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April 29, 1994

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

Subject: River Bend Station - Unit 1
Docket No. 50-458
Radiological Environmental Operating Report for 1993
File Nos.: G9.5, G9.25.1.5

RBG- 40535

Gentlemen:

Enclosed is the Annual Radiological Environmental Operating Report for 1993. This report is submitted in accordance with Subsection 6.9.1.7 of Appendix A (Technical Specifications) to River Bend Station License Number NPF-47.

Sincerely,

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RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

RIVER BEND STATION

FOR THE OPERATING PERIOD

January 1, 1993 - December 31, 1993

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RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1993

Abstract

During 1993, a land use census and radiological environmental monitoring were conducted in the vicinity of River Bend Station (RBS). As part of the monitoring program, the RBS Environmental Services Group participated in an interlaboratory comparison program with 93.8 percent of analytical results within control limits. The land use census revealed 5 salient changes in receptor locations since 1992. Nineteen monitoring exceptions occurred out of a total effort of 1,996 samples collected and 2,524 subsequent analyses performed. Seventeen of these exceptions involved Technical Specification requirements, but none had significant impact on program quality. Although well below the required detection limits, slightly elevated (relative to baseline data) levels of Cesium-137 were sporadically measured in both indicator and control media; these concentrations were presumably attributable to the 1986 incident at Chernobyl, Russia. The only measurable increases in radionuclide activity, or levels of radiation above baseline levels in the vicinity of RBS during 1993, which are attributed to plant operation, are the expected low levels in the liquid discharge line. The levels of activity measured in environmental media and in the liquid discharge were below the required levels of detection, and therefore substantially below Technical Specification reporting levels. The 1993 Radiological Environmental Monitoring Program thus substantiated the adequacy of source control and effluent monitoring at River Bend Station during 1993.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1993

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1.0 INTRODUCTION

This Annual Radiological Environmental Operating Report for the period of January 1 through December 31, 1993, is submitted in accordance with Technical Specification 6.9.1.7 of Appendix A to River Bend Station License Number NPF-47.

River Bend Station (RBS) is a 936 MWe General Electric boiling water reactor located in West Feliciana Parish, Louisiana, 4.1 km southeast of St. Francisville (Figure 1). Waste heat from RBS is dissipated via a system using five mechanical draft cooling towers which draw makeup water from the Mississippi River, 3.3 (air) km to the west. Blowdown from the cooling tower system dilutes low-level liquid radioactive waste and is discharged to the Mississippi River through a 4.4-km buried pipe located downstream of the intake structure (Fig. 2). Gaseous radioactive effluents are released through the main plant exhaust duct, the fuel building exhaust duct, and the radwaste building exhaust duct.

The area within a 16-km radius of RBS includes substantial portions of West Feliciana, East Feliciana, and Pointe Coupee parishes, as well as small portions of East and West Baton Rouge parishes. Most of the land in this area is devoted, in about equal proportions, to forests and agriculture (pasture, various crops). Wetlands, streams/lakes, and urban/improved lands comprise the remainder of the immediate vicinity of the plant. Besides St. Francisville, (4.1 km northwest), human population centers near RBS are New Roads (10 km southwest) and Jackson (12 km northeast). Industrial facilities in the immediate vicinity of RBS are James River Corporation Paper Mill (5 km south); Big Cajun No. 2 Power Station (5 km southwest); and the Corps of Engineers concrete casting yard (5 km west).

The area within an 80-km radius of RBS contains all or portions of 19 Louisiana parishes and five Mississippi counties. This area has generally the same makeup as that of the immediate vicinity of RBS, although wetlands, agricultural lands, and urban/improved lands are relatively more extensive (at the expense of forested lands) in the southwestern and southeastern quadrants. Baton Rouge, centered at about 38 km southeast, is the only large city in the general vicinity of RBS.

During 1993, radiological environmental monitoring in the vicinity of RBS was performed by the Gulf States Utilities Company (GSU) Environmental Services Group with support from the plant Radiological Programs department in maintaining/calibrating air samplers and in reading/annealing thermoluminescence dosimeters. On December 31, 1993, Gulf States Utilities completed a merger with Entergy, becoming a wholly-owned subsidiary of Entergy. Beginning January 1, 1994, Entergy Operations Inc. (EOI), the Entergy business unit responsible for nuclear power operations, became the operator of River Bend Station. The radiological environmental monitoring in the vicinity of RBS will continue to be performed by the Environmental Services Group, now a part of the plant Chemistry Department, with continued support from the plant Radiological Programs Department.

2.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

2.1 Purpose/Bases

The Radiological Environmental Monitoring Program (REMP) was established to provide representative measurements of radiation and of radioactive materials, resulting from RBS operation, in those exposure pathways and for those radionuclides that lead to the highest potential exposures of members of the public.

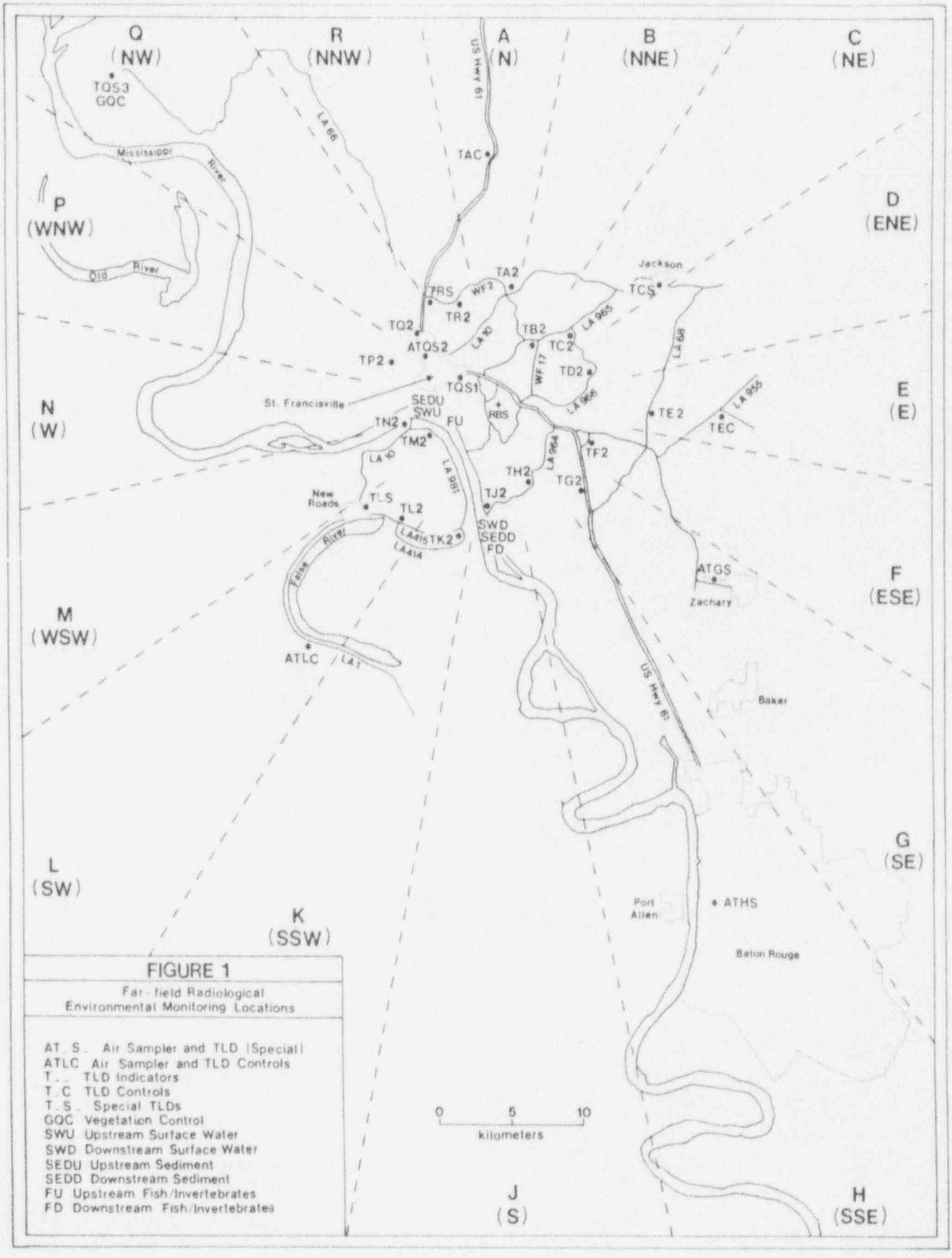

FIGURE 1

Far - field Radiological Environmental Monitoring Locations

AT_S_ Air Sampler and TLD (Special)
ATLC Air Sampler and TLD Controls
T_ _ TLD Indicators
T_C TLD Controls
T_S_ Special TLDs
GOC Vegetation Control
SWU Upstream Surface Water
SWD Downstream Surface Water
SEDU Upstream Sediment
SEDD Downstream Sediment
FU Upstream Fish/Invertebrates
FD Downstream Fish/Invertebrates

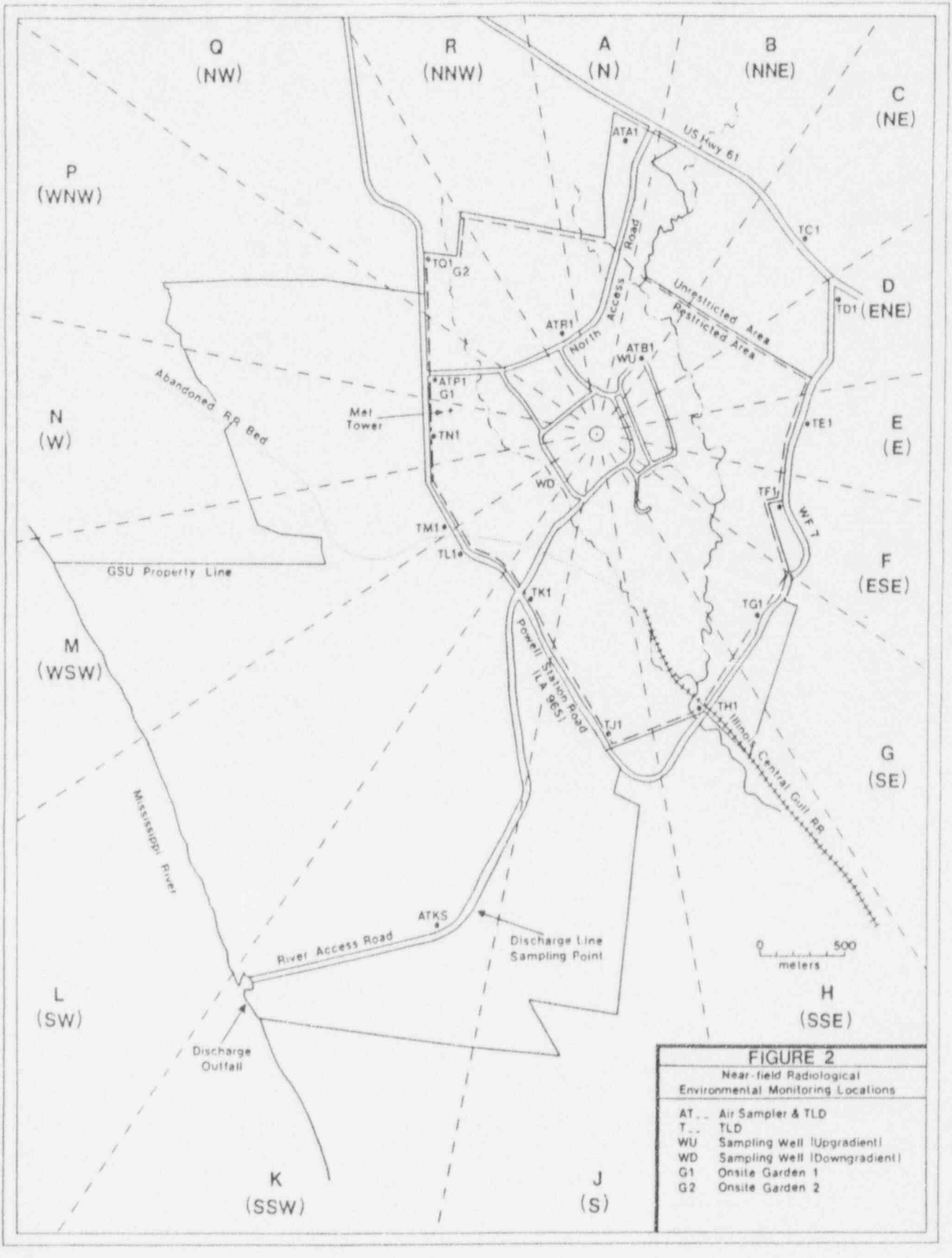

FIGURE 2
Near-field Radiological Environmental Monitoring Locations

AT_ _	Air Sampler & TLD
T_ _	TLD
WU	Sampling Well (Upgradient)
WD	Sampling Well (Downgradient)
G1	Onsite Garden 1
G2	Onsite Garden 2

The REMP implements Section IV.B.2 of Appendix I of 10CFR50 and thereby supplements the radioactive effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways.

The REMP applies the concepts of indicator vs. control and preoperational vs. operational intercomparisons to verify the adequacy of source controls and resultant human radiation doses. In addition to 10CFR50, Appendix I, the program is based on guidance provided in the Nuclear Regulatory Commission's Radiological Branch Technical Position, Revision 1, November 1979, as well as NRC Regulatory Guides 4.1 and 4.15.

2.2 Environmental Radiation Exposure Pathways

Elements of the REMP monitor indications of the impacts of gaseous (airborne) and liquid effluents released from River Bend Station. The specific methods used in monitoring the pathways by which these effluents could lead to human exposure, based on existing demographic information, are:

HUMAN EXPOSURE PATHWAYS

(A)	Airborne Pathway	Monitoring Media
	Immersion Dose (external)	Air Samples (Particulates and Radioiodines)
	Ingestion Dose (internal)	Vegetation/Food Crop Samples, Air Samples
(B)	Direct Exposure Pathway	Monitoring Media
	External Dose	Thermoluminescence Dosimetry (TLD) Area Monitors
(C)	Waterborne Pathway	Monitoring Media
	Ingestion Dose (internal)	Surface Water Samples Groundwater Sample Drinking Water Samples Fish/Invertebrate Samples Shoreline Sediment Samples
	Immersion Dose (external)	Surface Water Samples Shoreline Sediment Samples

Site-related dispersion characteristics, demography, hydrology, land use, anticipated source terms, and the exposure pathways outlined above were considered in the selection of the sample media, sampling and analysis frequencies, sampling/measurement locations, and types of analyses. These criteria were used to establish both the preoperational and operational phases of the REMP.

The program that evolved during the preoperational (baseline) monitoring phase incorporates all of the elements in the RBS Technical Specifications (3/4.12.1, 3/4.12.2, 3/4.12.3) plus special study criteria, and is illustrated in Table 1 and Figures 1 and 2.

2.3 Land Use Census for 1993

The annual land use census, which implements Section IV.B.3 of Appendix I of 10CFR50, was conducted during the 1993 growing season in accordance with RBS Technical Specification 3/4.12.2. Table 2 summarizes the results and notes changes in nearest receptor locations within 8 km from those identified in the Radiological Environmental Operating Report for 1992.

The 1993 census identified residences within 8 km of the RBS reactor containment in all sectors except L (SW) and M (WSW). The nearest resident in sector P (WNW) was 3.4 km, versus 3.5 km in 1992. The gardens identified in sectors P (WNW) and Q (NW) are the onsite gardens established in the sectors with the highest calculated annual average ground level D/Q. These gardens are REMP indicator locations for broadleaf vegetation (Table 1, Fig. 2). No receptor gardens were found in sectors H (SSE) and K (SSW) in 1993, compared to gardens at 1.7 km and 7.4 km in 1992 census. A farther garden in sector R (NNW) at 3.7 km was reported as compared to 3.0 km in 1992.

No dairy animals were found within 8 km of RBS during the 1993 census; milk goats were located at 9 km in sector A (N). Historically, there had never been enough dairy sites to accommodate the minimum RBS Technical Specification requirements for analysis of milk, so monitoring of broadleaf vegetation has been performed from the outset.

GSU began a survey of meat animals within the 8 km radius of RBS during the 1990 census. This initial survey identified beef herds in all sectors except L (SW). During the 1991 census, meat animals were located in sector L (SW) at 4.6 km. A closer meat animal was reported in sector D (ENE) at 1.2 km in 1993, compared to 1.4 km in the 1992 census.

2.4 Interlaboratory Comparison Program Results for 1993

The Environmental Services Group participated in the U.S. Environmental Protection Agency (USEPA) Laboratory Intercomparison Program during 1993 in accordance with RBS Technical Specification 3/4.12.3. RBS results (Table 3) were within the control limits for the normalized range (precision) for all analyses, and within the USEPA "known" value (accuracy) for all but three analyses. The discrepancy for these analyses is discussed below. The USEPA discontinued the cross-check media for "food" in 1989, and although milk sampling and analysis is not required of RBS at this time, the results for the cross-check media for "milk" are included as a gauge for the "food" sample analyses (i.e., vegetation and fish) performed by RBS.

2.5 Program Exceptions

Certain samples and analyses were inadvertently omitted or unavoidably altered during the 1993 operating period, out of a total effort of 1,996 samples collected and 2,524 subsequent analyses performed. These exceptions and the reasons for the omissions/alterations are delineated in Table 4 in accordance with Technical Specification requirements. Corrective actions and impacts on program quality are discussed below.

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 1 of 6)

Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analysis
Airborne Particulates and Radioiodines	Samples from 9 Locations:		
	INDICATOR STATIONS		
	AA1. River Bend Training Center; 1.7 km N.	Continuous air sampler with filter collection weekly or as required by dust loading, whichever is more frequent.	Charcoal cartridge: analysis weekly for radioiodine.
	AR1. River Bend Station North Access Road across from plant entrance; 0.8 km NNW.		Particulate filter: analysis weekly for gross beta and gamma isotopic activity[1] following filter changes.
	AP1. Near River Bend Station Onsite Garden #1; 0.9 km WNW.		
	AQS2. St. Francis Substation on US hwy. (Bus.) 61 in St. Francisville; 5.8 km NW (nearest community location).		Composite particulate filters: analysis quarterly for gamma isotopic activity.
	CONTROL AND SPECIAL INTEREST STATIONS[1]		
	ALC. Parlange Power Center in Oscar; 20 km SW (Control).		
	AB1. River Bend Station cooling tower yard; 0.5 km NNE.[2]		
	AKS. River Bend Station River Access Road; 2.8 km SSW.[2]		
	AGS. GSU Service Center compound in Zachary; 17 km SE.[3]		
	AHS. Roof of GSU Office Building, North Blvd., Baton Rouge; 40 km SSE.[3]		
Direct Radiation	Measurements from 44 locations		
	INDICATOR STATIONS		
	TA1. River Bend Training Center; 1.7 km N.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly.[1]	Gamma exposure monthly and quarterly.[1]
	TA2. GSU utility pole #246 at Jct of La Hwy 10 and West Feliciana Parish Road (WF) 2 in Elm Park; 8 km N.		
	TB1. River Bend Station cooling tower yard; 0.5 km NNE.		
	TB2. Stub pole at Jct of La Hwy 965 and Audubon Lane (WF 17); 5 km NNE.		

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 2 of 6)

Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analysis
Direct Radiation (continued)	**TC1**. Stub pole at Jct of US Hwy 61 and Old Highway 61; 1.7 km NE. **TC2**. Stub pole along La Hwy 966, 0.6 km south of Jct of La Hwys 966 and 965; 7 km NE. **TD1**. Stub pole along WF 7, 150 meters south of Jct of WF 7 and US Hwy 61; 1.6 km ENE. **TD2**. Stub pole along La Hwy 966, 4 km south of Jct of La Hwys 966 and 965; 6.3 km ENE. **TE1**. Stub pole along WF 7, 1 km south of Jct of wf 7 and US Hwy 61; 1.3 km E. **TE2**. Gravel Power Center on La Hwy 68, 2 km north of Jct of La Hwys 68 and 964; 10 km E. **TF1**. Stub pole along WF 7, 1.6 km south of Jct of WF 7 and US Hwy 61; 1.3 km ESE. **TF2**. On La Hwy 954, 0.6 km north of Jct of La 954 and US Hwy 61; 6 km ESE. **TG1**. Stub pole along WF 7, 2 km south of Jct of WF 7 and US Hwy 61; 1.6 km SE. **TG2**. Telephone pole at gate to Marathon Tank Farm on US Hwy 61, near Delombre; 7.5 km SE. **TH1**. Stub pole at Illinois Central Gulf Railroad crossing of WF 7 (near Grants Bayou); 1.7 km SSE. **TH2**. First telephone pole on La Hwy 964 north of the entrance to James River Corporation paper mill; 5.5 km SSE. **TJ1**. Stub pole near River Bend Station gate #23 on La Hwy 965; 1.5 km S. **TJ2**. Large tree along River Road, 100 meters north of James River Corporation intake structure; 5.8 km S. **TK1**. GSU utility pole #L10178 on La Hwy 965, 20 meters south of RBS River Access Road; 0.9 km SSW. **TK2**. Stub pole at Jct of La Hwys 414 and 415; 8 km SSW.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly.[1]	Gamma exposure monthly and quarterly.[1]

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 3 of 6)

Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analysis
Direct Radiation (continued)	**TL1**. Second utility pole on La Hwy 965 south of former Illinois Central Gulf Railroad crossing; 1.0 km SW. **TL2**. Second utility pole along La Hwy 415 east of Louisiana & Arkansas Railroad crossing (near Patin's Dike); 9.5 km SW. **TM1**. First utility pole on La Hwy 965 north of former Illinois Central Gulf Railroad crossing; 0.9 km WSW. **TM2**. Utility pole along La Hwy 981, about 3 km south of Jct of La Hwys 981 and 10; 4.2 km WSW. **TN1**. Utility pole along La Hwy 965, between RBS gates #13 and #14; 0.9 km W. **TN2**. Utility pole with electrical meter near west bank ferry landing (La Hwy 10); 6 km W. **TP1**. Near RBS Onsite Garden #1; 0.9 km WNW. **TP2**. Stub pole about 1.5 km north of former ICG RR trestle on Tunica Street, western outskirts of St. Francisville; 7.3 km WNW. **TQ1**. GSU property sign along La Hwy 965 about 1 km north of RBS North Access Road; 1.4 km NW. **TQ2**. GSU pole at Jct of North Commerce and American Beauty Streets, St Francisville; 6.9 km NW. **TR1**. RBS North Access Road across from plant entrance; 0.8 km NNW. **TR2**. Tree along north side of WF 2, past Jacock Road, about 1.8 km east of Jct of WF 2 and US Hwy 61; 8 km NNW. CONTROL AND SPECIAL INTEREST STATIONS[1] **TAC**. Telephone pole along US Hwy 61 about 200 meters north of Hamilton Station Water Tower, near Wakefield; 18 km N.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly.[1]	Gamma exposure monthly and quarterly.

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 4 of 6)

Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analysis
	CONTROL AND SPECIAL INTEREST STATIONS[1]		
Direct Radiation (continued)	**TEC**. Stub pole at Jct of La Hwy 955 and Midway Road, 4.8 km north of Jct of La Hwys 955 and 964; 16 km E.[2]	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly.[3]	Gamma exposure monthly and quarterly.[3]
	TLC. Parlange Power Center in Oscar; 20 km SW.		
	TCS. Utility pole at gate to East Louisiana State Hospital in Jackson; 12.3 km NE.		
	TGS. GSU Service Center compound in Zachary; 17 km SE.		
	THS. Roof of GSU Office Building, North Boulevard, Baton Rouge; 40 km SSE.		
	TKS. RBS River Access Road; 2.8 km SSW.[2]		
	TLS. Utility pole near False River Academy sign at edge of New Roads; 9.9 km SW.		
	TQS1. Behind Pentecostal Church (opposite West Feliciana Hospital) near Jct of US Hwy 61 and Ferdinand Street; 4 km NW.		
	TQS2. St. Francis Substation on US Hwy (Business) 61 in St. Francisville; 5.8 km NW.		
	TQS3. Utility pole at Louisiana State Penitentiary dairy, near Angola; 35 km NW.		
	TRS. Stub pole at Jct of WF 2 and US Hwy 61, near Bains (West Feliciana High School); 9.2 km NNW.[2]		
Waterborne	**SURFACE WATER**[4]		
	SWU. Mississippi River about 4 km upstream from the RBS liquid discharge, near La Hwy 10 ferry crossing.	Weekly grabs, composited over monthly and quarterly periods.	Monthly composite: gamma isotopic, tritium[5] and gross beta analysis[6]. Quarterly composite: tritium analysis.
	SWD. Mississippi River about 4 km downstream from the RBS liquid discharge, near the James River Corporation paper mill.		
	DL. RBS liquid discharge line at the blowdown control structure along the River Access Road.	Flow-weighted hourly grabs, composited monthly and quarterly.	

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 5 of 6)

Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analysis
Waterborne	**DRINKING WATER**[6]		
	Nearest downstream water supply: IH-10 bridge in Baton Rouge, 53.9 km downstream from the RBS liquid discharge; or People's Water Service Company in Donaldsonville, 138 km downstream from the RBS liquid discharge.	Weekly grabs, composited over monthly and quarterly periods.	Monthly composite: gamma isotopic, tritium[1] and gross beta analysis[1]. Quarterly composite: tritium analysis.
	GROUNDWATER		
	WD. Upland Terrace Aquifer well, downgradient from the plant, about 470 meters SW.	Quarterly grab.	Gross beta, gamma isotopic, and tritium analyses quarterly[1].
	WU. Upland Terrace Aquifer well, upgradient from the plant, about 470 meters NNE (control).		
	SHORELINE SEDIMENT		
	SEDD. East shore of the Mississippi River, about 4 km downstream from the plant, near the James River Corporation paper mill.	Semiannual grab.	Gamma isotopic analysis semiannually.
	SEDU. East shore of the Mississippi River, about 4 km upstream from the plant, near the La Hwy 10 ferry.[7]		
Ingestion	**FISH AND INVERTEBRATES**		
	FD. One sample of each of three commercially and/or recreationally important species from the downstream area influenced by the RBS liquid discharge.[7]	Semiannually or seasonally, when available.	Gamma isotopic analysis on edible portions semiannually or seasonally.
	FU. One sample of each of three commercially and/or recreationally important species from the upstream area not influenced by the RBS liquid discharge (control).[7]		
	PRODUCE[8]		
	G1/G2. Two samples of each of three different types of leafy vegetables from onsite gardens near the site boundary in areas of highest calculated average ground-level D/Q; 1 km WNW and 1.1 km NW.	Monthly during the growing season.	Gamma isotopic and I-131 analyses monthly.
	GQC. One sample of each of three different kinds of leafy vegetables from the Louisiana State Penitentiary at Angola; 35 km NW (control).		

TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 6 of 6)

NOTES:

(1) For purposes of data summary, comparisons, and discussion, the sampling locations designated as "Special Interest" are treated as indicator stations if they are within 16 km of RBS and control stations if they are beyond 16 km.

(2) Sample/measurement location not required by RBS Technical Specifications (not identified in ODCM).

(3) Sampling and/or analysis frequency greater than required by RBS Technical Specifications and ODCM.

(4) The upstream (control) sample is taken at a distance beyond influence of the plant discharge. The downstream (indicator) sample is taken in an area beyond but near the mixing zone.

(5) Gross beta analysis not required by RBS Technical Specifications and ODCM.

(6) Drinking water sampling/analyses not required by RBS Technical Specifications and ODCM. (No drinking water pathway exists due to extreme distance to nearest intake). The upstream surface water sampling location (SWU) is used as a "control" for drinking water analyses comparisons.

(7) Preferred species are river shrimp (Macrobracium ohione), blue catfish (Ictalurus furcatus), and freshwater drum (Aplodinotus grunniens); if these are unavailable, other edible species may be substituted.

(8) No irrigation pathway exists due to the extreme distance of nearest domestic water intake (see Note 6); leafy vegetables are sampled and analyzed because of limited availability of milk samples.

Air Particulates and Radioiodines

Thirteen program exceptions, with lost of sample/sample volume, occurred involving air particulate and radioiodine sampling. Two of these involved non-technical specifications location (AHS). Eight exceptions were a result of power outages due to unknown reasons, and/or storm/weather related. Four outages were a result of equipment problems/failures, which may have been weather related. In spite of the numerous power failures, samples were collected and analyzed from all locations with adequate volumes to achieve all required detection limits, except for location AA1 (7/6/93 - 7/12/93), and AHS (1/18/93 - 1/25/93).

RBS is reviewing methods for determining more precisely when, during the week-long sample period, power outages or equipment failures occur so that comparison with wind direction joint frequencies will document the extent to which required sampling was achieved. Instruments have been purchased, but not yet deployed, for each sampling location to plot actual hours of outage when failures occur. This equipment should be in the field by the end of 1994.

Direct Radiation (TLD)

Data for one quarterly (4th quarter) and two monthly (10/93,11/93) TLD badges at location TAC was lost due to vandalism. Quarterly data for TA2 could not be replaced with monthly data due to lost of monthly data at the same location. May data for location TEC was also lost due to vandalism.

Vegetation Sample

Two vegetation samples collected in July failed to meet detection limits for I-131. The LLD for I-131 in vegetation is 60 pCi/km, while the reported LLD's were 71.9 and 75.4 pCi/km. The delay in analyzing the samples, due to an inoperative gamma spectroscopy system, was the cause of not meeting required LLD's. The samples were collected on 7/30/93, and not counted until 8/12/93. Additional samples for July could not be collected. Vegetation samples are now collected earlier in the month to allow for additional collections, if such instrument problems arise.

Surface Water Sample

Surface water samples composited during January failed to meet detection limits for certain nuclides, due to delay in analysis caused by problems experienced with the gamma spectroscopy system in February. Surface water samples up-stream (SWU) and down-stream (SWD), discharge-line (DL), and drinking water (DL) sample (non-tech.spec) failed to meet LLD's for I-131, La-140, and Ba-140. The reported LLD's and required LLD's are as follows:

Water Sample Location	I-131 (15 pCi/l LLD)	Ba-140 (60 pCi/l LLD)	LA-140 (15 pCi/l LLD)
SWD	28.5	54.5	24.7
SWD	16.3	62.0	28.3
DL	30.3	58.6	20.2
DW	16.2	57.5	22.

RBS began installation of gamma spectroscopy hardware and software upgrades during 1993 in order update the spectroscopy technology and to correct problems with computer interface reliability, which caused the analytical delays and missed LLDs during 1993.

TABLE 2

RESULTS OF LAND USE CENSUS

Sector	Nearest Residence	Range (km)	Nearest Garden	Range (km)	Nearest Dairy	Range (km)	Nearest Meat Animal	Range (km)
A (N)	Jones	1.8	Jones	1.8	-	-	Daniel, H.	3.0
B (NNE)	Dreher	1.6	Harvey	1.8	-	-	Harvey	1.8
C (NE)	Magee	1.5	Magee	1.5	-	-	Daniel, H.	1.7
D (ENE)	Lambert	1.4	Daniel, E.I.	1.6	-	-	[1]Daniel, E.I.	1.2
E (E)	Bickham	2.2	Bickham	2.2	-	-	Daniel, E.I.	1.2
F (ESE)	Shelton	3.4	Eisworth	3.6	-	-	Daniel, E.I.	1.2
G (SE)	Mills	6.6	Mills	6.6	-	-	Bickham	3.5
H (SSE)	Koffman	1.7	[2]none	-	-	-	Daniel, E.I.	3.9
J (S)	Bliss	1.8	Bliss	1.8	-	-	Daniel, E.I.	3.5
K (SSW)	Guillory	7.4	[3]none	-	-	-	Daniel, E.I.	3.5
L (SW)	-	-	-	-	-	-	Bergeron	4.6
M (WSW)	-	-	-	-	-	-	Langois	5.0
N (W)	Lacost	6.1	-	-	-	-	Langois	5.0
P (WNW)	[4]Hermann	3.4	RBS #1	0.96	-	-	Hardovin	7.4
Q (NW)	Davis	1.3	RBS #2	1.07	-	-	Cole	1.3
R (NNW)	Young	1.7	[5]Cummings	3.7	-	-	Vessel	3.0

NOTES:

(1) Closer grazing meat animal, 1.2 km compared to 1.4 km in the 1992 census.

(2) No garden within 8 km, compared to 1.7 km in 1992 census.

(3) No garden within 8 km, compared to 7.4 km in 1992 census.

(4) Closer residence, 3.4 km compared to 3.5 km in 1992 census.

(5) Farther garden, 3.7 km compared to 3.0 km in 1992 census.

TABLE 3

USEPA INTERCOMPARISON (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

Sample Type (units)	Date	Analysis	USEPA "Known" Value[a]	RBS Value	RBS N-DEV[b]	RBS N-RANGE[c]	Average Result[d]
Air Filter (pCi/filter)	08/27/93	Beta	47.00 ± 8.7	49.33	+0.81	0.118	49.32 ± 4.62
		Cs-137	9.00 ± 8.7	9.00	0.00	0.236	10.00 ± 1.62
Milk[e]	09/24/93	I-131	127.00 ± 20.8	116.67	-0.48	0.246	120.12 ± 8.37
		Cs-137	49.00 ± 8.7	49.67	+0.23	0.473	50.02 ± 3.00
		K (nat)	1679.00 ± 145.2	1734.00	+1.13	0.169	1674.07 ± 95.22
Water (pCi/liter)	01/29/93	Beta	44.00 ± 8.7	30.33[f]	-4.73[f]	0.591	41.99 ± 7.41
	02/05/93	I-131	100.00 ± 17.3	98.00	-0.35	0.118	101.36 ± 8.20
	04/20/93	Beta	177.00 ± 46.8	138.67	-2.46	0.328	155.52 ± 18.41
		Co-60	39.00 ± 8.7	37.67	-0.46	0.118	39.36 ± 2.9
		Cs-134	27.00 ± 8.7	23.67	-1.15	0.118	25.40 ± 2.14
		Cs-137	32.00 ± 8.7	31.00	-0.35	0.236	32.60 ± 2.81
	06/04/93	H-3	9844.00 ± 1707.2	9144.67	-1.23	0.209	9591.82 ± 689.1
	06/11/93	Co-60	15.00 ± 8.7	14.67	-0.12	0.118	39.36 ± 2.9
		Zn-65	103.00 ± 17.3	108.33	+0.92	0.236	107.54 ± 7.83
		Ru-106	119.00 ± 20.8	86.67[f]	-4.67[f]	0.197	103.87 ± 12.83
		Ba-133	99.00 ± 17.3	96.00	-0.52	0.118	96.74 ± 6.87
		Cs-134	5.00 ± 6.85	4.67	-0.12	0.118	5.39 ± 1.57
		Cs-137	5.00 ± 6.85	5.00	0.00	0.236	5.76 ± 1.47
	07/23/93	Beta	43.00 ± 12.0	33.00	-2.50	0.256	37.65 ± 8.49
	10/08/93	I-131	117.00 ± 20.8	115.33	-0.24	0.049	117.68 ± 10.62
	10/19/93	Beta	58.00 ± 17.3	46.33	-2.02	0.295	53.40 ± 6.43
		Co-60	10.00 ± 8.7	9.00	-0.35	0.000	10.41 ± 1.63
		Cs-134	12.00 ± 8.7	9.00	-1.04	0.000	9.78 ± 1.86
		Cs-137	10.00 ± 8.7	10.00	0.00	0.000	10.93 ± 1.72
	10/29/93	Beta	15.00 ± 8.7	15.33	+0.12	0.236	17.01 ± 4.80
	11/05/93	H-3	7398.00 ± 1283.9	6741.00	-1.54	0.084	7215.65 ±574.68
	11/12/93	Co-60	30.00 ± 8.7	30.00	0.00	0.000	29.72 ± 2.33
		Zn-65	150.00 ± 26.00	161.67	+1.35	0.079	156.07 ± 9.24
		Ru-106	201.00 ± 34.7	155.33[f]	-3.95[f]	0.177	175.18 ± 18.32
		Ba-133	79.00 ± 13.9	77.67	-0.29	0.074	76.45 ± 6.31
		Cs-134	59.00 ± 8.7	53.33	-1.96	0.118	54.42 ± 4.53
		Cs-137	40.00 ± 8.7	43.00	+1.04	0.000	42.14 ± 3.04

NOTES

(a) USEPA "known" values are listed with a range reflecting control (3 sigma) limits.
(b) The normalized deviation from the "known" value is computed by USEPA from the deviation and the standard error of the mean; ±2.000 is the warning limit and ±3.000 is the control limit.
(c) The normalized range is computed by USEPA from the mean range, the control limit, and the standard error of the range; +2.000 is the warning limit and +3.000 is the control limit.
(d) The grand average of all participants' results (excluded outliers) is listed with the experimental (calculated) sigma for all laboratories.
(e) USEPA discontinued the cross-check media "Food" in 1989. Although milk sampling and analysis by RBS is not performed, the cross-check samples of milk were analyzed, and the data included as a gauge of the "food" sample (i.e., vegetation, fish) analyses performed by RBS. The units for the nuclides I-131 and Cs-137 are pCi/liter, and for natural potassium is mg/l.
(f) The results reported to USEPA were out of the control limits; refer to the discussion on program exceptions.

TABLE 4

MONITORING PROGRAM EXCEPTIONS

SAMPLE TYPE	PERIOD	LOCATION	EXCEPTION/REASON
Air Particulate and Radioiodine	1/18-1/25/93	AHS*	Air particulate filter lost while exchanging filters due to windy conditions. This sampler is located on a rooftop, and the filter was blown off of the roof.
	3/29-4/5/93	All locations	Between 1% and 3% of weekly sample volumes not collected due to power outages.
	4/19-4/26/93	AA1, AB1*, AR1, AKS*, AP1	About 0.5% of weekly sample volumes not collected due to power outage.
	5/17-5/25/93	AA1	About 83% of the weekly sample volume not collected due to a tripped breaker trip.
	6/1-6/7/93	AQS2	About 3.4% of the weekly sample volume not collected due to a power outage.
	6/7-6/15/93	AHS*	About 1.5% of the weekly sample volume not collected due to a power outage.
	6/21-6/28/93	AA1, AB1*, AR1, AKS*, AP1, AHS*	About 1.3% of the weekly sample volumes not collected due to power outages.
	6/28-7/6/93	AA1	About 45% of the weekly sample volume not collected due to a tripped breaker.
	7/6-7/12/93	AA1	About 93% of the weekly sample volume not collected (and analytical LLD not achieved due to low sample volume) due to sampling equipment malfunction.
	7/12-7/19/93	AA1	About 32% of the weekly sample volume not collected due to a power outage and sampling equipment malfunction.
	7/19-7/26/93	AA1	About 2.5% of the weekly sample volume not collected due to a power outage.
	7/26-8/9/93	AA1, AB1*, AR1, AKS*, AP1, ALC	About 1% of the weekly sample volumes not collected due to power outages.
	8/16-8/23/93	ALC, AGS*	About 1.4% (at ALC) and 30% (at AGS) of weekly sample volumes not collected due to power outages.
TLD's	10/93 , 11/93, 4th Qtr 1993	TA2	No data for these periods at this location. TLD badges were missing/stolen.
	5/93	TEC	No data for this period at this location. TLD badge was missing/stolen.
Vegetation	11/93	G1, G2	Sample analysis failed to meet all required LLDs; Delay in sample counting due to counting instrument and computer system problems.
Surface Water	1/93	SWU, SWD, DL, DW*	Sample analysis failed to meet all required LLDs; Delay in sample counting due to counting instrument and computer system problems.
EPA Cross Checks	1/29/93	Gross Beta in Water Study	Results exceeded control limits of study; low bias in reported activity still under investigation, but is believed to be caused by loss of sample during final stages of sample preparation.
	6/11/93 and 11/12/93	Gamma in Water Study (Ru-106)	Results exceeded control limits in both studies for Ru-106; low bias in reported activity is still under investigation, USEPA is evaluating a problem with the Ru-106 standard used for cross-check samples in 1993.

*Sample/measurement is not required by RBS Technical Specifications (not identified in ODCM)

USEPA Cross-check:

The RBS results of the USEPA gross beta-in-water study of 1/29/93 were outside the control limits of the study. RBS reported results averaging 30.3 pCi/l, while the control limits were 35.3 to 52.7 pCi/l, with a known value of 44 pCi/l. Instrument quality control data and worksheet calculations were reviewed with no indication of a problem. Four other beta-in-water studies were prepared and analyzed during the year with all results within the control limits for the respective study, although these results were biased low. RBS will implement microwave digestion for water samples during 1994, but the cause of the low bias results is still under investigation at this writing.

The Ru-106 results of the USEPA gamma-in-water studies of 6/11/93 and 11/12/93 were both below the control limits of the respective studies. RBS investigation found no problems in the preparation of the sample, or no gamma software or nuclide library changes that might effect analysis results of the sample. After receiving the results of the second study, RBS contacted the Radioanalysis Branch, EPA EMSL-LV, and found that many participants in the program have been bias low over the last three gamma-in-water studies in the Ru-106 analysis., and that the standard used to prepare the study samples is still under investigation.

3.0 INTERPRETATION OF REMP RESULTS

3.1 Summary of Operational REMP Results

Monitoring results for the exposure pathways are itemized in Appendix A and summarized in Table 5, from which measured activities of the naturally-occurring daughters of uranium and thorium are excluded. For purposes of data summary, comparison, and discussion, the sampling locations designated "Special Interest" in Table 1 are treated as indicator stations if they are within 16 km of RBS and control stations if they are beyond 16 km.

3.1.1 Airborne Exposure Pathway - Measurements of radioiodine and other gamma-emitters were all below their respective LLDs -- that is, "undetectable" at the required analytical sensitivities. Noble gases (Kr-87, Xe-133, Xe-135) were detected in air samples throughout the year. Cs-137 was measured in charcoal cartridges at indicator and control locations, presumably traces of Chernobyl fallout. Gross beta activities averaged 0.021 pCi/m^3 at indicator locations and 0.022 pCi/m^3 at control locations.

3.1.2 Direct Exposure Pathway - The monthly average gamma ray exposures for indicator and control locations were 4.27 and 4.33 millirem (mR) total, respectively. Quarterly exposures averaged 12.2 mR total at indicator locations and 10.3 mR total at control locations.

3.1.3 Waterborne Exposure Pathway - No gamma-emitters were measured in surface water or in drinking water at levels approaching the Technical Specification LLDs. The gamma emitters Mn-54, Co-58, Fe-59, Co-60, Cr-51, Zn-65, and Nb-95 were measured in a few monthly composite samples from the CWS discharge line at concentrations between 0.64 and 152 picocuries per liter. Gross beta activities in surface water averaged 45.6 pCi/l in the discharge line and from 3 to 10 pCi/l at all other stations. Tritium (H-3) activities in surface water averaged 4962 pCi/l in the discharge line and were below detection limits at all other locations. Gross beta activities averaged 2.78 pCi/l in the downgradient WD (indicator), and 2.31 pCi/l in upgradient WU (control) groundwater. Besides naturally-occurring gamma emitters, Cs-137 was measured in Mississippi River shoreline up-stream sediment at 25.1 pCi/kg dry; down-stream at 15.7 pCi/kg dry. As in the case of the airborne Cs-137 activity, this slightly elevated level (relative to baseline conditions) is probably attributable to the 1986 incident at Chernobyl, Russia.

3.1.4 Ingestion Exposure Pathway - Specific activities for radioiodine were below the required LLD in the ingestion pathway monitoring media during 1993. Only naturally-occurring gamma emitters was measured in broadleaf vegetation and fish in 1993.

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
(Page 1 of 4)

River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period 1/1/93 to 12/31/93

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Air Particulate (pCi/m^3)	Gross Beta (449)	0.01	0.021 (300/300) 0.005 - 0.087	AA1 1.7 km N	0.023 (50/50) 0.009 - 0.050	0.022 (148/149) 0.011 - 0.048	0
	Be-7[3] (449)	None Required	0.063 (194/300) 0.031 - 0.234	AGS 17 km SE	0.091 (37/50) 0.058 - 0.261	0.074 (103/149) 0.057 - 0.261	0
	K-40[3] (450)	None Required	0.505 (298/300) 0.143 - 0.994	AGS 17 km SE	0.578 (49/50) 0.212 - 1.160	0.510 (149/150) 0.212 - 1.160	0
	Cs-134 (449)	0.05	All < LLD			All < LLD	0
	Cs-137 (449)	0.06	All < LLD			All < LLD	0
Air Radioiodine (pCi m^3)	I-131 (450)	0.07	All < LLD			All < LLD	0
Direct (TLD)[4] (mR total)	Gamma Monthly (528)		4.27 (454/456) 3.22 - 4.95	TM2 4.2 km WSW	4.95 (12/12) 4.34 - 5.92	4.33 (71/72) 3.75 - 4.38	0
	Gamma Quarterly (176)		12.15 (151/152) 8.38 - 15.56	TM2 4.2 km WSW	14.03 (4/4) 12.72 - 15.36	10.30 (24/24) 9.59 - 14.06	0
Surface Water (pCi/liter)	H-3 (12)	3000	4962 (4/8) 3814 - 6386	DL	4962 (4/4) 3814 - 6386	All < LLD	0
	Mn-54 (36)	15	7.84 (12/24) 0.64 - 23.5	DL	7.84 (12/12) 0.64 - 23.5	All < LLD	0
	Co-58 (36)	15	1.75 (9/24) 0.95 - 3.60	DL	1.75 (9/12) 0.95 - 3.60	All < LLD	0
	Fe-59 (36)	30	5.22 (3/24) 2.33 - 7.56	DL	5.22 (3/12) 2.33 - 7.56	All < LLD	0
	Co-60 (36)	15	31.1 (13/24) 0.70 - 152	DL	33.6 (12/12) 7.33 - 152	All < LLD	0
	Zn-65 (36)	30	2.63 (4/24) 1.59 - 3.52	DL	2.63 (4/12) 1.59 - 3.52	All < LLD	0
	Nb-95 (36)	15	1.94 (2/24) 0.75 - 3.12	DL	1.94 (2/12) 0.75 - 3.12	All < LLD	0
	Zr-95 (36)	30	All < LLD			All < LLD	0
	I-131 (36)	15	10.5 (1/24) single value	DL	10.5 (1/12) single value	All < LLD	0
	Cs-134 (36)	15	0.90 (1/24) single value	DL	0.90 (1/12) single value	All < LLD	0
	Cs-137 (36)	18	1.88 (2/24) 1.79 - 1.96	DL	1.88 (2/12) single value	All < LLD	0

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
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Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Surface Water (pCi/liter) (continued)	Ba-140 (36)	60	12.7 (1/24) single value	DL	12.7 (1/12) single value	All < LLD	0
	La-140 (36)	15	10.5 (1/24) single value	DL	10.5 (1/12) single value	All < LLD	0
	Gross Beta (36)	4	26.6 (24/24) 2.46 - 147	DL	45.6 (12/12) 12.0 - 147	6.52 (9/12) 4.05 - 8.99	0
Groundwater (pCi/liter)	H-3 (8)	3000	All < LLD	WU 470 m NNE	226 (1/4) single value	226 (1/4) single value	0
	Mn-54 (8)	15	All < LLD			All < LLD	0
	Co-58 (8)	15	All < LLD			All < LLD	0
	Fe-59 (8)	30	All < LLD			All < LLD	0
	Co-60 (8)	15	All < LLD			All < LLD	0
	Zn-65 (8)	30	All < LLD			All < LLD	0
	Nb-95 (8)	15	All < LLD			All < LLD	0
	Zr-95 (8)	30	All < LLD			All < LLD	0
	I-131 (8)	15	All < LLD			All < LLD	0
	Cs-134 (8)	15	All < LLD			All < LLD	0
	Cs-137 (8)	18	0.34 (1/4) single value	WD 470 m SW	0.34 (1/4) single value	All < LLD	0
	Ba-140 (8)	60	All < LLD			All < LLD	0
	La-140 (8)	15	All < LLD			All < LLD	0
	Gross Beta (8)	4	2.78 (2/4) 2.48 - 3.07	WD 470 m SW	2.78 (2/4) 2.48 - 3.07	2.31 (2/4) 1.87 - 2.75	0
Drinking Water[3] (pCi/liter)	H-3 (4)	3000	All < LLD			All < LLD	0
	Mn-54 (12)	15	All < LLD			All < LLD	0
	Co-58 (12)	15	All < LLD			All < LLD	0
	Fe-59 (12)	30	All < LLD			All < LLD	0

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period 1/1/93 to 12/31/93

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Drinking Water (pCi/liter) (continued)	Zn-65 (12)	30	All < LLD			All < LLD	0
	Co-60 (12)	15	All < LLD			All < LLD	0
	Nb-95 (12)	15	All < LLD			All < LLD	0
	Zr-95 (12)	30	All < LLD			All < LLD	0
	I-131 (12)	15	All < LLD			All < LLD	0
	Cs-134 (12)	15	All < LLD			All < LLD	0
	Cs-137 (12)	18	All < LLD			All < LLD	0
	Ba-140 (12)	60	All < LLD			All < LLD	0
	La-140 (12)	15	All < LLD			All < LLD	0
	Gross Beta (12)	4	5.65 (11/12) 2.80 - 10.1	SWU 4 km upstream	6.52 (9/12) 4.05 - 8.99	6.52 (9/12) 4.05 - 8.99	0
Shoreline Sediment[3] (pCi/kg dry)	K-40[3] (4)	None Required	8688 (2/2) 4475 - 12900	SEDD 4 km downstream	8688 (2/2) 4475 - 12900	7302 (2/2) 1392 - 13213	0
	Cs-134 (4)	150	All < LLD			All < LLD	0
	Cs-137 (4)	180	15.7 (1/2) single value	SEDU 4 km upstream	25.1 (1/2) single value	25.1 (1/2) single value	0
Fish/Invertebrates (pCi/kg wet)	K-40[3] (12)	None Required	3001 (6/6) 2327 - 3804	FD 4 km downstream	3001 (6/6) 2327 - 3804	2895 (6/6) 2115 - 3803	0
	Mn-54 (12)	15	All < LLD			All < LLD	0
	Co-58 (12)	130	All < LLD			All < LLD	0
	Fe-59 (12)	260	All < LLD			All < LLD	0
	Co-60 (12)	130	All < LLD			All < LLD	0
	Zn-65 (12)	260	All < LLD			All < LLD	0
	Cs-134 (12)	130	All < LLD			All < LLD	0
	Cs-137 (12)	160	All < LLD			All < LLD	0

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period 1/1/93 to 12/31/93

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Broadleaf Vegetation (pCi/kg wet)	Be-7[3] (108)	None Required	287 (56/72) 49 - 1448	G1 1 km WNW	325 (27/36) 80 - 1448	287 (28/36) 64 - 1153	N/A
	K-40[3] (108)	None Required	4405 (72/72) 1585 - 22293	GQC 35 km NW	5216 (34/36) 1975 - 36941	5216 (34/36) 1975 - 36941	N/A
	I-131 (108)	60	All < LLD			All < LLD	0
	Cs-134 (108)	60	All < LLD			All < LLD	0
	Cs-137 (108)	80	All < LLD			All < LLD	0

NOTES:

(1) Lower Limit of Detection (LLD) as defined in RBS Technical Specifications (NUREG-1172).

(2) Mean and range based on detectable measurements only. The fraction of detectable measurements at specified locations is indicated in parentheses (f).

(3) Specific activities found for certain common and readily distinguished, naturally occurring nuclides are included to provide perspective. It should also be noted that other gamma emitting, naturally occurring nuclides (e.g., primordial series) are often detected but not reported because of the complexities and uncertainties of specific identification.

(4) Monthly gamma exposure estimates are "normalized" to a 30-day month and quarterly gamma exposure estimates are "normalized" to a 90-day quarter.

(5) The upstream surface water sampling location, though not required, is used as a "control" for drinking water comparisons.

(6) An upstream sediment sampling location, though not required, is used as a "control" for shoreline sediment comparisons. Cesium-137 was detected at both locations, presumably as a consequence of runoff from areas affected by fallout from the accident at Chernobyl, Russia, in 1986.

3.2 Comparison of Operational and Baseline REMP Results

Radioiodine and other gamma emitters in the airborne exposure pathway were not measured at levels above the required LLDs during 1993. Gross beta activities on air particulate filters averaged 0.021 pCi/m^3 at indicator and 0.022 pCi/m^3 at control locations in 1993, compared to 0.03 pCi/m^3 at both indicator and control locations during the preoperational phase of the REMP (Appendix B).

In the direct exposure pathway, the 1993 net average readings for monthly and quarterly TLDs from both indicator and control locations were slightly lower than the corresponding values for the baseline period. Thus far, no appreciable differences have been observed in TLD exposures between indicator and control locations or between the same locations from one year to the next.

In the waterborne exposure pathway, average activities analyzed for required gamma-emitting nuclides were measured below the RBS Technical Specification LLDs during 1993 as had been the case during the preoperational phase (Appendix B). Gross beta and tritium levels in water are compared below:

WATERBORNE AVERAGE GROSS BETA (pCi/l)

Location	Pre-Operational	1989	1990	1991	1992	1993
Surface Water, Upstream (4 km)	7.80	7.79	9.75	4.55	5.15	6.52
RBS Discharge Line	N/A	32.05	40.39	33.90	143.55	45.60
Surface Water, Downstream (4 km)	8.10	7.41	9.52	5.23	5.59	7.60
Drinking Water (Baton Rouge, IH-10 bridge)	6.80	8.23	9.47	5.05	5.01	5.65
Upgradient groundwater	6.00	3.61	6.03	<2.91	<3.02	2.31
Downgradient groundwater	4.00	3.44	4.73	3.17	3.04	2.78

WATERBORNE AVERAGE TRITIUM (pCi/l)

Location	Pre-Operational	1989	1990	1991	1992	1993
Surface Water, Upstream (4 km)	<3000	<554	<209	<371	<355	<362
RBS Discharge Line	N/A	3469	20452	7047	5744	4962
Surface Water, Downstream (4 km)	<3000	<554	<209	<374	<364	<362
Drinking Water (Baton Rouge, IH-10 bridge)	<3000	<557	<210	188	<360	<373
Upgradient groundwater	<3000	<881	<211	<366	<352	<372
Downgradient groundwater	<3000	<872	<207	<363	<348	<373

Gross beta activities in the discharge line samples returned to normal in 1993 after the elevated levels of 1992 due to outage decontamination activities. As observed in previous years, the annual average gross beta activity for the control location (SWU) averaged the same as that for the indicator location (SWD). The gross beta activity levels in the discharge line sample (DL) seemingly reflect the normal cycles of concentration at which the station cooling towers are operated.

Tritium activities in the discharge line decreased on average from 1992, reflecting the releases already noted in the 1993 Semiannual Radioactive Effluent Release Report (see also Table 6). These reduced tritium levels reflect a decrease from 1990 due to removal of failed fuel, but represent an increase compared to years prior to 1990, due to more efficient radioactive wastewater treatment and reuse (e.g., boiler makeup). In the RBS boiler-reactor, tritium is produced by ternary fission of the reactor fuel (^{235}U), although only a small fraction of that tritium would diffuse through the fuel's cladding. Tritium is also produced by neutron reactions with certain isotopes of boron, deuterium and lithium when present in the boiler (e.g. as control rod material - boron). The particulates (metals and salts) are removed in this treatment leaving the tritium behind as water (e.g., [^{3}H-O-^{1}H]). When this water is reused as boiler makeup, the tritium concentration in the water increases.

In the ingestion exposure pathway, no gamma emitting nuclides were measured above LLDs during 1993, and there appear to have been no increases in radionuclide concentrations attributable to RBS operation in food/forage media over baseline levels (Appendix B). Naturally-occurring K-40 was measured at an average of 4405 pCi/kg in indicator vegetation and at an average of 5216 pCi/kg in control vegetation in 1993, roughly the same levels encountered prior to RBS operation (Appendix B). Another natural nuclide, Be-7, averaged 287 and 287 pCi/kg in indicator and control vegetation samples, respectively, during 1993. Although presumably present, Be-7 was not quantified during the preoperational phase for comparison.

3.3 Comparison of REMP Results with Operating Controls

The only measurable increases in concentrations of radionuclides or levels of radiation, attributable to plant operation, in the vicinity of RBS during 1993 appear to have been the expected low levels in the liquid Discharge Line. The indicator vs. control comparisons for airborne gross beta activity (Section 3.1.1; Table 5 and Appendix A) corroborate the reports of limited or no releases of particulates or radioiodine in 1993. The 1993 TLD data (Section 3.1.2; Table 5 and Appendix A) showed no appreciable differences in direct radiation exposures between indicator and control locations. Excerpted liquid effluent data from the Semiannual Radioactive Effluent Release Report are listed in Table 6 along with the corresponding Discharge Line analytical data for those nuclides which were measured by the REMP during 1993. These nuclide activities were well below the NRC reporting levels, but are listed here for comparison to substantiate the adequacy of source control and effluent monitoring at River Bend Station.

TABLE 6

SUMMARY COMPARISON OF LIQUID EFFLUENT QUANTITIES/ACTIVITIES[a] AND REMP DISCHARGE LINE MONITORING RESULTS

Quantities Released	1st Quarter 1993	2nd Quarter 1993	3rd Quarter 1993	4th Quarter 1993	Total for 1993
Liters of Effluent	6.25E+06	1.62E+07	9.52E+06	6.60E+06	3.86E+07
Liters of Dilution	1.02E+09	1.16E+09	1.03E+09	1.22E+09	4.43E+09
Curies of H-3	5.68E+00	8.30E+00	5.81E+00	1.04E+01	3.02E+01
Curies of Cr-51	1.79E-02	1.23E-02	2.20E-02	1.96E-01	2.48E-01
Curies of Mn-54	1.96E-03	8.78E-03	1.01E-02	2.21E-02	4.29E-02
Curies of Co-58	5.47E-04	2.83E-03	2.69E-03	4.48E-03	1.05E-02
Curies of Fe-59	1.26E-04	2.38E-03	2.37E-03	8.65E-03	1.35E-02
Curies of Co-60	1.21E-02	4.40E-02	4.29E-02	5.26E-02	1.52E-01
Curies of Zn-65	4.77E-04	1.83E-03	3.08E-03	4.77E-03	1.02E-02
Curies of Nb-95	1.29E-05	4.43E-04	4.33E-04	1.80E03	2.69E-03

Predicted (Extrapolated) Specific Activities (pCi/l) versus 1993 REMP

Measured Nuclide	1st Quarter 1993	2nd Quarter 1993	3rd Quarter 1993	4th Quarter 1993	Mean for 1993	1993 REMP Mean (Range) (pCi/liter)
H-3	5535	7057	5589	8479	6665	5025 (1037 - 12443)[b] 4962 (3814 - 6386)[c]
Cr-51	17.4	10.5	21.2	160	52.3	58.9 (13.3 - 150)
Mn-54	1.91	7.47	9.72	18.0	9.28	7.84 (0.64 - 23.5)
Co-58	0.53	0.47	2.59	3.65	1.81	2.25 (0.95 - 3.60)
Fe-59	0.12	2.02	2.28	7.05	2.87	5.22 (2.33 - 7.56)
Co-60	11.8	37.4	41.3	42.9	33.4	33.6 (7.33 - 152)
Zn-65	0.46	1.56	2.96	3.89	2.22	1.94 (0.75 - 3.12)
Nb-95	0.01	0.38	0.42	1.47	0.57	2.63 (1.59 - 3.52)

NOTES:

(a) Effluent quantities and nuclide activities excerpted from the 1993 Annual Radioactive Effluent Release Reports already submitted.

(b) Results from monthly composites.

(c) Results from quarterly composites.

APPENDIX A

Listings of 1993 REMP Results

The following tables list individual analytical results and direct measurements of radiation (TLD exposures) recorded by the Radiological Environmental Monitoring Program (REMP) during 1993. Concentrations measured for certain common and readily-distinguished, naturally-occurring nuclides are included to provide perspective. It should be noted that other gamma-emitting, naturally-occurring nuclides (e.g., primordial series) were often detected but are not listed because of the complexities and uncertainties of specific identifications.

Air Particulate Filter Gross Beta Activity (E-2 pCi/m³)

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93	3.27	3.20	3.41	4.13	1.70	3.80	3.00	3.40	3.70
01/12/93	2.23	2.34	2.21	2.65	2.39	2.50	2.39	2.10	2.59
01/18/93	3.81	2.76	3.44	4.17	2.48	4.13	3.54	3.78	4.23
01/25/93	1.71	1.24	1.83	2.13	1.65	1.98	1.57	na	1.97
02/04/93	2.44	2.27	2.44	2.77	2.27	2.68	2.25	2.23	2.65
02/10/93	3.68	2.94	3.31	4.05	2.58	4.19	3.45	3.68	4.37
02/23/93	1.44	2.30	2.64	2.94	2.35	2.86	2.53	2.50	2.93
03/03/93	2.68	2.44	2.70	3.21	2.39	3.01	2.42	2.41	3.09
03/09/93	3.32	3.34	3.39	3.76	3.16	3.78	3.70	3.48	3.85
03/15/93	2.56	2.75	2.79	3.11	2.55	3.00	2.93	2.87	3.08
03/23/93	1.94	1.52	1.53	1.79	1.60	2.06	1.62	1.52	1.73
03/29/93	2.04	2.33	2.19	2.62	2.22	1.97	2.29	2.23	2.47
04/05/93	1.66	1.34	1.65	1.86	1.69	1.65	2.02	1.45	2.11
04/12/93	1.85	1.69	1.72	2.01	2.05	1.67	1.72	1.72	2.02
04/19/93	2.38	2.05	1.72	2.26	2.70	1.93	2.06	1.84	2.86
04/26/93	1.92	1.59	1.36	2.21	2.23	1.69	2.07	1.25	2.48
05/03/93	1.53	1.09	1.00	1.65	1.69	1.24	1.59	1.12	1.75
05/10/93	1.90	1.75	1.49	1.82	2.18	1.53	1.80	1.80	2.39
05/17/93	2.17	1.84	1.51	2.37	2.48	1.85	2.37	1.87	2.46
05/25/93	5.04	2.32	2.16	2.75	2.93	2.21	2.74	2.36	3.33
06/01/93	1.88	2.13	2.14	2.35	2.58	1.93	2.58	2.19	2.91
06/07/93	1.92	1.63	1.84	2.17	2.23	1.75	2.03	1.67	2.11
06/15/93	1.83	2.04	1.92	1.99	2.04	1.71	2.02	1.40	2.25
06/21/93	1.20	1.22	1.16	1.04	1.62	1.16	1.42	1.23	1.93
06/28/93	0.99	0.99	1.05	0.75	1.07	0.79	1.13	0.90	1.32
07/06/93	2.87	3.23	2.96	2.41	3.40	2.65	3.23	2.61	3.82
07/12/93	2.51	1.77	1.52	1.08	1.65	1.37	1.72	1.35	1.98
07/19/93	1.18	1.28	1.06	1.01	1.29	1.11	1.14	1.05	1.27
07/26/93	2.13	2.11	1.66	1.49	2.08	1.54	2.11	1.76	2.64
08/09/93	2.36	1.77	1.54	1.27	1.76	1.36	1.54	1.41	2.12
08/16/93	2.39	2.03	1.76	1.59	2.11	1.74	1.81	1.56	2.38
08/23/93	2.50	2.36	1.95	1.71	2.33	1.92	2.13	2.10	3.49
09/01/93	2.27	1.99	1.84	1.68	2.09	1.72	2.01	1.86	2.35
09/08/93	2.40	2.15	2.01	2.05	2.33	1.56	2.26	2.00	2.66
09/13/93	4.16	3.65	3.09	3.20	3.95	3.05	2.94	3.21	4.82
09/21/93	0.94	0.97	0.93	0.77	0.55	0.59	1.16	0.83	1.32
09/27/93	1.40	1.41	1.26	1.07	8.66	8.24	1.19	1.31	1.77
10/06/93	2.98	2.65	2.00	2.19	1.71	1.65	2.51	2.79	3.03
10/11/93	2.46	2.59	1.66	1.83	1.20	1.30	1.50	2.03	2.11
10/18/93	2.69	2.58	2.34	2.16	1.66	1.79	2.55	2.42	2.60
10/25/93	2.01	2.02	1.61	1.49	1.35	1.18	1.73	2.08	1.80
11/01/93	2.29	2.17	1.59	1.74	1.16	1.53	2.26	1.96	2.29
11/08/93	2.01	1.68	1.76	1.25	1.14	1.07	1.54	1.57	1.75
11/16/93	1.84	1.47	1.64	1.62	1.19	1.24	1.43	1.95	1.88
11/22/93	1.42	1.09	1.36	1.03	1.03	0.95	1.29	1.67	1.60
11/29/93	2.72	1.91	1.98	2.28	1.72	1.47	2.58	2.53	2.39
12/16/93	2.80	2.08	2.25	2.36	2.10	1.52	2.70	2.77	2.18
12/13/93	2.46	1.63	1.94	2.23	1.70	1.24	2.11	2.04	2.03
12/20/93	2.97	1.88	2.29	2.15	1.25	1.43	2.31	2.64	2.30
12/28/93	1.89	1.45	1.63	1.72	1.56	1.06	1.84	1.58	1.88

NOTE:
Activities shown are values actually measured

Air Particulate Filter Beryllium-7 Activity (E-2 pCi/m³) by Location

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93	5.32			8.07	7.93				5.84
01/12/93			5.20						
01/18/93	7.97		7.85			9.71	6.57	7.08	8.22
01/25/93									11.10
02/04/93	11.00	12.70	11.00	13.00	10.70	10.40	11.30	9.82	10.70
02/10/93	15.30	13.20	12.70	12.20	10.60	15.60			16.40
02/23/93		5.99	7.16	6.26	7.44	7.91	7.13	6.36	10.20
03/03/93	8.49	7.10	5.37	8.38		10.50	5.69	3.76	9.21
03/09/93	8.40			3.62	8.79	6.24	6.32	10.40	6.76
03/15/93	9.60	5.50	5.86	12.80	8.67	10.80	10.50	14.20	11.90
03/22/93		8.17	5.72	8.36	7.61	7.55		7.99	9.02
03/29/93				8.75		5.92		8.99	6.51
04/05/93		6.20	6.37	6.31	4.59	5.49	7.42		
04/12/93		5.75	8.87	11.10	10.30	9.32	5.23	6.87	8.08
04/19/93	15.00	10.00	7.54		15.10	10.70	13.00	12.30	14.00
04/26/93	19.80	15.40	16.50	23.40	22.10	14.20	20.00	12.80	23.50
05/03/93	9.63	6.14	11.30	11.20	10.50	7.59	10.60	11.90	18.10
05/10/93	7.19	8.27	6.78	10.20	8.09	8.92		7.93	12.00
05/17/93	9.58	10.10	9.14	12.80	12.40	7.34	14.00	10.00	15.80
05/25/93	3.10	12.60	9.22	17.80	14.30	16.00	13.20	12.80	26.10
06/01/93	11.80	11.60	10.70	12.10	17.50	10.50	13.50	11.20	13.60
06/07/93	11.00	5.94	11.00	10.60	11.40		10.70	11.60	12.90
06/15/93	7.95	9.36	6.69	8.59	6.31	8.69	8.34	10.00	10.30
06/21/93		7.47	9.40	7.25	11.60	7.15	7.57		12.40
06/28/93					12.90	4.93		7.76	10.70
07/06/93	9.91	12.20	12.00	10.40	6.94	5.51	13.50	9.05	13.50
07/12/93		12.20	10.40	5.80	7.43	12.00	12.70	7.16	9.04
07/19/93	13.20	5.71	10.90	8.51	10.10	6.48	10.40	7.49	8.58
07/26/93	8.75	11.20	11.80	6.74	12.20	7.30	12.00	8.53	14.10
08/09/93	8.46	11.10	10.10	7.12	10.50	7.04	8.81	7.81	11.70
08/16/93	13.80	12.40	10.80	8.29	12.40	11.10	7.78	11.60	11.20
08/23/93	6.45	10.20	7.78		10.70	5.56	8.84	7.42	16.70
09/01/93	10.40	12.20		10.30	10.60	10.10	10.60	7.18	9.70
09/08/93	9.45	10.70	8.51	9.02	9.02		15.20		16.10
09/13/93		14.50	12.90	10.30	8.32		10.90	10.80	16.30
09/21/93	5.51			5.56			6.63		
09/27/93	11.70	10.50		11.90			12.10		14.50
10/05/93	14.70	12.40	11.30	12.40	5.87	4.76	10.80	13.70	15.90
10/11/93		6.52	9.81		8.71				
10/18/93	14.70	9.79		7.05			6.56	10.30	9.20
10/25/93	11.70		6.11	7.46			6.44	7.77	7.37
11/01/93	8.12	9.28	8.21						
11/08/93	10.30						10.80		
11/16/93								11.90	
11/22/93									
12/06/93									
11/29/93		10.60							
12/13/93									
12/20/93									
12/28/93									

NOTE:
Activities shown are values actually measured

Air Particulate Filter Cesium-134 Activity (E-2 pCi/m³) by Location

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93	<1.19	<1.80	<1.58	<1.93	<1.49	<1.40	<1.41	<1.16	<1.62
01/12/93	<1.17	<1.24	<1.39	<1.23	<1.33	<1.02	<1.36	<1.08	<1.35
01/18/93	<1.30	<1.40	<1.45	<1.64	<1.13	<1.27	<1.58	<1.32	<1.48
01/25/93	<1.13	<1.02	<1.47	<1.40	<1.25	<1.20	<1.26	na	<1.19
02/04/93	<0.85	<0.87	<0.95	<0.94	<0.90	<0.74	<0.87	<0.71	<0.72
02/10/93	<1.59	<1.62	<1.36	<1.75	<1.32	<1.48	<1.27	<1.59	<1.61
02/23/93	<0.56	<0.81	<0.63	<0.78	<0.63	<0.59	<0.67	<0.60	<0.65
03/03/93	<0.97	<1.01	<1.07	<1.16	<1.18	<1.11	<1.19	<0.86	<1.14
03/09/93	<1.31	<1.34	<1.45	<1.48	<1.47	<1.51	<1.22	<1.12	<1.47
03/15/93	<1.32	<1.60	<1.58	<1.47	<1.59	<1.43	<1.53	<0.94	<1.56
03/22/93	<1.10	<1.04	<1.09	<1.22	<1.18	<1.17	<1.07	<0.89	<1.31
03/29/93	<1.22	<1.56	<1.40	<1.77	<1.22	<1.27	<1.39	<1.10	<1.50
04/05/93	<1.32	<1.28	<1.23	<1.49	<1.36	<1.22	<1.32	<1.27	<1.47
04/12/93	<1.43	<1.40	<1.35	<1.50	<1.15	<1.28	<1.38	<1.17	<1.50
04/19/93	<1.41	<1.19	<1.18	<2.05	<1.47	<1.11	<1.32	<1.18	<1.49
04/26/93	<1.39	<1.07	<1.42	<1.26	<1.48	<1.32	<1.27	<1.14	<1.25
05/03/93	<1.34	<1.25	<1.23	<1.41	<1.53	<1.32	<1.38	<1.35	<1.66
05/10/93	<1.50	<1.13	<1.31	<1.35	<1.51	<1.06	<2.04	<1.07	<1.37
05/17/93	<1.48	<1.30	<1.25	<1.43	<1.25	<1.27	<1.57	<1.28	<1.59
05/25/93	<0.43	<1.22	<1.10	<1.14	<1.13	<1.05	<1.40	<0.95	<1.41
06/01/93	<1.32	<1.18	<1.20	<1.38	<1.23	<1.24	<1.31	<1.09	<1.80
06/07/93	<1.68	<1.54	<1.50	<1.59	<1.37	<1.71	<1.78	<1.48	<1.77
06/15/93	<1.34	<1.08	<1.12	<1.15	<1.75	<1.11	<1.12	<0.89	<1.25
06/21/93	<1.73	<1.59	<1.58	<1.57	<1.22	<1.68	<1.53	<1.48	<1.80
06/28/93	<1.92	<1.14	<1.32	<1.31	<1.82	<1.19	<1.50	<1.28	<1.47
07/06/93	<2.04	<1.27	<1.27	<1.29	<1.34	<1.08	<1.23	<1.08	<1.37
07/12/93	<19.5	<1.57	<1.60	<1.62	<1.25	<1.40	<1.65	<1.23	<1.68
07/19/93	<1.90	<1.38	<1.32	<1.34	<1.63	<1.04	<1.42	<1.21	<1.41
07/26/93	<1.63	<1.24	<1.51	<1.36	<1.42	<1.02	<1.45	<1.28	<1.38
08/09/93	<0.66	<0.63	<0.66	<0.63	<1.38	<0.61	<0.72	<0.65	<0.67
08/16/93	<1.23	<1.21	<1.15	<1.15	<0.63	<1.23	<1.38	<1.10	<1.23
08/23/93	<1.34	<1.40	<1.34	<1.26	<1.28	<1.19	<1.20	<1.30	<1.83
09/01/93	<1.00	<0.92	<1.02	<1.06	<0.87	<1.00	<0.87	<0.93	<1.02
09/08/93	<1.49	<1.20	<1.42	<1.21	<1.38	<1.19	<1.48	<1.41	<1.47
09/13/93	<2.04	<1.69	<2.02	<2.03	<1.68	<1.91	<1.92	<1.40	<1.85
09/21/93	<1.03	<1.06	<1.16	<1.19	<1.12	<1.00	<0.99	<0.99	<1.23
09/27/93	<1.74	<1.54	<1.67	<1.55	<1.63	<1.53	<1.43	<1.71	<1.62
10/05/93	<1.19	<1.14	<1.20	<1.15	<1.22	<1.26	<0.97	<1.18	<1.23
10/11/93	<1.61	<1.35	<1.49	<1.91	<1.48	<1.68	<1.97	<1.76	<2.76
10/18/93	<1.53	<1.33	<1.52	<1.31	<1.26	<1.40	<1.26	<1.42	<1.45
10/25/93	<1.26	<1.14	<1.30	<1.14	<1.32	<1.24	<1.25	<1.40	<1.31
11/01/93	<1.09	<1.24	<1.16	<2.06	<1.85	<2.21	<1.82	<2.03	<2.55
11/08/93	<1.34	<3.25	<3.32	<3.46	<2.59	<1.60	<1.41	<2.08	<2.88
11/16/93	<3.22	<3.01	<2.33	<2.45	<2.54	<2.20	<2.63	<1.63	<1.82
11/22/93	<2.08	<1.86	<2.00	<4.02	<3.01	<4.82	<3.46	<2.28	<3.26
12/06/93	<2.77	<2.71	<3.16	<2.15	<3.47	<2.35	<1.96	<3.76	<3.12
11/29/93	<2.88	<1.10	<2.77	<2.59	<2.48	<2.26	<2.56	<2.24	<2.40
12/13/93	<2.40	<2.98	<2.62	<2.97	<2.28	<2.93	<2.39	<2.53	<2.93
12/20/93	<2.61	<1.98	<1.95	<1.88	<2.91	<3.10	<2.48	<2.35	<3.56
12/28/93	<2.36	<2.30	<2.11	<2.51	<1.92	<2.41	<1.65	<2.19	<2.85

NOTE:

Activities indicated are minimum detectable activities (MDAs) under the particular conditions of analyses (i.e., Cs-134 may or may not have been present, but if so, there cannot have been more than the amounts shown), or they are values actually measured.

Air Particulate Filter Cesium-137 Activity (E-2 pCi/m^3) by Location

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	A31	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93	<1.39	<1.85	<1.63	<1.91	<1.49	<1.40	<1.43	<1.27	<1.36
01/12/93	<1.15	<1.50	<1.40	<1.35	<1.25	<1.31	<1.28	<1.10	<1.60
01/18/93	<1.55	<1.49	<1.45	<1.76	<1.23	<1.52	<1.47	<1.10	<1.78
01/25/93	<1.14	<1.21	<1.42	<1.24	<1.15	<0.99	<1.38	na	<1.21
02/04/93	<0.72	<0.86	<0.88	<1.07	<0.75	<0.83	<0.96	<0.74	<0.79
02/10/93	<1.54	<1.54	<1.52	<1.70	<1.56	<1.38	<1.42	<1.73	<1.52
02/23/93	<0.59	<0.77	<0.67	<0.75	<0.65	<0.63	<0.63	<0.56	<0.74
C3/03/93	<0.93	<1.11	<1.21	<1.17	<1.03	<1.11	<1.22	<0.88	<1.10
03/09/93	<1.14	<1.44	<1.53	<1.65	<1.61	<1.16	<1.94	<1.22	<1.50
03/15/93	<1.30	<1.47	<1.53	<1.69	<1.39	<1.38	<1.78	<1.20	<1.57
03/22/93	<0.96	<1.06	<1.28	<1.42	<1.11	<1.21	<1.19	<0.97	<1.30
03/29/93	<1.35	<1.55	<1.63	<1.73	<1.41	<1.08	<1.60	<1.08	<1.39
04/05/93	<1.53	<1.37	<1.21	<1.48	<1.42	<1.32	<1.73	<1.51	<1.32
04/12/93	<1.35	<1.34	<1.23	<1.55	<1.51	<1.45	<1.40	<1.38	<1.58
04/19/93	<1.71	<1.45	<1.36	<1.16	<1.53	<1.37	<1.40	<1.17	<1.40
04/26/93	<1.45	<1.23	<1.05	<1.39	<1.49	<1.15	<1.47	<1.07	<1.45
05/03/93	<1.33	<1.19	<1.23	<1.35	<1.57	<1.34	<1.88	<1.44	<1.66
05/10/93	<1.40	<1.15	<1.60	<1.29	<1.48	<1.08	<2.05	<1.23	<1.36
05/17/93	<1.52	<1.35	<1.31	<1.43	<1.45	<1.40	<1.41	<1.27	<1.48
05/25/93	<0.45	<1.14	<0.99	<1.19	<1.21	<1.16	<1.36	<1.28	<1.21
06/01/93	<1.34	<1.41	<1.17	<1.27	<1.30	<1.24	<1.26	<1.15	<1.67
06/07/93	<1.79	<1.58	<1.54	<1.37	<1.19	<1.65	<1.64	<1.49	<1.93
06/15/93	<1.41	<1.14	<1.19	<1.49	<1.65	<0.99	<1.23	<0.91	<1.27
06/21/93	<1.90	<1.69	<1.90	<1.60	<1.33	<1.70	<1.74	<1.50	<1.60
06/28/93	<1.95	<1.38	<1.31	<1.22	<1.78	<1.21	<1.43	<1.26	<1.49
07/06/93	<2.24	<1.36	<1.21	<1.21	<1.46	<1.18	<1.32	<1.05	<1.51
07/12/93	<20.1	<1.38	<1.31	<1.80	<1.17	<1.56	<1.79	<1.21	<1.57
07/19/93	<2.20	<1.55	<1.54	<1.54	<1.36	<1.35	<1.57	<1.19	<1.68
07/26/93	<1.55	<1.15	<1.49	<1.37	<1.38	<1.37	<1.14	<1.30	<1.51
08/09/93	<0.73	<0.70	<0.78	<0.67	<1.53	<0.72	<0.66	<0.70	<0.73
08/16/93	<1.38	<1.24	<1.34	<1.27	<0.76	<1.19	<1.28	<1.31	<1.42
08/23/93	<1.25	<1.16	<1.47	<1.37	<1.28	<1.42	<1.47	<1.32	<2.00
09/01/93	<1.17	<1.00	<1.07	<1.21	<0.91	<0.94	<0.91	<0.90	<1.09
09/08/93	<1.69	<1.25	<1.58	<1.23	<1.46	<1.02	<1.40	<1.48	<1.40
09/13/93	<2.22	<1.48	<2.25	<2.25	<1.76	<1.74	<1.98	<1.83	<1.87
09/21/93	<1.13	<1.16	<1.15	<1.22	<1.12	<1.08	<1.10	<1.08	<1.17
09/27/93	<1.60	<1.40	<1.85	<1.72	<1.60	<1.66	<1.51	<1.92	<1.47
10/05/93	<1.20	<1.41	<1.18	<1.41	<0.95	<1.26	<1.11	<1.34	<1.56
10/11/93	<1.98	<1.36	<1.91	<2.02	<1.32	<1.62	<2.18	<1.95	<2.36
10/18/93	<1.72	<1.12	<1.46	<1.36	<1.37	<1.30	<1.23	<1.47	<1.54
10/25/93	<1.09	<1.33	<1.51	<1.36	<1.24	<1.33	<1.10	<1.45	<1.39
11/01/93	<1.15	<1.04	<1.17	<2.45	<1.98	<2.45	<2.11	<2.80	<3.04
11/08/93	<1.50	<3.77	<2.78	<5.27	<3.02	<1.78	<1.39	<1.52	<3.19
11/16/93	<3.97	<3.54	<2.73	<4.01	<2.50	<3.56	<2.27	<1.72	<2.02
11/22/93	<2.09	<2.25	<2.36	<4.60	<5.82	<3.80	<3.58	<3.23	<3.21
12/06/93	<2.29	<2.07	<2.99	<3.38	<3.71	<3.23	<1.93	<3.52	<3.19
11/29/93	<3.58	<1.26	<2.74	<1.97	<3.08	<2.60	<2.28	<2.60	<2.97
12/13/93	<2.51	<2.81	<2.21	<1.88	<2.80	<2.88	<3.03	<3.26	<3.07
12/20/93	<2.13	<2.02	<1.84	<1.80	<3.70	<2.25	<2.63	<2.75	<3.54
12/28/93	<3.19	<2.71	<2.49	<2.50	<2.15	<2.70	<2.79	<3.12	<2.41

NOTE:
Activities indicated are minimum detectible activities (MDAs) under the particular conditions of analyses (i.e., Cs-137 may or may not have been present, but if so, there cannot have been more than the amounts shown), or they are values actually measured.

Charcoal Cartridge Potassium-40 Activity (E-2 pCi/m') by Location

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93		85.50	57.60	84.40	70.70	67.10	45.60	39.10	69.70
01/12/93	58.10	61.90	45.70	46.80	33.40	41.20	50.90	43.60	51.80
01/18/93	69.80	75.00	66.80	56.10	65.00	62.80	61.60	43.40	71.60
01/25/93	46.60	36.70	56.40	52.20	59.90	55.60	51.60	40.70	62.20
02/04/93	26.30	34.90	43.50	46.60	46.70	43.30	35.80	24.30	41.10
02/10/93	63.80	54.70	53.90	97.40	71.20	55.80	75.50	96.71	94.70
02/23/93	20.40	18.50	26.80	18.70	30.10	19.70	23.50	26.80	
03/03/93	39.80	48.00	64.40	46.40	58.00	39.70	51.20	36.70	54.00
03/09/93	42.10	51.20	78.80	61.50	73.20	63.40	60.70	55.10	67.00
03/15/93	58.40	89.70	58.90	68.30	75.20	67.80	62.10	61.50	59.40
03/22/93	43.40	50.00	38.20	31.80	51.80	51.10	63.20	35.50	53.80
03/29/93	46.20	56.90	72.30	93.60	55.60	35.90	67.00	40.80	64.60
04/05/93	61.70	47.70	44.00	38.60	60.70	55.00	62.50	42.40	56.10
04/12/93	70.90	53.20	64.60	49.80	63.60	32.60	56.80	49.20	56.90
04/19/93	66.30	49.70	67.50	43.70	76.90	55.30	48.30	59.30	62.60
04/26/93	47.90	39.80	56.90	62.40	63.80	62.30	63.10	51.80	61.50
05/03/93	45.40	48.30	59.80	67.40	52.70	21.70	91.20	72.10	76.80
05/10/90	54.10	75.40	38.00	66.10	69.40	65.70	72.70	43.10	43.10
05/17/93	58.70	61.20	67.00	60.80	45.90	61.30	58.90	54.60	55.80
05/25/93	49.40	62.70	36.40	56.40	76.30	46.40	39.90	52.10	50.30
06/01/93	63.00	36.00	40.90	53.70	71.60	57.90	57.70	55.30	58.50
06/07/93	46.30	58.60	60.30	99.40	69.50	77.50	52.60	51.70	67.20
06/15/93	49.60	38.00	41.50	50.60	41.70	73.00	51.[illegible]	37.20	45.90
06/21/93	60.60	56.30	47.10	48.20	80.00	74.50	61.[illegible]	41.20	86.50
06/28/93	36.30	50.70	45.60	48.50	58.30	38.00	34.10	46.00	49.00
07/06/93	70.30	34.00	50.10	39.50	40.30	44.90	39.10	36.80	49.40
07/12/93		61.60	49.70	60.50	42.50	39.90	35.60	57.10	51.60
07/19/93	63.20	35.50	47.20	32.50	42.70	34.60	40.70	51.70	81.00
07/26/93	48.20	30.10	45.80	54.40	54.40	36.30	52.20	53.60	51.90
08/09/93	24.30	24.00	17.90	14.30	21.70	25.70	34.50	21.50	21.20
08/16/93	42.20	63.60	54.60	66.60	47.50	40.20	37.70	47.90	46.30
08/23/93	51.90	37.00	51.50	47.90	64.50	48.90	40.90	41.60	71.10
09/01/93	42.70	40.60	36.90	27.60	35.50	39.60	43.30	34.10	37.80
09/08/93	34.00	49.90	62.20	43.20	38.20	56.60	58.30	35.70	45.50
09/13/93	76.60	39.70	80.00	68.20	65.30	82.80	71.60	81.40	85.30
09/21/93	45.30	68.90	47.30	45.90	48.40	31.70	45.70	40.50	63.40
09/27/93	44.70	32.60	74.50	94.70	52.90	64.20	42.10		71.90
10/05/93	37.40	35.60	51.90	43.00	35.80	40.30	23.00	35.40	53.00
10/11/93	45.20	42.70	42.60	58.30	55.20		75.10	51.20	16.00
10/18/93	19.20	40.20	43.80	28.30	40.50	39.50	43.20	50.80	49.10
10/25/93	45.70	56.70	49.90	68.30	50.30	55.80	62.70	55.40	67.10
11/01/93	42.00	38.80	41.20	45.50	37.30	65.60	42.90	31.90	50.50
11/08/93	45.30	34.60	42.70	62.40	42.70	59.60	40.90	48.60	53.50
11/16/93	31.30	63.10	22.60	39.40	40.10	36.80	60.50	39.90	45.50
11/22/93	51.70	45.60	46.80	68.80	62.50	48.40	49.40	25.60	63.70
11/29/93	44.50	41.90	48.20	52.90	57.00	42.80	49.40	36.10	37.20
12/06/93	49.30	35.10	45.70	61.20	42.10	62.10	25.20	36.00	69.00
12/13/93	39.90	35.70	68.50	66.50	43.80	69.80	49.00	39.50	44.20
12/20/93	36.10	21.50	58.60	54.00	45.30	56.70	38.20	44.60	62.60
12/28/93	35.00	89.70	46.80	50.10	42.80	41.80	30.40	39.90	40.90

NOTE:
Activities shown are values actually measured.

Charcoal Cartridge Iodine-131 Activity (E-2 pCi/m³)

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/05/93	<1.78	<2.36	<2.33	<1.88	<1.98	<2.05	<2.01	<1.70	<2.14
01/12/93	<1.47	<1.55	<1.68	<1.80	<1.44	<1.55	<1.83	<1.41	<1.72
01/18/93	<1.58	<1.89	<1.73	<2.26	<2.04	<1.93	<1.99	<1.87	<2.09
01/25/93	<1.49	<1.41	<1.63	<1.69	<1.59	<1.66	<1.67	<1.40	<1.74
02/04/93	<0.97	<1.17	<1.02	<1.39	<1.03	<1.12	<1.31	<0.91	<1.26
02/10/93	<2.01	<1.86	<1.89	<2.28	<1.94	<1.77	<2.30	<2.04	<2.30
02/23/93	<0.75	<0.88	<0.80	<1.07	<0.80	<0.81	<0.82	<0.64	<1.03
03/03/93	<1.31	<1.46	<1.34	<1.42	<1.20	<1.31	<1.47	<1.19	<2.20
03/09/93	<1.43	<1.87	<1.70	<1.80	<1.58	<2.01	<1.83	<1.74	<2.17
03/15/93	<1.32	<1.89	<1.92	<1.86	<1.52	<1.69	<2.14	<1.67	<2.01
03/23/93	<1.40	<1.70	<1.67	<1.58	<1.47	<1.55	<1.55	<1.13	<1.51
03/29/93	<1.69	<2.12	<1.82	<2.13	<1.83	<1.80	<2.21	<1.56	<2.15
04/05/93	<1.72	<1.90	<1.58	<1.87	<1.84	<1.78	<1.83	<1.77	<1.93
04/12/93	<1.72	<1.86	<1.68	<1.94	<1.64	<1.54	<2.04	<1.93	<2.10
04/19/93	<1.73	<1.59	<1.92	<1.80	<1.64	<1.59	<1.92	<1.44	<1.93
04/26/93	<1.80	<2.50	<2.06	<2.27	<1.97	<1.74	<1.75	<1.56	<1.83
05/03/93	<2.13	<1.78	<1.54	<2.07	<2.02	<1.75	<2.06	<2.15	<2.79
05/10/90	<1.81	<1.70	<1.55	<2.26	<1.73	<1.64	<1.92	<1.67	<2.03
05/17/93	<1.50	<1.84	<1.69	<1.62	<1.69	<1.56	<1.72	<1.87	<1.97
05/25/93	<1.21	<1.29	<1.26	<1.79	<1.83	<1.40	<1.62	<1.52	<1.94
06/01/93	<1.87	<1.59	<1.51	<1.66	<2.22	<1.80	<1.82	<1.76	<2.15
06/07/93	<2.29	<2.01	<1.75	<1.72	<2.01	<2.26	<2.01	<1.90	<2.68
06/15/93	<1.53	<1.26	<1.40	<1.79	<1.56	<1.30	<1.48	<1.44	<1.84
06/21/93	<2.13	<1.78	<1.86	<1.77	<2.16	<2.16	<1.78	<1.93	<2.38
06/28/93	<1.65	<1.80	<1.60	<2.04	<1.97	<1.91	<2.13	<1.39	<2.06
07/06/93	<2.68	<1.60	<1.60	<1.61	<1.64	<1.55	<1.57	<1.57	<1.82
07/12/93	<19.1	<2.28	<2.69	<1.53	<2.35	<2.19	<2.48	<2.04	<3.06
07/19/93	<1.78	<1.56	<1.95	<2.06	<2.01	<1.68	<1.97	<1.85	<2.17
07/26/93	<1.61	<1.58	<1.64	<1.66	<1.62	<1.51	<1.89	<1.89	<2.33
08/09/93	<0.81	<0.81	<0.84	<1.62	<0.92	<0.77	<0.89	<0.75	<0.99
08/16/93	<1.50	<1.68	<1.49	<0.76	<1.84	<1.63	<2.06	<1.88	<2.17
08/23/93	<1.54	<1.62	<1.55	<1.80	<1.62	<1.78	<1.88	<2.05	<3.03
09/01/93	<1.30	<1.23	<1.60	<2.30	<1.21	<1.39	<1.58	<1.28	<1.36
09/08/93	<1.73	<1.58	<1.89	<1.43	<1.73	<1.89	<2.26	<2.17	<2.61
09/13/93	<2.19	<2.22	<2.43	<1.77	<3.00	<2.93	<2.65	<2.91	<3.13
09/21/93	<1.34	<1.29	<1.48	<2.67	<1.69	<1.64	<1.51	<1.27	<1.76
09/27/93	<2.11	<2.24	<2.24	<1.65	<2.35	<2.46	<2.27	<4.61	<3.09
10/05/93	<1.88	<1.66	<1.56	<2.58	<1.78	<1.85	<1.83	<1.67	<1.74
10/11/93	<2.23	<2.28	<1.96	<1.86	<2.18	<2.57	<3.00	<2.98	<3.80
10/18/93	<1.99	<1.54	<1.85	<2.24	<2.31	<1.71	<2.56	<2.55	<3.15
10/25/93	<1.87	<2.60	<2.10	<1.85	<2.00	<2.34	<1.57	<2.52	<2.42
11/01/93	<1.88	<1.73	<2.09	<2.30	<1.94	<2.08	<2.08	<2.22	<2.09
11/08/93	<1.93	<1.49	<1.83	<1.79	<2.10	<1.70	<1.78	<1.82	<2.15
11/16/93	<1.46	<1.40	<1.57	<2.14	<1.59	<1.32	<1.36	<1.47	<1.73
11/22/93	<1.85	<1.58	<1.83	<1.50	<1.68	<1.82	<2.12	<2.19	<2.00
11/29/93	<1.67	<1.50	<1.54	<2.08	<1.61	<1.67	<1.92	<1.88	<1.82
12/06/93	<1.86	<1.40	<1.68	<1.74	<1.59	<1.56	<1.76	<1.89	<2.14
12/13/93	<1.66	<1.62	<1.36	<1.65	<1.73	<1.71	<1.67	<1.84	<1.90
12/20/93	<1.82	<1.55	<2.11	<1.68	<1.47	<1.64	<1.53	<1.95	<2.01
12/28/93	<1.34	<1.48	<1.47	<2.29	<1.37	<1.55	<1.46	<1.44	<1.67

NOTE:
Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, I-131 may or may not be present, but if so, there cannot have been more present than the amounts noted).

Normalized Gamma-Ray Exposure Summary (mR)
Quarterly Thermoluminescence Dosimeter Results

INDICATOR STATION	1ST QTR	2ND QTR	3RD QTR	4TH QTR
TA1	12.70	11.48	11.52	13.75
TA2	13.72	13.35	14.07	na
TB1	12.72	12.45	12.99	15.27
TB2	13.19	13.54	13.48	15.56
TC1	12.20	12.13	12.80	14.16
TC2	10.99	10.07	10.94	12.46
TCS	11.72	10.44	11.33	12.56
TD1	12.90	12.13	13.58	14.46
TD2	12.56	10.63	12.21	13.16
TE1	11.69	11.25	12.60	13.26
TE2	10.36	9.23	9.96	11.26
TF1	11.99	10.98	12.89	13.56
TF2	12.98	12.23	13.77	15.26
TG1	13.31	12.62	13.19	15.56
TG2	11.93	11.29	12.80	13.66
TH1	10.58	9.49	10.15	11.36
TH2	11.30	11.01	11.33	12.46
TJ1	11.69	10.86	11.62	12.66
TJ2	10.78	9.83	9.51	11.96
TK1	12.50	11.45	11.72	13.86
TK2	14.08	12.20	12.11	14.56
TKS	10.68	10.80	10.60	12.86
TL1	11.59	11.48	12.68	13.86
TL2	10.48	9.20	10.15	11.86
TLS	13.78	11.84	13.19	14.66
TM1	10.58	9.54	10.25	11.73
TM2	14.28	12.72	13.77	15.36
TN1	13.03	11.57	12.80	13.96
TN2	10.08	9.49	10.06	11.66
TP1	12.52	12.35	12.40	13.85
TP2	11.83	11.94	12.01	13.46
TQ1	12.01	10.90	11.92	13.65
TQ2	11.72	11.29	12.01	13.36
TQS1	13.21	12.15	12.40	13.86
TQS2	11.39	10.80	10.74	12.46
TR1	8.94	8.38	8.39	10.21
TR2	12.87	11.76	12.50	13.86
TRS	12.77	12.23	12.21	13.56
CONTROL STATION				
TAC	12.08	10.96	12.11	13.76
TEC	11.93	11.10	12.21	14.06
TGS	12.08	11.35	11.72	13.36
THS	13.89	12.03	12.60	14.66
TLC	10.28	9.59	10.35	11.86
TQS3	11.70	11.38	12.31	13.66

Normalized Gamma-Ray Exposure Summary (mR)
Monthly Thermoluminescence Dosimeter Results

INDICATOR STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TA1	4.54	3.96	4.03	4.16	4.17	3.82	4.01	4.56	4.18	4.56	4.78	5.00
TA2	4.56	4.73	4.60	4.39	4.89	4.25	4.53	4.83	4.46	na	na	5.53
TB1	4.74	5.07	4.66	4.76	4.89	4.35	4.43	4.65	4.78	4.89	5.05	5.67
TB2	4.86	4.62	4.29	4.58	4.60	4.17	4.43	4.83	4.56	5.00	5.38	5.74
TC1	4.33	5.40	4.12	4.26	4.07	4.02	4.53	4.41	4.46	4.78	5.14	5.44
TC2	3.96	4.18	3.47	3.73	3.76	3.48	3.99	3.67	3.71	4.00	4.18	4.99
TCS	4.06	4.18	3.88	3.83	3.76	3.48	3.99	4.00	3.81	4.33	4.61	4.78
TD1	4.75	4.96	4.48	4.36	4.58	4.11	4.63	4.75	4.67	4.68	5.14	5.22
TD2	4.26	4.51	4.09	4.01	3.96	3.65	3.88	4.25	3.92	3.78	4.35	4.78
TE1	4.33	4.40	3.94	3.96	4.38	4.02	4.22	4.49	4.24	4.47	4.96	5.44
TE2	3.46	3.96	3.36	3.36	3.55	3.14	3.70	3.63	3.60	3.44	4.01	4.46
TF1	4.23	4.29	3.94	3.76	3.85	3.84	4.43	4.32	4.35	4.47	4.96	5.33
TF2	4.66	4.51	4.40	4.11	4.38	4.25	4.63	4.92	4.67	4.78	4.78	5.64
TG1	5.05	4.84	4.48	4.36	4.69	4.29	4.63	4.75	4.56	4.68	5.31	5.78
TG2	4.26	4.51	4.29	4.02	4.48	3.65	4.41	4.50	4.14	4.56	4.87	5.21
TH1	3.71	3.84	3.48	3.46	3.65	3.20	3.50	3.81	3.60	3.74	4.25	4.33
TH2	3.96	3.96	3.78	3.73	3.86	3.39	3.66	3.75	3.92	3.89	4.35	4.99
TJ1	4.02	4.18	3.94	3.96	3.96	3.56	3.70	4.15	4.14	4.06	4.61	4.89
TJ2	3.92	3.73	3.75	3.56	3.55	3.29	3.34	3.91	3.55	3.64	4.61	4.67
TK1	4.33	4.18	4.03	4.06	3.96	3.75	3.29	4.12	4.25	4.37	4.78	5.56
TK2	4.66	4.73	6.12	4.20	4.38	3.99	4.14	4.52	4.43	4.66	5.13	4.99
TKS	3.92	4.18	3.75	3.66	3.86	3.38	3.77	3.81	3.81	3.85	4.34	4.44
TL1	4.44	4.18	4.12	3.86	4.07	3.82	4.74	4.52	4.61	4.47	4.78	5.44
TL2	3.76	3.73	3.75	3.58	3.76	3.22	3.64	3.77	3.64	3.97	4.01	4.26
TLS	4.46	4.84	4.21	4.11	4.38	4.25	4.44	4.84	4.69	5.12	5.21	5.61
TM1	3.71	3.73	3.48	3.56	3.76	3.38	3.70	3.99	3.67	3.71	4.25	4.22
TM2	4.96	5.18	4.85	4.54	4.89	4.34	4.74	4.84	4.69	5.01	5.38	5.92
TN1	4.52	4.73	4.03	4.26	4.17	4.09	4.12	4.63	4.27	4.56	5.40	5.33
TN2	3.66	3.73	3.39	3.36	3.24	3.22	3.34	3.56	3.46	3.74	4.35	4.26
TP1	4.41	4.62	4.03	4.26	4.38	4.00	4.32	4.31	4.35	4.56	4.78	5.44
TP2	4.46	4.40	4.19	3.88	4.35	4.09	4.43	4.06	3.92	4.46	4.53	5.22
TQ1	4.31	4.18	3.94	3.86	4.07	3.64	3.91	4.09	3.84	4.24	4.69	5.22
TQ2	4.36	4.29	4.09	3.79	4.35	3.56	4.12	4.32	4.03	4.14	4.61	5.22
TQS1	4.56	4.62	4.56	4.11	4.54	4.17	4.43	4.57	4.37	4.56	5.13	5.44
TQS2	4.56	3.84	3.90	3.73	3.66	3.56	3.70	3.95	3.85	3.92	4.44	4.89
TR1	3.56	3.18	2.85	2.96	2.93	2.50	3.19	3.20	2.98	3.44	3.90	4.00
TR2	4.56	4.62	4.40	4.24	4.66	4.17	4.22	4.41	4.24	4.44	4.78	5.42
TRS	4.56	4.62	4.50	4.15	4.66	3.74	4.84	4.23	4.46	4.56	4.87	5.10
CONTROL STATION												
TAC	4.56	4.40	4.03	4.06	4.54	3.74	4.12	4.15	4.46	4.67	4.78	5.10
TEC	4.36	4.29	3.98	4.01	na	3.82	3.81	4.42	4.35	4.22	4.95	5.10
TGS	4.56	4.51	4.12	3.79	4.48	3.91	3.94	4.97	4.43	4.55	4.70	4.99
THS	5.06	4.96	4.57	4.33	5.10	4.42	4.24	4.63	4.43	4.66	5.13	5.61
TLC	3.86	4.18	3.75	3.47	3.65	3.14	3.54	3.56	3.55	3.74	4.10	4.47
TQS3	4.38	4.31	4.30	3.87	4.32	3.74	4.22	4.74	4.39	4.33	4.70	5.10

Gross Beta Activities (pCi/liter) in Water Samples

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DL	WD	SWU	WU	BLANK[1]
JAN	6.58	4.69	41.14		6.30		<2.31
FEB	5.93	4.87	45.58	2.48	6.19	2.75	<1.70
MAR	4.27	2.80	30.10		<2.54		<1.80
APR	23.90	<2.30	20.95		<2.30		<1.84
MAY	4.86	4.40	12.00	3.07	<2.61	<2.61	<2.09
JUN	7.81	6.72	13.48		7.44		<1.35
JUL	10.20	10.10	32.40		8.16		<1.86
AUG	6.73	6.18	20.80		5.99		<1.98
SEP	7.33	7.59	147.00	<2.43	8.99	1.87	<1.95
OCT	2.46	4.15	42.40		4.05		<2.05
NOV	5.95	6.14	64.20		6.58		<2.05
DEC	5.16	4.53	77.20	<2.50	5.01	<2.50	<2.00

NOTES:

(1) Distilled, deionized well water (laboratory reagent water)is used for the analytical blank.

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from DL are composites of flow-weighted grabs. Samples from WU and WD are quarterly grabs.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis (that is, gross beta activity may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Tritium Activities (pCi/liter) in Monthly Water Samples

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DL	WD	SWU	WU	BLANK[1]
JAN	<354	<352	3562	<349	<349	<350	<353
FEB	<371	<362	2389	<368	<361	<367	<368
MAR	<374	<372	7428	<373	<372	<372	<382
APR	<387	<387	12443	<385	<386	<383	<370
MAY	<357	<358	2679	<355	<360	<355	<348
JUN	<374	<370	1037	<368	<371	<367	<352
JUL	<280	<279	4687	<277	<277	<277	<196
AUG	<266	<267	3183	<266	<267	<226	<266
SEP	<269	<269	3483	<269	<269	<269	<266
OCT	<281	<282	6521	<283	<283	<282	<281
NOV	<297	<300	4186	<292	<295	<299	<285
DEC	<288	<290	8702	<287	<286	<286	<283

Tritium Activities (pCi/liter) in Quarterly Water Samples

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DL	WD	SWU	WU	BLANK[1]
QTR1	<362	<219	4655	<373	<362	<372	<362
QTR2	<341	<340	4994	<355	<339	<355	<331
QTR3	<280	<280	3814	<277	<275	226	<275
QTR4	<299	<300	6386	<287	<299	<286	<300

NOTES:

(1) Distilled, deionized well water (laboratory reagent water)is used for the analytical blank.

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from DL are composites of flow-weighted grabs; the samples from WD and WU are monthly grabs.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis (that is, tritium may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location

BERYLLIUM-7

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
FEB			7.22			
DEC			7.17			

POTASSIUM-40

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN			31.00		20.00	
FEB	16.40	12.30	26.90	11.30	13.80	12.90
MAR	11.80	12.60	21.80		19.10	
APR	16.90	11.50	21.20		14.70	
MAY		22.10		11.50		13.10
JUN	15.60	19.50	17.70		21.60	
JUL	14.40	12.80			15.70	
AUG	17.70	18.60	14.30		11.40	
SEP	15.50	18.50	21.70	9.94	21.10	10.10
OCT	14.30	12.30	26.60		15.80	
NOV	11.60	17.20	29.50		17.10	
DEC	4.04	14.20	32.50	13.30		18.40

CHROMIUM-51

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN						
FEB			29.60			
MAR			19.60			
APR						
MAY			13.20			
JUN						
JUL						
AUG						
SEP			43.00			
OCT			105.00			
NOV			52.10			
DEC			150.00			

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location

MANGANESE-54

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.73	<1.75	4.29		<1.38	
FEB	<1.42	<1.42	4.87	<1.44	<1.45	<1.41
MAR	<1.46	<1.50	2.29		<1.51	
APR	<1.45	<1.37	0.64		<1.53	
MAY	<1.39	<1.61	4.27	<1.69	<1.67	<1.76
JUN	<1.47	<1.57	3.57		<1.58	
JUL	<1.32	<1.48	4.23		<1.46	
AUG	<1.43	<1.25	5.80		<1.42	
SEP	<1.38	<1.41	18.18	<1.42	<1.94	<1.47
OCT	<1.42	<1.35	5.06		<1.41	
NOV	<1.48	<1.42	17.40		<1.33	
DEC	<0.63	<1.21	23.50	<1.29	<1.35	<1.32

COBALT-58

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<2.36	<2.29	<2.37		<1.98	
FEB	<1.60	<1.81	1.32	<1.73	<1.63	<1.71
MAR	<1.75	<1.91	<2.00		<1.76	
APR	<1.47	<1.61	<1.94		<1.63	
MAY	<1.61	<2.02	1.84	<1.81	<1.87	<1.99
JUN	<1.60	<1.90	1.89		<1.85	
JUL	<1.53	<1.60	1.16		<1.75	
AUG	<1.64	<1.59	1.21		<1.80	
SEP	<1.60	<1.77	1.76	<1.59	<2.63	<1.65
OCT	<1.58	<1.74	0.95		<1.64	
NOV	<1.52	<1.64	2.01		<1.48	
DEC	<0.75	<1.49	3.60	<1.71	<1.62	<1.50

IRON-59

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<6.52	<5.65	<6.04		<4.99	
FEB	<3.80	<4.49	<5.62	<4.17	<4.01	<4.42
MAR	<4.80	<5.22	<5.39		<4.55	
APR	<3.34	<3.70	<4.50		<3.60	
MAY	<3.82	<4.82	<4.30	<4.45	<4.36	<4.44
JUN	<4.01	<4.40	2.33		<4.44	
JUL	<3.96	<3.85	<4.80		<4.19	
AUG	<4.10	<3.75	<5.21		<4.56	
SEP	<4.14	<4.83	<7.49	<3.96	<6.57	<4.30
OCT	<3.97	<4.14	<5.36		<4.02	
NOV	<3.32	<4.10	5.76		<3.53	
DEC	<1.78	<3.73	7.56	<3.67	<4.03	<3.92

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location

COBALT-60

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.82	<1.73	23.50		<1.49	
FEB	<0.67	<1.46	27.30	<1.40	<1.50	<1.42
MAR	<1.38	<1.47	10.90		0.37	
APR	0.70	<1.38	7.33		<1.61	
MAY	<1.57	<1.88	13.40	<1.69	<1.74	<1.83
JUN	<0.68	<1.55	19.00		<1.47	
JUL	<1.43	<1.40	20.50		<1.51	
AUG	<1.49	<1.36	21.40		<1.34	
SEP	<1.40	<1.47	152.00	<1.43	<2.11	<1.39
OCT	<1.47	<1.43	26.40		<1.47	
NOV	<1.44	<1.41	37.30		<1.43	
DEC	<0.23	<1.23	44.00	<1.21	<1.47	<1.35

ZINC-65

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<4.11	<3.96	<3.85	<2.95	<3.41	
FEB	<3.20	<3.18	<4.16		<3.33	<3.22
MAR	<3.18	<3.34	<3.48		<3.42	
APR	<2.91	<2.98	<4.16	<3.41	<3.50	
MAY	<3.25	<4.38	<3.77		<3.98	<4.10
JUN	<3.21	<3.32	<4.06		<3.06	
JUL	<3.35	<3.09	1.59		<3.24	
AUG	<3.36	<3.11	<3.97	<3.18	<3.32	
SEP	<3.11	<3.19	3.52		<4.69	<2.95
OCT	<3.10	<3.08	2.18		<3.10	
NOV	<3.05	<3.15	<5.95	<2.63	<3.15	
DEC	<1.43	<2.81	3.21		<3.11	<2.83

NIOBIUM-95

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<3.97	<3.64	<3.63		<3.25	
FEB	<2.09	<2.52	<3.19	<2.64	<2.14	<2.72
MAR	<2.57	<3.02	<3.23		<2.78	
APR	<1.87	<2.00	<2.33		<2.08	
MAY	<2.01	<2.68	<2.21	<2.49	<2.49	<2.66
JUN	<2.16	<2.60	<2.76		<2.43	
JUL	<2.24	<2.24	<2.37		<2.32	
AUG	<2.34	<2.21	<2.69		<2.64	
SEP	<2.28	<2.66	<4.45	<2.31	<3.42	<2.33
OCT	<2.21	<2.45	0.75		<2.34	
NOV	<1.80	<2.38	<3.63		<1.98	
DEC	<0.96	<2.14	3.12	<2.20	<2.19	<2.24

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location

ZIRCONIUM-95

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<4.40	<4.17	<4.02		<4.09	
FEB	<2.78	<3.14	<3.88	<3.15	<2.98	<3.42
MAR	<3.22	<3.54	<3.90		<3.61	
APR	<2.73	<2.82	<3.31		<2.92	
MAY	<2.82	<3.52	<3.16	<3.53	<3.55	<3.43
JUN	<2.76	<3.31	<3.60		<3.07	
JUL	<2.81	<3.00	<3.47		<3.27	
AUG	<3.14	<2.74	<3.46		<3.29	
SEP	<2.92	<3.37	<5.32	<3.06	<4.64	<3.09
OCT	<2.93	<3.18	<3.63		<3.14	
NOV	<2.73	<3.05	<5.02		<2.79	
DEC	<1.33	<2.75	<4.17	<2.78	<3.02	<2.78

IODINE-131

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<16.30	<16.20	<30.30		<28.50	
FEB	<4.36	<8.47	<9.31	<9.51	<4.67	<9.56
MAR	<13.50	<13.60	<13.70		<13.00	
APR	<2.81	<3.40	<3.50		<3.41	
MAY	<5.07	<3.90	<5.38	<3.42	<3.94	<3.48
JUN	<6.83	<7.21	<7.36		<6.79	
JUL	<5.03	<5.51	<5.65		<4.95	
AUG	<6.56	<7.16	<6.52		<8.31	
SEP	<5.41	<12.50	<8.04	<6.70	<7.45	<9.47
OCT	<5.56	<7.65	<8.19		<4.45	
NOV	<2.19	<3.17	<5.70		<2.10	
DEC	<3.52	<9.47	10.50	<8.67	<3.12	<7.80

CESIUM-134

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.73	<1.67	<1.44		<1.56	
FEB	<1.25	<1.32	<1.41	<1.28	<1.39	<1.43
MAR	<1.32	<1.33	<1.39		<1.43	
APR	<1.30	<1.25	<1.62		<1.53	
MAY	<1.38	<1.60	<1.44	<1.61	<1.55	<1.75
JUN	<1.38	<1.41	0.90		<1.36	
JUL	<1.30	<1.26	<1.31		<1.42	
AUG	<1.35	<1.26	<1.48		<1.29	
SEP	<1.31	<1.31	<1.88	<1.27	<1.83	<1.30
OCT	<1.31	<1.30	<1.40		<1.39	
NOV	<1.29	<1.30	<2.37		<1.28	
DEC	<0.55	<1.10	<1.72	<1.10	<1.42	<1.23

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location

CESIUM-137

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.78	<1.51	<1.47		<1.45	
FEB	<1.38	<1.33	<1.55	<1.36	<1.48	<1.42
MAR	<1.37	<1.46	<1.36		<1.47	
APR	<1.32	<1.30	<1.59		<1.41	
MAY	<1.41	<1.68	<1.45	<1.65	<1.55	<1.74
JUN	<1.36	<1.44	<1.56		<1.48	
JUL	<1.30	<1.35	<1.51		<1.42	
AUG	<1.33	<1.23	<1.54		<1.43	
SEP	<1.29	<1.34	<2.20	0.34	<2.08	<1.33
OCT	<1.28	<1.41	<1.48		<1.46	
NOV	<1.35	<1.49	1.79		<1.40	
DEC	<0.60	<1.14	1.96	<1.08	<1.39	<1.28

BARIUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<62.00	<57.50	<58.60		<54.50	
FEB	<17.00	<29.90	<36.30	<27.30	<18.60	<28.40
MAR	<32.40	<47.50	<47.80		<31.90	
APR	<14.00	<16.60	<15.80		<17.40	
MAY	<15.60	<21.90	<16.50	<19.80	<21.50	<20.70
JUN	<21.60	<27.80	<28.10		<24.80	
JUL	<19.40	<20.90	<21.60		<20.80	
AUG	<25.30	<24.00	<26.20		<29.40	
SEP	<22.00	<38.90	<44.30	<23.30	<43.30	<25.90
OCT	<22.30	<26.40	12.70		<22.20	
NOV	<13.40	<18.20	<25.30		<12.70	
DEC	<8.33	<26.20	<32.50	<24.70	<18.40	<27.70

LANTHANUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<28.30	<22.20	<20.20		<24.70	
FEB	<6.62	<12.00	<11.90	<10.80	<7.44	<12.90
MAR	<13.20	<5.37	<4.58		<14.50	
APR	<5.27	<6.85	<6.36		<6.46	
MAY	<7.23	<10.20	<5.99	<7.98	<7.66	<9.46
JUN	<8.77	<11.70	<9.60		<10.40	
JUL	<7.44	<8.51	<8.42		<8.47	
AUG	<9.96	<8.44	<9.17		<11.70	
SEP	<8.14	<15.10	<14.10	<8.91	<5.43	<10.00
OCT	<9.20	<11.10	<11.70		<9.69	
NOV	<5.10	<8.78	<9.27		<5.65	
DEC	<3.59	<10.80	10.50	<9.10	<8.05	<11.80

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

Gamma-Emitting Nuclides in Sediment (pCi/kg dry) by Location

PERIOD	POTASSIUM-40 DOWNSTREAM	POTASSIUM-40 UPSTREAM	BERYLLIUM-7 DOWNSTREAM	BERYLLIUM-7 UPSTREAM
MAY	4475.00	1392.00		
NOV	12900.00	13213.00		

PERIOD	CESIUM-134 DOWNSTREAM	CESIUM-134 UPSTREAM	CESIUM-137 DOWNSTREAM	CESIUM-137 UPSTREAM
MAY	<14.50	<12.90	<16.10	<14.70
NOV	<24.90	<25.30	15.70	25.10

Gamma-Emitting Nuclides in Fish (pCi/kg wet) by Location

POTASSIUM-40

PERIOD	DOWNSTREAM #1	DOWNSTREAM #2	DOWNSTREAM #3	UPSTREAM #1	UPSTREAM #2	UPSTREAM #3
JUL	2643	2592	2327	2515	2613	2115
DEC	3431	3208	3804	3803	3183	3138

MANGANESE-54

PERIOD	DOWNSTREAM #1	DOWNSTREAM #2	DOWNSTREAM #3	UPSTREAM #1	UPSTREAM #2	UPSTREAM #3
JUL	<19.0	<63.4	<58.5	<9.80	<10.8	<14.3
DEC	<107	<82.4	<113	<89.0	<86.6	<64.0

IRON-59

PERIOD	DOWNSTREAM #1	DOWNSTREAM #2	DOWNSTREAM #3	UPSTREAM #1	UPSTREAM #2	UPSTREAM #3
JUL	<77.5	<218	<190	<33.5	<39.8	<59.9
DEC	<244	<208	<240	<102	<235	<200

COBALT-58

PERIOD	DOWNSTREAM #1	DOWNSTREAM #2	DOWNSTREAM #3	UPSTREAM #1	UPSTREAM #2	UPSTREAM #3
JUL	<21.5	<80.2	<67.0	<13.1	<12.0	<15.6
DEC	<109	<73.1	<114	<105	<103	<69.1

NOTE:
Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed).

Gamma-Emitting Nuclides in Fish (pCi/kg wet) by Location

COBALT-60

	DOWNSTREAM			UPSTREAM		
PERIOD	#1	#2	#3	#1	#2	#3
JUL	<22.3	<70.4	<72.5	<12.2	<11.5	<15.0
DEC	<105	<62.9	<133	<79.7	<105	<77.1

ZINC-65

	DOWNSTREAM			UPSTREAM		
PERIOD	#1	#2	#3	#1	#2	#3
JUL	<54.4	<179	<147	<27.4	<27.0	<40.9
DEC	<242	<189	<243	<211	<200	<159

CESIUM-134

	DOWNSTREAM			UPSTREAM		
PERIOD	#1	#2	#3	#1	#2	#3
JUL	<14.4	<59.4	<57.5	<8.80	<8.20	<15.1
DEC	<82.3	<68.0	<97.7	<70.8	<68.2	<63.9

CESIUM-137

	DOWNSTREAM			UPSTREAM		
PERIOD	#1	#2	#3	#1	#2	#3
JUL	<18.1	<64.8	<54.6	<8.80	<9.20	<13.5
DEC	<70.6	<82.0	<98.3	<75.3	<91.9	<70.9

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed.

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation
Site Garden #1 (Indicator)

COLLECTION DATE	CS-134	CS-137	I-131	BE-7	K-40
01/22/93	<75.4	<65.7	<56.9		4428
01/22/93	<40.6	<41.5	<32.2	336	3616
01/22/93	<34.1	<33.3	<39.8	193	4257
01/29/93	<8.02	<8.80	<14.5	363	3043
02/06/93	<34.3	<35.0	<29.6	318	4863
02/26/93	<39.7	<39.3	<44.9	315	3309
02/26/93	<39.1	<40.8	<53.9	541	3732
03/19/93	<22.8	<25.0	<33.0	1149	3865
03/19/93	<20.3	<20.7	<30.9	188	3296
03/26/93	<27.2	<29.3	<32.5		2244
04/16/93	<25.6	<24.2	<20.9	362	3803
04/23/93	<23.4	<28.5	<19.8	164	6848
04/30/93	<35.6	<27.9	<27.5		2716
05/14/93	<27.4	<37.1	<40.3	791	10870
05/21/93	<25.2	<29.7	<23.5		2530
05/28/93	<23.8	<29.8	<28.9	137	2944
06/18/93	<35.6	<38.2	<32.4	162	5734
06/18/93	<26.9	<34.6	<28.5		2293
06/30/93	<37.4	<44.8	<39.2	638	5957
07/16/93	<39.4	<41.6	<39.6		2102
07/23/93	<27.3	<31.8	<27.6	214	3885
07/30/93	<28.0	<28.7	<71.9	341	2489
08/28/93	<29.4	<31.8	<37.1	1448	2783
08/27/93	<35.9	<43.6	<49.9	827	6156
08/31/93	<21.9	<25.2	<19.4	134	2067
09/30/93	<28.3	<28.0	<28.3	1188	3829
09/30/93	<27.3	<28.9	<25.6	271	3514
09/30/93	<29.2	<27.1	<25.1	109	2529
10/28/93	<34.1	<31.1	<37.5	2636	2636
10/28/93	<23.6	<25.1	<28.1	236	3962
11/29/93	<19.7	<26.0	<19.5		3818
11/29/93	<19.7	<20.5	<18.3	80	2421
11/29/93	<42.7	<48.7	<35.9	509	3541
12/30/93	<31.2	<28.7	<24.6	166	1585
12/30/93	<38.1	<43.1	<32.5		4346
12/30/93	<37.2	<33.9	<32.7	533	4082

NOTE:

Sampling requirement for vegetation is one sample of each of three different types from each location per month.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed.

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation
Site Garden #2 (Indicator)

COLLECTION DATE	CS-134	CS-137	I-131	BE-7	K-40
01/22/93	<33.2	<32.6	<24.9	320	2907
01/22/93	<36.1	<41.1	<35.1	315	3401
01/29/93	<7.59	<8.16	<13.8	49	3537
02/06/93	<31.0	<32.3	<38.0	426	5539
02/26/93	<36.1	<42.0	<40.4	311	5737
02/26/93	<38.3	<28.1	<35.9	253	5197
03/19/93	<20.8	<22.1	<27.8		2832
03/19/93	<19.9	<22.8	<33.6	322	5013
03/26/93	<33.4	<29.9	<29.4		3934
04/16/93	<22.3	<22.8	<21.9	625	4042
04/23/93	<18.9	<23.7	<21.0	86	5466
04/30/93	<25.4	<26.1	<25.7		4975
05/14/93	<24.2	<22.9	<31.8	236	7427
05/21/93	<23.0	<25.9	<24.3		3852
05/28/93	<20.6	<22.2	<25.4	262	3937
06/18/93	<31.0	<36.7	<26.7	160	3062
06/18/93	<29.1	<33.8	<29.5	147	3576
06/30/93	<27.4	<31.0	<25.7	401	3105
07/16/93	<44.5	<35.8	<35.1	211	4083
07/23/93	<31.1	<32.6	<26.2	253	3703
07/30/93	<26.1	<25.1	<75.4	279	5406
08/31/93	<22.4	<27.2	<24.5	205	4550
08/31/93	<19.7	<20.5	<22.8	251	5949
08/31/93	<9.99	<10.9	<12.5	276	6039
09/30/93	<45.1	<47.9	<40.9	977	4078
09/30/93	<25.7	<28.6	<23.8	208	4636
09/30/93	<26.8	<31.0	<27.2		4158
10/28/93	<29.7	<30.8	<26.8	144	5531
10/28/93	<24.0	<25.4	<33.8	541	6383
10/28/93	<29.6	<31.8	<38.5	219	4144
11/29/93	<39.7	<47.3	<26.2	391	4574
11/29/93	<30.3	<40.1	<32.9	394	3633
11/29/93	<33.7	<44.3	<31.2		2263
12/30/93	<35.8	<40.7	<28.8	382	7721
12/30/93	<41.8	<45.7	<39.2	319	4613
12/30/93	<28.8	<23.6	<26.9		2077

NOTE:

Sampling requirement for vegetation is one sample of each of three different types from each location per month.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed.

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation
Control Location-Angola

COLLECTION DATE	CS-134	CS-137	I-131	BE-7	K-40
01/08/93	<15.0	<17.2	<19.8	64	3465
01/08/93	<15.0	<17.9	<19.8	525	1975
01/08/93	<25.7	<27.3	<30.5		2222
02/08/93	<30.4	<35.3	<31.5	258	2911
02/08/93	<34.7	<42.1	<33.0	462	5547
03/04/93	<17.6	<22.0	<30.1	206	2425
03/04/93	<19.5	<17.9	<27.3	387	2535
03/04/93	<25.2	<28.2	<37.4	533	5179
04/06/93	<20.4	<21.3	<40.1	159	4987
04/06/93	<19.8	<24.1	<38.6	130	4832
04/06/93	<14.0	<17.1	<30.5	178	5557
05/12/93	<20.8	<22.2	<36.6	341	7218
05/12/93	<23.6	<25.6	<38.3	339	3890
05/12/93	<20.0	<22.6	<34.1	392	4192
06/03/93	<27.2	<30.1	<38.2	949	5355
06/03/93	<24.3	<25.2	<39.4	484	9386
06/03/93	<26.4	<35.6	<40.6	641	4544
07/08/93	<33.0	<34.0	<34.3		3294
07/08/93	<31.4	<34.3	<27.3		
07/08/93	<29.3	<34.8	<30.7		4277
08/06/93	<39.1	<42.5	<47.2	326	7364
08/06/93	<33.1	<35.2	<38.6	324	2633
08/06/93	<25.2	<27.9	<33.1	193	4291
09/07/93	<53.4	<54.4	<48.1	838	3691
09/07/93	<55.8	<51.4	<50.7	685	5764
09/07/93	<39.4	<41.6	<35.4	523	5586
10/08/93	<20.0	<19.3	<26.9		3931
10/08/93	<27.1	<26.2	<36.7		5342
10/08/93	<22.5	<23.7	<34.0		5987
10/28/93	<50.3	<55.1	<50.8	1153	11890
11/04/93	<15.9	<18.8	<32.4	125	2549
11/04/93	<17.8	<19.4	<27.6	139	3393
11/04/93	<23.8	<29.0	<35.8	250	2344
12/27/93	<21.6	<25.1	<23.9	180	2756
12/27/93	<27.5	<33.1	<29.5	115	4111
12/27/93	<5.99	<7.20	<11.9	88	3652

NOTE:

Sampling requirement for vegetation is one sample of each of three different types from each location per month.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed.

Air Particulate Filter Composite Activity (E-2 pCi/m^3)

LOCATION	COLLECTION DATE	PERIOD	CS-134	CS-137
AA1	02/16/93	1STQTR	<0.10	<0.09
AB1	02/16/93	1STQTR	<0.13	<0.14
AR1	02/16/93	1STQTR	<0.12	<0.11
AKS	02/16/93	1STQTR	<0.13	<0.12
AP1	02/16/93	1STQTR	<0.11	<0.11
AQS2	02/16/93	1STQTR	<0.11	<0.11
ALC	02/16/93	1STQTR	<0.13	<0.12
AHS	02/16/93	1STQTR	<0.12	<0.10
AGS	02/16/93	1STQTR	<0.14	<0.11
AA1	05/20/93	2NDQTR	<0.21	<0.18
AB1	05/20/93	2NDQTR	<0.14	<0.10
AR1	05/20/93	2NDQTR	<0.15	<0.13
AKS	05/20/93	2NDQTR	<0.14	<0.13
AP1	05/20/93	2NDQTR	<0.16	<0.15
AQS2	05/20/93	2NDQTR	<0.13	<0.12
ALC	05/20/93	2NDQTR	<0.15	<0.13
AHS	05/20/93	2NDQTR	<0.13	<0.14
AGS	05/20/93	2NDQTR	<0.15	<0.17
AA1	08/21/93	3RDQTR	<0.12	<0.14
AB1	08/21/93	3RDQTR	<0.11	<0.11
AR1	08/21/93	3RDQTR	<0.13	<0.12
AKS	08/21/93	3RDQTR	<0.12	<0.12
AP1	08/21/93	3RDQTR	<0.15	<0.14
AQS2	08/21/93	3RDQTR	<0.12	<0.12
ALC	08/21/93	3RDQTR	<0.11	<0.12
AHS	08/21/93	3RDQTR	<0.12	<0.12
AGS	08/21/93	3RDQTR	<0.14	<0.11
AA1	11/12/93	4THQTR	<0.20	<0.17
AB1	11/12/93	4THQTR	<0.19	<0.15
AR1	11/12/93	4THQTR	<0.17	<0.17
AKS	11/12/93	4THQTR	<0.20	<0.20
AP1	11/12/93	4THQTR	<0.17	<0.15
AQS2	11/12/93	4THQTR	<0.16	<0.17
ALC	11/12/93	4THQTR	<0.20	<0.19
AHS	11/12/93	4THQTR	<0.17	<0.18
AGS	11/12/93	4THQTR	<0.21	<0.21

NOTE:

Activities indicated are minimum detectible activities (MDA) under the particular conditions of analyses. Samples counted are composed of thirteen filters from each location composited each quarter.

APPENDIX B

Summary of Preoperational REMP (Baseline) Results

Table B.1 summarizes the results of preoperational radiological environmental monitoring from January, 1983, through October, 1985. Further details are available in the respective annual reports (1983, 1984, and 1985).

TABLE B.1

PREOPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
(Page 1 of 4)

River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period 1/1/83 to 10/31/85

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Air Particulate (pCi/m^3)	Gross Beta (1086)	0.01	0.03 (752/759) 0.01 - 0.09	AQS2 5.8 km NW	0.03 (146/158) 0.01 - 0.09	0.03 (326/327) 0.01 - 0.08	N/A
	Cs-134 (95)	0.05	All < LLD			All < LLD	N/A
	Cs-137 (95)	0.06	All < LLD			All < LLD	N/A
Air Radioiodine (pCi m^3)	I-131 (1086)	0.07	All < LLD			All < LLD	N/A
Direct (TLD)[3] (mR total)	Gamma Monthly (1214)		6.8 (1018/1064) 0.7 - 19.3	TM2 4.2 km WSW	7.8 (27/28) 3.2 - 16.2	6.7 (139/150) 0 - 27.8	N/A
	Gamma Quarterly (472)		19.0[3] (404/418) 6.8 - 32.1	TG1 1.6 km SE	27.5[3] (11/11) 12.2 - 27.6	18.9[3] (51/54) 6.5 - 23.5	N/A
Surface Water (pCi/liter)	H-3 (24)	2000	All < LLD			All < LLD	N/A
	Mn-54 (68)	15	All < LLD			All < LLD	N/A
	Co-58 (68)	15	All < LLD			All < LLD	N/A
	Fe-59 (68)	30	All < LLD			All < LLD	N/A
	Co-60 (68)	15	All < LLD			All < LLD	N/A
	Zn-65 (68)	30				All < LLD	N/A
	Nb-95 (68)	15				All < LLD	N/A
	Zr-95 (68)	30	All < LLD			All < LLD	N/A
	I-131 (68)	15	All < LLD			All < LLD	N/A
	Cs-134 (68)	15	All < LLD			All < LLD	N/A
	Cs-137 (68)	18	All < LLD			ALL > LLD	N/A
	Ba-140 (68)	60	All < LLD			ALL < LLD	N/A
	La-140 (68)	15	All < LLD			All < LLD	N/A
	Gross Beta (52)	4	8.1 (23/26) 4 - 12	SWD 4 km downstream	8.1 (23/26) 4 - 12	7.8 (24/26) 5 - 13	N/A

TABLE B.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period 1/1/83 to 10/31/85

Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Groundwater[3] (pCi/liter)	H-3 (24)	2000	All < LLD			All < LLD	N/A
	Mn-54 (22)	15	All < LLD			All < LLD	N/A
	Co-58 (22)	15	All < LLD			All < LLD	N/A
	Fe-59 (22)	30	All < LLD			All < LLD	N/A
	Co-60 (22)	15	All < LLD			All < LLD	N/A
	Zn-65 (22)	30	All < LLD			All < LLD	N/A
	Nb-95 (22)	15	All < LLD			All < LLD	N/A
	Zr-95 (22)	30	All < LLD			All < LLD	N/A
	I-131 (22)	15	All < LLD			All < LLD	N/A
	Cs-134 (22)	15	All < LLD			All < LLD	N/A
	Cs-137 (22)	18	All < LLD			All < LLD	N/A
	Ba-140 (22)	60	All < LLD			All < LLD	N/A
	La-140 (22)	15	All < LLD			All < LLD	N/A
	Gross Beta (15)	4	4 (5/12) 2 - 8	WD 470 m SW	4 (5/12) 2 - 8	6 (2/3) 3 - 9	N/A
Drinking Water[3] (pCi/liter)	H-3 (18)	2000	All < LLD			All < LLD	N/A
	Mn-54 (40)	15	All < LLD			All < LLD	N/A
	Co-58 (40)	15	All < LLD			All < LLD	N/A
	Fe-59 (40)	30	All < LLD			All < LLD	N/A
	Co-60 (40)	15	All < LLD			All < LLD	N/A
	Zn-65 (40)	30	All < LLD			All < LLD	N/A
	Nb-95 (40)	15	All < LLD			All < LLD	N/A
	Zr-95 (40)	30	All < LLD			All < LLD	N/A

TABLE B.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Drinking Water[3] (pCi/liter) (continued)	I-131 (40)	15	All < LLD			All < LLD	N/A
	Cs-134 (40)	15	All < LLD			All < LLD	N/A
	Cs-137 (40)	18	All < LLD			All < LLD	N/A
	Ba-140 (40)	60	All < LLD			All < LLD	N/A
	La-140 (40)	15	All < LLD			All < LLD	N/A
	Gross Beta (54)	4	6.8 (28/28) 3 - 12	Donaldsonville 138 km downstream	6.8 (28/28) 3 - 12	7.8 (24/26) 5 - 13	N/A
Shoreline Sediment[4] (pCi/kg dry)	K-40[5] (2)	None Required	13700 (2/2) 11400 - 15900	SED 4 km downstream	13700 (2/2) 11400 - 15900	Not Required	N/A
	Cs-134 (4)	150	All < LLD				N/A
	Cs-137 (4)	180	All < LLD			All < LLD	N/A
Milk (pCi/liter)	K-40[5] (18)	None Required	1313 (8/9) 1179 - 1475	MF2 6 km ESE	1313 (8/9) 1179 - 1475	1318 (7/9) 1196 - 1409	N/A
	I-131 (81)	1	All < LLD			All < LLD[7]	N/A
	Cs-134 (82)	15	All < LLD			All < LLD[7]	N/A
	Cs-137 (82)	18	All < LLD			All < LLD[7]	N/A
	Ba-140 (82)	60	All < LLD			All < LLD[7]	N/A
	La-140 (82)	15	All < LLD			All < LLD	N/A
Fish/Invertebrates (pCi/kg wet)	K-40[5] (6)	None Required	9037 (2/2)	FD 1 km downstream	9037 (2/2) 6320 - 11754	7840 (4/4) 4177 - 11438	N/A
	Mn-54 (15)	130	All < LLD			All < LLD	N/A
	Co-58 (15)	130	All < LLD			All < LLD	N/A
	Fe-59 (15)	260	All < LLD[7]			All < LLD[7]	N/A
	Co-60 (15)	130	All < LLD			All < LLD	N/A
	Zn-65 (15)	260	All < LLD			All < LLD	N/A

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River Bend Station
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Medium or Pathway Sampled (Unit of Measure)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] (LLD)	All Indicator Stations Mean (f)[2] Range	Location with Highest Annual Mean		Control Locations Mean (f)[2] Range	Number of Nonroutine Reported Results
				Name Distance/Direction	Mean (f)[2] Range		
Fish/Invertebrates (pCi/kg wet) (continued)	Cs-134 (15)	130	All < LLD			All < LLD	N/A
	Cs-137 (15)	150	All < LLD			All < LLD	N/A
	K-40[6] (11)	None Required	3368 (6/10) 1398 - 5389	G2 1.3 km NW	3368 (6/10) 1398 - 5389	3768 single value	N/A
	I-131 (75)	60	All < LLD[7]			All < LLD	N/A
	Cs-134 (76)	60	All < LLD			All < LLD	N/A
	Cs-137 (76)	80	97 (4/43) 59 - 120	G1 1 km WNW	97 (4/43) 59 - 120	All < LLD	N/A

NOTES:

(1) Lower Limit of Detection (LLD) as defined in RBS Technical Specifications (NUREG-1172).

(2) Mean and range based on detectable measurements only. The fraction of detectable measurements at specified locations is indicated in parentheses (f).

(3) For each of the TLD locations in 1985, a value equal to ⅓ of its 4th Quarter gamma exposure is used to simulate a "quarterly" measurement for October, 1985.

(4) Beginning in January, 1985, groundwater was sampled from one upgradient (WU - control) and one downgradient (WD - indicator) well; previously, groundwater was sampled from construction dewatering (well-point) wells.

(5) The upstream surface water sampling location (SWU) is used as a "control" for drinking water comparisons.

(6) The values listed for K-40 were derived from the incipient in-house analytical program.

(7) The values listed for the control location for milk were derived from the incipient in-house analytical program. Training of personnel in calibration and analytical methods delayed sample preparation and counting. As a result, the required LLDs were not met (by the in-house analytical program during this training period) in 2 out of 8 I-131 analyses; 1 out of 9 Cs-134 analyses; 1 out of 9 of Cs-137 analyses; 2 out of 9 Ba-140 analyses; and 4 out of 9 La-140 analyses. Similarly, the required LLD for I-131 in broadleaf vegetation was not met in 1 out of 11 analyses. (See discussion of Program Exceptions in the Preoperational Radiological Environmental Monitoring Report for 1985.)

(8) The LLD for one downstream fish sample (catfish, analyzed in-house) was 265 pCi/kg (wet). The LLD for one upstream fish sample (largemouth bass, analyzed in-house) was 263 pCi/kg (wet).