08/2005	0.023	0.022	0.024	0.022	0.024
02/08/2005	02/22/2005	0.029	0.026	0.030	0.027	0.028
02/22/2005	03/08/2005	0.026	0.026	0.030	0.026	0.027
03/08/2005	03/22/2005	0.016	0.017	0.018	0.016	0.018
03/22/2005	04/05/2005	0.015	0.014	0.017	0.016	0.016
04/05/2005	04/19/2005	0.016	0.017	0.018	0.016	0.016
04/19/2005	05/03/2005	0.017	0.016	0.018	0.018	0.017
05/03/2005	05/17/2005	0.023	0.021	0.064	0.021	0.025
05/17/2005	05/31/2005	0.018	0.018	0.021	0.019	0.019
05/31/2005	06/14/2005	0.019	0.019	0.023	0.018	0.019
06/14/2005	06/28/2005	0.029	0.025	0.029	0.025	0.029
06/28/2005	07/12/2005	0.028	0.029	0.029	0.026	0.028
07/12/2005	07/26/2005	0.022	0.022	0.023	0.02	0.024
07/26/2005	08/09/2005	0.027	0.029	0.030	0.027	0.029
08/09/2005	08/23/2005	0.022	0.021	0.022	0.021	0.023
08/23/2005	09/07/2005	0.035	0.035	0.038	0.035	0.038
09/07/2005	09/20/2005	0.033	0.035	0.035	0.033	0.035
09/20/2005	10/04/2005	0.019	0.021	0.023	0.021	0.020
10/04/2005	10/18/2005	0.024	0.024	0.021	0.021	0.022
10/18/2005	11/01/2005	0.026	0.026	0.027	0.036	0.032
11/01/2005	11/15/2005	0.028	0.027	0.030	0.018	0.029
11/15/2005	11/29/2005	0.025	0.024	0.027	0.021	0.027
11/29/2005	12/12/2005	0.046	0.046	0.049	0.033	0.039
12/12/2005	12/22/2005	0.036	0.041	0.041	0.027	0.043

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**
12/28/2004	01/11/2005	<0.017	<0.015	<0.018	<0.015	<0.017
01/11/2005	01/25/2005	<0.017	<0.015	<0.015	<0.020	<0.015
01/25/2005	02/08/2005	<0.010	<0.014	<0.009	<0.012	<0.013
02/08/2005	02/22/2005	<0.017	<0.014	<0.014	<0.013	<0.012
02/22/2005	03/08/2005	<0.012	<0.012	<0.011	<0.013	<0.013
03/08/2005	03/22/2005	<0.013	<0.014	<0.014	<0.012	<0.012
03/22/2005	04/05/2005	<0.015	<0.017	<0.018	<0.015	<0.016
04/05/2005	04/19/2005	<0.019	<0.015	<0.022	<0.015	<0.016
04/19/2005	05/03/2005	<0.018	<0.016	<0.016	<0.016	<0.021
05/03/2005	05/17/2005	<0.017	<0.014	<0.050	<0.019	<0.018
05/17/2005	05/31/2005	<0.018	<0.018	<0.023	<0.017	<0.015
05/31/2005	06/14/2005	<0.017	<0.017	<0.018	<0.018	<0.019
06/14/2005	06/28/2005	<0.013	<0.013	<0.012	<0.015	<0.014
06/28/2005	07/12/2005	<0.017	<0.018	<0.014	<0.018	<0.019
07/12/2005	07/26/2005	<0.012	<0.010	<0.011	<0.012	<0.016
07/26/2005	08/09/2005	<0.019	<0.020	<0.017	<0.018	<0.016
08/09/2005	08/23/2005	<0.012	<0.013	<0.016	<0.010	<0.010
08/23/2005	09/07/2005	<0.014	<0.019	<0.017	<0.018	<0.019
09/07/2005	09/20/2005	<0.014	<0.013	<0.014	<0.015	<0.013
09/20/2005	10/04/2005	<0.013	<0.014	<0.014	<0.013	<0.011
10/04/2005	10/18/2005	<0.021	<0.024	<0.021	<0.022	<0.018
10/18/2005	11/01/2005	<0.014	<0.016	<0.013	<0.019	<0.013
11/01/2005	11/15/2005	<0.012	<0.018	<0.017	<0.017	<0.012
11/15/2005	11/29/2005	<0.017	<0.019	<0.020	<0.021	<0.018
11/29/2005	12/12/2005	<0.056	<0.049	<0.046	<0.049	<0.052
12/12/2005	12/22/2005	<0.022	<0.030	<0.028	<0.024	<0.022

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

Inner Ring (Indicators)					
Station	**1st Qtr '05 (mrem)**	**2nd Qtr '05 (mrem)**	**3rd Qtr '05 (mrem)**	**4th Qtr '05 (mrem)**	**Annual Mean '05 (mrem)**
3	4.3	6.4	3.9	4.1	**4.7**
145	6.4	7.4	4.9	6.1	**6.2**
146	6.4	8.3	4.9	6.1	**6.4**
147	6.4	7.4	4.9	6.1	**6.2**
1	6.4	11.2	7.0	7.1	**7.9**
148	6.4	8.3	5.9	7.1	**6.9**
110	7.5	8.3	5.9	7.1	**7.2**
149	6.4	7.4	5.9	7.1	**6.7**
4	6.4	8.3	5.9	6.1	**6.7**
150	7.5	8.3	5.9	7.1	**7.2**
151 *	7.5	9.3	8.0	8.1	**8.2**
2	7.5	8.3	5.9	7.1	**7.2**
56	7.5	9.3	7.0	8.1	**8.0**
109	7.5	9.3	7.0	7.1	**7.7**
108	6.4	8.3	7.0	7.1	**7.2**
152	6.4	8.3	4.9	7.1	**6.7**

*** 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 '05 (mrem)**	**2nd Qtr '05 (mrem)**	**3rd Qtr '05 (mrem)**	**4th Qtr '05 (mrem)**	**Annual Mean '05 (mrem)**
6	5.3	7.4	3.9	6.1	**5.7**
111	3.2	5.5	3.9	5.1	**4.4**
116	6.4	8.3	5.9	7.1	**6.9**
125	3.2	4.6	2.9	4.1	**3.7**
127 *	7.5	8.3	7.0	7.1	**7.5**
137	6.4	8.3	4.9	6.1	**6.4**
153	5.3	7.4	7.0	8.1	**7.0**

*** Station with highest annual mean.**

Special Interest Areas – (Control)					
Station	**1st Qtr '05 (mrem)**	**2nd Qtr '05 (mrem)**	**3rd Qtr '05 (mrem)**	**4th Qtr '05 (mrem)**	**Annual Mean '05 (mrem)**
7	4.3	7.4	4.9	6.1	**5.7**

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)	12/31/2004	01/31/2005	<2.66	<6.54	<3.71	<2.70	<6.01	<5.76	<3.52	<4.98	<3.25	<3.48	<12.44	<6.39
Station 10 (Control)	12/31/2004	01/31/2005	<2.69	<6.30	<2.41	<2.60	<6.09	<4.92	<3.31	<2.80	<2.88	<2.93	<10.64	<4.32
Station 8 (Indicator)	01/31/2005	02/28/2005	<4.96	<9.95	<4.79	<4.38	<7.25	<7.32	<5.01	<6.88	<5.23	<4.40	<20.77	<7.56
Station 10 (Control)	01/31/2005	02/28/2005	<3.81	<11.99	<5.42	<4.70	<10.38	<10.27	<6.26	<5.31	<5.90	<6.59	<26.07	<5.99
Station 8 (Indicator)	02/28/2005	03/31/2005	<3.95	<8.52	<2.91	<3.77	<7.19	<7.20	<4.11	<9.17	<4.02	<2.89	<18.97	<6.84
Station 10 (Control)	02/28/2005	03/31/2005	<3.28	<7.42	<3.81	<3.79	<8.38	<6.71	<3.77	<6.89	<3.99	<4.05	<15.73	<5.99
Station 8 (Indicator)	03/31/2005	04/30/2005	<4.20	<6.76	<3.12	<3.08	<6.18	<7.16	<4.10	<5.07	<3.08	<3.20	<14.57	<5.68
Station 10 (Control)	03/31/2005	04/30/2005	<3.29	<7.17	<3.53	<3.17	<8.80	<5.96	<3.38	<4.71	<4.43	<3.27	<15.50	<5.49
Station 8 (Indicator)	04/30/2005	05/31/2005	<3.30	<6.89	<4.11	<2.99	<7.08	<6.59	<4.21	<6.01	<4.12	<3.85	<20.52	<5.69
Station 10 (Control)	04/30/2005	05/31/2005	<4.23	<8.31	<3.42	<4.39	<7.87	<7.48	<4.45	<6.22	<4.35	<3.43	<20.45	<7.51
Station 8 (Indicator)	05/31/2005	06/30/2005	<2.62	<4.66	<3.92	<2.41	<6.26	<6.26	<4.21	<5.66	<3.80	<3.69	<16.86	<6.55
Station 10 (Control)	05/31/2005	06/30/2005	<3.60	<5.96	<3.25	<4.12	<7.95	<6.30	<4.34	<4.85	<4.42	<4.09	<17.90	<6.43

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)	06/30/2005	07/31/2005	<5.67	<10.73	<3.50	<6.21	<9.34	<10.50	<6.42	<7.02	<6.92	<6.65	<21.12	<8.11
Station 10 (Control)	06/30/2005	07/31/2005	<5.07	<9.71	<4.09	<5.11	<9.13	<8.61	<5.42	<8.34	<5.61	<3.05	<18.27	<5.45
Station 8 (Indicator)	07/31/2005	08/31/2005	<4.48	<10.42	<4.28	<4.45	<11.14	<8.71	<3.93	<8.47	<3.24	<7.10	<20.95	<9.83
Station 10 (Control)	07/31/2005	08/31/2005	<3.70	<7.63	<4.34	<5.33	<9.05	<8.75	<5.38	<10.52	<4.59	<4.02	<28.81	<9.49
Station 8 (Indicator)	08/31/2005	09/30/2005	<2.94	<9.26	<4.21	<4.74	<7.62	<7.38	<3.87	<9.44	<4.32	<2.95	<23.80	<6.02
Station 10 (Control)	08/31/2005	09/30/2005	<2.96	<4.82	<3.36	<3.21	<7.57	<7.52	<4.17	<9.07	<3.60	<3.36	<23.12	<8.49
Station 8 (Indicator)	09/30/2005	10/31/2005	<3.09	<7.52	<4.15	<3.64	<8.46	<7.19	<3.29	<4.59	<4.19	<3.16	<15.97	<6.50
Station 10 (Control)	09/30/2005	10/31/2005	<2.99	<5.54	<2.90	<3.45	<7.68	<6.19	<3.05	<5.71	<4.16	<3.61	<14.79	<2.99
Station 8 (Indicator)	10/31/2005	11/30/2005	<3.68	<6.64	<4.39	<3.82	<8.28	<6.60	<4.83	<6.05	<4.85	<4.21	<24.32	<5.65
Station 10 (Control)	10/31/2005	11/30/2005	<4.81	<9.11	<5.04	<2.93	<9.18	<6.11	<6.32	<8.88	<4.55	<4.53	<26.60	<8.65
Station 8 (Indicator)	11/30/2005	12/31/2005	<3.92	<9.42	<2.86	<3.46	<9.38	<5.10	<4.21	<13.80	<3.73	<3.29	<31.66	<8.72
Station 10 (Control)	11/30/2005	12/31/2005	<4.77	<8.96	<4.01	<3.51	<5.24	<6.56	<5.92	>14.98	<3.76	<3.43	<26.38	<7.30

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)	12/31/2004	03/31/2005	<587
Station 10 (Control)	12/31/2004	03/31/2005	<576
Station 8 (Indicator)	03/31/2005	06/30/2005	666
Station 10 (Control)	03/31/2005	06/30/2005	<556
Station 8 (Indicator)	06/30/2005	09/30/2005	1121
Station 10 (Control)	06/30/2005	09/30/2005	<597
Station 8 (Indicator)	09/30/2005	12/31/2005	842
Station 10 (Control)	09/30/2005	12/31/2005	<588

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)	03/17/2005	1.13	<0.87	<4.87	<5.84	<5.41	<3.42	<10.62	<7.69	<4.91	<5.52	<6.73	<21.15	<6.21
Station 57 (Control)	03/17/2005	<1.69	<0.90	<5.30	<7.07	<5.20	<3.95	<7.90	<7.90	<4.12	<3.24	<4.86	<20.72	<5.71
Station 14 (Indicator)	06/14/2005	<1.68	<0.88	<3.32	<9.59	<3.86	<3.45	<9.69	<7.25	<3.57	<3.88	<4.07	<16.12	<6.80
Station 57 (Control)	06/14/2005	1.71	<0.88	<3.36	<7.05	<3.55	<3.62	<6.96	<5.06	<3.86	<3.75	<3.86	<11.44	<4.57
Station 14 (Indicator)	09/13/2005	2.25	<0.90	<2.76	<6.99	<3.30	<3.18	<8.28	<6.24	<4.21	<3.19	<3.82	<13.60	<5.86
Station 57 (Control)	09/13/2005	1.62	<0.90	<2.75	<7.52	<2.84	<2.47	<5.91	<5.09	<3.66	<3.31	<3.14	<15.88	<5.90
Station 14 (Indicator)	12/12/2005	2.34	<0.90	<4.48	<5.81	<3.90	<3.83	<10.97	<9.89	<7.51	<4.01	<4.49	<41.03	<10.09
Station 57 (Control)	12/12/2005	1.77	<0.89	<4.68	<8.74	<4.63	<4.23	<7.07	<6.83	<4.15	<4.26	<3.46	<31.67	<9.53

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

Location	Collection Date	H-3
	Required LLD →	**2000**
Station 14 (Indicator)	03/17/2005	<583
Station 57 (Control)	03/17/2005	<572
Station 14 (Indicator)	06/14/2005	<552
Station 57 (Control)	06/14/2005	<565
Station 14 (Indicator)	09/13/2005	<566
Station 57 (Control)	09/13/2005	<571
Station 14 (Indicator)	12/12/2005	<583
Station 57 (Control)	12/12/2005	<568

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)	10/12/2005	<115.34	666.8
Station 16 (Control)	10/14/2005	<107.73	<84.99

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)	10/04/2005	<9.98	<5.60	<13.16	<15.65	<45.54	<12.42	<11.51
Station 16 (Control)	09/08/2005	<16.99	<8.72	<32.38	<14.10	<37.28	<14.86	<13.88

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)	06/16/2005	<53.06	<43.90	<49.59
Station 55 (Control)	06/16/2005	<58.87	<44.85	<51.88
Station 13 (Indicator)	07/18/2005	<58.35	<31.71	<38.48
Station 55 (Control)	07/21/2005	<50.45	<32.12	<39.86
Station 13 (Indicator)	08/18/2005	<32.84	<27.07	<17.28
Station 55 (Control)	08/18/2005	<52.01	<28.68	<25.33

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)	E4570-125	06/09/2005	I-131	91.7	96.3	0.88	0.386
Water (pCi/liter)	E4569-125	06/09/2005	Beta	214	232	1.48	0.055
	E4568-125	06/09/2005	Cr-51	330	347	0.89	0.251
			Mn-54	136	140	0.55	0.217
			Co-58	69.7	81.3	2.89	0.678
			Fe-59	158	165.7	0.84	0.262
			Co-60	169	191	2.25	0.384
			Zn-65	93.8	100	1.08	0.378
			I-131	104	95.7	-1.39	0.170
			Cs-134	206	213	0.56	0.086
			Cs-137	101	107	1.09	0.117
			Ce-141	214	232	1.48	0.055
	E4719-125	09/15/2005	H-3	4190	4337	0.61	0.152
Milk (pCi/liter)	E4571-125	06/09/2005	Cr-51	303	254	-2.82	1.111
			Mn-54	125	126.0	0.18	0.614
			Fe-59	63.9	74.7	2.92	0.647
			Co-60	145	132.0	-1.51	0.407
			Zn-65	155.0	158.0	0.37	0.495
			I-131	86.9	83.3	-0.71	0.068
			Cs-134	95.0	89.0	-1.09	0.373
			Cs-137	189	184	-0.49	0.281
			Ce-141	92.4	95.7	0.61	0.447

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)	E4717-125	09/15/2005	Beta	95.8	94.2	-0.29	0.253
	E4720-125	09/15/2005	Cr-51	237	209	-2.05	0.548
			Mn-54	64.5	65.3	0.21	0.449
			Co-58	44.4	43.1	-0.51	0.931
			Fe-59	42.7	44.7	0.81	0.332
			Co-60	117	112	-0.79	0.454
			Zn-65	86.6	89.6	0.60	0.498
			Cs-134	85.7	80.2	-1.12	0.193
			Cs-137	137	135	-0.29	0.302
			Ce-141	164	153	-1.16	0.576
Sediment (pCi/gram)	E4718-125	09/15/2005	Cr-51	0.455	0.467	0.47	0.091
			Mn-54	0.124	0.155	**4.28** [d]	0.191
			Co-58	0.085	0.093	1.63	0.347
			Fe-59	0.082	0.090	1.76	1.008
			Co-60	0.225	0.246	1.59	0.158
			Zn-65	0.166	0.187	2.19	0.676
			Cs-134	0.164	0.183	1.97	0.396
			Cs-137	0.364	0.418	2.55	0.097
			Ce-141	0.314	0.355	2.24	0.150

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; ±2.00 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 associated with a gamma isotopic analysis of a sediment sample that was outside the control limits for accuracy in the 2005 Interlaboratory Comparison program participation studies.

The result outside the control limits for accuracy was in the analysis of the nuclide Mn-54 in Analytics sample number E4718-125 of September 15, 2005. River Bend Station's normalized-deviation for the analysis was +4.28 with control limits of ±3.00. This high bias result is considered conservative and as having no impact on past results of the program. Mn-54 results were all within control limits in other program samples for the year 2005, with normalized-deviation of 0.55 in a water sample analysis, 0.21 in an air filter sample analysis, and 0.18 in a milk sample analysis.

Review of trending information of Mn-54 results in sediment samples indicates a steady high bias, with only one result for Mn-54 out of the control limits in 1998. Reanalysis of the 2005 sediment sample produced results very similar to the original averaged result.

Analytics was contacted concerning the high Mn-54 bias result. The explanation received was that the effect of coincidence summing where the 834 keV gamma efficiency (of Mn-54) is lower due to coincidence summing of the 898 and 1836 keV gammas from Y-88 would give a lower efficiency and therefore a higher value for Mn-54.

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 = 2005 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	2005 Maximum Concentration	Conversion Factor For Skin	Total Skin Dose	Conversion Factor For Total Body	Total Body Dose
Cs-137	666.8	4.90 E-09	8.76 E-04	4.20 E-09	7.51 E-04
TOTAL			**8.76 E-04**		**7.51 E-04**