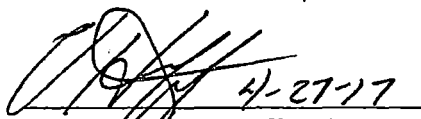
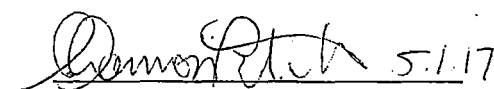


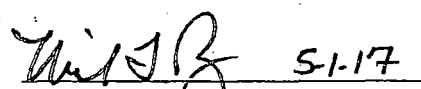
**RIVER BEND STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT FOR 2016**

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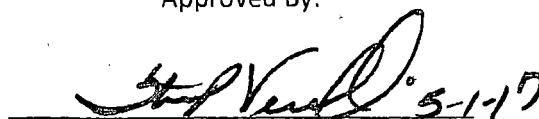

5-1-17
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Summary

The Annual Radiological Environmental Operating Report presents data obtained through analyses of environmental samples collected for the River Bend Station (RBS) Radiological Environmental Monitoring Program (REMP) for the period January 1, 2016 through December 31, 2016. This report fulfills a requirement specified in RBS Technical Requirements Manual (TRM) 5.6.2 as required by Technical Specification 5.6.2 of Appendix A to RBS License Number NPF-47. During 2016, REMP results remained at background levels, as has been the case in previous years.

All required lower limit of detection (LLD) capabilities were achieved in all sample analyses during 2016, as required by the RBS Technical Requirement Manual (TRM). No measurable levels of radiation above baseline levels attributable to River Bend Station operation were detected in the vicinity of RBS. The 2016 Radiological Environmental Monitoring Program thus substantiated the adequacy of source control and effluent monitoring at River Bend Station with no observed impact of plant operations on the environment.

Radiological Environmental Monitoring Program

RBS established the REMP prior to the station's becoming operational (1985) to provide data on background radiation and radioactivity normally present in the area. RBS has continued to monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring direct radiation. RBS also samples milk if milk-producing animals used for human consumption are present within five miles (8 km) of the plant.

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

In 2016, environmental samples were collected for radiological analysis. The results of indicator locations were compared with control locations and previous studies. It was concluded that no significant relationship exists between RBS operation and effect on the area around the plant. The review of 2016 data showed radioactivity levels in the environment were undetectable in many locations and near background levels in significant pathways.

Harmful Effects or Irreversible Damage

The REMP monitoring did not detect any harmful effects or evidence of irreversible damage in 2016. Therefore, no analysis or planned course of action to alleviate problems was necessary.

Reporting Levels

River Bend Station reviews indicate that no REMP sample equaled or exceeded reporting levels for radioactivity concentration in environmental samples, as outlined in RBS Technical Requirements Manual Table 3.12.1-2, when averaged over any calendar quarter. Therefore, 2016 results did not require any Radiological Monitoring Program Special Reports.

Radioactivity Not Attributable to RBS

The RBS REMP has detected radioactivity attributable to other sources not associated with the operation of RBS. These instances are summarized as follows:

- ◆ In 2011, I-131 was detected in a control vegetation sample, and indicator and control air sample media, which was credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake.
- ◆ In 1986, following the radioactive plume release due to reactor core degradation at the Chernobyl Nuclear Power Plant, RBS REMP detected I-131 in water, vegetation, and air samples.
- ◆ I-131 was also detected during 1998 in the wastewater treatment plant effluent, which was attributed to the medical treatment of a RBS employee.
- ◆ In 2006, Cs-137 was detected in upstream and downstream Mississippi River sediment samples. This activity was not present in the 2016 samples.
- ◆ In 2015, low level Cs-137 activity was detected in a soil sample collected during an emergency preparedness drill from a location greater than five miles from River Bend. This activity is attributed to the well documented global presence of low level Cs-137 activity due to residual weapons testing fallout.

Comparison to Federal and State Programs

RBS personnel compared REMP data to federal and state monitoring programs as results became available. Historically, the programs used for comparison have included the U.S. Nuclear Regulatory Commission (NRC) TLD (Thermoluminescent Dosimeter) Direct Radiation Monitoring Network and the Louisiana Department of Environmental Quality – Office of Environmental Compliance (LDEQ-OEC).

The NRC TLD Network Program was discontinued in 1998. Historically these results have compared to those from the RBS REMP. RBS 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 LDEQ-OEC and the RBS REMP entail similar radiological environmental monitoring program elements. These programs include co-located air samplers, and similar locations for sample media such as water, fish and food products. 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 RBS in 2016 due to unavailability of milk-producing animals used for human consumption. The RBS Technical Requirements Manual requires collection of milk samples if available commercially within 8 km (5 miles) of the plant. RBS personnel collected vegetation samples to monitor the ingestion pathway, as specified in RBS Technical Requirements Manual Table 3.12.1-1, because of milk unavailability.

◆ Sampling Deviations

Listed below are sampling deviations that occurred during 2016. As described in footnote (a) to RBS Technical Requirements Manual Table 3.12.1-1, deviations are permitted from the required sampling schedule due to malfunction of equipment or other legitimate reasons.

Station	Sampling Period	Problem Description	Comment
AN1 AP1	04/05/16 to 04/19/16	Power Outage	Air sampler locations AN1 & AP1 lost power for 3.1 hours due to power outage. (CR-RBS-2016-3020)
AGC	07/26/16 to 08/09/16 08/09/16 to 08/17/16 *Partial sample analyzed	Pump Failure Power Outage	Air sampler location AGC found not running and could not restart. (CR-RBS-2016-5659)

◆ Missed Samples

In 2016, one control air sample was not analyzed due to a power outage and sampler pump failure.

◆ Unavailable Results

There were no unavailable results in 2016.

Program Modifications

RBS made no modifications to the REMP during the year 2016.

Attachments

Attachments 1 through 7 contain results of air, TLD, water, sediment, fish, food products and special samples collected in 2016. River Bend's REMP TLDs were analyzed by Stanford Dosimetry. The Teledyne Brown Engineering Environmental Laboratory analyzed all remaining samples. Attachment 8 contains Teledyne Brown Engineering's participation in the Interlaboratory Comparison Program during the year 2016.

1. Introduction

1.1. Radiological Environmental Monitoring Program

River Bend Station 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 the following:

- 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 RBS.
- 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, as seen in Figure 1-1, are monitored as required by the RBS Technical Requirements Manual 3.12.1. A description of the RBS REMP sample locations utilized to monitor exposure pathways are described in Table 1.1 and shown in Figures 1-2 and 1-3. RBS may occasionally supplement this program with additional sampling in order to provide a comprehensive and well-balanced program.

Section 2.0 of this report provides a discussion of 2016 sampling results with Section 3.0 providing a summary of results for the monitored exposure pathways.

1.3. Land Use Census

RBS personnel conduct a land use census biannually as required by RBS Technical Requirements Manual 3.12.2. The last land use census was performed in 2016. The next scheduled land use census will be performed in 2018. Section 2.8 on the report contains a narrative on the results of the 2016 land use 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	<p><u>Radioiodine and Particulates</u> 2 samples from close to the 2 SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground level D/Q.</p>	<p>AN1 (0.9 km W) - RBS site Hwy 965; 0.4 km south of Activity Center.</p> <p>AP1 (0.9 km WNW) - Behind River Bend Station Activity Center.</p>	Continuous sampler operation with sample collection every two weeks, or more frequently if required by dust loading.	<p>Radioiodine Canisters - I-131 analysis every two weeks.</p> <p>Air Particulate - Gross beta radioactivity analysis following filter change.</p>
	<p><u>Radioiodine and Particulates</u> 1 sample from the vicinity of a community having the highest calculated annual average ground level D/Q.</p>	<p>AQS2 (5.8 km NW) - St. Francis Substation on US Hwy. (Bus.) 61 in St. Francisville.</p>		
	<p><u>Radioiodine and Particulates</u> 1 sample from a control location, as for example 15 - 30 km distance and in the least prevalent wind direction.</p>	<p>AGC (17.0 km SE) - Entergy Service Center compound in Zachary. (Control)</p>		
Direct Radiation	<p><u>TLDs</u> One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.</p>	<p>TA1 (1.7 km N) - River Bend Training Center.</p> <p>TB1 (0.5 km NNE) - Utility pole near River Bend Station cooling tower yard area.</p> <p>TC1 (1.7 km NE) - Telephone pole at Jct. US Hwy. 61 and Old Highway 61.</p>	Quarterly	mR exposure quarterly.

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	<p>TLDs One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.</p>	<p>TD1 (1.6 km ENE) – Stub pole along WF7, 150m S of Jct. WF7 and US Hwy. 61.</p> <p>TE1 (1.3 km E) – Stub pole along WF7, 1 km S of Jct. WF7 and US Hwy. 61.</p> <p>TF1 (1.3 km ESE) – Stub pole along WF7, 1.6 km S of Jct. WF7 and US Hwy. 61.</p> <p>TG1 (1.6 km SE) – Stub pole along WF7, 2 km S of Jct. WF7 and US Hwy. 61.</p> <p>TH1 (1.7 km SSE) – Stub pole at power line crossing of WF7 (near Grants Bayou).</p> <p>TJ1 (1.5 km S) – Stub pole near River Bend Station Gate #23 on Powell Station Road (LA Hwy. 965).</p> <p>TK1 (0.9 km SSW) – Utility pole on Powell Station Road (LA Hwy. 965), 20 m S of River Bend Station River Access Road.</p> <p>TL1 (1.0 km SW) – First utility pole on Powell Station Road (LA Hwy. 965) S of former Illinois Central Gulf RR crossing.</p>	Quarterly	mR exposure quarterly.

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	<p>TLDs One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.</p>	<p>TM1 (0.9 km WSW) - Third utility pole on Powell Station Road (LA Hwy. 965) N of former Illinois Central Gulf RR crossing.</p> <p>TN1 (0.9 km W) - Utility pole along Powell Station Road (LA Hwy. 965), near garden and AN1 air sampler location.</p> <p>TP1 (0.9 km WNW) - Behind River Bend Station Activity Center at AP1 air sampler location.</p> <p>TQ1 (0.6 km NW) - Across from MA-1 on RBS North Access Road.</p> <p>TR1 (0.8 km NNW) - River Bend Station North Access Road across from Main Plant entrance.</p>	Quarterly	mR exposure quarterly.
	<p>TLDs The balance of the stations (8) to be placed in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control locations.</p>	<p>TAC (15.8 km N) - Utility pole at Jct. of US Hwy. 61 and LA Hwy. 421, 7.9 km north of Bains. (Control)</p> <p>TCS (12.3 km NE) - Utility pole at gate to East Louisiana State Hospital in Jackson. (Special)</p> <p>TEC (16.0 km E) - Stub pole at jct. of Hwy. 955 and Greenbrier Road, 4.8 km North of Jct. of Hwys 955 and 964. (Control)</p>		

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	<p>TLDs The balance of the stations (8) to be placed in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control locations.</p>	<p>TGS (17.0 km SE) – Entergy Service Center compound in Zachary. (Special)</p> <p>TNS (6.0 km W) – Utility pole with electrical meter at west bank ferry landing (LA Hwy. 10). (Special)</p> <p>TQS1 (4.0 km NW) – Utility pole front of Pentecostal church (opposite West Feliciana Parish Hospital) near Jct. US Hwy. 61 and Commerce Street. (Special)</p> <p>TQS2 (5.8 km NW) – St. Francis Substation on business US Hwy. 61 in St. Francisville. (Special)</p> <p>TRS (9.2 km NNW) - Stub pole at Jct. of US Hwy. 61 and WF2 near Bains (West Feliciana High School). (Special)</p>	Quarterly	mR exposure quarterly.
Waterborne	<p>Surface Water 1 sample upstream and 1 sample downstream.</p>	<p>SWU (5.0 km W) - Mississippi River about 4 km upstream from the plant liquid discharge outfall, near LA Hwy. 10 ferry crossing.</p> <p>SWD (7.75 km S) - Mississippi River about 4 km downstream from plant liquid discharge outfall, near paper mill.</p>	Grab samples quarterly	Gamma isotopic analysis and tritium analysis quarterly.

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	<p><u>Groundwater</u> Samples from 1 or 2 sources only if likely to be affected.</p>	<p>WU (~470 m NNE) - Upland Terrace Aquifer well upgradient from plant. WD (~470 m SW) - Upland Terrace Aquifer well downgradient from plant.</p>	Semiannually	Gamma isotopic and tritium analysis semiannually.
	<p><u>Sediment From Shoreline</u> 1 sample from downstream area with existing or potential recreational value.</p>	<p>SEDD (7.75 km S) - Mississippi River about 4 km downstream from plant liquid discharge outfall, near paper mill.</p>	Annually	Gamma isotopic analysis annually.
Ingestion	<p><u>Milk</u> If commercially available, 1 sample from milking animals within 8 km distant where doses are calculated to be greater than 1 mrem per year. 1 sample from milking animals at a control location 15 - 30 km distant when an indicator location exists.</p>	Currently, no available milking animals within 8 km of RBS.	Quarterly when animals are on pasture.	Gamma isotopic and I-131 analysis quarterly when animals are on pasture.
	<p><u>Fish and Invertebrates</u> 1 sample of a commercially and/or recreationally important species in vicinity of plant discharge area. 1 sample of similar species in area not influenced by plant discharge.</p>	<p>FD (7.75 km S) - One sample of a commercially and/or recreationally important species from downstream area influenced by plant discharge. FU (4.0 km WSW) - One sample of a commercially and/or recreationally important species from upstream area not influenced by plant discharge.</p>	Annually	Gamma isotopic analysis on edible portions annually

**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	<p><u>Food Products</u></p> <p>1 sample of one type of broadleaf vegetation grown near the SITE BOUNDARY location of highest predicted annual average ground level D/Q if milk sampling is not performed.</p> <p>1 sample of similar broadleaf vegetation grown 15 – 30 km distant, if milk sampling is not performed.</p>	<p>GN1 (0.9 km W) – Sampling will be performed in accordance with Table 3.12.1-1 Section 4.a of the Technical Requirements Manual.</p> <p>GQC (32.0 km NW) - One sample of similar vegetables from LA State Penitentiary at Angola. (Control)</p> <p>GQ1</p>	Quarterly during the growing season.	Gamma isotopic and I-131 analysis quarterly.

Figure 1-1
Exposure Pathways

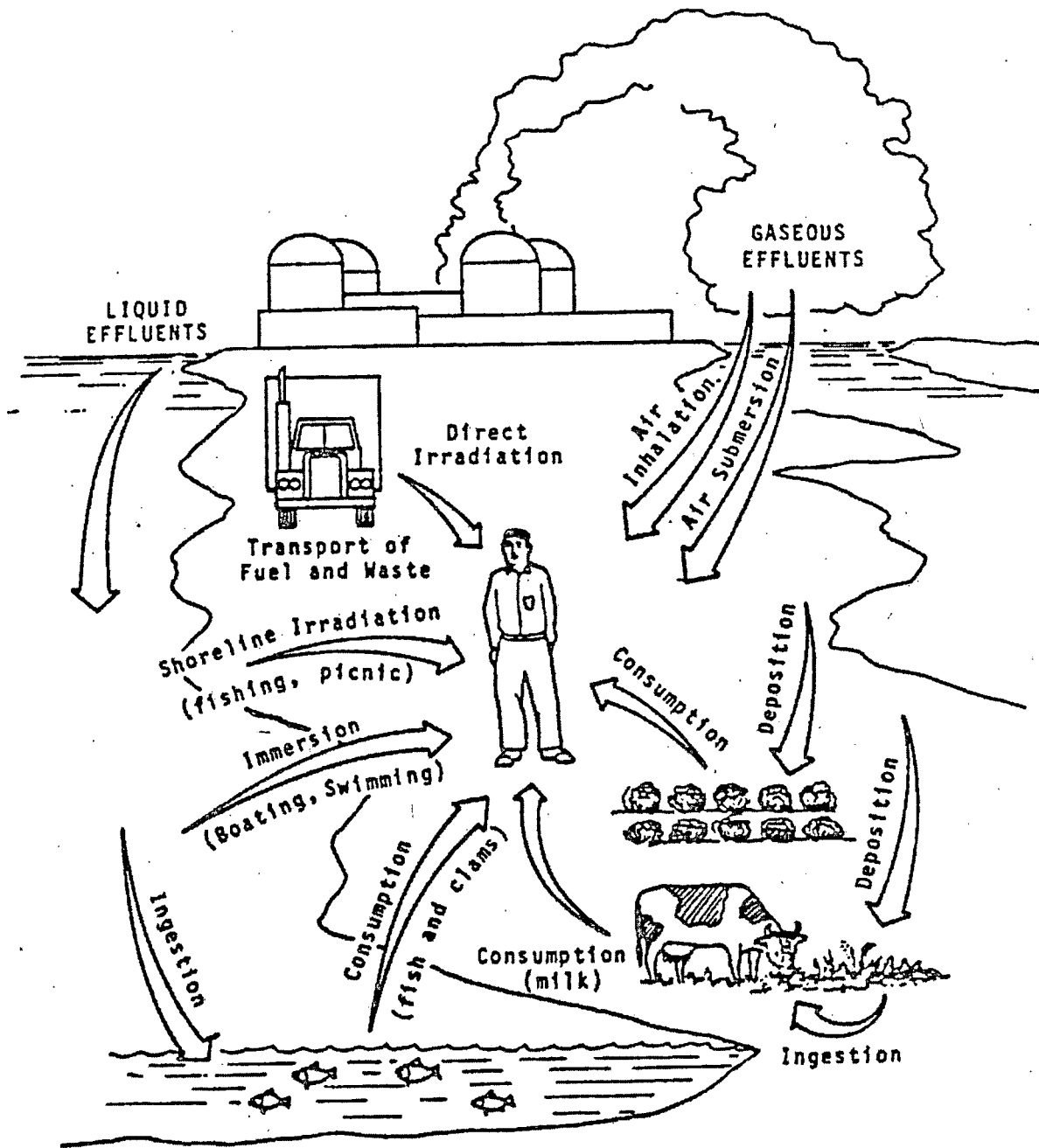
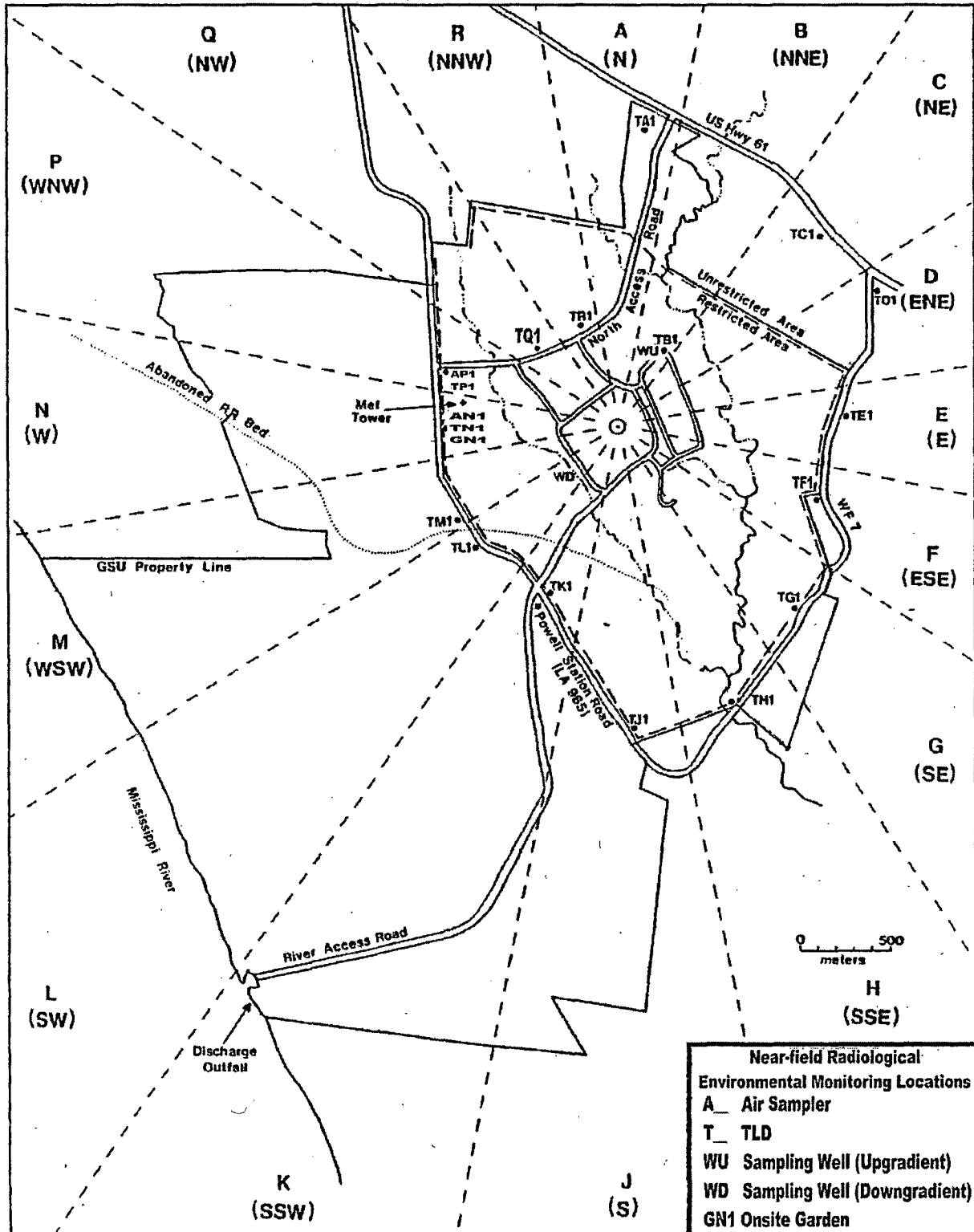
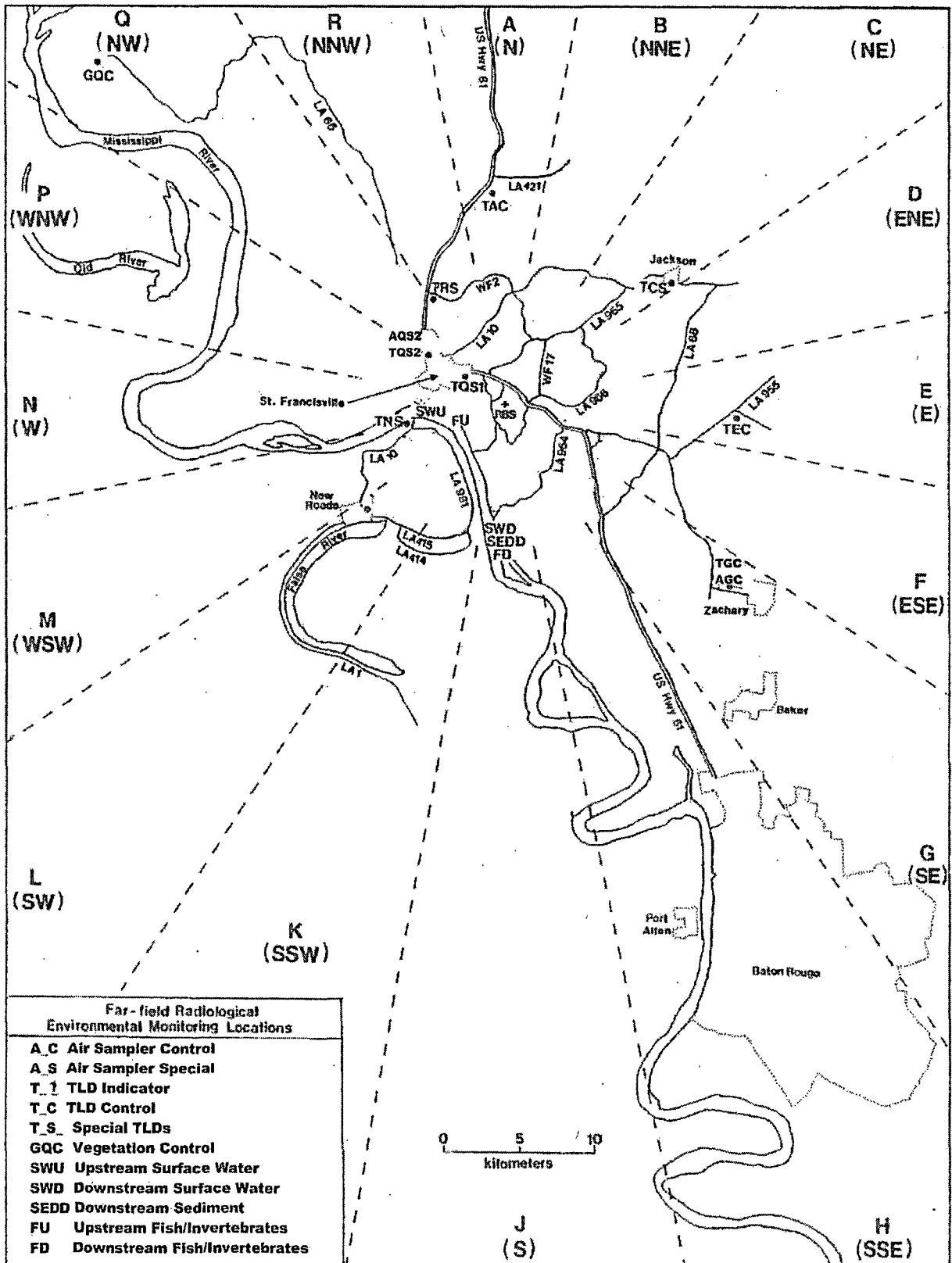


Figure 1-2
 Sample Collection Sites – Near Field



**Figure 1-3
Sample Collection Sites – Far Field**



2. Interpretation and Trends of Results

Table 3.1 provides a comparison of the indicator and control location mean values for the 2016 data, and indicates that the environment around the plant is unaffected by plant operations.

2.1. Air Particulate and Radioiodine Sample Results

Iodine-131 attributable to RBS was not detected in the radioiodine cartridges during 2016 as has been the case in previous years. Indicator gross beta air particulate results for 2016 were similar to preoperational and operational levels as seen below. Results are reported as annual average pCi/m³ (picocuries per cubic meter). (Attachment 1.1)

<u>Monitoring Period</u>	<u>Result</u>
Preoperational	0.030
2016	0.017
2015	0.017
2014	0.019
2013	0.019
2012	0.025
2011	0.026
2010	0.024
2009	0.023
2008	0.023

2.2. Thermoluminescent Dosimetry Sample Results

Gamma radiation exposure in the reporting period compares to previous years. Figure 2-1 compares quarterly indicator results for 2016 with control location data from 1986 to 2016. All indicator results were within three-sigma of the control data.

RBS normalizes measured exposure to 90 days and relies on comparison of the indicator locations to the control as a measure of plant impact. RBS's comparison of the indicator and special interest area TLD results to the controls, as seen in Table 3.1, indicates that the ambient radiation levels are unaffected by plant operations. Therefore, levels continue to remain at or near background. (Attachment 2.1)

2.3. Water Sample Results

Analytical results for 2016 surface water and groundwater samples were similar to those reported in previous years.

Surface water samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides and tritium. Gamma radionuclides were below detectable limits at the indicator and control locations. Tritium was also below detectable limits at all locations. Listed below is a comparison of 2016 results from the indicator location as compared to the preoperational and previous operational years. Results are reported as annual average pCi/l (picocuries per liter). (Attachment 3.1)

<u>Radionuclide</u>	<u>2016</u>	<u>2003 – 2016</u>	<u>Preoperational</u>
Gammas	<LLD	<LLD	<LLD
Tritium	<LLD	<LLD	<LLD

Groundwater samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides and tritium. Gamma radionuclides and tritium were below detectable limits at the indicator and control locations. Listed below is a comparison of 2016 results from the indicator location as compared to the preoperational and previous operational years. Results are reported as annual average pCi/l. (Attachment 4.1)

<u>Radionuclide</u>	<u>2016</u>	<u>2003 – 2016</u>	<u>Preoperational</u>
Gammas	<LLD	<LLD	<LLD
Tritium	<LLD	<LLD	<LLD

Based on these comparisons, the operation of RBS had no impact on this pathway during 2016, and levels of radionuclides monitored for this pathway continue to remain similar to those obtained in operational and preoperational years.

2.4. Shoreline Sediment Sample Results

A shoreline sediment sample was collected from the indicator location in 2016 and analyzed for gamma radionuclides. RBS also samples a non-REMP upstream control sediment sample. A review of historical indicator and upstream sediment samples periodically shows Cs-137. No Cs-137 was indicated on the samples in 2016. Therefore, based on these measurements, RBS operations had no significant radiological impact upon the environment or public via this pathway. (Attachment 5.1)

2.5. Milk Sample Results

The REMF did not include milk sampling within five miles (8 km) of RBS in 2016 due to unavailability of milk-producing animals used for human consumption. The RBS Technical Requirements Manual requires collection of milk samples if available commercially within 8 km (5 miles) of the plant. RBS personnel collected vegetation samples to monitor the ingestion pathway, as specified in RBS Technical Requirements Manual Table 3.12.1-1, because of milk unavailability.

2.6. Food Product Sample Results

Food product samples were collected when available from three locations (indicator and control) in 2016 and analyzed for gamma radionuclides in accordance with Table TRM 3.12.1-1. The 2016 levels attributable to RBS remained undetectable, which is consistent with previous operational years. Therefore, since levels continue to remain at background, it can be concluded that plant operations is not impacting this pathway. (Attachment 6.1)

2.7. Fish and Invertebrate Sample Results

Fish samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides. In 2016, gamma radionuclides were below detectable limits that were consistent with the preoperational and operational monitoring periods. Therefore, based on these measurements, RBS operations had no significant radiological impact upon the environment or public by this pathway. (Attachment 7.1)

2.8. Land Use Census Results

The Land Use Census was conducted in accordance with procedure-ESP-8-051, as required by Technical Requirements Manual (TRM) (TR 3.12.2).

A garden census is not conducted pursuant to the note in the TRM (TLCO 3.12.2) that allows the sampling of broadleaf vegetation in the highest calculated average ground-level D/Q sector near site boundary in lieu of the garden census.

The milk animal census identified no milk animals within 8 km (5 miles) of River Bend site. This information was verified by the County Agents from West Feliciana, East Feliciana, and Pointe Coupee parishes.

No resident census changes were noted, as indicated in Table 2.1.

No locations were identified in 2016 that would yield a calculated dose or dose commitment greater than those contained in the TRM (TR 3.11).

Table 2.1 contains data from the most recently completed Land Use Census.

2.9. Interlaboratory Comparison Results

The purpose of the Interlaboratory Comparison Program (ICP) is to confirm the accuracy of results produced by Teledyne Brown Engineering. Samples of various matrices (i.e. soil, water, vegetation, air filters, and milk) are spiked with known amounts of radioactivity by commercial vendors of this service and by departments within the government. TBE participates in three programs. Two are commercial, Analytics Inc. and Environmental Resource Associates (ERA) and one is a government sponsored program, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP). The DOE's Idaho National Engineering Laboratory administers the MAPEP. All three programs are blind performance evaluation studies in which samples with known activities are sent to TBE for analysis. Once analyzed, TBE submits the results to the respective agency for evaluation. The results of these evaluations are published in TBE's quarterly and annual QA reports.

The 2016 Interlaboratory Comparison Program includes all contractually required matrices and analyses TBE supplies to customers and specifically RBS's Technical Requirements Manual 3.12.3. Attachment 8 contains these results.

In reviewing our environmental inter-laboratory crosscheck programs, we identified 1) duplication of efforts on some matrices and isotopes and 2) that we are performing crosscheck samples on some matrices and isotopes that we do not perform for clients. Since the DOE MAPEP is designed to evaluate the ability of analytical facilities to correctly analyze for radiological constituents representative of those at DOE sites, the needed changes were made to the MAPEP program. Therefore, the following isotopes were removed from the MAPEP program:

Soil – gamma – will be provided by Analytics twice per year in 2016.

AP – gamma – is currently provided by Analytics.

Water – gamma, H-3, Sr-90, uranium, gross alpha and gross beta currently provided by ERA.

MAPEP evaluates non-reported (NR) analyses as failed if they were reported in the previous series.

For the TBE laboratory, 156 out of 160 analyses performed met the specified acceptance criteria. Four analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program.

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

1. Teledyne Brown Engineering's MAPEP March 2016 air particulate cross check sample is now being provided to TBE by Analytics. MAPEP's policy is to evaluate as failed non-reported nuclides that were reported in the previous study. NCR 16-14

- 1a. Since the Sr-90 was reported in the previous MAPEP study but not in this study MAPEP evaluated the Sr-90 for Soil as failed. NCR 16-14
- 1b. The MAPEP March 2016 Sr-90 in vegetation was evaluated as failing a false positive test. In reviewing the data that was reported vs the data in LIMS, it was found that the error was incorrectly reported as 0.023 rather than the correct value of 0.230. If the value had been reported with the activity and correct uncertainty of 0.301 ± 0.230 , MAPEP would have evaluated the result as acceptable. NCR 16-14
2. Teledyne Brown Engineering's Analytics' March 2016 milk Sr-90 result of $15 \pm .125$ pCi/L was higher than the known value of 11.4 pCi/L with a ratio of 1.32. The upper ratio of 1.30 (acceptable with warning) was exceeded. After an extensive review of the data it is believed the technician did not rinse the filtering apparatus properly and some cross contamination from one of the internal laboratory spike samples may have been transferred to the analytics sample. We feel the issue is specific to the March 2016 Analytics sample. NCR 16-26
3. Teledyne Brown Engineering's ERA November 2016 sample for H-3 in water was evaluated as failing. A result of 918 pCi/L was reported incorrectly due to a data entry issue. If the correct value of 9180 had been reported, ERA would have evaluated the result as acceptable. NCR 16-34
4. Teledyne Brown Engineering's Analytics' December 2016 milk Sr-90 sample result of $14.7 \pm .26$ pCi/L was higher than the known value of 10 pCi/L with a ratio of 1.47. The upper ratio of 1.30 (acceptable with warning) was exceeded. The technician entered the wrong aliquot into the LIMS system. To achieve a lower error term TBE uses a larger aliquot of 1.2L (Normally we use .6L for client samples). If the technician had entered an aliquot of 1.2L into the LIMS system, the result would have been 12.2 pCi/L, which would have been considered acceptable. NCR 16-35

Table 2-1
Land Use Census Results

2016

Item #	Sector	Nearest Residence	Range (km)	Nearest Milk Animal	Range (km)	Comment #
1	A (N)	5498 Hwy 61 St.Francisville, LA 70775	1.9	-	-	
2	B (NNE)	4549 Old Hwy 61 St.Francisville, LA 70775	1.4	-	-	
3	C (NE)	4553 Old Hwy 61 St.Francisville, LA 70775	1.5	-	-	
4	D (ENE)	12657 Powell Station Rd. St.Francisville, LA 70775	1.4	-	-	
5	E (E)	4635 Hwy 61 St.Francisville, LA 70775	2.4	-	-	
6	F (ESE)	12019 Fairview Way Jackson, LA 7748	2.6	-	-	
7	G (SE)	3319 Hwy 964 Jackson, LA 70748	3.7	-	-	
8	H (SSE)	11813 Powell Station Rd. St.Francisville, LA 70775	1.7	-	-	
9	J (S)	11649 Powell Station Rd. St.Francisville, LA 70775	1.8	-	-	
10	K (SSW)	8909 Hwy 981 New Roads, LA 70760	6.6	-	-	
11	L (SW)			-	-	1
12	M (WSW)	10933 Cajun 2 Rd. New Roads, LA 70760	5.1	-	-	
13	N (W)			-	-	1
14	P (WNW)	10426 Old Field Rd. St.Francisville, LA 70775	3.7	-	-	
15	Q (NW)	9537 Hwy 965 St.Francisville, LA 70775	1.3	-	-	
16	R (NNW)	9794 Hwy 965 St.Francisville, LA 70775	1.6	-	-	

#	Comment
1	No residence located within 8 km.

FIGURE 2-1
TLD Indicator Results (2016) Versus Control Data (1986-2016)

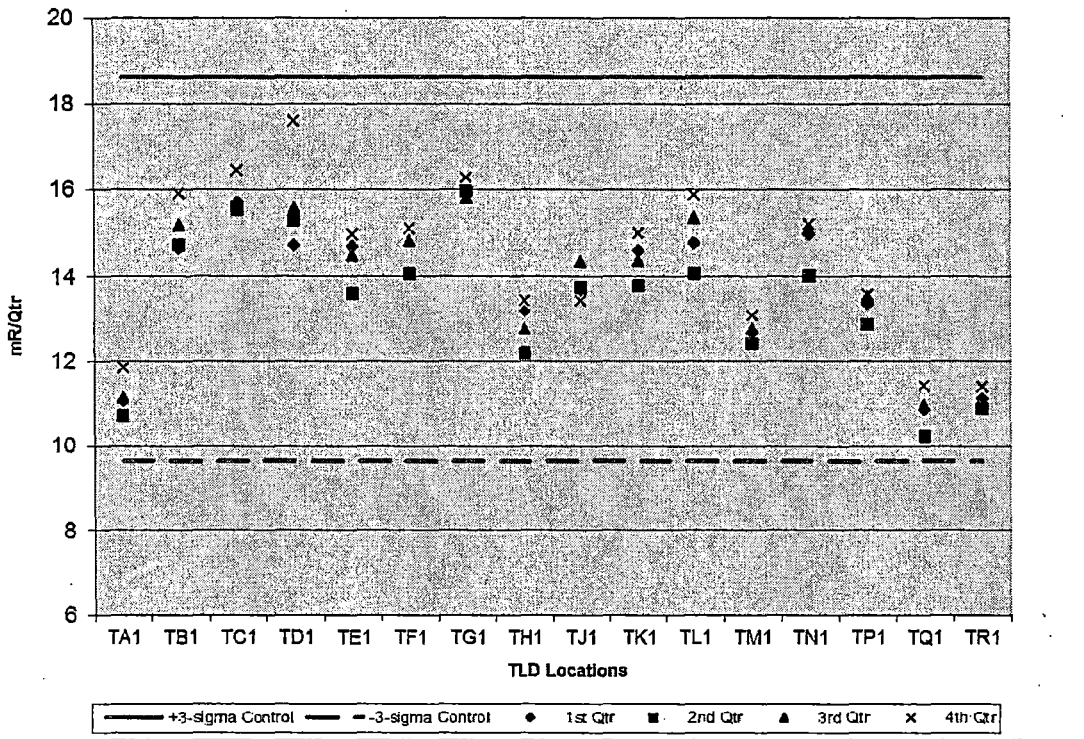
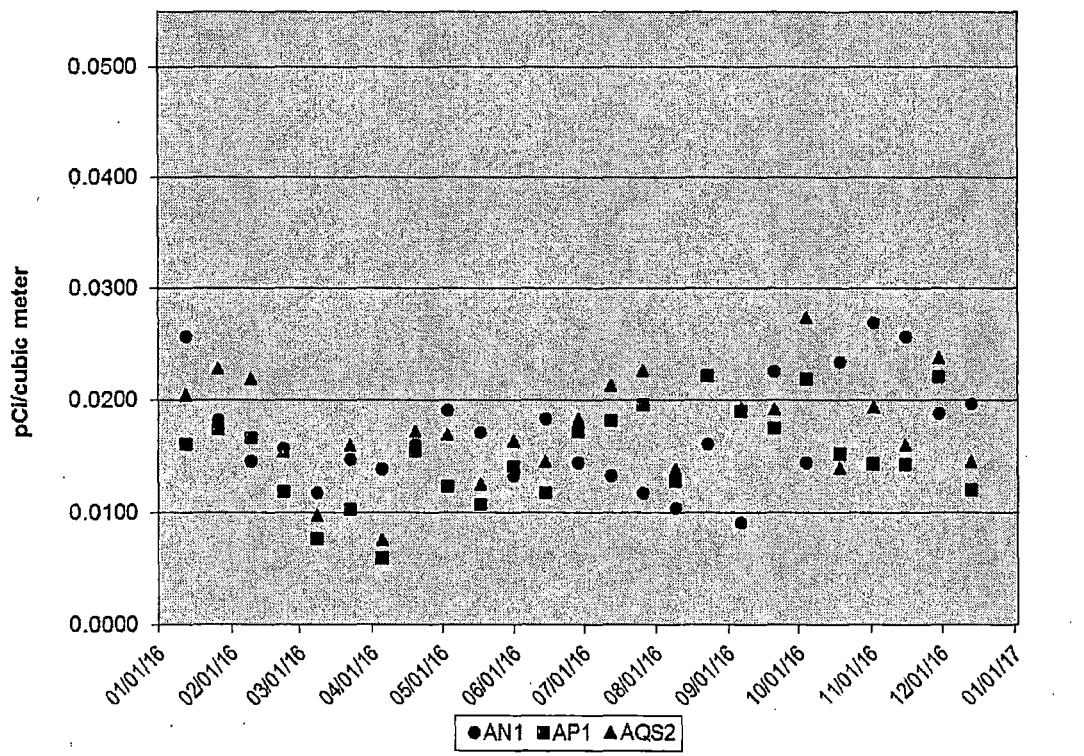


FIGURE 2-2
Gross Beta Indicator Results (2016)



3. Radiological Environmental Monitoring Program Summary

3.1. 2016 Program Results Summary

Table 3.1 summarizes the 2016 REMP results. RBS 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.

<p>Table 3.1</p> <p>Environmental Radiological Monitoring Program Summary</p>

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2016 to December 31 2016

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Air Particulate (pCi/m ³)	GR-B	103	0.01	.017 (78/78) (.008/.03)	AGC (17.0 km SE)	.019 (25/25) (.009/.042)	.019 (25/25) (.009/.042)	0
Air Iodine (pCi/m ³)	I-131	103	0.07	ND(0/78) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/25) (ND-ND)	0
Indicators TLDs (mR/Quarter)	Gamma Dose Quarterly	64	NA	13.9 (64/64) (10.3/17.6)	TG1 (1.6 km SE)	16.0 (4/4) (15.8/16.3)	NA	0
Special Interest TLDs (mR/Quarter)	Gamma Dose Quarterly	24	NA	14.4 (24/24) (12.8/16.3)	TQS1 (4.0 km NW)	15.8 (4/4) (15.4/16.3)	NA	0
Control TLDs (mR/Quarter)	Gamma Dose Quarterly	8	NA	NA	TAC (15.8 km N)	15.9 (4/4) (15.1/16.5)	15.3 (8/8) (13.8/16.5)	0
Surface Water (pCi/L)	H-3	10	2000	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Mn-54	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Co-58	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Fe-59	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2016 to December 31 2016

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Surface Water (cont'd) (pCi/L)	Co-60	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Zn-65	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Nb-95	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Zr-95	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	I-131	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Cs-134	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Cs-137	10	18	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Ba-140	10	60	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	La-140	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
Ground Water (pCi/L)	H-3	4	2000	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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				Name	Mean(2) Range(2)			
Ground Water (cont'd) (pCi/L)	Mn-54	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Co-58	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Fe-59	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Co-60	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Zn-65	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Nb-95	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Zr-95	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	I-131	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Cs-134	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
Cs-137	4	18	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0	

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
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Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Ground Water (cont'd) (pCi/L)	Ba-140	4	60	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	La-140	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
Shoreline Sediment (pCi/kg,dry)	Mn-54	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Co-58	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Fe-59	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Co-60	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Zn-65	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Nb-95	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Zr-95	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	I-131	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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 (County/State)

Docket No. 50-458
 Reporting Period January 1 2016 to December 31 2016

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Shoreline Sediment (cont'd) (pCi/kg,dry)	Cs-134	2	150	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Cs-137	2	180	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Ba-140	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	La-140	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
Food Products (pCi/kg,wet)	Mn-54	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Co-58	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Fe-59	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Co-60	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Zn-65	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Nb-95	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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 (County/State)

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				Name	Mean(2) Range(2)			
Food Products (cont'd) (pCi/kg,wet)	Zr-95	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	I-131	12	60	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Cs-134	12	60	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Cs-137	12	80	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Ba-140	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	La-140	12	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
Fish (pCi/kg,wet)	Mn-54	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Co-58	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Fe-59	2	260	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Co-60	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2016 to December 31 2016

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Fish (cont'd) (pCi/kg, wet)	Zn-65	2	260	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Nb-95	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Zr-95	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	I-131	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Cs-134	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Cs-137	2	150	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Ba-140	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	La-140	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0

(1) Nominal Lower Limit of Detection (LLD), as stated in ODCM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

(3) ND = Non Detectable.

(4) NA = Not Applicable.

Attachment 1 through 7

Data Tables

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES

LOCATION NUMBER AGC					
COLLECT START DATE	COLLECT STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/29/15	01/12/16	8.12E+02	CU.M	2.89E-02 ± 2.59E-03	L.T. 2.30E-02
01/12/16	01/26/16	7.89E+02	CU.M	2.32E-02 ± 2.34E-03	L.T. 3.26E-02
01/26/16	02/09/16	7.60E+02	CU.M	2.16E-02 ± 2.38E-03	L.T. 2.95E-02
02/09/16	02/23/16	7.76E+02	CU.M	1.46E-02 ± 1.99E-03	L.T. 2.09E-02
02/23/16	03/08/16	7.81E+02	CU.M	1.02E-02 ± 1.69E-03	L.T. 2.32E-02
03/08/16	03/22/16	7.71E+02	CU.M	1.03E-02 ± 1.74E-03	L.T. 3.02E-02
03/22/16	04/05/16	7.90E+02	CU.M	1.69E-02 ± 2.02E-03	L.T. 2.74E-02
04/05/16	04/19/16	7.65E+02	CU.M	1.53E-02 ± 2.03E-03	L.T. 3.77E-02
04/19/16	05/03/16	7.63E+02	CU.M	1.81E-02 ± 2.15E-03	L.T. 5.37E-02
05/03/16	05/17/16	7.35E+02	CU.M	2.27E-02 ± 2.47E-03	L.T. 2.53E-02
05/17/16	05/31/16	7.61E+02	CU.M	1.90E-02 ± 2.32E-03	L.T. 3.49E-02
05/31/16	06/14/16	7.44E+02	CU.M	1.43E-02 ± 2.01E-03	L.T. 3.85E-02
06/14/16	06/28/16	7.31E+02	CU.M	2.06E-02 ± 2.36E-03	L.T. 3.21E-02
06/28/16	07/12/16	7.23E+02	CU.M	1.63E-02 ± 2.14E-03	L.T. 4.47E-02
07/12/16	07/26/16	7.51E+02	CU.M	1.35E-02 ± 1.95E-03	L.T. 5.23E-02
07/26/16*	08/09/16*				
08/17/16	08/23/16	3.20E+02	CU.M	9.69E-03 ± 2.99E-03	L.T. 5.20E-02
08/23/16	09/06/16	7.83E+02	CU.M	1.40E-02 ± 1.96E-03	L.T. 1.51E-02
09/06/16	09/20/16	7.82E+02	CU.M	8.81E-03 ± 1.64E-03	L.T. 3.94E-02
09/20/16	10/04/16	5.44E+02	CU.M	2.41E-02 ± 2.92E-03	L.T. 1.98E-02
10/04/16	10/20/16	4.63E+02	CU.M	1.72E-02 ± 2.83E-03	L.T. 4.80E-02
10/20/16	11/01/16	2.90E+02	CU.M	4.17E-02 ± 5.55E-03	L.T. 3.51E-02
11/01/16	11/15/16	8.12E+02	CU.M	2.71E-02 ± 2.50E-03	L.T. 1.26E-02
11/15/16	11/29/16	5.10E+02	CU.M	2.90E-02 ± 3.44E-03	L.T. 4.64E-02
11/29/16	12/14/16	5.18E+02	CU.M	1.60E-02 ± 2.72E-03	L.T. 4.90E-02
12/13/16	12/27/16	8.12E+02	CU.M	1.68E-02 ± 2.08E-03	L.T. 3.11E-02

* Power outage and sampler pump failure. CR-RBS-2016-5659

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES

LOCATION NUMBER AN1

COLLECT START DATE	COLLECT STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/29/15	01/12/16	7.69E+02	CU.M	2.47E-02 ± 2.49E-03	L.T. 2.43E-02
01/12/16	01/26/16	7.69E+02	CU.M	2.57E-02 ± 2.48E-03	L.T. 3.35E-02
01/26/16	02/09/16	8.11E+02	CU.M	1.82E-02 ± 2.13E-03	L.T. 2.77E-02
02/09/16	02/23/16	8.01E+02	CU.M	1.45E-02 ± 1.94E-03	L.T. 2.03E-02
02/23/16	03/08/16	8.14E+02	CU.M	1.57E-02 ± 1.97E-03	L.T. 2.23E-02
03/08/16	03/22/16	7.92E+02	CU.M	1.17E-02 ± 1.79E-03	L.T. 2.96E-02
03/22/16	04/05/16	8.01E+02	CU.M	1.47E-02 ± 1.88E-03	L.T. 2.72E-02
04/05/16*	04/19/16*	7.91E+02	CU.M	1.38E-02 ± 1.91E-03	L.T. 3.65E-02
04/19/16	05/03/16	8.03E+02	CU.M	1.60E-02 ± 1.98E-03	L.T. 5.12E-02
05/03/16	05/17/16	7.91E+02	CU.M	1.91E-02 ± 2.20E-03	L.T. 2.36E-02
05/17/16	05/31/16	8.07E+02	CU.M	1.71E-02 ± 2.15E-03	L.T. 3.29E-02
05/31/16	06/14/16	7.95E+02	CU.M	1.33E-02 ± 1.88E-03	L.T. 3.60E-02
06/14/16	06/28/16	7.95E+02	CU.M	1.83E-02 ± 2.14E-03	L.T. 2.97E-02
06/28/16	07/12/16	7.95E+02	CU.M	1.44E-02 ± 1.92E-03	L.T. 4.08E-02
07/12/16	07/26/16	8.12E+02	CU.M	1.33E-02 ± 1.85E-03	L.T. 4.83E-02
07/26/16	08/09/16	8.12E+02	CU.M	1.17E-02 ± 1.76E-03	L.T. 2.78E-02
08/09/16	08/23/16	7.72E+02	CU.M	1.04E-02 ± 1.72E-03	L.T. 3.03E-02
08/23/16	09/06/16	8.20E+02	CU.M	1.60E-02 ± 2.01E-03	L.T. 2.60E-02
09/06/16	09/20/16	8.56E+02	CU.M	9.03E-03 ± 1.56E-03	L.T. 3.62E-02
09/20/16	10/04/16	8.64E+02	CU.M	2.25E-02 ± 2.20E-03	L.T. 2.98E-02
10/04/16	10/18/16	8.34E+02	CU.M	1.44E-02 ± 1.86E-03	L.T. 2.76E-02
10/18/16	11/01/16	8.43E+02	CU.M	2.34E-02 ± 2.35E-03	L.T. 3.13E-02
11/01/16	11/15/16	8.36E+02	CU.M	2.69E-02 ± 2.45E-03	L.T. 2.92E-02
11/15/16	11/29/16	8.36E+02	CU.M	2.57E-02 ± 2.46E-03	L.T. 2.84E-02
11/29/16	12/13/16	8.42E+02	CU.M	1.88E-02 ± 2.16E-03	L.T. 3.16E-02
12/13/16	12/27/16	8.36E+02	CU.M	1.97E-02 ± 2.18E-03	L.T. 3.01E-02

* Power outage for 3.1 hours. CR-RBS-2016-3020

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES

LOCATION NUMBER AP1

COLLECT START DATE	COLLECT STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/29/15	01/12/16	8.34E+02	CU.M	2.56E-02 ± 2.42E-03	L.T. 2.24E-02
01/12/16	01/26/16	8.31E+02	CU.M	2.26E-02 ± 2.24E-03	L.T. 3.10E-02
01/26/16	02/09/16	9.04E+02	CU.M	1.56E-02 ± 1.88E-03	L.T. 2.49E-02
02/09/16	02/23/16	9.50E+02	CU.M	1.13E-02 ± 1.59E-03	L.T. 1.71E-02
02/23/16	03/08/16	9.55E+02	CU.M	1.77E-02 ± 1.89E-03	L.T. 1.90E-02
03/08/16	03/22/16	9.41E+02	CU.M	8.99E-03 ± 1.46E-03	L.T. 2.49E-02
03/22/16	04/05/16	8.55E+02	CU.M	1.58E-02 ± 1.87E-03	L.T. 2.55E-02
04/05/16*	04/19/16*	8.25E+02	CU.M	1.30E-02 ± 1.82E-03	L.T. 3.51E-02
04/19/16	05/03/16	8.10E+02	CU.M	1.37E-02 ± 1.84E-03	L.T. 5.08E-02
05/03/16	05/17/16	8.15E+02	CU.M	1.75E-02 ± 2.08E-03	L.T. 2.29E-02
05/17/16	05/31/16	8.33E+02	CU.M	1.74E-02 ± 2.13E-03	L.T. 3.19E-02
05/31/16	06/14/16	8.20E+02	CU.M	1.38E-02 ± 1.87E-03	L.T. 3.49E-02
06/14/16	06/28/16	8.11E+02	CU.M	1.66E-02 ± 2.03E-03	L.T. 1.03E-02
06/28/16	07/12/16	8.10E+02	CU.M	1.40E-02 ± 1.88E-03	L.T. 4.01E-02
07/12/16	07/26/16	7.07E+02	CU.M	1.24E-02 ± 1.96E-03	L.T. 5.55E-02
07/26/16	08/09/16	8.01E+02	CU.M	1.38E-02 ± 1.89E-03	L.T. 2.82E-02
08/09/16	08/23/16	8.12E+02	CU.M	8.69E-03 ± 1.55E-03	L.T. 2.89E-02
08/23/16	09/06/16	7.92E+02	CU.M	1.61E-02 ± 2.06E-03	L.T. 2.70E-02
09/06/16	09/20/16	8.23E+02	CU.M	7.55E-03 ± 1.51E-03	L.T. 3.77E-02
09/20/16	10/04/16	8.30E+02	CU.M	2.37E-02 ± 2.30E-03	L.T. 3.11E-02
10/04/16	10/18/16	8.32E+02	CU.M	1.66E-02 ± 1.98E-03	L.T. 2.77E-02
10/18/16	11/01/16	8.41E+02	CU.M	2.38E-02 ± 2.37E-03	L.T. 3.14E-02
11/01/16	11/15/16	8.26E+02	CU.M	3.04E-02 ± 2.61E-03	L.T. 2.96E-02
11/15/16	11/29/16	7.75E+02	CU.M	2.99E-02 ± 2.74E-03	L.T. 1.29E-02
11/29/16	12/13/16	8.52E+02	CU.M	1.74E-02 ± 2.08E-03	L.T. 3.12E-02
12/13/16	12/27/16	8.26E+02	CU.M	2.04E-02 ± 2.23E-03	L.T. 3.05E-02

*Power outage for 3.1 hours. CR-RBS-2016-3020

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES

LOCATION NUMBER AQS2					
COLLECT START DATE	COLLECT STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/29/15	01/12/16	8.12E+02	CU.M	2.86E-02 ± 2.58E-03	L.T. 2.30E-02
01/12/16	01/26/16	7.88E+02	CU.M	2.55E-02 ± 2.44E-03	L.T. 3.27E-02
01/26/16	02/09/16	8.10E+02	CU.M	1.96E-02 ± 2.20E-03	L.T. 2.77E-02
02/09/16	02/23/16	8.15E+02	CU.M	1.44E-02 ± 1.92E-03	L.T. 7.73E-03
02/23/16	03/08/16	8.30E+02	CU.M	9.20E-03 ± 1.56E-03	L.T. 2.19E-02
03/08/16	03/22/16	8.16E+02	CU.M	1.12E-02 ± 1.73E-03	L.T. 2.87E-02
03/22/16	04/05/16	8.25E+02	CU.M	1.61E-02 ± 1.93E-03	L.T. 2.64E-02
04/05/16	04/19/16	8.14E+02	CU.M	1.49E-02 ± 1.93E-03	L.T. 3.55E-02
04/19/16	05/03/16	7.87E+02	CU.M	1.44E-02 ± 1.91E-03	L.T. 5.22E-02
05/03/16	05/17/16	7.75E+02	CU.M	2.10E-02 ± 2.32E-03	L.T. 2.40E-02
05/17/16	05/31/16	7.64E+02	CU.M	2.14E-02 ± 2.43E-03	L.T. 3.47E-02
05/31/16	06/14/16	7.57E+02	CU.M	1.31E-02 ± 1.92E-03	L.T. 3.78E-02
06/14/16	06/28/16	7.79E+02	CU.M	1.88E-02 ± 2.18E-03	L.T. 3.02E-02
06/28/16	07/12/16	7.87E+02	CU.M	1.75E-02 ± 2.10E-03	L.T. 4.12E-02
07/12/16	07/26/16	8.19E+02	CU.M	1.14E-02 ± 1.73E-03	L.T. 2.01E-02
07/26/16	08/09/16	7.72E+02	CU.M	1.35E-02 ± 1.92E-03	L.T. 2.93E-02
08/09/16	08/23/16	7.84E+02	CU.M	1.05E-02 ± 1.70E-03	L.T. 2.98E-02
08/23/16	09/06/16	7.85E+02	CU.M	1.56E-02 ± 2.04E-03	L.T. 2.71E-02
09/06/16	09/20/16	7.96E+02	CU.M	7.69E-03 ± 1.55E-03	L.T. 3.88E-02
09/20/16	10/04/16	7.84E+02	CU.M	2.18E-02 ± 2.28E-03	L.T. 3.28E-02
10/04/16	10/18/16	8.11E+02	CU.M	1.69E-02 ± 2.02E-03	L.T. 2.99E-02
10/18/16	11/01/16	8.14E+02	CU.M	2.54E-02 ± 2.48E-03	L.T. 3.24E-02
11/01/16	11/15/16	8.17E+02	CU.M	2.84E-02 ± 2.55E-03	L.T. 2.99E-02
11/15/16	11/29/16	8.13E+02	CU.M	2.93E-02 ± 2.64E-03	L.T. 2.92E-02
11/29/16	12/13/16	8.40E+02	CU.M	2.00E-02 ± 2.22E-03	L.T. 1.33E-02
12/13/16	12/27/16	8.17E+02	CU.M	2.20E-02 ± 2.32E-03	L.T. 3.08E-02

ATTACHMENT 2.1
RIVER BEND STATION
THERMOLUMINESCENT DOSIMETERS (TLD)
mR/Qtr

Sample Nuclide	Location	First Quarter 01/01/16-03/31/16	Second Quarter 04/01/16-06/30/16	Third Quarter 07/01/16-09/30/16	Fourth Quarter 10/01/16-01/01/16	Quarter Average - 1 S.D.
TLD	TA1	11.1	10.7	11.2	11.9	11.2 ± 0.5
	TAC	15.1	16.0	16.1	16.5	15.9 ± 0.6
	TB1	14.7	14.7	15.2	15.9	15.1 ± 0.6
	TC1	15.7	15.6	15.5	16.5	15.8 ± 0.4
	TCS	13.3	12.8	13.7	13.7	13.4 ± 0.4
	TD1	14.7	15.3	15.6	17.6	15.8 ± 1.2
	TE1	14.7	13.6	14.5	15.0	14.5 ± 0.6
	TEC	14.3	13.8	14.7	15.5	14.6 ± 0.7
	TF1	14.1	14.1	14.8	15.1	14.5 ± 0.5
	TG1	15.9	16.0	15.8	16.3	16.0 ± 0.2
	TGS	15.2	15.6	15.5	16.2	15.6 ± 0.4
	TH1	13.2	12.2	12.8	13.4	12.9 ± 0.6
	TJ1	13.7	13.7	14.3	13.5	13.8 ± 0.4
	TK1	14.6	13.8	14.4	15.0	14.4 ± 0.5
	TL1	14.8	14.1	15.4	15.9	15.0 ± 0.8
	TM1	12.7	12.4	12.8	13.1	12.7 ± 0.3
	TN1	15.0	14.0	15.1	15.2	14.8 ± 0.5
	TNS	13.7	13.7	13.8	14.2	13.9 ± 0.3
	TP1	13.4	12.9	13.5	13.6	13.3 ± 0.3
	TQ1	10.9	10.3	11.0	11.4	10.9 ± 0.5
	TR1	11.1	10.9	10.9	11.4	11.1 ± 0.2
	TRS	15.0	15.0	14.7	14.9	14.9 ± 0.2
	TQS1	15.6	15.4	16.0	16.3	15.8 ± 0.4
	TQS2	12.8	12.8	13.0	13.6	13.0 ± 0.4
Average/Quarter		14.0 ± 1.4	13.7 ± 1.6	14.2 ± 1.6	14.7 ± 1.7	
Range		(10.9-15.9)	(10.3-16)	(10.9-16.1)	(11.4-17.6)	
Detection/Total		24/24	24/24	24/24	24/24	

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
 pCi/L

STATION NUMBER SWD

DATE COLLECTED	03/01/16	06/08/16	09/07/16	10/31/16
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 3.27E+02	L.T. 5.12E+02	L.T. 6.19E+02	L.T. 6.27E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 3.70E+00	L.T. 4.81E+00	L.T. 2.14E+00	L.T. 2.03E+00
CO-58	L.T. 4.64E+00	L.T. 5.64E+00	L.T. 2.25E+00	L.T. 2.35E+00
FE-59	L.T. 7.44E+00	L.T. 1.24E+01	L.T. 4.94E+00	L.T. 4.56E+00
CO-60	L.T. 4.44E+00	L.T. 5.16E+00	L.T. 2.03E+00	L.T. 2.09E+00
ZN-65	L.T. 8.41E+00	L.T. 9.91E+00	L.T. 4.51E+00	L.T. 4.61E+00
NB-95	L.T. 4.27E+00	L.T. 5.81E+00	L.T. 2.27E+00	L.T. 2.64E+00
ZR-95	L.T. 7.31E+00	L.T. 7.95E+00	L.T. 4.03E+00	L.T. 4.19E+00
I-131	L.T. 1.11E+01	L.T. 1.47E+01	L.T. 7.80E+00	L.T. 1.34E+01
CS-134	L.T. 3.72E+00	L.T. 4.88E+00	L.T. 2.01E+00	L.T. 1.93E+00
CS-137	L.T. 4.31E+00	L.T. 5.70E+00	L.T. 2.32E+00	L.T. 2.15E+00
BA-140	L.T. 2.66E+01	L.T. 3.50E+01	L.T. 1.70E+01	L.T. 2.24E+01
LA-140	L.T. 7.81E+00	L.T. 1.09E+01	L.T. 5.83E+00	L.T. 7.25E+00

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

STATION NUMBER SWD DUP

DATE COLLECTED 03/01/16

RADIOCHEMICAL ANALYSIS:

H-3 L.T. 3.34E+02

GAMMA SPECTRUM ANALYSIS:

MN-54	L.T. 3.55E+00
CO-58	L.T. 4.27E+00
FE-59	L.T. 7.62E+00
CO-60	L.T. 3.60E+00
ZN-65	L.T. 7.66E+00
NB-95	L.T. 4.29E+00
ZR-95	L.T. 6.52E+00
I-131	L.T. 1.07E+01
CS-134	L.T. 3.85E+00
CS-137	L.T. 4.29E+00
BA-140	L.T. 2.85E+01
LA-140	L.T. 6.94E+00

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
 pCi/L

STATION NUMBER SWU

DATE COLLECTED	03/01/16	06/08/16	09/07/16	10/31/16
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 3.29E+02	L.T. 5.21E+02	L.T. 6.13E+02	L.T. 6.00E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 4.28E+00	L.T. 5.24E+00	L.T. 1.75E+00	L.T. 2.06E+00
CO-58	L.T. 3.81E+00	L.T. 5.20E+00	L.T. 1.98E+00	L.T. 2.30E+00
FE-59	L.T. 1.07E+01	L.T. 1.28E+01	L.T. 4.49E+00	L.T. 4.80E+00
CO-60	L.T. 5.00E+00	L.T. 7.00E+00	L.T. 1.99E+00	L.T. 2.18E+00
ZN-65	L.T. 8.37E+00	L.T. 9.44E+00	L.T. 3.63E+00	L.T. 3.77E+00
NB-95	L.T. 4.12E+00	L.T. 5.51E+00	L.T. 1.99E+00	L.T. 2.69E+00
ZR-95	L.T. 7.83E+00	L.T. 9.30E+00	L.T. 3.48E+00	L.T. 4.06E+00
I-131	L.T. 1.08E+01	L.T. 1.43E+01	L.T. 7.50E+00	L.T. 1.33E+01
CS-134	L.T. 3.86E+00	L.T. 4.38E+00	L.T. 1.76E+00	L.T. 2.02E+00
CS-137	L.T. 4.56E+00	L.T. 5.54E+00	L.T. 2.00E+00	L.T. 2.17E+00
BA-140	L.T. 2.43E+01	L.T. 3.46E+01	L.T. 1.44E+01	L.T. 2.21E+01
LA-140	L.T. 7.13E+00	L.T. 1.20E+01	L.T. 4.40E+00	L.T. 7.53E+00

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

STATION NUMBER SWU DUP

DATE COLLECTED 03/01/16

RADIOCHEMICAL ANALYSIS:

H-3 L.T. 3.29E+02

GAMMA SPECTRUM ANALYSIS:

MN-54	L.T. 3.74E+00
CO-58	L.T. 4.08E+00
FE-59	L.T. 1.03E+01
CO-60	L.T. 4.26E+00
ZN-65	L.T. 8.12E+00
NB-95	L.T. 4.92E+00
ZR-95	L.T. 9.50E+00
I-131	L.T. 1.32E+01
CS-134	L.T. 4.16E+00
CS-137	L.T. 4.39E+00
BA-140	L.T. 3.12E+01
LA-140	L.T. 1.05E+01

ATTACHMENT 4.1
RIVER BEND STATION
GROUNDWATER
pCi/L

DATE COLLECTED	LOCATION GWD		LOCATION GWU	
	06/07/16	10/26/16	06/07/16	10/26/16
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 5.21E+02	L.T. 6.14E+02	L.T. 5.23E+02	L.T. 6.12E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 3.90E+00	L.T. 1.58E+00	L.T. 3.48E+00	L.T. 1.66E+00
CO-58	L.T. 4.53E+00	L.T. 1.68E+00	L.T. 4.02E+00	L.T. 1.84E+00
FE-59	L.T. 1.02E+01	L.T. 4.02E+00	L.T. 9.89E+00	L.T. 4.38E+00
CO-60	L.T. 4.48E+00	L.T. 1.61E+00	L.T. 3.82E+00	L.T. 1.53E+00
ZN-65	L.T. 8.73E+00	L.T. 3.06E+00	L.T. 9.36E+00	L.T. 3.05E+00
NB-95	L.T. 5.72E+00	L.T. 1.88E+00	L.T. 5.09E+00	L.T. 2.17E+00
ZR-95	L.T. 8.30E+00	L.T. 3.15E+00	L.T. 8.44E+00	L.T. 3.44E+00
I-131	L.T. 1.48E+01	L.T. 1.50E+01	L.T. 1.49E+01	L.T. 1.45E+01
CS-134	L.T. 4.39E+00	L.T. 1.52E+00	L.T. 3.86E+00	L.T. 1.55E+00
CS-137	L.T. 4.48E+00	L.T. 1.57E+00	L.T. 4.77E+00	L.T. 1.60E+00
BA-140	L.T. 3.35E+01	L.T. 2.14E+01	L.T. 3.08E+01	L.T. 2.07E+01
LA-140	L.T. 1.10E+01	L.T. 6.66E+00	L.T. 5.55E+00	L.T. 6.44E+00

ATTACHMENT 5.1
RIVER BEND STATION
SHORELINE SEDIMENT
pCi/kg, dry

	LOCATION SEDD	LOCATION SEDU
DATE COLLECTED	09/21/16	09/21/16
GAMMA SPECTRUM ANALYSIS:		
MN-54	L.T. 3.62E+01	L.T. 7.61E+01
CO-58	L.T. 4.81E+01	L.T. 6.42E+01
FE-59	L.T. 1.15E+02	L.T. 1.42E+02
CO-60	L.T. 5.03E+01	L.T. 6.07E+01
ZN-65	L.T. 1.17E+02	L.T. 1.61E+02
NB-95	L.T. 5.11E+01	L.T. 8.39E+01
ZR-95	L.T. 6.82E+01	L.T. 1.26E+02
I-131	L.T. 1.01E+02	L.T. 1.49E+02
CS-134	L.T. 4.66E+01	L.T. 1.07E+02
CS-137	L.T. 4.61E+01	L.T. 8.28E+01
BA-140	L.T. 2.43E+02	L.T. 4.26E+02
LA-140	L.T. 5.44E+01	L.T. 9.61E+01

ATTACHMENT 6.1
RIVER BEND STATION
FOOD PRODUCTS
 pCi/kg, wet

LOCATION GN1

DATE COLLECTED	03/14/16	06/06/16	09/13/16	12/12/16
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 2.50E+01	L.T. 1.30E+01	L.T. 2.46E+01	L.T. 3.20E+01
CO-58	L.T. 2.78E+01	L.T. 1.34E+01	L.T. 2.43E+01	L.T. 3.97E+01
FE-59	L.T. 5.81E+01	L.T. 2.34E+01	L.T. 4.83E+01	L.T. 7.56E+01
CO-60	L.T. 2.89E+01	L.T. 1.46E+01	L.T. 2.22E+01	L.T. 3.81E+01
ZN-65	L.T. 6.01E+01	L.T. 2.43E+01	L.T. 5.42E+01	L.T. 6.72E+01
NB-95	L.T. 3.06E+01	L.T. 1.34E+01	L.T. 3.22E+01	L.T. 3.93E+01
ZR-95	L.T. 4.44E+01	L.T. 2.31E+01	L.T. 4.10E+01	L.T. 6.47E+01
I-131	L.T. 4.20E+01	L.T. 2.52E+01	L.T. 4.73E+01	L.T. 5.14E+01
CS-134	L.T. 2.46E+01	L.T. 1.39E+01	L.T. 2.70E+01	L.T. 3.59E+01
CS-137	L.T. 2.63E+01	L.T. 1.49E+01	L.T. 2.49E+01	L.T. 3.76E+01
BA-140	L.T. 1.13E+02	L.T. 6.63E+01	L.T. 1.09E+02	L.T. 1.54E+02
LA-140	L.T. 3.51E+01	L.T. 1.61E+01	L.T. 4.11E+01	L.T. 3.80E+01

ATTACHMENT 6.1
RIVER BEND STATION
FOOD PRODUCTS
 pCi/kg, wet

LOCATION GQ1

DATE COLLECTED	03/14/16	06/07/16	09/13/16	12/08/16
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 3.15E+01	L.T. 1.79E+01	L.T. 2.96E+01	L.T. 3.14E+01
CO-58	L.T. 3.13E+01	L.T. 1.54E+01	L.T. 2.76E+01	L.T. 2.57E+01
FE-59	L.T. 5.94E+01	L.T. 3.26E+01	L.T. 6.39E+01	L.T. 6.87E+01
CO-60	L.T. 3.41E+01	L.T. 1.58E+01	L.T. 1.86E+01	L.T. 2.81E+01
ZN-65	L.T. 7.10E+01	L.T. 3.84E+01	L.T. 6.32E+01	L.T. 6.17E+01
NB-95	L.T. 3.69E+01	L.T. 1.70E+01	L.T. 3.44E+01	L.T. 3.07E+01
ZR-95	L.T. 6.12E+01	L.T. 2.74E+01	L.T. 4.23E+01	L.T. 5.54E+01
I-131	L.T. 4.59E+01	L.T. 2.98E+01	L.T. 5.76E+01	L.T. 5.23E+01
CS-134	L.T. 2.82E+01	L.T. 1.81E+01	L.T. 3.00E+01	L.T. 2.72E+01
CS-137	L.T. 3.06E+01	L.T. 1.74E+01	L.T. 2.67E+01	L.T. 3.06E+01
BA-140	L.T. 1.04E+02	L.T. 7.91E+01	L.T. 1.12E+02	L.T. 1.24E+02
LA-140	L.T. 3.56E+01	L.T. 2.17E+01	L.T. 4.13E+01	L.T. 5.11E+01

ATTACHMENT 6.1
RIVER BEND STATION
FOOD PRODUCTS
 pCi/kg, wet

LOCATION GQC

DATE COLLECTED	03/01/16	06/07/16	09/15/16	12/08/16
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 5.82E+00	L.T. 1.44E+01	L.T. 2.10E+01	L.T. 1.47E+01
CO-58	L.T. 5.34E+00	L.T. 1.52E+01	L.T. 2.34E+01	L.T. 1.62E+01
FE-59	L.T. 9.48E+00	L.T. 3.54E+01	L.T. 4.06E+01	L.T. 2.75E+01
CO-60	L.T. 5.96E+00	L.T. 2.28E+01	L.T. 2.61E+01	L.T. 1.94E+01
ZN-65	L.T. 1.50E+01	L.T. 4.29E+01	L.T. 4.70E+01	L.T. 3.00E+01
NB-95	L.T. 6.63E+00	L.T. 1.93E+01	L.T. 3.14E+01	L.T. 1.78E+01
ZR-95	L.T. 7.63E+00	L.T. 2.71E+01	L.T. 3.82E+01	L.T. 3.49E+01
I-131	L.T. 5.75E+00	L.T. 2.60E+01	L.T. 4.36E+01	L.T. 2.74E+01
CS-134	L.T. 5.19E+00	L.T. 1.41E+01	L.T. 1.72E+01	L.T. 1.21E+01
CS-137	L.T. 5.20E+00	L.T. 1.76E+01	L.T. 2.47E+01	L.T. 1.65E+01
BA-140	L.T. 2.21E+01	L.T. 7.58E+01	L.T. 1.26E+02	L.T. 7.15E+01
LA-140	L.T. 3.93E+00	L.T. 1.98E+01	L.T. 1.24E+01	L.T. 1.63E+01

ATTACHMENT 7.1
RIVER BEND STATION
FISH
pCi/kg, wet

	LOCATION FD	LOCATION FU
DATE COLLECTED	08/09/16	08/09/16
GAMMA SPECTRUM ANALYSIS:		
MN-54	L.T. 4.95E+01	L.T. 5.86E+01
CO-58	L.T. 6.05E+01	L.T. 5.79E+01
FE-59	L.T. 1.60E+02	L.T. 1.46E+02
CO-60	L.T. 4.98E+01	L.T. 5.48E+01
ZN-65	L.T. 9.82E+01	L.T. 1.28E+02
NB-95	L.T. 6.22E+01	L.T. 6.94E+01
ZR-95	L.T. 1.10E+02	L.T. 1.16E+02
I-131	L.T. 3.65E+02	L.T. 4.00E+02
CS-134	L.T. 6.71E+01	L.T. 7.10E+01
CS-137	L.T. 4.90E+01	L.T. 5.13E+01
BA-140	L.T. 6.09E+02	L.T. 6.72E+02
LA-140	L.T. 1.24E+02	L.T. 2.23E+02

Attachment 8

**Teledyne Brown Engineering's Interlaboratory Comparison Program
Tables**

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)			
March 2016	E11476	Milk	Sr-89	pCi/L	97	86.7	1.12	A			
			Sr-90	pCi/L	15	11.4	1.32	N(2)			
March 2016	E11477	Milk	I-131	pCi/L	85.9	82.2	1.05	A			
			Ce-141	pCi/L	106	98.4	1.08	A			
			Cr-51	pCi/L	255	243	1.05	A			
			Cs-134	pCi/L	134	130	1.03	A			
			Cs-137	pCi/L	174	161	1.08	A			
			Co-58	pCi/L	123	117	1.05	A			
			Mn-54	pCi/L	141	117	1.21	W			
			Fe-59	pCi/L	152	131	1.16	A			
			Zn-65	pCi/L	193	179	1.08	A			
			Co-60	pCi/L	259	244	1.06	A			
			March 2016	E11479	AP	Ce-141	pCi	69	81.1	0.85	A
						Cr-51	pCi	242	201	1.20	W
						Cs-134	pCi	98.1	107.0	0.92	A
						Cs-137	pCi	136	133	1.02	A
Co-58	pCi	91.9				97	0.95	A			
Mn-54	pCi	98.6				96.2	1.02	A			
Fe-59	pCi	98.8				108	0.91	A			
Zn-65	pCi	131				147	0.89	A			
March 2016	E11478	Charcoal	I-131	pCi	85.3	88.3	0.97	A			
			Fe-55	pCi/L	1800	1666	1.08	A			
March 2016	E11480	Water	Fe-55	pCi/L	1800	1666	1.08	A			
June 2016	E11537	Milk	Sr-89	pCi/L	94.4	94.4	1.00	A			
			Sr-90	pCi/L	13.4	15.4	0.87	A			
June 2016	E11538	Milk	I-131	pCi/L	96.8	94.5	1.02	A			
			Ce-141	pCi/L	129	139	0.93	A			
			Cr-51	pCi/L	240	276	0.87	A			
			Cs-134	pCi/L	157	174	0.90	A			
			Cs-137	pCi/L	117	120	0.98	A			
			Co-58	pCi/L	131	142	0.92	A			
			Mn-54	pCi/L	128	125	1.02	A			
			Fe-59	pCi/L	132	122	1.08	A			
			Zn-65	pCi/L	235	235	1.00	A			
			Co-60	pCi/L	169	173	0.98	A			

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable, reported result falls within ratio limits of 0.80-1.20. W=Acceptable with warning, reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable, reported result falls outside the ratio limits of < 0.70 and > 1.30.

(2) NCR 16-26 was initiated

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)	
June 2016	E11539	Charcoal	I-131	pCi	86.1	89.4	0.96	A	
			E11540	AP	Ce-141	pCi	105	99.8	1.05
	Cr-51	pCi	216		198.0	1.09	A		
	Cs-134	pCi	113		125	0.90	A		
	Cs-137	pCi	94.5		86.6	1.09	A		
	Co-58	pCi	101		102	0.99	A		
	Mn-54	pCi	88.8		90.2	0.98	A		
	Fe-59	pCi	82		87.5	0.94	A		
	Zn-65	pCi	174		169	1.03	A		
	Co-60	pCi	143		124	1.15	A		
	E11541	Water	Fe-55		pCi/L	164	186	0.88	A
	September 2016	E11609	Milk	Sr-89	pCi/L	90	90.9	0.99	A
				Sr-90	pCi/L	13.3	13.7	0.97	A
		E11610	Milk	I-131	pCi/L	80.4	71.9	1.12	A
Ce-141				pCi/L	81.3	93	0.87	A	
Cr-51				pCi/L	198	236	0.84	A	
Cs-134				pCi/L	122	136	0.90	A	
Cs-137				pCi/L	119	119	1.00	A	
Co-58				pCi/L	92.2	97.4	0.95	A	
Mn-54				pCi/L	156	152	1.03	A	
Fe-59				pCi/L	97.5	90.6	1.08	A	
Zn-65				pCi/L	189	179	1.06	A	
Co-60				pCi/L	131	135	0.97	A	
E11611		Charcoal	I-131	pCi	52.4	59.9	0.87	A	
E11612		AP	Ce-141	pCi	67.5	63.6	1.06	A	
			Cr-51	pCi	192	161.0	1.19	A	
			Cs-134	pCi	91.4	92.6	0.99	A	
			Cs-137	pCi	93.9	80.8	1.16	A	
			Co-58	pCi	66	66.4	0.99	A	
	Mn-54		pCi	104	104	1.00	A		
	Fe-59		pCi	60.5	61.8	0.98	A		
	Zn-65		pCi	140	122	1.15	A		
	Co-60		pCi	119	91.9	1.29	W		

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable, reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning, reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable, reported result falls outside the ratio limits of < 0.70 and > 1.30.

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 3 OF 3)**

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
September 2016	E11613	Water	Fe-55	pCi/L	1990	1670	1.19	A
			E11614	Soil	Ce-141	pCi/g	0.153	0.175
	Cr-51	pCi/g	0.482		0.441	1.09	A	
	Cs-134	pCi/g	0.270		0.254	1.06	A	
	Cs-137	pCi/g	0.313		0.299	1.05	A	
	Co-58	pCi/g	0.177		0.182	0.97	A	
	Mn-54	pCi/g	0.340		0.285	1.19	A	
	Fe-59	pCi/g	0.206		0.17	1.21	W	
	Zn-65	pCi/g	0.388		0.335	1.16	A	
	Co-60	pCi/g	0.284		0.252	1.13	A	
December 2016	E11699	Milk	Sr-89	pCi/L	95	74.2	1.28	W
			Sr-90	pCi/L	14.7	10	1.47	N(3)
	E11700	Milk	I-131	pCi/L	97.5	97.4	1.00	A
			Ce-141	pCi/L	136	143	0.95	A
			Cr-51	pCi/L	247	280	0.88	A
			Cs-134	pCi/L	164	178	0.92	A
			Cs-137	pCi/L	120	126	0.95	A
			Co-58	pCi/L	139	146	0.95	A
			Mn-54	pCi/L	126	129	0.98	A
			Fe-59	pCi/L	114	125	0.91	A
			Zn-65	pCi/L	237	244	0.97	A
			Co-60	pCi/L	168	178	0.94	A
	E11701	Charcoal	I-131	pCi	95.6	98	0.98	A
	E11702	AP	Ce-141	pCi	91.7	97.7	0.94	A
			Cr-51	pCi	210	192.0	1.09	A
			Cs-134	pCi	122	122	1.00	A
			Cs-137	pCi	93.9	86.4	1.09	A
			Co-58	pCi	92	100	0.92	A
			Mn-54	pCi	93.7	88.5	1.06	A
			Fe-59	pCi	84.9	85.4	0.99	A
Zn-65			pCi	176	167	1.05	A	
Co-60	pCi	151	122	1.24	W			
E11730	AP	Sr-89	pCi	79.7	92	0.87	A	
		Sr-90	pCi	10	12.5	0.80	A	
E11703	Water	Fe-55	pCi/L	2180	1800	1.21	W	

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable, reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning, reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable, reported result falls outside the ratio limits of < 0.70 and > 1.30.

(3) NCR 16-35 was initiated

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)	
March 2016	16-MaW34	Water	Am-241	Bq/L	0.008		(1)	A	
			Ni-63	Bq/L	12.4	12.3	8.6-16.0	A	
			Pu-238	Bq/L	1.4900	1.2440	0.871-1.617	A	
			Pu-239/240	Bq/L	0.729	0.641	0.449-0.833	A	
	16-MaS34	Soil	Ni-63	Bq/kg	1140	1250.0	875-1625	A	
			Sr-90	Bq/kg	8.15		(1)	A	
	16-RdF34	AP	U-234/233	Bq/sample	0.1620	0.1650	0.116-0.215	A	
			U-238	Bq/sample	0.163	0.172	0.120-0.224	A	
	16-GrF34	AP	Gr-A	Bq/sample	0.608	1.20	0.36-2.04	A	
			Gr-B	Bq/sample	0.8060	0.79	0.40-1.19	A	
	16-RdV34	Vegetation	Cs-134	Bq/sample	10.10	10.62	7.43-13.81	A	
			Cs-137	Bq/sample	6.0	5.62	3.93-7.31	A	
			Co-57	Bq/sample	13.3000	11.8	8.3-15.3	A	
			Co-60	Bq/sample	0.013		(1)	A	
			Mn-54	Bq/sample	0.0150		(1)	A	
			Sr-90	Bq/sample	0.301		(1)	N(4)	
			Zn-65	Bq/sample	10.500	9.6	6.7-12.5	A	
	September 2016	16-MaW35	Water	Am-241	Bq/L	0.626	0.814	.570-1058	W
				Ni-63	Bq/L	12.4	17.2	12.0-22.4	A
Pu-238				Bq/L	1.23	1.13	0.79-1.47	W	
Pu-239/240				Bq/L	0.0318	0.013	(1)	A	
16-MaS35		Soil	Ni-63	Bq/kg	724	990	693-1287	A	
			Sr-90	Bq/kg	747	894	626-1162	A	
16-RdF35		AP	U-234/233	Bq/sample	0.160	0.15	0.105-0.195	A	
			U-238	Bq/sample	0.157	0.156	0.109-0.203	A	
16-RdV35		Vegetation	Cs-134	Bq/sample	-0.103		(1)	A	
			Cs-137	Bq/sample	5.64	5.54	3.88-7.20	A	
			Co-57	Bq/sample	7.38	6.81	4.77-8.85	A	
			Co-60	Bq/sample	4.81	4.86	3.40-6.32	A	
			Mn-54	Bq/sample	7.4	7.27	5.09-9.45	A	
			Sr-90	Bq/sample	0.774	0.80	0.56-1.04	A	
			Zn-65	Bq/sample	5.46	5.4	3.78-7.02	A	

(1) False positive test.

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

(4) NCR 16-14 was initiated

**ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 1 OF 1)**

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)			
May 2016	RAD-105	Water	Sr-89	pCi/L	48.9	48.2	37.8 - 55.6	A			
			Sr-90	pCi/L	25.0	28.5	20.7 - 33.1	A			
			Ba-133	pCi/L	53.1	58.8	48.7 - 64.9	A			
			Cs-134	pCi/L	40.9	43.3	34.6 - 47.6	A			
			Cs-137	pCi/L	84.8	78.4	70.6 - 88.9	A			
			Co-60	pCi/L	108	102	91.8 - 114	A			
			Zn-65	pCi/L	226	214	193 - 251	A			
			Gr-A	pCi/L	38.9	62.7	32.9 - 77.8	A			
			Gr-B	pCi/L	41.9	39.2	26.0 - 46.7	A			
			I-131	pCi/L	24.1	26.6	22.1 - 31.3	A			
			U-Nat	pCi/L	4.68	4.64	3.39 - 5.68	A			
			H-3	pCi/L	7720	7840	6790 - 8620	A			
			November 2016	RAD-107	Water	Sr-89	pCi/L	43.0	43.3	33.4-50.5	A
Sr-90	pCi/L	30.0				33.6	24.6-38.8	A			
Ba-133	pCi/L	47.8				54.9	45.4-60.7	A			
Cs-134	pCi/L	72.9				81.8	67.0-90.0	A			
Cs-137	pCi/L	189				210	189-233	A			
Co-60	pCi/L	58.4				64.5	58.0-73.4	A			
Zn-65	pCi/L	243				245	220-287	A			
Gr-A	pCi/L	37.2				68.4	35.9-84.5	A			
Gr-B	pCi/L	35.1				33.9	22.1-41.6	A			
I-131	pCi/L	23.5				26.3	21.9-31.0	A			
U-Nat	pCi/L	49.2				51.2	41.6-56.9	A			
H-3	pCi/L	918				9820	8540-10800	N(5)			
	MRAD-25	AP				Gr-A	pCi/Filter	56.8	71.2	23.9-111	A

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. N=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

(5) NCR 16-34 was initiated