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April 18, 1997

U.S. Nuclear Regulatory Commission  
Mail Station P1-37  
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station  
Docket No. 50-416  
License No. NPF-29  
Annual Radiological Environmental Operating  
Report for 1996

GNRO-97/00032

Gentlemen:

In accordance with the Grand Gulf Nuclear Station Unit 1  
Technical Specification 5.6.2, attached is the Annual  
Radiological Environmental Operating Report for the period  
January 1, 1996 through December 31, 1996.

Yours truly,

WKH/MJL

attachment: 1996 Annual Radiological Environmental Operating  
Report

cc: (See Next Page)

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April 18, 1997  
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Page 2 of 2

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**GRAND GULF NUCLEAR STATION**

**1996 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT**

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## Summary

The Annual Radiological Environmental Operating Report (AREOR) presents Grand Gulf Nuclear Station (GGNS) Environmental Surveillance Program (ESP) data obtained through analyses of environmental samples collected for the period January 1, 1996 through December 31, 1996. The AREOR fulfills the requirements of GGNS Technical Specifications 5.6.2.

During 1996 and as in previous years, GGNS detected plant-related radionuclides in the discharge basin surface water (Cobalt-60 and Tritium). GGNS personnel routinely monitor results from these areas to note any trends. Their 1996 review of these areas over previous years indicates the following:

- Cobalt-60 levels in the discharge basin surface water continue to be well below the lower limit of detection (LLD) values outlined in the Offsite Dose Calculation Manual (ODCM) Specifications and are not demonstrating any increase.
- Tritium levels in the discharge basin surface water continue to be elevated due to increased levels in the reactor coolant and radioactive effluents caused by stress corrosion cracking of control blade absorber tubes. This has resulted in a pathway for the release of boron. Subsequently, tritium production results from the neutron activation. Reduction in tritium levels can be expected as control blades are gradually replaced and the number of blades above 20% depletion is reduced. No regulatory limits for radioactive effluents have been exceeded.

### **Environmental Surveillance Program**

GGNS established the ESP in 1978 before the station became operational (1985) to provide data on background radiation and radioactivity normally present in the area. GGNS has continued to monitor the environment by sampling air,



milk, water, vegetation, sediment and fish, as well as measuring radiation directly.

The ESP includes sampling indicator and control locations within an 18-mile radius of the plant. The ESP utilizes indicator locations near the site to show any increases or buildup of radioactivity that might occur due to station operation, and control locations farther away from the site to indicate the presence of only naturally occurring radioactivity. GGNS personnel compare indicator results with control and preoperational results to assess any impact GGNS operation might have had on the surrounding environment.

In 1996, GGNS personnel collected environmental samples for radiological analysis. They compared results of indicator locations with control locations and previous studies, and concluded that overall no significant relationship exists between GGNS operation and effect on the plant environs. Their review of 1996 data, in many cases, showed undetectable radiation levels in the environment and near background levels in significant pathways associated with GGNS, with exception of the tritium levels detected in the discharge basin surface water.

#### **Harmful Effects or Irreversible Damage**

The ESP monitoring did not detect any harmful effects or evidence of irreversible damage in 1996. Therefore, no analysis or planned course of action to alleviate problems was necessary.

#### **Reporting Levels**

GGNS' review indicates that no samples equaled or exceeded reporting levels for radioactivity concentration in environmental samples, as outlined in ODCM Specifications Table 6.12.1-2 when averaged over any calendar quarter,

due to GGNS effluents. Therefore, 1996 results did not trigger any Radiological Monitoring Program Special Reports.

#### **Radioactivity Not Attributable To GGNS**

The GGNS ESP detected radioactivity attributable to other sources twice. These include the 25th Chinese nuclear test explosion in 1980, and the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986.

#### **Comparison To Federal and State Programs**

GGNS personnel compared ESP data to federal and state monitoring programs as results became available. The programs used for comparison include the U.S. Nuclear Regulatory Commission (NRC) TLD Direct Radiation Monitoring Network and the Mississippi State Department of Health (MSDH), Division of Radiological Health.

The latest available NRC TLD Network results compare to those from the GGNS ESP. Through 1996, GGNS and NRC TLD results continue to remain similar to the historical average and continue to verify that plant operations is not affecting the ambient radiation levels in the environment.

The MSDH and the GGNS ESP entail similar radiological environmental monitoring program requirements. These programs include collocated air samples and splitting or sharing sample media such as vegetation, water, sediment, fish, and milk. Both programs have obtained similar results over previous years. In 1996, and as in previous years, the MSDH and GGNS detected radioactivity attributable to plant effluent in the barge slip.

#### **Sampling Deviations**

The ESP lost two TLDs required by ODCM Specifications during 1996 due to vandalism. Other TLD programs experience losses of this type. In 1996,

GGNS personnel calculated a 99% (142 of 144) recovery rate for required ODCM Specification TLDs, which compares with other TLD programs.

The ESP did not include milk sampling within five miles (8 km) of GGNS in 1996 due to unavailability. Although GGNS personnel were previously sampling the Alcorn State University control location, changes were made to the ODCM Technical Specifications which specified that the control would only be collected if an indicator station exists. GGNS personnel did continue to collect vegetation samples to monitor the ingestion pathway, as specified in ODCM Specifications Table 6.12.1-1, because of milk unavailability.

GGNS personnel conducted all other ESP activities as required by the ODCM Specification without exception.

#### **Program Modifications**

GGNS made the following REMP modifications during 1996:

- Discontinued air sampling locations AS-5 TC and AS-6 BF.
- Discontinued cistern water sampling.
- Changed groundwater sampling frequency from quarterly to annually and indicator location from Arnold Acres to GGNS Construction Well.
- Discontinued sampling the discharge basin surface water and changed sampling frequency for the upstream and downstream surface water locations from monthly to quarterly. In addition, added an annual sample at a downstream location during a liquid radwaste discharge.
- Changed vegetation sampling frequency from three different sample types from two onsite gardens and one control location on a monthly basis to one sample type on a quarterly basis from one of the two onsite gardens and control location.

- Changed milk sampling frequency to quarterly for indicator locations, when available, with sampling of the control location only occurring with the presence of indicator locations.
- Discontinued fish sampling.
- Changed sampling frequency for the downstream sediment location (SEDHAM) from semiannually to annually and added an annual upstream location.
- Reduced TLDs from sixteen inner and outer ring TLDs to sixteen inner/outer ring only and eight special interest areas.
- Changed land use census frequency from annually to once every two years.

These modification were approved July 1996.

#### **Unavailable Results**

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

#### **Attachments**

Attachment I contains results of air, milk, water, vegetation, sediment, fish and thermoluminescent dosimeter (TLDs) samples collected in 1996. TLDs were analyzed by Arkansas Nuclear One (ANO) Dosimetry. Since Entergy's nuclear sites discontinued utilizing the Entergy Services, Inc. (ESI) laboratory effective May 1, 1996, the remaining samples were analyzed by ESI and the River Bend Station (RBS) environmental laboratory. Attachment I also contains RBS' participation in the interlaboratory comparison program during 1996. Attachment II contains results of samples collected at special interest areas by GGNS personnel and analyzed by ESI and the RBS environmental laboratory.

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## **SECTION 1.0**

### **INTRODUCTION**

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## **1.1 Environmental Surveillance Program Purpose and Design Criteria**

GGNS established the ESP to minimize any associated radiation endangerment to human health or the environment by ensuring that plant operating controls function properly. The ESP purpose involves:

- Evaluating environmental sampling procedures, equipment and techniques.
- Measuring radiation levels and their variations in environmental media in the area surrounding the plant.
- Determining average levels of radiation and radioactive material in various environmental media.
- Detecting effects, if any, of GGNS operation on the environmental radiation levels and concentrations.

The ESP design criteria includes:

- Analyzing important pathways for anticipated types and quantities of radionuclides released into the environment.
- Considering the possibility of a buildup of long-lived radionuclides in the environment and identifying physical and biological accumulations that may contribute to human exposures.
- Considering the potential radiation exposure to plant and animal life in the environment surrounding GGNS.
- Correlating levels of radiation and radioactivity in the environment with radioactive releases from station operation.

## **1.2 Dose Pathways Associated with GGNS**

Figure 1-1 shows potential exposure pathways that could occur as a result of a nuclear power plant. However, direct dose from gaseous effluent and thyroid dose from ingesting milk involves the most

significant environmental dose pathways from a nuclear power station. GGNS operations have little, if any, impact on these pathways due to very low levels of radiation released, remote location and absence of milking animals within five miles of GGNS. In addition, the GGNS Final Environmental Report lists the first use of drinking water from the Mississippi River as more than 200 miles downstream. Therefore, GGNS operations have little, if any, impact on this pathway.

### **1.3 Pathways Monitored**

The ESP includes the sampling program for monitoring airborne, waterborne, ingestion and direct radiation pathways as required by Table 6.12.1-1 in the ODCM. GGNS supplements this program with additional sampling in order to provide a comprehensive and well-balanced program. Tables 1-1 through 1-4 provide a description of the GGNS ESP sample locations. Only sample locations required by the ODCM are keyed to Figures 1-2 and 1-3 as shown in the Tables. Section 2.0 of this report provides a discussion of 1996 sampling results and Section 3.0 provides a summary of results for the monitored exposure pathways.

### **1.4 Program Description**

#### **1.4.1 Air Particulate and Radioiodine**

The GGNS ESP utilized five continuous air samplers to provide gross beta, gamma and radioiodine activity measurements by the airborne exposure pathway at the beginning of 1996. GGNS modifications to the REMP reduced air sampling locations to three. These remaining air samplers (Figures 1-2 and 1-3, and Table 1-1) met the requirements of ODCM Specification 6.12.1, as follows:

- One close to the SITE BOUNDARY having the highest calculated annual average groundlevel D/Q
- One in the vicinity of a community having the highest calculated annual average groundlevel D/Q (Port Gibson)
- One from a control location 15 - 30 km (10 - 20 miles) distance (Vicksburg, MS).

GGNS personnel placed air samplers one meter above the ground in weatherproof houses, with a 47-millimeter glass fiber filter in the intake line of the vacuum pump and a 2 x 1-inch charcoal cartridge located directly downstream. GGNS personnel maintained air flow at 1.25 cubic feet per minute. They changed filters and cartridges weekly and had them analyzed for gross beta radionuclides and radioiodine activity, respectively. The analytical laboratory analyzed quarterly composites of air filters for gamma radionuclides.

#### **1.4.2 Thermoluminescent Dosimetry**

The GGNS ESP measured ambient radiation in the environment surrounding GGNS with 59 TLDs to provide a quantitative measurement of the area radiation levels at the beginning of 1996. GGNS modifications to the REMP reduced TLD locations to 40 (Figures 1-2 and 1-3, and Table 1-2). They collected dosimeters quarterly and used the following criteria in establishing TLD locations

- ODCM Specification 6.12.1 requires 40 TLDs, positioned as outlined below:
  - Eight TLDs located in the general areas of the site boundary.
  - Eight TLDs located approximately 3 to 5 miles from the site.
  - Eight TLDs located in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control stations.
- Sixteen permanent TLD stations at the protected area boundary.
- The remaining 3 TLDs utilized as duplicates at varying locations.

#### **1.4.3 Milk**

At the beginning of 1996, ODCM Specifications required the following:

- Sample collection from milking animals in three locations within a five km distance having the highest dose potential. If milking animals were unavailable within five km, collect milk samples from three locations, between five to eight km, where calculated doses exceed 1.0 millirem per year.
- One control sample at a distance of 15-30 km.

GGNS modifications to the REMP reduced the milk sampling frequency to quarterly for indicator locations, when available, with sampling of the control location only occurring when indicator locations are present.

GGNS personnel were previously collecting a control milk sample semiannually from the Alcorn State University Dairy (Figure 1-3 and Table 1-3) to establish background data. However, the ESP did not include milk animals in 1996 within eight km (five miles) of GGNS due to unavailability. Therefore, Section 1.4.5 of this report addresses the unavailability of milk samples within the vicinity of GGNS.

#### **1.4.4 Cistern Water, Surface Water and Groundwater**

GGNS personnel sampled **cistern water** monthly at two locations, an indicator near the site (McGee) and a control (Willis) (Figures 1-2 and 1-3, and Table 1-3) at the beginning of 1996. GGNS modifications to the REMP eliminated these locations after July 1996. They collected samples in labeled containers and had them analyzed for gross beta radionuclides, Iodine-131, gamma radionuclides and a quarterly composite tritium.

Although sampling frequency was reduced to quarterly after July 1996 due to REMP modifications, GGNS personnel continued to sample **surface water** from the Mississippi River monthly at points upstream (control) and downstream (indicator) of the plant discharge (Figure 1-2 and Table 1-3) through 1996. GGNS personnel also collected a annual downstream sample during a liquid radwaste discharge as a result of REMP modifications. They collected samples in labeled containers and had them analyzed for gamma radionuclides and a quarterly composite tritium.



Although this location was eliminated after July 1996 due to REMP modifications, GGNS personnel continued to collect an additional surface water sample from the GGNS Discharge Basin. They composited this sample monthly with an automatic sampler that collected a preset volume at hourly intervals. They collected the sample in a labeled container and had it analyzed for gamma radionuclides and a quarterly composite tritium.

GGNS personnel sampled groundwater quarterly from two locations (Figure 1-2 and Table 1-3), Arnold Acres (indicator location) and Port Gibson City (control location) at the beginning of 1996. GGNS modifications to the REMP reduced sampling frequency to annually and relocated the indicator location from Arnold Acres to the onsite GGNS Construction Well after July 1996. They collected samples in labeled containers and had them analyzed for gamma radionuclides and tritium.

#### **1.4.5 Vegetation**

At the beginning of 1996, GGNS personnel collected broadleaf vegetation samples monthly for measurement of radioactivity by the ingestion exposure pathway, due to the unavailability of milk samples within five miles of GGNS as follows:

- Three different kinds of broadleaf vegetation grown nearest each of two different offsite locations with highest anticipated annual average groundlevel D/Q. GGNS met this requirement by maintaining two

gardens inside the SITE BOUNDARY, Sectors J and H. These sampling locations (Figure 1-2 and Table 1-4) provided a more conservative assessment of doses due to the higher deposition rates (D/Qs) than would be measured at offsite sampling locations.

- Control samples of each of the similar types of onsite vegetation 15-30 km from the site. GGNS met this requirement by maintaining a garden at in Sector K at Alcorn State University (Figure 1-3 and Table 1-4).

GGNS modifications to the REMP reduced sampling frequency from three different sample types from two onsite gardens and one control location on a monthly basis, to one sample type on a quarterly basis from one of the two onsite gardens and a control location.

The ESP prefers green-leafy vegetables suitable for human consumption as the primary source of broadleaf vegetation. At times, GGNS personnel took samples of any vegetation with relatively broad leaves on which airborne radioactive particulate material might be deposited, due to unavailability of green-leafy vegetables suitable for human consumption. They had the raw samples analyzed for gamma radionuclides and Iodine-131.

#### **1.4.6 Sediment**

At the beginning of 1996, GGNS personnel collected sediment samples semiannually at the following locations (Figure 1-2 and Table 1-4):



- River shoreline in plant effluent discharge (Barge Slip)
- Downstream of the barge slip in the vicinity of the Hamilton Lake outfall (indicator location)
- Upstream from the GGNS discharge (Upper Grand Gulf Landing)

ODCM Specifications require only a sediment sample from the downstream location (indicator). However, the ESP utilized additional samples from an upstream location (control) and the barge slip (indicator).

GGNS modifications to the REMP reduced the sampling frequency for the downstream sediment location (SEDHAM) to annually and added an annual upstream location.

GGNS personnel collected sediment samples near the shoreline from the top one-inch layer of sediment. They then discarded foreign objects and transferred the samples to clean, labeled containers for gamma radionuclide analyses.

#### **1.4.7 Fish**

At the beginning of 1996, GGNS personnel collected fish semiannually in the Mississippi River at the following locations (Figure 1-2 and Table 1-4):

- Downstream of the GGNS discharge point into the Mississippi River (indicator location)
- Upstream of the GGNS discharge point into the Mississippi River uninfluenced by plant operations (control location).

GGNS modifications to the REMP eliminated these locations after July 1996.

GGNS personnel collected fish by net, trotline, electroshock or purchased from commercial fishermen. They accompanied commercial fishermen, when purchasing samples, to ensure representative and valid samples from required locations. GGNS personnel collected a sufficient amount from each location to provide a minimum of 1000 grams (wet weight) of eviscerated fish sample. They had the samples analyzed for gamma radionuclides.

#### **1.4.8 Special Samples**

GGNS personnel collected special samples occasionally from nonroutine ESP locations to provide supplementary data and to address areas of special interests. Sample media may include sediment, water, milk, fish, meat and vegetation and may be analyzed for gamma radionuclides, Iodine-131, tritium or gross beta radionuclides, depending upon current interest.

#### **1.4.9 Land Use Census**

GGNS modifications to the REMP reduced the land use census frequency from annually to once every two years. In previous years, GGNS conducted an annual land use census as described in ODCM Specification 6.12.2. This census identifies changes in uses of land in unrestricted areas surrounding GGNS which would require modifications to the ESP or ODCM. The land use census identified important criteria in each of the 16 meteorological sectors, such as nearest:

- Residence.
- Animal milked for human consumption.

- Garden of greater than 50 m<sup>2</sup> (500 ft<sup>2</sup>) producing broadleaf vegetation.  
GGNS personnel conduct the land use census by:
- Field surveys in each meteorological sector out to five miles in order to confirm:
  - Nearest permanent residence
  - Nearest unoccupied residence
  - Nearest garden and approximate size
  - Nearest milking animal.
- Identifying locations on map, measuring distances to GGNS and recording results on surveillance data sheets.
- Comparing current census results to previous results.
- Contacting the Claiborne County Agent for verification of nearest dairy animals.

TABLE 1-1

## Air Sample Locations

<u>Air Sampler Number</u>	<u>Figure</u>	<u>Location</u>
AS-1 PG	1-2	Southeast of GGNS at the Port Gibson City Barn (Sector G, Radius 5.5 miles)
AS-3 61VA	1-3	North-northeast of GGNS on Hwy 61, north of the Vicksburg Airport (Sector B, Radius 18 miles)
AS-5 TC *	Not Shown	South of GGNS at the former Training Center (Sector J, Radius 0.4 miles)
AS-6 BF *	Not Shown	South-southwest of GGNS at the GGNS Ball Field (Sector K, Radius 0.4 miles)
AS-7 UH	1-2	South-southeast of GGNS at the IBEW Union Hall (Sector H, Radius 0.5 miles)

\* Station discontinued after August 6, 1996.

TABLE 1-2

## TLD Locations

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-00	Maintained in lead shield during the exposure period	Not Shown	-	-
M-01	Across the road from Lake Claiborne entry gate	1-2	E	3.5
M-07	AS-1 PG, Port Gibson City Barn	1-3	G	5.5
M-09	Warner Tully Y-Camp	1-2	D	3.5
M-10	Grand Gulf Military Park	1-2	A	1.5
M-14 (Control)	AS-3-61VA, Hwy 61, north of Vicksburg Airport	1-3	B	18.0
M-16	Meteorological Tower	1-2	A	0.9
M-17	South side, Grand Gulf Road	1-2	C	0.5
M-19	Eastern SITE BOUNDARY property line, NNE of HWSA	1-2	E	0.5
M-20 *	Hazardous waste storage area (HWSA)	Not Shown	F	0.5
M-21	Near former Training Center Building, on Bald Hill Road	1-2	J	0.4
M-22	Former RR entrance crossing on Bald Hill Road	1-2	G	0.5

\* Station discontinued after third quarter 1996.

TABLE 1-2

## TLD Locations

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-23	Gin Lake Road 50 yards north of Heavy Haul Road on power pole	1-2	Q	0.5
M-25	Radial Well Number 1	1-2	N	1.6
M-27 *	WSW near SITE BOUNDARY property line, (Near Bucksnot Road)	Not Shown	M	1.5
M-28	Former Glodjo residence	1-2	L	0.9
M-31	Duplicate TLD installed quarterly at varying locations	Not Shown	-	-
M-32	Duplicate TLD installed quarterly at varying locations	Not Shown	-	-
M-33 (Control)	Newellton, Louisiana, Water Tower	1-3	P	12.5
M-36	Curve on HW 608, point nearest GGNS at power pole	1-2	P	5.0
M-38	Lake Bruin State Park, entrance road	1-3	M	9.5
M-39	St. Joseph, Louisiana, Aux. Water Tank	1-3	M	13.0
M-40	Headley Drive, near River Port Entrance	1-2	M	2.3

\* Station discontinued after third quarter 1996.

**TABLE 1-2****TLD Locations**

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-41 *	Radial Well Number 4	Not Shown	P	1.3
M-45 *	Old Visitor Center gate	Not Shown	D	0.5
M-47 *	Bridge 0.6 miles west of Rodney-Westside Road/ Mont Gomer Road intersection, north side	Not Shown	L	5.2
M-48	0.4 miles South on Mont Gomer Road on west side	1-2	K	4.8
M-49	Fork in Bessie Weathers Road/ Shaifer Road	1-2	H	4.5
M-50	Panola Hunting Club entrance	1-3	B	5.3
M-51 *	Ingelside Karnac Ferry Road between Deer Camp Road and Y-Camp Road	Not Shown	C	4.2
M-55	Near Ingelside Karnac Ferry Road/ Ashland Road Intersection	1-2	D	5.0
M-56 *	H.W. Watson Elementary and Junior High School	Not Shown	G	4.2
M-57	Hwy 61, behind the Welcome to Port Gibson sign at Glensdale Subdivision	1-2	F	4.5

\* Station discontinued after third quarter 1996.



TABLE 1-2

## TLD Locations

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-58 *	Hwy 61, Big Bayou Pierre bridge, southeast end	Not Shown	E	5.0
M-59 *	Off levee at Winter Quarters Hunting camp	Not Shown	N	5.1
M-60	Duplicate TLD installed quarterly at varying locations	Not Shown	-	-
M-61	Protected area fence	Not Shown	D	Onsite
M-62	Protected area fence	Not Shown	E	Onsite
M-63	Protected area fence	Not Shown	N	Onsite
M-64	Protected area fence	Not Shown	M	Onsite
M-65	Protected area fence	Not Shown	L	Onsite
M-66	Protected area fence	Not Shown	K	Onsite
M-67	Protected area fence	Not Shown	J	Onsite

\* Station discontinued after third quarter 1996.



**TABLE 1-2**  
**TLD Locations**

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-68	Protected area fence	Not Shown	H	Onsite
M-69	Protected area fence	Not Shown	G	Onsite
M-70	Protected area fence	Not Shown	F	Onsite
M-71	Protected area fence	Not Shown	C	Onsite
M-72	Protected area fence	Not Shown	B	Onsite
M-74	Protected area fence	Not Shown	P	Onsite
M-76	Protected area fence	Not Shown	A	Onsite
M-77	Protected area fence	Not Shown	R	Onsite
M-81	Administration Building	Not Shown	Q	Onsite
M-86 *	North Site Access Road entrance near SITE BOUNDARY	Not Shown	B	0.5

\* Station discontinued after third quarter 1996.

TABLE 1-2

## TLD Locations

<u>TLD No.</u>	<u>Location</u>	<u>Figure</u>	<u>Sector</u>	<u>Mile</u>
M-88 *	River mile marker 409.5	Not Shown	A	4.2
M-89 *	Middle Ground Island	Not Shown	R	4.4
M-90 *	Across from Middle Ground Island, near Louisiana State Line (Yucatan cutoff of 1929)	Not Shown	Q	3.5
M-91 *	Transmission line by pond (Off Shaifer Road near Widows Creek)	Not Shown	J	4.5
M-92 *	Fence behind orchard (Bald Hill Road)	Not Shown	K	0.4
M-93 *	Underground cable sign (Bald Hill Road)	Not Shown	H	0.4
M-94	Sector R near Meteorological Tower	1-2	R	0.8

\* Station discontinued after third quarter of 1996.

TABLE 1-3

## Milk and Water Locations

<u>Milk (Control Location)</u>	<u>Figure</u>	<u>Location</u>
ALCONT	1-3	Located south-southwest of GGNS at Alcorn State University (Sector K, Radius 10.5 miles)
<u>Cistern Water</u>		
McGee Cistern *	Not Shown	Located north of GGNS at the McGee house on Frazier Road (Sector A, Radius 0.9 miles)
Willis Cistern *	Not Shown	Located at the C. E. Willis house on Shiloh Road east-northeast of GGNS near the the Shiloh Baptist Church (Sector D, Radius 6.0 miles)
<u>Surface Water</u>		
Upstream	1-2	At least 4500 ft upstream of the GGNS discharge point into the Mississippi River to allow adequate mixing of the Mississippi and Big Black Rivers (Sector Q - R, 1.8 miles)

\* Station discontinued after July 1996.

TABLE 1-3

## Milk and Water Locations

<u>Surface Water (cont'd)</u>	<u>Figure</u>	<u>Location</u>
Downstream	1-2	At least 5000 ft downstream of the GGNS discharge point into the Mississippi River near Radial Well No. 1 (Sector N, 1.6 miles)
MS River Downstream	1-2	Downstream of the GGNS discharge point (during a liquid radwaste discharge) in the Mississippi River near Radial Well No. 5 (Sector Q - P, 1.3 miles)
Discharge Basin *	Not Shown	West-northwest of GGNS in parking lot, YRD-133-PKG-LOT A (Sector P, 0.2 miles)
<u>Groundwater</u>		
PGWELL	1-2	PORT GIBSON WELLS - Taken from distribution system or one of the five wells (Sector G, Radius 5.0 miles)
AAWELL *	Not Shown	Arnold Acres Well (Sector J, Radius 1.1 miles)
Construction Water Well	1-2	GGNS CONSTRUCTION WATER WELL - Taken from distribution system or the well (Sector P, Radius 0.4 miles)

\* Station discontinued after July 1996.

TABLE 1-4

## Vegetation, Sediment and Fish Locations

<u>Vegetation</u>	<u>Figure</u>	<u>Location</u>
Broadleaf Vegetation	1-2	South of GGNS near former Training Center on Bald Hill Road (Sector J, 0.4 miles)
	1-2	South-southeast of GGNS between the former training center and the IBEW Union Hall on Bald Hill Road (Sector H, 0.4 miles)
	1-3	Alcorn State University south-southwest of GGNS (Sector K, 10.5 miles) when available, otherwise a location 15-30 km distant
<u>Sediment</u>		
SEDHAM	1-2	Downstream of the GGNS discharge point in the Mississippi River near Hamilton Lake outlet (Sector N, 1.6 miles)
SEDBAR *	Not Shown	Barge slip (Sector Q, 1.5 miles)
SEDCONT	1-2	Upstream of the GGNS discharge point in the Mississippi River (Minimum of 100 yds)

\* Station discontinued after July 1996.

TABLE 1-4

## Vegetation, Sediment and Fish Locations

<u>Fish</u>	<u>Figure</u>	<u>Location</u>
Fish and Invertebrates *	Not Shown	Downstream of the GGNS discharge point into the Mississippi River
	Not Shown	Upstream of the GGNS discharge point into the Mississippi River uninfluenced by plant operations

\* Sampling of fish was discontinued after July 1996.

FIGURE 1-1

Exposure Pathways

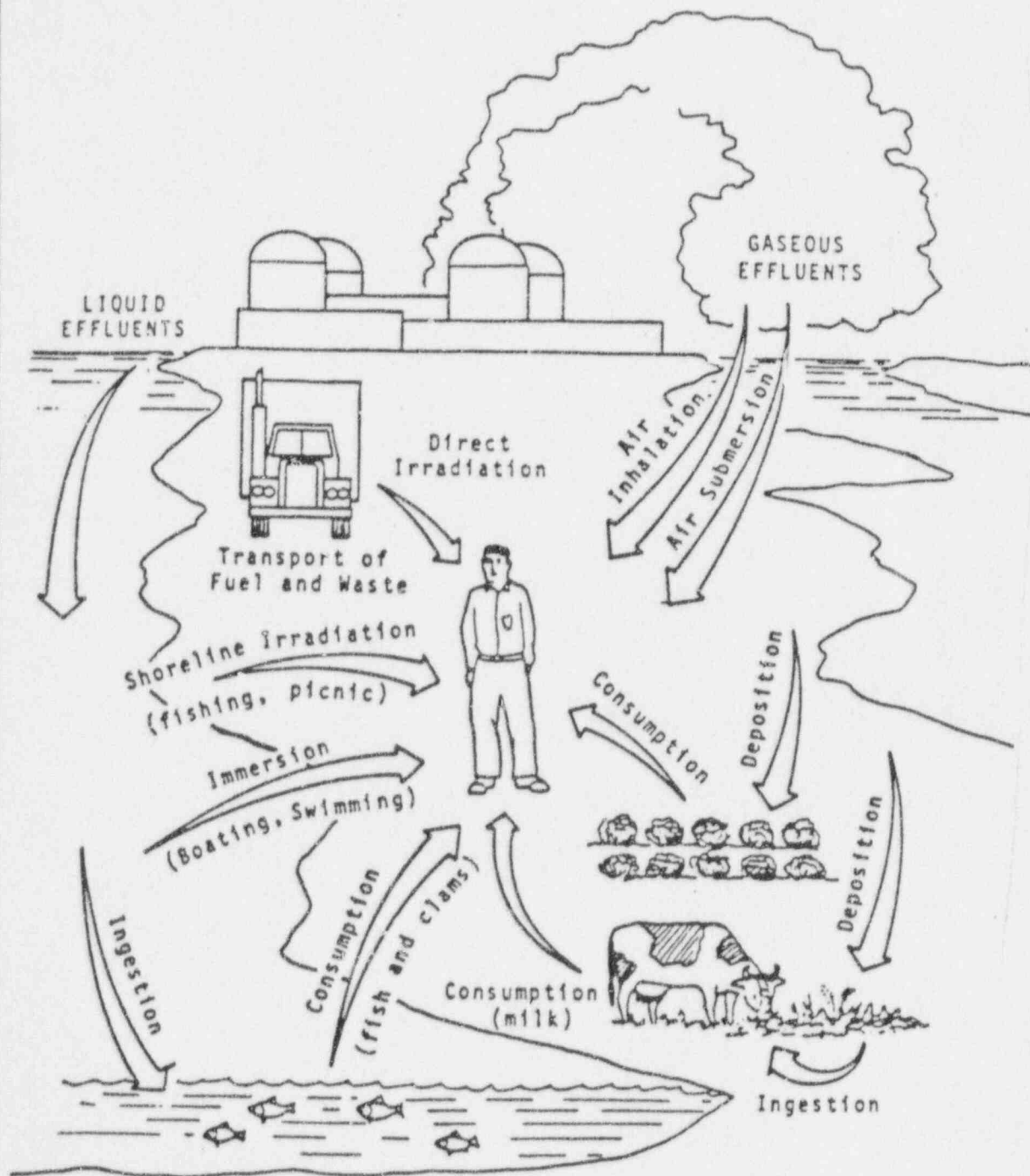
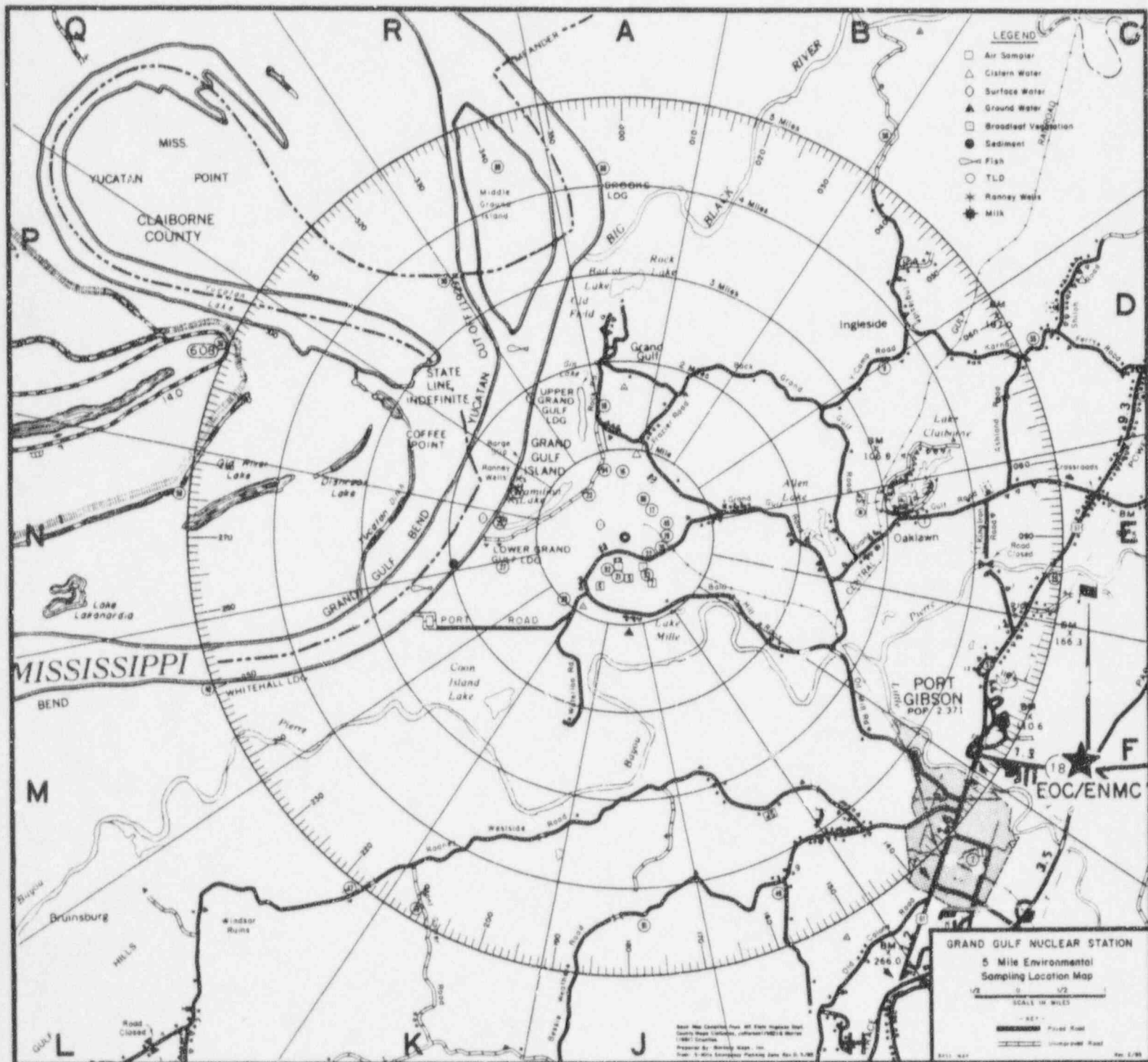




FIGURE 1-2

Sample Collection Sites - 5 Mile Map







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**SECTION 2.0**

**ENVIRONMENTAL SURVEILLANCE PROGRAM**

**(INTERPRETATIONS AND TRENDS OF RESULTS)**

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## **2.1 Air Particulate and Radioiodine Sample Results**

GGNS did not detect any gamma radionuclides in the quarterly air particulate composites nor Iodine-131 in the radioiodine cartridges during 1996, as has been the case in previous years. The ESP detected radioactivity in this pathway attributable to other sources twice. These include the 25th Chinese nuclear test explosion in 1980, and the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986. Therefore, the airborne exposure pathway has been unaffected by the operation of GGNS and airborne concentrations continue to be at background levels.

Gross beta concentrations during 1996 for indicator locations ranged from 0.005 - 0.0473 pCi/m<sup>3</sup> with a mean of 0.021 pCi/m<sup>3</sup> as compared to the control locations which ranged from 0.00591 - 0.0555 pCi/m<sup>3</sup> with a mean of 0.020 pCi/m<sup>3</sup>. This further emphasizes that the airborne pathway continues to remain at background levels.

## **2.2 Thermoluminescent Dosimetry Sample Results**

Gamma radiation dose in 1996 compares to previous years as shown in Figure 2-1. This figure shows 1987 - 1996 annual average results for indicator locations compared to the Vicksburg control. This figure indicates that ambient radiation levels have remained at or near background levels.

The ESP recorded the following quarterly TLD doses for ODCM Specification locations during 1996:

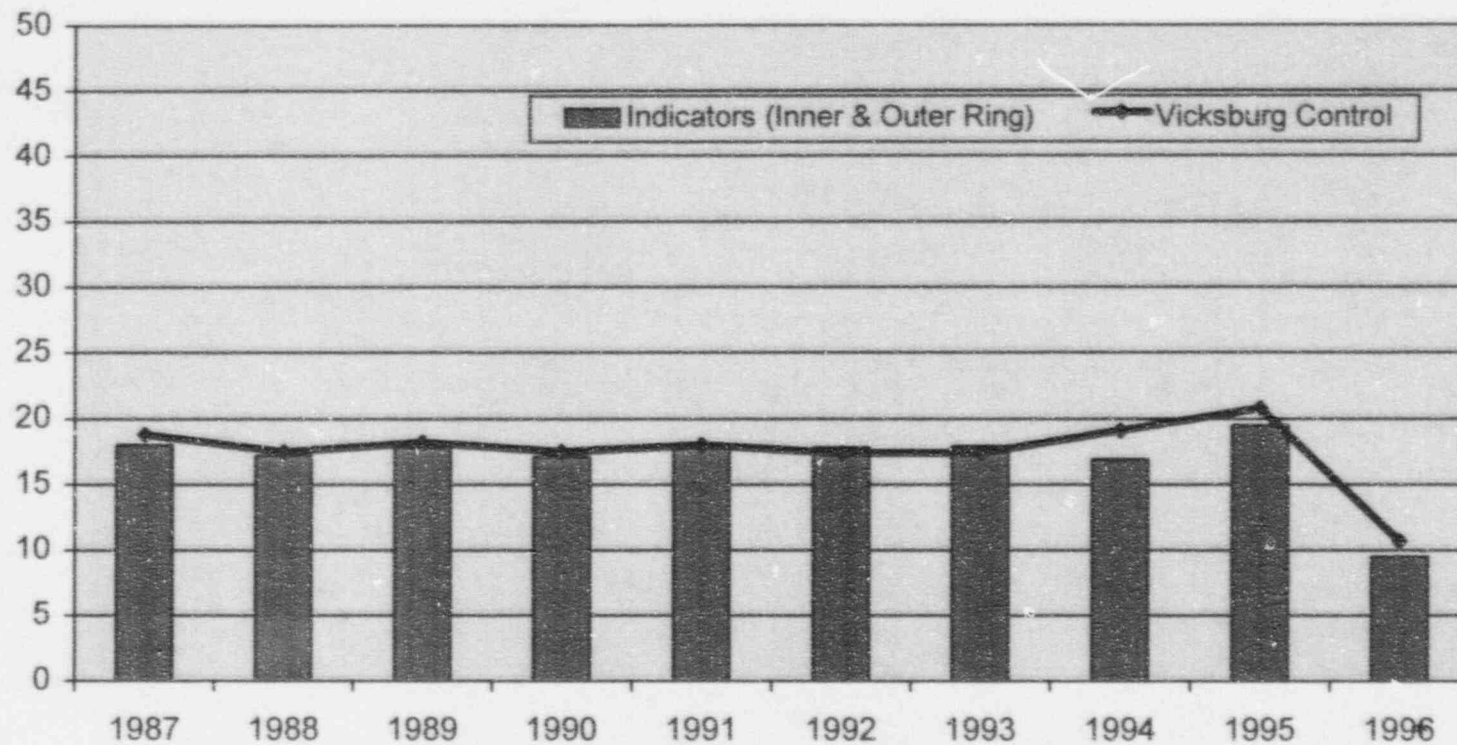
- Inner ring, mean of 9.5 mrem and range of 4.5 - 14.3 mrem
- Outer ring, mean of 9.6 mrem and range of 4.8 - 13.9 mrem
- Special Interest, mean of 9.4 mrem and range of 7.0 - 12.6 mrem
- Control, mean of 10.7 mrem and range of 8.9 - 13.2 mrem.

GGNS reported measured doses in 1996 as net exposure (field reading - transit/shield reading) normalized to 92 days. Previously, GGNS had reported measured doses as gross exposure. This reporting change did not affect the program since GGNS relies on comparison of the indicator locations to the control as a measure of plant impact. GGNS' comparison of the inner, outer and special interest TLD results to the control, indicates that the ambient radiation levels are unaffected by plant operations. Therefore, levels continue to remain at or near background.

Figure 2-1  
TLD Radiation Dose

1987 - 1996 TLD Results  
Indicators Versus Controls

Annual Average mR/Qtr



\* 1996 data is net dose (field reading - transit/shield reading) normalized to 92 days. Previous doses reported as gross exposure.

### **2.3 Milk Sample Results**

GGNS personnel did not collect milk samples within five miles of the GGNS site in 1996 due to the absence of milking animals. However, they did collect milk samples from the Alcorn State University control location and had them analyzed for Iodine-131 and gamma radionuclides. As in preoperational and previous operational years, GGNS has not detected any radionuclides attributable to plant operations.

### **2.4 Water Sample Results**

#### **Cistern Water**

GGNS did not detect any gamma radionuclides, Iodine-131 or tritium in cistern water samples during 1996, which is consistent with previous years. Gross beta concentrations for the indicator location had a mean of 2.09 pCi/l as compared to the control which ranged from 2.58 - 6.47 pCi/l with a mean of 4.03 pCi/l. These results indicate that this pathway has not been affected by plant operations.

#### **Surface Water**

Gamma radionuclides remained undetectable in the upstream and downstream Mississippi River location which is consistent with preoperational and previous operational years. In addition, gamma radionuclides were undetectable in an annual downstream sample collected during a liquid radwaste discharge. Tritium was detected in small concentrations, well below the required LLD value, at the upstream, downstream and annual downstream location as follows:

- Upstream - mean of 153.4 pCi/l, range of 114.0 - 219.0 pCi/l
- Downstream - mean of 194.0 pCi/l, range of 140.0 - 271.0 pCi/l
- Annual Downstream - mean of 385.5, range of 359.0 - 412.0 pCi/l.



These tritium values ranged from 79% to 94% below the required LLD value of 2000 pCi/l, therefore, the uncertainty and error associated with these results are high. Based on this and review of historical data, GGNS concluded that concentrations continue to remain at or near background levels at these locations.

Cobalt-60 was detected in the discharge basin at concentrations which ranged from 2.0 - 4.0 pCi/l with a mean of 3.3 pCi/l. These values ranged from 73% to 87% below the required LLD value of 15.0 pCi/l, therefore, the uncertainty and error associated with these results are high. Based on this and review of historical data, and the fact that this radionuclide was not detected after April 1996, GGNS concluded that there is no detectable trend associated with this area.

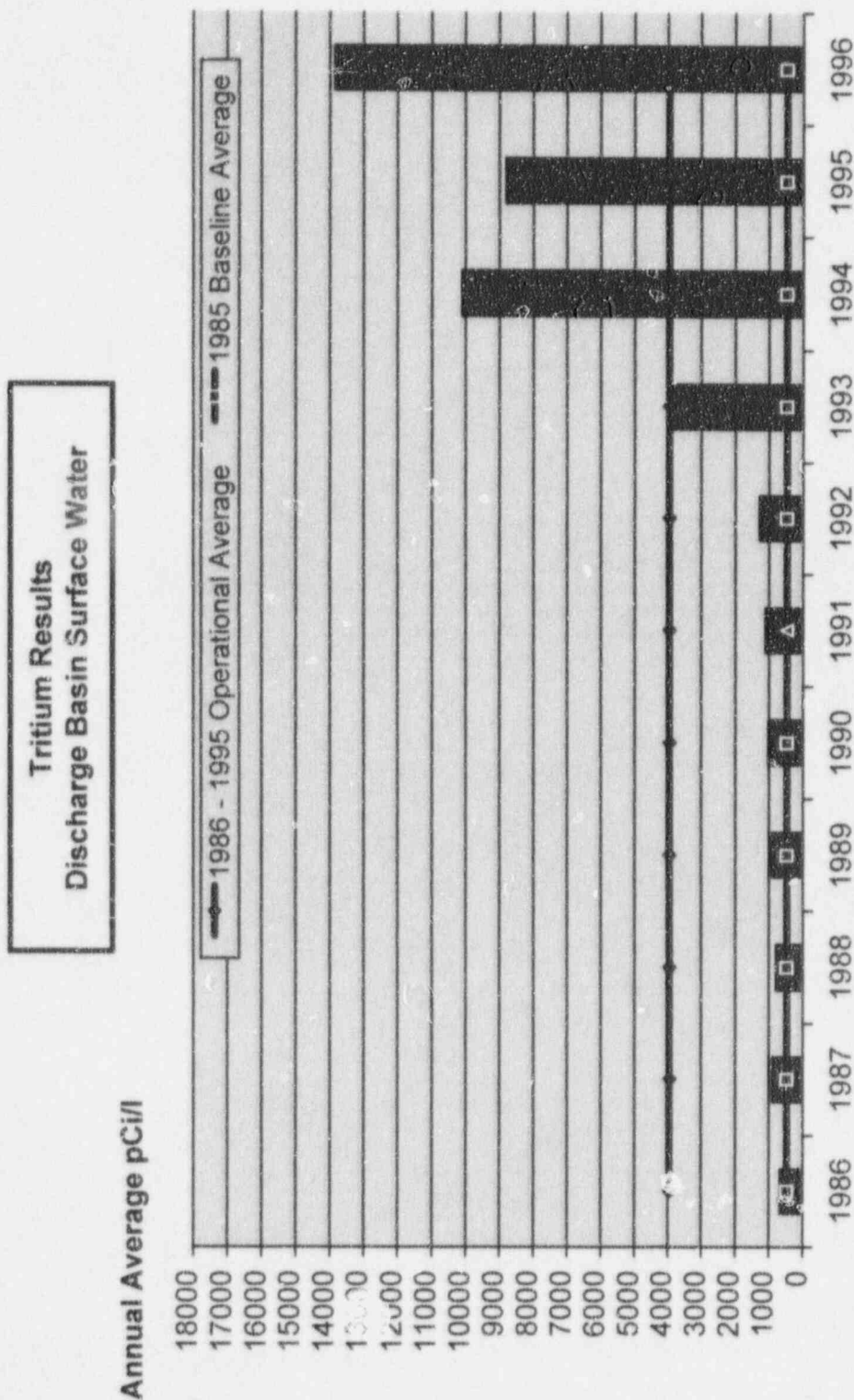
Tritium levels for discharge basin surface water ranged from 10835.0 - 16440.0 pCi/l with a mean of 13847.2 pCi/l. Tritium levels continue to be elevated due to increased levels in the reactor coolant and radioactive effluents caused by stress corrosion cracking of control blade tubes. This has resulted in a pathway for the release of boron. Subsequently, tritium production results from the neutron activation. Reduction in the tritium levels can be expected as control blades are gradually replaced and the number of blades above 20% depletion is reduced. No, regulatory limits for radioactive effluents have been exceeded. Figure 2-2 presents tritium results from 1985 through 1996 for this area.

#### **Groundwater**

GGNS did not detect any gamma radionuclides or tritium in groundwater samples during 1996, as has been the case in previous years. These results indicate that this pathway has not been affected by plant operations.



**Figure 2-2**  
**Discharge Basin Tritium Results**



## **2.5 Vegetation Sample Results**

GGNS did not detect any gamma radionuclides in vegetation samples during 1996, as has been the case in preoperational and previous operational years. These results indicate that this pathway has not been affected by plant operations.

## **2.6 Sediment Sample Results**

Gamma radionuclides remained undetectable in the upstream Mississippi River location during 1996 which is consistent with previous years. The downstream Mississippi River location, (Hamilton Lake) contained Cesium-137 at concentrations which ranged from 31.2 - 112.0 pCi/kg with a mean of 85.1 pCi/kg. This location also contained Cesium-137 during the preoperational years at an average concentration of 295.0 pCi/kg. GGNS attributes this activity at the downstream location to past atmospheric weapons testing, since the probability of this location being affected by plant operations is remote due to the enormous dilution and sedimentation factors involved with the Mississippi River.

No gamma radionuclides were detected at the barge slip location (SEDBAR) during this reporting period. Table 2-1 provides an analytical results summary for 1987 through 1996 barge slip sediment samples. GGNS personnel attributes the presence of radioactivity at this area over previous years to buildup of very small amounts of particulates. This table continues to show that radionuclide concentrations in the barge slip sediment are stabilizing. Although, previous sampling of the barge slip sediment revealed a wide range of activity, GGNS personnel have found no definite correlation between radionuclide concentrations and plant operating levels, effluent releases or river elevation.

TABLE 2-1

## Barge Slip Sediment Analytical Summary \*

Year	Mn-54	Fe-59	Co-58	Co-60	Cr-51	Cs-134	Cs-137
1987	2205.0	ND**	103.0	799.0	1454.0	87.0	189.0
1988	480.0	ND**	82.0	628.0	777.0	109.0	142.0
1989	734.0	ND**	56.0	736.0	199.0	104.0	159.0
1990	258.0	ND**	39.0	424.0	853.0	ND**	124.0
1991	1252.0	ND**	59.0	1171.0	307.0	ND**	145.0
1992	164.0	ND**	ND**	294.0	ND**	ND**	76.0
1993	1202.0	53.0	143.0	949.0	471.5	ND**	117.5
1994	396.0	ND**	ND**	411.0	ND**	ND**	84.5
1995	148.5	ND**	42.0	245.0	ND**	ND**	82.5
1996	ND**	ND**	ND**	ND**	ND**	ND**	ND**

\* Units in picocuries/kilogram

\*\* None detected

## **2.7 Fish Sample Results**

GGNS did not detect any gamma radionuclides in fish samples during 1996, as has been the case in preoperational and previous operational years. These results indicate that this pathway has not been affected by plant operations.

## **2.8 Special Sample Results**

In 1996, GGNS personnel collected sixteen special samples and had them analyzed for gamma radionuclides, gross beta radionuclides and/or tritium. Discussion below provides descriptions of special samples collected and their results.

- Eight groundwater samples as follows:
  - Four samples (one recount) from North Construction Well #3 - gross beta radionuclides and tritium detected twice/no gamma radionuclides detected.
  - Four samples (one recount) from South Construction Well #4 - gross beta radionuclides and tritium detected once/no gamma radionuclides detected.
- One rainfall sample - no tritium detected.
- Two sediment samples as follows:
  - One sample from Basin A - Manganese-54 and Cesium-137 detected.
  - One sample from Basin B - Manganese-54, Cobalt-60 and Cesium-137 detected.
- One sewage effluent sample from Outfall 010 - no gamma radionuclides detected/gross beta radionuclides detected.

- Four stormwater samples from Outfall 007 - gross beta radionuclides not detected/tritium detected once.

Detectable measurements from the sampling areas are well below the required environmental LLD values. Therefore, the uncertainty and error associated with these results are high. Results are summarized in Section 3.0.

## **2.9 Land Use Census Results**

GGNS did not conduct a land use census during 1996 as a result of the REMP modifications. This modification changed the frequency from annual to once every two years.

## **2.10 Interlaboratory Comparison Results**

RBS' environmental laboratory analyzed interlaboratory comparison samples for GGNS. Attachment I contains these results. GGNS' review of RBS' interlaboratory comparison indicated that 95% of the sample results were within the acceptable control limits of the three normalized deviations, with 5% outside the limits. GGNS' and RBS' review of sample results outside the acceptable control limits indicated that there was no impact on previous reported data. Section 10.0 of Attachment I provides more discussion on sample results outside the acceptable control limits

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**SECTION 3.0**

**ENVIRONMENTAL SURVEILLANCE PROGRAM SUMMARY**

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### **3.1     1996 Program Results Summary**

Table 3-1 summarizes required ODCM Specification, special and supplemental ESP sample results for 1996. Table 3-1 also includes sample recount and duplicate analyses. GGNS personnel did not use values reported as less than (<) for determining indicator and control location ranges and means. With exception of the elevated tritium levels in the discharge basin surface water, 1996 results compare to that encountered in previous years.



TABLE 3-1

## Environmental Monitoring Program Summary

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416Location of Facility Claiborne, Mississippi  
(County, State)Reporting Period January - December 1996

Sample Type (Units)	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean (F) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean (F) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean (F) <sup>c</sup> [ Range ]		
Air Particulate (pCi/m <sup>3</sup> )	GB 227	0.01	0.021 ( 120 / 121 ) [ 0.005 - 0.0473 ]	AS-7 UH ( Sector H, 0.5 mi )	0.023 ( 56 / 57 ) [ 0.008 - 0.0453 ]	0.020 ( 105 / 106 ) [ 0.00591 - 0.0555 ]	0
	GS 18						
	Cs-134	0.05	<LLD	N/A	N/A	<LLD	0
	Cs-137	0.06	<LLD	N/A	N/A	<LLD	0
Airborne Iodine (pCi/m <sup>3</sup> )	I-131 227	0.07	<LLD	N/A	N/A	<LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma 57	(f)	9.5 ( 57 / 57 ) [ 4.5 - 14.3 ]	M-27 ( Sector M, 1.5 mi )	12.0 ( 3 / 3 ) [ 10.8 - 13.3 ]	N/A	0
Outer Ring TLDs (mR/Qtr)	Gamma 54	(f)	9.6 ( 54 / 54 ) [ 4.8 - 13.9 ]	M-49 ( Sector H, 4.5 mi )	11.4 ( 4 / 4 ) [ 9.6 - 13.9 ]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma 27	(f)	9.4 ( 27 / 27 ) [ 7.0 - 12.6 ]	M-01 ( Sector E, 3.5 mi )	11.4 ( 3 / 3 ) [ 10.7 - 12.6 ]	N/A	0
Control TLD (mR/Qtr)	Gamma 4	(f)	N/A	N/A	N/A	10.7 ( 4 / 4 ) [ 8.9 - 13.2 ]	0
Protected Area TLDs (mR/Qtr)	Gamma 64	(f)	22.2 ( 64 / 64 ) [ 6.1 - 76.4 ]	M-69 ( Sector G, Onsite )	58.3 ( 4 / 4 ) [ 33.7 - 76.4 ]	N/A	0

TABLE 3-1

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				Location <sup>d</sup>	Mean (F) <sup>c</sup> [ Range ]		
Cistern Water (pCi/l)	GB 18	4	2.09 ( 1 / 9 ) [ N/A ]	McGee Cistern ( Sector A, 0.9 mi )	2.09 ( 1 / 9 ) [ N/A ]	4.03 ( 7 / 9 ) [ 2.58 - 6.47 ]	0
	I-131 20	1.0	<LLD	N/A	N/A	<LLD	0
	H-3 10	2000	<LLD	N/A	N/A	<LLD	0
	GS 20						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

TABLE 3-1

## Environmental Monitoring Program Summary

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				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Surface Water ( pCi/l )	H-3      25	2000	5914.8 ( 12 / 15 ) [ 140.0 - 16440.0 ]	Discharge Basin ( Sector P, 0.2 mi )	13847.2 ( 5 / 5 ) [ 10835.0 - 16440.0 ]	153.4 ( 5 / 9 ) [ 114.0 - 219.0 ]	5
	GS      43						
	Mn-54	15	<LLD	NA	NA	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	3.3 ( 4 / 29 ) [ 2.0 - 4.0 ]	Discharge Basin ( Sector P, 0.2 mi )	3.3 ( 4 / 14 ) [ 2.0 - 4.0 ]	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

TABLE 3-1

## Environmental Monitoring Program Summary

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Sample Type (Units)	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean (F) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean (F) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean (F) <sup>c</sup> [ Range ]		
Groundwater (pCi/l)	H-3 8	2000	<LLD	N/A	N/A	<LLD	0
	GS 8						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

TABLE 3-1

## Environmental Monitoring Program Summary

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				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Milk ( pCi/l )	I-131      2	1.0	N/A	N/A	N/A	<LLD	0
	GS            2						
	Cs-134	15	N/A	N/A	N/A	<LLD	0
	Cs-137	18	N/A	N/A	N/A	<LLD	0
	Ba-140	60	N/A	N/A	N/A	<LLD	0
	La-140	15	N/A	N/A	N/A	<LLD	0
Vegetation ( pCi/kg )	I-131      83	60	<LLD	N/A	N/A	<LLD	0
	GS            83						
	Cs-134	60	<LLD	N/A	N/A	<LLD	0
	Cs-137	80	<LLD	N/A	N/A	<LLD	0

TABLE 3-1

## Environmental Monitoring Program Summary

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 (County, State)

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Fish ( pCi/kg )	GS 4						
	Mn-54	130	<LLD	N/A	N/A	<LLD	0
	Fe-59	260	<LLD	N/A	N/A	<LLD	0
	Co-58	130	<LLD	N/A	N/A	<LLD	0
	Co-60	130	<LLD	N/A	N/A	<LLD	0
	Zn-65	260	<LLD	N/A	N/A	<LLD	0
	Cs-134	130	<LLD	N/A	N/A	<LLD	0
	Cs-137	150	<LLD	N/A	N/A	<LLD	0
Bottom Sediment ( pCi/kg )	GS 8						
	Mn-54	(f)	<LLD	NA	NA	<LLD	0
	Fe-59	(f)	<LLD	NA	NA	<LLD	0
	Co-58	(f)	<LLD	NA	NA	<LLD	0
	Co-60	(f)	<LLD	NA	NA	<LLD	0
	Cr-51	(f)	<LLD	NA	NA	<LLD	0
	Cs-134	150	<LLD	NA	NA	<LLD	0
	Cs-137	180	85.1 ( 3 / 5 ) [ 31.2 - 112.0 ]	Hamilton Lake ( Sector N, 1.6 mi )	85.1 ( 3 / 3 ) [ 31.2 - 112.0 ]	<LLD	0



TABLE 3-1

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				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Special Groundwater ( pCi/l )	GB 6	4	7.2 ( 3 / 6 ) [ 2.5 - 15.2 ]	South Construction Well ( Sector P, 0.4 mi )	15.2 ( 1 / 3 ) [ N/A ]	N/A	0
	H-3 10	2000	416.7 ( 3 / 10 ) [ 160.0 - 570.0 ]	South Construction Well ( Sector P, 0.4 mi )	520.0 ( 1 / 5 ) [ N/A ]	N/A	0
	GS 2						
	Mn-54	15	<LLD	N/A	N/A	N/A	0
	Fe-59	30	<LLD	N/A	N/A	N/A	0
	Co-58	15	<LLD	N/A	N/A	N/A	0
	Co-60	15	<LLD	N/A	N/A	N/A	0
	Zn-65	30	<LLD	N/A	N/A	N/A	0
	Zr-95	30	<LLD	N/A	N/A	N/A	0
	Nb-95	15	<LLD	N/A	N/A	N/A	0
	Cs-134	15	<LLD	N/A	N/A	N/A	0
	Cs-137	18	<LLD	N/A	N/A	N/A	0
	Ba-140	60	<LLD	N/A	N/A	N/A	0
	La-140	15	<LLD	N/A	N/A	N/A	0



TABLE 3-1

## Environmental Monitoring Program Summary

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 (County, State)

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Special Rainfall ( pCi/l )	H-3 1	2000	<LLD	N/A	N/A	N/A	0
Special Sediment ( pCi/kg )	GS 2						
	Mn-54	(f)	8.0 ( 2 / 2 ) [ 7.0 - 9.0 ]	Basin B ( Sector M, 0.3 mi )	9.0 ( 1 / 1 ) [ N/A ]	N/A	0
	Fe-59	(f)	<LLD	N/A	N/A	N/A	0
	Co-58	(f)	<LLD	N/A	N/A	N/A	0
	Co-60	(f)	21.0 ( 1 / 1 ) [ N/A ]	Basin B ( Sector M, 0.3 mi )	21.0 ( 1 / 1 ) [ N/A ]	N/A	0
	Cr-51	(f)	<LLD	N/A	N/A	N/A	0
	Cs-134	150	<LLD	N/A	N/A	N/A	0
	Cs-137	180	16.0 ( 2 / 2 ) [ 10.0 - 22.0 ]	Basin A ( Sector R, 0.3 mi )	22.0 ( 1 / 1 ) [ N/A ]	N/A	0

TABLE 3-1

## Environmental Monitoring Program Summary

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416Location of Facility Claiborne, Mississippi  
(County, State)Reporting Period January - December 1996

Sample Type (Units)	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean (F) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean (F) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean (F) <sup>c</sup> [ Range ]		
Special Sewage Effluent (pCi/l)	GB 1	4	5.1 (1/1) [ N/A ]	Outfall 010 ( Sector R, 0.3 mi )	5.1 (1/1) [ N/A ]	N/A	0
	GS 1						
	Mn-54	15	<LLD	N/A	N/A	N/A	0
	Fe-59	30	<LLD	N/A	N/A	N/A	0
	Co-58	15	<LLD	N/A	N/A	N/A	0
	Co-60	15	<LLD	N/A	N/A	N/A	0
	Zn-65	30	<LLD	N/A	N/A	N/A	0
	Zr-95	30	<LLD	N/A	N/A	N/A	0
	Nb-95	15	<LLD	N/A	N/A	N/A	0
	Cs-134	15	<LLD	N/A	N/A	N/A	0
	Cs-137	18	<LLD	N/A	N/A	N/A	0
	Ba-140	60	<LLD	N/A	N/A	N/A	0
	La-140	15	<LLD	N/A	N/A	N/A	0
Special Stormwater (pCi/l)	GB 1	4	<LLD	N/A	N/A	N/A	0
	H-3 3	2000	280.0 (1/3) [ N/A ]	Outfall 007 ( Sector M, 0.3 mi )	280.0 (1/3) [ N/A ]	N/A	0

TABLE 3-1

Environmental Monitoring Program Summary

Name of Facility <u>Grand Gulf Nuclear Station</u> Docket No. <u>50-416</u>	
Location of Facility <u>Claiborne, Mississippi</u>	Reporting Period <u>January - December 1996</u>
(County, State)	

- a GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.
- b LLD = Required lower limit of detection based on Grand Gulf Nuclear Station ODCM Specification Table 6.12.1-3.
- c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).
- d Locations are specified (1) by name and (2) sector relative to reactor site.
- e Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.
- f LLD not defined in GGNS ODCM Specification Table 6.12.1-3.

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**ATTACHMENT I**

**1996 Environmental Sampling and Analytical Report**

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## Summary of Monitoring Results

### Radionuclides Detected

The following radionuclides were detected during this reporting period:

- Cobalt-60 and tritium in the discharge basin surface water.
- Tritium in the upstream and downstream surface water.
- Cesium-137 in the downstream sediment.

### Duplicate Samples

The term "GG" ending of lab number denotes a duplicate sample.

### Sample Deviations

The following air sample locations had equipment malfunctions during this reporting period.

Location	Sample Period	Run Time (hrs)	Comment
AS-1 PG	01/23/96 - 01/30/96	Not Applicable	No flow at collection
AS-3 61VA	12/27/95 - 01/02/96	139.58	Blown fuse
AS-5 TC	01/30/96 - 02/06/96	126.17	Electrical outage
AS-6 BF	01/30/96 - 02/06/96	126.17	Electrical outage
AS-7 UH	01/30/96 - 02/06/96	125.17	Electrical outage
AS-7 UH	03/05/96 - 03/12/96	68.95	Blown fuse
AS-7 UH	08/06/96 - 08/13/96	151.43	Mechanical failure
AS-1 PG	06/18/96 - 06/25/96	Not Applicable	No flow at collection
AS-1 PG	08/06/96 - 08/13/96	Not Applicable	No flow at collection
AS-3 61VA	10/29/96 - 11/05/96	Not Applicable	No flow at collection

One first quarter TLD (M-01) and one second quarter TLD (M-88) was missing in the field due to vandalism during this reporting period.

No other deviations occurred during this reporting period.

### Required Lower Limit of Detection (LLD) Values

All LLDs for this reporting period were within the acceptable limits required by the ODCM technical specifications.

### **Analytical Laboratory Services**

Entergy's nuclear sites discontinued utilizing the laboratory services of Entergy Services, Incorporated located in Little Rock, Arkansas, and began using River Bend Station's environmental laboratory located at St. Francisville, Louisiana on May 1, 1996.

### **Program Modifications**

Modifications to GGNS' Radiological Environmental Monitoring Program were approved during July 1996. These modifications were as follows:

- Air sampling locations AS-5 TC and AS-6 BF were discontinued.
- Cistern water sampling was discontinued.
- Sampling frequency for groundwater was changed from quarterly to annually and indicator location was changed from Arnold Acres to the GGNS Construction Well.
- Sampling of the discharge basin surface water was discontinued and the sampling frequency for the upstream and downstream surface water locations was changed from monthly to quarterly. In addition, an annual sample is to be collected at a downstream location during a liquid radwaste discharge.
- Vegetation sampling frequency was changed from three different sample types from two onsite gardens and one control location on a monthly basis to one sample type on a quarterly basis from one of the two onsite gardens and one sample type on a quarterly basis from a control location.
- Milk sampling frequency was changed to quarterly for indicator locations, when available, with sampling of the control location only occurring when indicator locations are present.
- Fish sampling was discontinued.
- Sampling frequency for the downstream sediment location (SEDHAM) was changed from semiannually to annually and an annual upstream location was added.
- TLDs were changed from sixteen inner and outer ring TLDs to sixteen inner/outer ring only and eight special interest areas.



Table 1.1

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-1 PG, Port Gibson City Barn (Control)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
9600038	9600038	12/26/95	01/02/96	0.020 ± 0.002	<0.025
9600371	9600371	01/02/96	01/09/96	0.022 ± 0.002	<0.021
9600819	9600819	01/09/96	01/16/96	0.027 ± 0.002	<0.016
9601471	9601471	01/16/96	01/23/96	0.023 ± 0.002	<0.017
9602152	9602152	01/23/96	01/30/96 *	0.006 ± 0.002	<0.014
9602486	9602486	01/30/96	02/06/96	0.018 ± 0.002	<0.024
9602961	9602961	02/06/96	02/13/96	0.006 ± 0.002	<0.015
9603384	9603384	02/13/96	02/20/96	0.014 ± 0.002	<0.012
9604154	9604154	02/20/96	02/27/96	0.023 ± 0.002	<0.017
9604521	9604521	02/27/96	03/05/96	0.011 ± 0.002	<0.021
9604863	9604863	03/05/96	03/12/96	0.018 ± 0.002	<0.034
9605343	9605343	03/12/96	03/19/96	0.010 ± 0.002	<0.022
9605657	9605657	03/19/96	03/26/96	0.019 ± 0.002	<0.018
9606234	9606234	03/26/96	04/02/96	0.013 ± 0.002	<0.022
9606687	9606687	04/02/96	04/09/96	0.021 ± 0.002	<0.015
9607029	9607029	04/09/96	04/16/96	0.010 ± 0.002	<0.017
9607456	9607456	04/16/96	04/23/96	0.010 ± 0.002	<0.017
9607742	9607742	04/23/96	04/30/96	0.009 ± 0.002	<0.022
960084	960078	04/30/96	05/07/96	0.0170 ± 0.00238	<0.0217
960146	960140	05/07/96	05/14/96	0.0170 ± 0.00203	<0.0324
960192	960192	05/14/96	05/21/96	0.0293 ± 0.00244	<0.0171
960227	960227	05/21/96	05/28/96	0.0311 ± 0.00241	<0.0240
960275	960275	05/28/96	06/04/96	0.0555 ± 0.00303	<0.0202
960340	960340	06/04/96	06/11/96	0.0262 ± 0.00225	<0.0288
960380	960380	06/11/96	06/18/96	0.00591 ± 0.00149	<0.0307
960430	960430	06/18/96	06/25/96 *	<0.00198	<0.0241

\* See Sample Deviations on Page 1 of this report.

Table 1.1

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-1 PG, Port Gibson City Barn (Control)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
960469	960469	06/25/96	07/02/96	0.0223 ± 0.00213	<0.0245
960504	960504	07/02/96	07/09/96	0.0269 ± 0.00224	<0.0238
960554	960554	07/09/96	07/16/96	0.0242 ± 0.00214	<0.0191
960609	960609	07/16/96	07/23/96	0.0140 ± 0.00178	<0.0245
960664	960664	07/23/96	07/30/96	0.0159 ± 0.00187	<0.0221
960703	960703	07/30/96	08/06/96	0.0194 ± 0.00196	<0.0240
960751	960751	08/06/96	08/13/96 *	0.00615 ± 0.00270	<0.0389
960788	960788	08/13/96	08/20/96	0.0322 ± 0.00232	<0.0230
960828	960828	08/20/96	08/27/96	0.0307 ± 0.00233	<0.0187
960847	960847	08/27/96	09/03/96	0.0191 ± 0.00190	<0.0279
960889	960889	09/03/96	09/10/96	0.0281 ± 0.00219	<0.0242
960926	960926	09/10/96	09/17/96	0.0406 ± 0.00259	<0.0150
960958	960958	09/17/96	09/24/96	0.0276 ± 0.00226	<0.0154
960985	960985	09/24/96	10/01/96	0.0299 ± 0.00230	<0.0197
961046	961046	10/01/96	10/08/96	0.0360 ± 0.00243	<0.0149
961098	961098	10/08/96	10/15/96	0.0211 ± 0.00203	<0.0155
961119	961119	10/15/96	10/22/96	0.0286 ± 0.00223	<0.0171
961166	961166	10/22/96	10/29/96	0.0188 ± 0.00191	<0.0167
961190	961190	10/29/96	11/05/96	0.0265 ± 0.00214	<0.0177
961230	961230	11/05/96	11/12/96	0.0218 ± 0.00207	<0.0140
961268	961268	11/12/96	11/19/96	0.0286 ± 0.00221	<0.0175
961314	961314	11/19/96	11/26/96	0.0216 ± 0.00204	<0.0130
961342	961342	11/26/96	12/03/96	0.0327 ± 0.00236	<0.0178
961380	961380	12/03/96	12/10/96	0.0296 ± 0.00232	<0.0186
961405	961405	12/10/96	12/17/96	0.0219 ± 0.00205	<0.0164
961456	961456	12/17/96	12/23/96	0.0244 ± 0.00230	<0.0218
97001	97001	12/23/96	12/31/96	0.0165 ± 0.00173	<0.0183

\* See Sample Deviations on Page 1 of this report.

Table 1.2

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-3 61VA, Vicksburg Airport (Control)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
9600039	9600039	12/26/95	01/02/96 *	0.018 ± 0.002	<0.025
9600372	9600372	01/02/96	01/09/96	0.022 ± 0.002	<0.021
9600820	9600820	01/09/96	01/16/96	0.013 ± 0.002	<0.016
9601472	9601472	01/16/96	01/23/96	0.019 ± 0.002	<0.017
9602153	9602153	01/23/96	01/30/96	0.014 ± 0.002	<0.014
9602487	9602487	01/30/96	02/06/96	0.018 ± 0.002	<0.024
9602962	9602962	02/06/96	02/13/96	0.007 ± 0.002	<0.015
9603385	9603385	02/13/96	02/20/96	0.014 ± 0.002	<0.012
9604155	9604155	02/20/96	02/27/96	0.024 ± 0.002	<0.017
9604522	9604522	02/27/96	03/05/96	0.022 ± 0.003	<0.021
9604864	9604864	03/05/96	03/12/96	0.018 ± 0.002	<0.034
9605344	9605344	03/12/96	03/19/96	0.010 ± 0.002	<0.022
9605658	9605658	03/19/96	03/26/96	0.013 ± 0.002	<0.018
9606235	9606235	03/26/96	04/02/96	0.012 ± 0.002	<0.022
9606688	9606688	04/02/96	04/09/96	0.019 ± 0.002	<0.015
9607030	9607030	04/09/96	04/16/96	0.014 ± 0.002	<0.017
9607457	9607457	04/16/96	04/23/96	0.008 ± 0.002	<0.017
9607743	9607743	04/23/96	04/30/96	0.009 ± 0.002	<0.022
960085	960079	04/30/96	05/07/96	0.0149 ± 0.00233	<0.0241
960147	960141	05/07/96	05/14/96	0.0217 ± 0.00218	<0.0195
960193	960193	05/14/96	05/21/96	0.0258 ± 0.00223	<0.0258
960228	960228	05/21/96	05/28/96	0.0121 ± 0.00179	<0.0223
960276	960276	05/28/96	06/04/96	0.0268 ± 0.00228	<0.0163
960341	960341	06/04/96	06/11/96	0.0206 ± 0.00206	<0.0356
960381	960381	06/11/96	06/18/96	0.00960 ± 0.00165	<0.0333
960431	960431	06/18/96	06/25/96	0.00965 ± 0.00170	<0.0270

\* See Sample Deviations on Page 1 of this report.

Table 1.2

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-3 61VA, Vicksburg Airport (Control)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
960470	960470	06/25/96	07/02/96	0.0210 ± 0.00210	<0.0178
960505	960505	07/02/96	07/09/96	0.0233 ± 0.00213	<0.0300
960555	960555	07/09/96	07/16/96	0.0236 ± 0.00212	<0.0235
960610	960610	07/16/96	07/23/96	0.0135 ± 0.00176	<0.0388
960665	960665	07/23/96	07/30/96	0.0135 ± 0.00186	<0.0264
960704	960704	07/30/96	08/06/96	0.0164 ± 0.00188	<0.0315
960752	960752	08/06/96	08/13/96	0.0160 ± 0.00191	<0.0264
960789	960789	08/13/96	08/20/96	0.0252 ± 0.00211	<0.0248
960829	960829	08/20/96	08/27/96	0.0300 ± 0.00231	<0.0179
960848	960848	08/27/96	09/03/96	0.0181 ± 0.00188	<0.0394
960890	960890	09/03/96	09/10/96	0.0250 ± 0.00209	<0.0179
960927	960927	09/10/96	09/17/96	0.0354 ± 0.00244	<0.0152
960959	960959	09/17/96	09/24/96	0.0262 ± 0.00216	<0.0150
960986	960986	09/24/96	10/01/96	0.0275 ± 0.00224	<0.0168
961047	961047	10/01/96	10/08/96	0.0288 ± 0.00222	<0.0126
961099	961099	10/08/96	10/15/96	0.0196 ± 0.00198	<0.0154
961120	961120	10/15/96	10/22/96	0.0241 ± 0.00209	<0.0167
961167	961167	10/22/96	10/29/96	0.0156 ± 0.00179	<0.0196
961191	961191	10/29/96	11/05/96	0.0294 ± 0.00349	<0.0351
961231	961231	11/05/96	11/12/96	0.0191 ± 0.00199	<0.0164
961269	961269	11/12/96	11/19/96	0.0241 ± 0.00207	<0.0156
961315	961315	11/19/96	11/26/96	0.0180 ± 0.00191	<0.0165
961343	961343	11/26/96	12/03/96	0.0299 ± 0.00230	<0.0159
961381	961381	12/03/96	12/10/96	0.0239 ± 0.00216	<0.0162
961406	961406	12/10/96	12/17/96	0.0241 ± 0.00213	<0.0162
961457	961457	12/17/96	12/23/96	0.0225 ± 0.00230	<0.0215
97002	97002	12/23/96	12/31/96	0.0159 ± 0.00167	<0.0149

Table 1.3

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-5 TC, Old Training Center (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
9600040	9600040	12/26/95	01/02/96	0.020 ± 0.002	<0.025
9600373	9600373	01/02/96	01/09/96	0.024 ± 0.003	<0.021
9600821	9600821	01/09/96	01/16/96	0.012 ± 0.002	<0.016
9601473	9601473	01/16/96	01/23/96	0.016 ± 0.002	<0.017
9602154	9602154	01/23/96	01/30/96	0.013 ± 0.002	<0.014
9602488	9602488	01/30/96	02/06/96 *	0.017 ± 0.003	<0.024
9602963	9602963	02/06/96	02/13/96	0.005 ± 0.002	<0.015
9603386	9603386	02/13/96	02/20/96	0.015 ± 0.002	<0.012
9604156	9604156	02/20/96	02/27/96	0.022 ± 0.002	<0.017
9604523	9604523	02/27/96	03/05/96	0.018 ± 0.002	<0.021
9604865	9604865	03/05/96	03/12/96	0.015 ± 0.002	<0.034
9605345	9605345	03/12/96	03/19/96	0.010 ± 0.002	<0.022
9605659	9605659	03/19/96	03/26/96	0.016 ± 0.002	<0.018
9606236	9606236	03/26/96	04/02/96	0.014 ± 0.002	<0.022
9606689	9606689	04/02/96	04/09/96	0.019 ± 0.002	<0.015
9607031	9607031	04/09/96	04/16/96	0.016 ± 0.002	<0.017
9607458	9607458	04/16/96	04/23/96	0.009 ± 0.002	<0.017
9607744	9607744	04/23/96	04/30/96	0.009 ± 0.002	<0.022
960086	960080	04/30/96	05/07/96	0.0129 ± 0.00225	<0.0341
960148	960142	05/07/96	05/14/96	0.0242 ± 0.00225	<0.0211
960194	960194	05/14/96	05/21/96	0.0240 ± 0.00217	<0.0184
960229	960229	05/21/96	05/28/96	0.0251 ± 0.00224	<0.0174
960277	960277	05/28/96	06/04/96	0.0432 ± 0.00273	<0.0403
960342	960342	06/04/96	06/11/96	0.0414 ± 0.00266	<0.0234
960382	960382	06/11/96	06/18/96	0.0171 ± 0.00192	<0.0189
960432	960432	06/18/96	06/25/96	0.0122 ± 0.00181	<0.0257

\* See Sample Deviations on Page 1 of this report.

Table 1.3

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-5 TC, Old Training Center (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
960471	960471	06/25/96	07/02/96	0.0209 ± 0.00209	<0.0261
960506	960506	07/02/96	07/09/96	0.0292 ± 0.00230	<0.0269
960556	960556	07/09/96	07/16/96	0.0250 ± 0.00216	<0.0224
960611	960611	07/16/96	07/23/96	0.0146 ± 0.00179	<0.0195
960666	960666	07/23/96	07/30/96	0.0144 ± 0.00182	<0.0248
960705	960705	07/30/96	08/06/96	0.0188 ± 0.00195	<0.0227
**	**	**	**	**	**

\*\* See Program Modifications on Page 2 of this report.



Table 1.4

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-6 BF, GGNS Ball Field (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
9600041	9600041	12/26/95	01/02/96	0.015 ± 0.002	<0.025
9600374	9600374	01/02/96	01/09/96	0.026 ± 0.002	<0.021
9600822	9600822	01/09/96	01/16/96	0.015 ± 0.002	<0.016
9601474	9601474	01/16/96	01/23/96	0.019 ± 0.002	<0.017
9602155	9602155	01/23/96	01/30/96	0.015 ± 0.002	<0.014
9602489	9602489	01/30/96	02/06/96 *	0.018 ± 0.002	<0.024
9602964	9602964	02/06/96	02/13/96	0.006 ± 0.002	<0.015
9603387	9603387	02/13/96	02/20/96	0.012 ± 0.002	<0.012
9604157	9604157	02/20/96	02/27/96	0.022 ± 0.002	<0.017
9604524	9604524	02/27/96	03/05/96	0.018 ± 0.002	<0.021
9604866	9604866	03/05/96	03/12/96	0.015 ± 0.002	<0.034
9605346	9605346	03/12/96	03/19/96	0.010 ± 0.002	<0.022
9605660	9605660	03/19/96	03/26/96	0.020 ± 0.002	<0.018
9606237	9606237	03/26/96	04/02/96	0.014 ± 0.002	<0.022
9606690	9606690	04/02/96	04/09/96	0.018 ± 0.002	<0.015
9607032	9607032	04/09/96	04/16/96	0.017 ± 0.002	<0.017
9607459	9607459	04/16/96	04/23/96	0.008 ± 0.002	<0.017
9607745	9607745	04/23/96	04/30/96	0.010 ± 0.002	<0.022
960087	960081	04/30/96	05/07/96	0.0150 ± 0.00232	<0.0144
960149	960143	05/07/96	05/14/96	0.0210 ± 0.00216	<0.0360
960195	960195	05/14/96	05/21/96	0.0311 ± 0.00238	<0.0253
960230	960230	05/21/96	05/28/96	0.0444 ± 0.00277	<0.0222
960278	960278	05/28/96	06/04/96	0.0423 ± 0.00270	<0.0252
960343	960343	06/04/96	06/11/96	0.0473 ± 0.00280	<0.0289
960383	960383	06/11/96	06/18/96	0.0149 ± 0.00184	<0.0230
960433	960433	06/18/96	06/25/96	0.0130 ± 0.00184	<0.0218

\* See Sample Deviations on Page 1 of this report.



Table 1.4

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-6 BF, GGNS Ball Field (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
960472	960472	06/25/96	07/02/96	0.0248 ± 0.00221	<0.0192
960507	960507	07/02/96	07/09/96	0.0291 ± 0.00230	<0.0304
960557	960557	07/09/96	07/16/96	0.0272 ± 0.00223	<0.0268
960612	960612	07/16/96	07/23/96	0.0157 ± 0.00184	<0.0251
960667	960667	07/23/96	07/30/96	0.0172 ± 0.00192	<0.0306
960706	960706	07/30/96	08/06/96	0.0174 ± 0.00189	<0.0268
**	**	**	**	**	**

\*\* See Program Modifications on Page 2 of this report.

Table 1.5

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Cartridge)

Units: pCi/m<sup>3</sup>

Location: AS-7 UH, IBEW Union Hall (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
9600042	9600042	12/26/95	01/02/96	0.018 ± 0.002	<0.025
9600375	9600375	01/02/96	01/09/96	0.026 ± 0.002	<0.021
9600823	9600823	01/09/96	01/16/96	0.015 ± 0.002	<0.016
9601475	9601475	01/16/96	01/23/96	0.019 ± 0.002	<0.017
9602156	9602156	01/23/96	01/30/96	0.016 ± 0.002	<0.014
9602490	9602490	01/30/96	02/06/96 *	0.008 ± 0.002	<0.024
9602965	9602965	02/06/96	02/13/96	0.008 ± 0.002	<0.015
9603388	9603388	02/13/96	02/20/96	0.010 ± 0.002	<0.012
9604158	9604158	02/20/96	02/27/96	0.021 ± 0.002	<0.017
9604525	9604525	02/27/96	03/05/96	0.016 ± 0.002	<0.021
9604867	9604867	03/05/96	03/12/96 *	<0.007	<0.034
9605347	9605347	03/12/96	03/19/96	0.011 ± 0.002	<0.022
9605661	9605661	03/19/96	03/26/96	0.020 ± 0.002	<0.018
9606238	9606238	03/26/96	04/02/96	0.013 ± 0.002	<0.022
9606691	9606691	04/02/96	04/09/96	0.020 ± 0.002	<0.015
9607033	9607033	04/09/96	04/16/96	0.014 ± 0.002	<0.017
9607460	9607460	04/16/96	04/23/96	0.012 ± 0.002	<0.017
9607746	9607746	04/23/96	04/30/96	0.010 ± 0.002	<0.022
960088	960082	04/30/96	05/07/96	0.0150 ± 0.00232	<0.0267
960150	960144	05/07/96	05/14/96	0.0225 ± 0.00220	<0.0161
960196	960196	05/14/96	05/21/96	0.0274 ± 0.00227	<0.0369
960231	960231	05/21/96	05/28/96	0.0309 ± 0.00240	<0.0370
960279	960279	05/28/96	06/04/96	0.0452 ± 0.00277	<0.0224
960344	960344	06/04/96	06/11/96	0.0453 ± 0.00275	<0.0228
960384	960384	06/11/96	06/18/96	0.0180 ± 0.00194	<0.0243
960434	960434	06/18/96	06/25/96	0.0138 ± 0.00186	<0.0246

\* See Sample Deviations on Page 1 of this report.

Table 1.5

Sample Type: Air Particulate and Radioiodine

Collection: Continuous with Weekly Exchange

Analysis: Gross Beta (Particulate) and Iodine-131 (Radioiodine Catcher)

Units: pCi/m<sup>3</sup>

Location: AS-7 UH, IBEW Union Hall (Indicator)

Particulate Lab Number	Radioiodine Lab Number	Start Date	End Date	Gross Beta	I-131
		<u>Required LLD</u> →		<u>0.01</u>	<u>0.07</u>
960473	960473	06/25/96	07/02/96	0.0234 ± 0.00217	<0.0281
960508	960508	07/02/96	07/09/96	0.0267 ± 0.00223	<0.0271
960558	960558	07/09/96	07/16/96	0.0251 ± 0.00217	<0.0380
960613	960613	07/16/96	07/23/96	0.0145 ± 0.00179	<0.0272
960668	960668	07/23/96	07/30/96	0.0140 ± 0.00181	<0.0245
960707	960707	07/30/96	08/06/96	0.0169 ± 0.00188	<0.0349
960753	960753	08/06/96	08/13/96 *	0.0166 ± 0.00204	<0.0309
960790	960790	08/13/96	08/20/96	0.0336 ± 0.00236	<0.0258
960830	960830	08/20/96	08/27/96	0.0343 ± 0.00243	<0.0284
960849	960849	08/27/96	09/03/96	0.0180 ± 0.00188	<0.0353
960891	960891	09/03/96	09/10/96	0.0262 ± 0.00213	<0.0223
960891GG	960891GG	09/03/96	09/10/96	0.0276 ± 0.00217	<0.0224
960928	960928	09/10/96	09/17/96	0.0423 ± 0.00265	<0.0168
960929GG	960929GG	09/10/96	09/17/96	0.0364 ± 0.00249	<0.0191
960960	960960	09/17/96	09/24/96	0.0301 ± 0.00228	<0.0169
960987	960987	09/24/96	10/01/96	0.0317 ± 0.00236	<0.0170
960988GG	960988GG	09/24/96	10/01/96	0.0260 ± 0.00219	<0.0169
961048	961048	10/01/96	10/08/96	0.0404 ± 0.00254	<0.0182
961100	961100	10/08/96	10/15/96	0.0228 ± 0.00208	<0.0192
961121	961121	10/15/96	10/22/96	0.0327 ± 0.00234	<0.0176
961122GG	961122GG	10/15/96	10/22/96	0.0284 ± 0.00222	<0.0178
961168	961168	10/22/96	10/29/96	0.0175 ± 0.00187	<0.0165
961192	961192	10/29/96	11/05/96 *	0.0269 ± 0.00216	<0.0193
961232	961232	11/05/96	11/12/96	0.0219 ± 0.00207	<0.0155
961270	961270	11/12/96	11/19/96	0.0277 ± 0.00218	<0.0164
961316	961316	11/19/96	11/26/96	0.0224 ± 0.00206	<0.0202
961344	961344	11/26/96	12/03/96	0.0351 ± 0.00243	<0.0173
961382	961382	12/03/96	12/10/96	0.0300 ± 0.00233	<0.0151
961407	961407	12/10/96	12/17/96	0.0207 ± 0.00202	<0.0148
961458	961458	12/17/96	12/23/96	0.0229 ± 0.00226	<0.0219
97003	97003	12/23/96	12/31/96	0.0199 ± 0.00185	<0.0175

\* See Sample Deviations on Page 1 of this report.

Table 1.6  
Sample Type: Air Particulate  
Collection: Quarterly Composites of Weekly Samples  
Analysis: Gamma  
Units: pCi/m<sup>3</sup>

Location	Lab Number	Start Date	End Date	Cs-134	Cs-137
		<u>Required LLD</u> →		<u>0.05</u>	<u>0.06</u>
AS-1 PG, Port Gibson City Barn (Control)	9607626	12/27/95	03/26/96	<0.0008	<0.0005
AS-1 PG, Port Gibson City Barn (Control)	9607653	03/26/96	06/25/96	<0.006	<0.008
AS-1 PG, Port Gibson City Barn (Control)	961019	06/25/96	09/24/96	<0.0019	<0.0016
AS-1 PG, Port Gibson City Barn (Control)	970088	09/24/96	12/31/96	<0.0012	<0.0015
AS-3 61VA, Vicksburg Airport (Control)	9607627	12/27/95	03/26/96	<0.0009	<0.0011
AS-3 61VA, Vicksburg Airport (Control)	9607654	03/26/96	06/25/96	<0.003	<0.001
AS-3 61VA, Vicksburg Airport (Control)	961020	06/25/96	09/24/96	<0.0013	<0.0018
AS-3 61VA, Vicksburg Airport (Control)	970089	09/24/96	12/31/96	<0.0015	<0.0016
AS-5 TC, Old Training Center (Indicator)	9607628	12/27/95	03/26/96	<0.0008	<0.0009
AS-5 TC, Old Training Center (Indicator)	9607655	03/26/96	06/25/96	<0.005	<0.002
AS-5 TC, Old Training Center (Indicator) *	961021	06/25/96	08/06/96	<0.0041	<0.0051
AS-6 BF, GGNS Ball Field (Indicator)	9607629	12/27/95	03/26/96	<0.0008	<0.0006
AS-6 BF, GGNS Ball Field (Indicator)	9607656	03/26/96	06/25/96	<0.004	<0.004
AS-6 BF, GGNS Ball Field (Indicator) *	961022	06/25/96	08/06/96	<0.0036	<0.0030
AS-7 UH, IBEW Union Hall (Indicator)	9607630	12/27/95	03/26/96	<0.0008	<0.0006
AS-7 UH, IBEW Union Hall (Indicator)	9607657	03/26/96	06/25/96	<0.002	<0.006
AS-7 UH, IBEW Union Hall (Indicator)	961023	06/25/96	09/24/96	<0.0014	<0.0012
AS-7 UH, IBEW Union Hall (Indicator)	970090	09/24/96	12/31/96	<0.0013	<0.0012

\* See Program Modifications on Page 2 of this report.

Table 2.1

Sample Type: Cistern Water

Collection: Monthly Grab

Analysis: Gross Beta, Iodine-131 and Gamma

Units: pCi/l

Location: Willis Cistern (Control)

Lab Number	Collection Date	Gross Beta	I-131	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
<b>Required LLD →</b>		<b>4.0</b>	<b>1.0</b>	<b>15</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>18</b>	<b>60</b>	<b>15</b>
9600979	01/17/96	3.1 ± 2.0	<0.8	<2	<4	<2	<2	<5	<4	<3	<2	<2	<13	<4
9600980GG	01/17/96	3.4 ± 2.0	<0.7	<2	<4	<2	<2	<6	<6	<3	<3	<3	<11	<4
9603390	02/20/96	5.4 ± 1.9	<0.8	<4	<8	<4	<4	<9	<7	<4	<4	<4	<18	<4
9603391GG	02/20/96	4.1 ± 1.9	<0.6	<2	<5	<2	<3	<5	<4	<2	<3	<3	<11	<3
9605337	03/19/96	<2.6	<0.7	<3	<3	<3	<2	<6	<6	<3	<3	<3	<11	<3
9607303	04/19/96	<3.4	<0.9	<3	<7	<3	<3	<7	<8	<3	<4	<4	<15	<5
960127	05/13/96	2.58 ± 2.30	<0.86	<5.51	<10.1	<4.97	<4.32	<12.8	<10.8	<6.49	<4.84	<4.63	<14.6	<9.40
960127 *	05/13/96	NA	<0.90	<4.01	<9.51	<4.15	<3.87	<9.08	<7.96	<6.34	<4.40	<5.52	<21.2	<6.54
960288	06/05/96	3.13 ± 1.70	<0.90	<9.30	<18.0	<8.58	<7.27	<13.2	<13.6	<8.68	<9.01	<9.92	<27.9	<13.1
960493	07/08/96	6.47 ± 2.42	<0.89	<6.38	<8.66	<4.40	<3.78	<10.9	<9.20	<5.39	<4.82	<6.70	<19.3	<6.40
**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\* Duplicate gamma and Iodine-131 analysis only.

\*\* See Program Modifications on Page 2 of this report.

Table 2.2

Sample Type: Cistern Water

Collection: Monthly Grab

Analysis: Gross Beta, Iodine-131 and Gamma

Units: pCi/l

## Location: McGee Cistern (Indicator)

Lab Number	Collection Date	Gross Beta	I-131	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
Required LLD →		4.0	1.0	15	30	15	15	30	30	15	15	18	60	15
9600981	01/17/96	<2.8	<0.6	<2	<3	<2	<2	<4	<5	<2	<3	<2	<10	<3
9600982GG	01/17/96	<2.9	<0.8	<3	<7	<3	<3	<8	<6	<3	<3	<4	<19	<4
9603392	02/20/96	<2.8	<0.8	<4	<5	<4	<3	<7	<9	<4	<4	<4	<13	<5
9603393GG	02/20/96	<2.8	<0.7	<3	<3	<3	<2	<6	<6	<3	<4	<3	<10	<3
9605338	03/19/96	<2.7	<0.8	<3	<5	<4	<4	<7	<8	<4	<4	<3	<14	<4
9607304	04/19/96	<3.1	<0.8	<3	<6	<3	<3	<6	<6	<3	<3	<3	<13	<3
960128	05/13/96	<3.14	<0.77	<4.45	<9.90	<5.31	<5.06	<11.1	<5.76	<4.22	<4.20	<4.62	<15.3	<6.95
960128 *	05/13/96	NA	<0.89	<4.82	<8.61	<3.52	<4.72	<10.4	<8.84	<3.85	<4.80	<4.36	<25.6	<11.1
960289	06/05/96	2.09 ± 1.51	<0.84	<10.1	<16.3	<9.59	<9.17	<15.9	<12.7	<9.34	<8.69	<8.51	<34.6	<11.6
960494	07/08/96	<3.47	<0.81	<5.63	<8.63	<4.31	<3.40	<7.42	<7.63	<4.39	<4.33	<4.62	<23.6	<9.09
**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\* Duplicate gamma and Iodine-131 analysis only.

\*\* See Program Modifications on Page 2 of this report.



Table 2.3

Sample Type: Cistern Water

Collection: Quarterly Composite of Monthly Samples

Analysis: Tritium

Units: pCi/l

Location	Lab Number	Begin Date	End Date	H-3
			<u>Required LLD</u> →	<u>2000</u>
Willis Cistern (Control)	9605339	01/17/96	03/19/96	<220
Willis Cistern (Control)	9605340GG	01/17/96	03/19/96	<250
Willis Cistern (Control)	960313	04/19/96	06/05/96	<253
Willis Cistern (Control)	960303GG	04/19/96	06/05/96	<253
Willis Cistern (Control) *	960881	07/08/96	07/08/96	<248
McGee Cistern (Indicator)	9605341	01/17/96	03/19/96	<250
McGee Cistern (Indicator)	9605342GG	01/17/96	03/19/96	<250
McGee Cistern (Indicator)	960314	04/19/96	06/05/96	<253
McGee Cistern (Indicator)	960304GG	04/19/96	06/05/96	<251
McGee Cistern (Indicator) *	960882	07/08/96	07/08/96	<248

\* See Program Modifications on Page 2 of this report.



Table 3.1

Sample Type: Groundwater

Collection: Quarterly Grab

Analysis: Tritium and Gamma

Units: pCi/l

## Location: City of Port Gibson (Control)

Lab Number	Collection Date	H-3	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	<b>Required LLD →</b>	<b>2000</b>	<b>15</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>18</b>	<b>60</b>	<b>15</b>
9600618	01/09/96	<310	<3	<5	<3	<3	<7	<5	<3	<4	<3	<3	<15	<4
9600619GG	01/09/96	<310	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<7	<2
9606693	04/09/96	<250	<3	<7	<3	<3	<7	<7	<3	<4	<4	<3	<14	<4
960511	07/08/96	<248	<5.89	<12.9	<4.47	<5.54	<14.5	<9.95	<5.50	<7.54	<3.47	<6.23	<22.6	<10.7
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

\* See Program Modifications on Page 2 of this report.

Table 3.2

Sample Type: Groundwater

Collection: Quarterly Grab

Analysis: Tritium and Gamma

Units: pCi/l

Location: Arnold Acres (Indicator)

Lab Number	Collection Date	H-3	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	<b>Required LLD →</b>	<b>2000</b>	<b>15</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>18</b>	<b>60</b>	<b>15</b>
9600692	01/09/96	<310	<2	<2	<2	<2	<4	<4	<2	<3	<2	<2	<8	<2
9600693GG	01/09/96	<310	<2	<3	<2	<2	<5	<5	<2	<3	<2	<2	<10	<3
9606694	04/09/96	<250	<3	<5	<3	<2	<5	<5	<3	<4	<3	<3	<11	<3
960512	07/08/96	<249	<5.53	<7.81	<3.59	<4.85	<13.8	<7.61	<4.58	<7.37	<3.43	<6.17	<17.6	<8.82
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

\* See Program Modifications on Page 2 of this report.

Table 4.1

Sample Type: Surface Water

Collection: Monthly Grab

Analysis: Gamma

Units: pCi/l

Location: Upstream Mississippi River (Control)

Lab Number	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
Required LLD →		15	30	15	15	30	30	15	15	15	18	60	15
9600195	01/02/96	<3	<5	<3	<3	<6	<7	<4	<5	<4	<3	<15	<5
9600198GG	01/02/96	<3	<6	<3	<3	<6	<5	<3	<5	<2	<3	<16	<6
9602717	02/06/96	<4	<9	<4	<4	<10	<7	<4	<7	<4	<4	<25	<6
9602720GG	02/06/96	<3	<7	<3	<3	<8	<6	<4	<4	<3	<4	<18	<5
96046711	03/05/96	<2	<3	<3	<2	<5	<5	<3	<5	<3	<3	<12	<3
9606613	04/02/96	<3	<6	<4	<3	<7	<8	<3	<5	<4	<4	<15	<4
960056	05/01/96	<5.52	<15.0	<7.78	<11.8	<21.2	<16.7	<11.0	<8.42	<10.2	<8.77	<33.3	<12.6
960310	06/04/96	<7.52	<16.5	<7.30	<7.47	<18.2	<13.2	<7.98	<12.5	<6.89	<8.36	<33.8	<14.5
960489	07/02/96	<8.68	<11.5	<7.04	<1.47	<14.5	<9.95	<7.85	<14.4	<7.56	<5.41	<31.3	<14.5
960711	08/06/96	<8.01	<18.4	<6.53	<4.65	<20.3	<11.7	<4.49	<8.69	<8.56	<9.78	<28.2	<11.6
960862	09/03/96	<9.27	<15.4	<8.20	<6.20	<17.0	<7.91	<5.96	<9.80	<6.64	<3.47	<36.6	<14.1
961002	10/01/96	<5.45	<5.49	<4.49	<5.22	<10.1	<7.70	<5.50	<5.60	<3.09	<5.78	<16.9	<5.98
961201	11/05/96	<3.67	<9.63	<4.66	<3.31	<14.4	<8.61	<4.57	<9.36	<4.36	<5.52	<30.5	<8.81
961357	12/03/96	<5.69	<11.0	<6.42	<4.84	<13.5	<4.48	<6.39	<9.70	<3.91	<5.27	<24.6	<10.3

\* See Program Modifications on Page 2 of this report.

Table 4.2

Sample Type: Surface Water

Collection: Monthly Grab

Analysis: Gamma

Units: pCi/l

Location: Downstream Mississippi River (Indicator:)

Lab Number	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
<b>Required LLD →</b>		<b>15</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>18</b>	<b>60</b>	<b>15</b>
9600196	01/02/96	<3	<3	<3	<2	<5	<5	<3	<4	<3	<3	<12	<3
9600199GG	01/02/96	<4	<8	<4	<4	<10	<7	<5	<7	<4	<4	<26	<7
9602718	02/06/96	<3	<7	<4	<3	<9	<7	<4	<7	<4	<4	<23	<6
9602721GG	02/06/96	<2	<4	<2	<2	<4	<3	<2	<3	<2	<2	<10	<3
9604712	03/05/96	<3	<5	<3	<4	<7	<8	<4	<5	<3	<4	<15	<4
9606614	04/02/96	<4	<10	<5	<5	<7	<10	<4	<6	<5	<5	<18	<6
960057	05/01/96	<7.63	<12.8	<7.04	<8.43	<16.9	<11.2	<10.3	<9.29	<7.42	<8.69	<25.2	<8.41
960311	06/04/96	<11.4	<18.3	<11.0	<10.8	<21.6	<13.1	<9.92	<14.4	<10.3	<10.3	<37.0	<14.3
960490	07/02/96	<4.38	<12.4	<3.78	<5.74	<12.0	<10.5	<5.30	<10.7	<5.34	<5.47	<26.2	<3.39
960712	08/06/96	<5.67	<13.1	<9.55	<8.03	<18.6	<9.60	<7.18	<9.34	<8.84	<6.25	<27.9	<11.7
960708 *	08/06/96	<8.01	<15.1	<4.61	<5.44	<8.31	<15.5	<8.94	<8.95	<7.29	<9.88	<21.7	<9.52
960863	09/03/96	<5.54	<13.3	<7.37	<9.18	<20.4	<16.1	<7.21	<9.03	<9.11	<8.32	<23.7	<10.8
961901	10/01/96	<5.60	<10.1	<6.35	<3.43	<10.9	<7.99	<6.45	<6.15	<4.40	<4.29	<21.7	<6.16
961202	11/05/96	<4.55	<7.40	<5.53	<4.22	<7.34	<6.58	<4.55	<8.38	<3.46	<3.29	<23.7	<9.85
961358	12/03/96	<3.77	<11.0	<4.64	<3.44	<9.48	<7.14	<5.04	<9.01	<3.71	<5.23	<22.8	<11.0

\* Annual sample collected during radwaste discharge.

\*\* See Program Modifications on Page 2 of this report.

Table 4.3

Sample Type: Surface Water

Collection: Monthly Composite

Analysis: Gamma

Units: pCi/l

Location: Discharge Basin (Indicator)

Lab Number	Start Date	End Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
Required LLD →			15	30	15	15	30	30	15	15	15	18	60	15
9602719	01/02/96	02/06/96	<2	<4	<2	4 ± 1	<4	<3	<2	<3	<2	<2	<12	<3
9602722GG	01/02/96	02/06/96	<2	<4	<2	2 ± 1	<4	<3	<2	<3	<2	<2	<11	<3
9604779	02/06/96	03/04/96	<2	<4	<2	4 ± 1	<4	<3	<2	<4	<2	<2	<12	<3
9606615	03/04/96	04/01/96	<2	<6	<3	3 ± 1	<5	<4	<3	<4	<2	<3	<14	<4
960058	04/01/96	05/02/96	<9.00	<19.5	<8.08	<14.3	<17.6	<16.7	<10.8	<11.6	<10.0	<11.7	<40.6	<12.0
960059GG	04/01/96	05/02/96	<9.46	<15.6	<8.22	<12.3	<21.6	<15.1	<9.93	<10.6	<9.65	<9.79	<39.1	<11.6
960312	05/02/96	06/03/96	<8.12	<12.9	<4.65	<9.13	<15.0	<15.5	<9.50	<14.0	<6.26	<7.80	<44.0	<8.35
960491	06/03/96	07/02/96	<6.00	<7.12	<6.08	<6.07	<8.45	<6.03	<6.60	<9.62	<5.23	<4.75	<22.0	<11.3
960713	07/02/96	08/06/96	<5.26	<10.9	<6.60	<5.23	<10.1	<7.23	<5.81	<6.02	<4.20	<5.03	<18.2	<7.53
960864	08/06/96	09/04/96	<3.59	<12.8	<2.24	<7.16	<5.04	<9.22	<3.18	<7.20	<4.59	<5.73	<23.2	<9.18
961003	09/04/96	10/01/96	<5.11	<8.67	<6.15	<5.11	<10.5	<9.64	<6.34	<6.11	<5.27	<6.01	<22.1	<7.92
961203	10/01/96	11/05/96	<4.80	<5.67	<5.53	<7.11	<10.8	<7.63	<4.18	<8.91	<4.42	<4.84	<18.4	<7.26
961359	11/05/96	12/04/96	<4.77	<9.31	<4.09	<5.54	<8.19	<6.31	<4.81	<7.84	<4.77	<6.24	<24.4	<9.03
970069	12/04/96	01/07/97	<4.64	<9.91	<3.32	<5.35	<6.32	<6.51	<6.08	<8.96	<3.15	<5.90	<20.7	<6.56

\* See Program Modifications on Page 2 of this report.

Table 4.4

Sample Type: Surface Water

Collection: Quarterly Composite of Monthly Samples

Analysis: Tritium

Units: pCi/l

Location	Lab Number	Begin Date	End Date	H-3
		<u>Required LLD</u> →		<u>2000</u>
Upstream Ms River (Control)	9604781	01/02/96	03/05/96	<250
Upstream Ms River (Control)	9604782GG	01/02/96	03/05/96	<250
Upstream Ms River (Control)	960315	04/02/96	06/04/96	<252
Upstream Ms River (Control)	960317GG	04/02/96	06/04/96	<253
Upstream Ms River (Control)	960865	07/02/96	09/03/96	219 ± 108
Upstream Ms River (Control)	961138	07/02/96	07/02/96	114 ± 106
Upstream Ms River (Control)	961135	08/06/96	08/06/96	150 ± 107
Upstream Ms River (Control)	961139	09/03/96	09/03/96	167 ± 106
Upstream Ms River (Control)	961002	10/01/96	10/01/96	117 ± 106
Downstream Ms River (Indicator)	9604783	01/02/96	03/05/96	<250
Downstream Ms River (Indicator)	9604784GG	01/02/96	03/05/96	<250
Downstream Ms River (Indicator)	960316	04/02/96	06/04/96	<253
Downstream Ms River (Indicator)	960318GG	04/02/96	06/04/96	<252
Downstream Ms River (Indicator)	960866	07/02/96	09/03/96	147 ± 107
Downstream Ms River (Indicator)	961140	07/02/96	07/02/96	160 ± 106
Downstream Ms River (Indicator)	961136	08/06/96	08/06/96	271 ± 109
Downstream Ms River (Indicator)	961141	09/03/96	09/03/96	252 ± 108
Downstream Ms River (Indicator)	961001	10/01/96	10/01/96	140 ± 107
Downstream Ms River (Indicator) *	960708	08/06/96	08/06/96	412 ± 111
Downstream Ms River (Indicator) *	961137GG	08/06/96	08/06/96	359 ± 110
Discharge Basin (Indicator)	9606616	01/02/96	04/01/96	16410 ± 270
Discharge Basin (Indicator)	9606773GG	01/02/96	04/01/96	16440 ± 270
Discharge Basin (Indicator)	960492	04/01/96	07/02/96	13875 ± 242
Discharge Basin (Indicator)	961004	07/02/96	10/01/96	11676 ± 228
Discharge Basin (Indicator)	970070	10/01/96	01/07/97	10835 ± 222

\* Annual sample collected during radwaste discharge.

\*\* See Program Modifications on Page 2 of this report.



Table 5.1

Sample Type: Broadleaf Vegetation

Collection: Monthly Grab

Analysis: Iodine-131 and Gamma

Units: pCi/kg

Location: Sector K, 17 km - Alcorn State University (Control)

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<b>Required LLD →</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>80</b>
9600637	01/10/96	Collards	<17	<15	<16
9600638	01/10/96	Rape	<12	<16	<12
9600639	01/10/96	Kale	<13	<21	<14
9602726	02/09/96	Kale	<18	<19	<14
9602727	02/09/96	Rape	<17	<13	<15
9602728	02/09/96	Cabbage	<27	<28	<24
9604970	03/12/96	Collards	<25	<26	<19
9604971	03/12/96	Clover	<25	<22	<23
9604972	03/12/96	Henbit	<28	<23	<27
9606856	04/10/96	Rape	<17	<20	<19
9606857	04/10/96	Mustard Greens	<15	<15	<12
9606858	04/10/96	Kale	<21	<17	<20
960170	05/14/96	Mustards	<17.9	<12.6	<19.6
960172	05/14/96	Rape	<29.3	<34.4	<35.3
960175	05/14/96	Collards	<23.3	<14.8	<14.5
960347	06/10/96	Kale	<22.4	<15.3	<25.6
960351	06/10/96	Swiss Chard	<33.9	<18.2	<26.2
960349	06/10/96	Collards	<19.1	<22.3	<20.6
960350GG	06/10/96	Collards	<39.3	<17.4	<25.2
960348GG	06/10/96	Swiss Chard	<32.1	<23.7	<35.4
960346GG	06/10/96	Kale	<28.1	<23.9	<23.0



Table 5.1

Sample Type: Broadleaf Vegetation

Collection: Monthly Grab

Analysis: Iodine-131 and Gamma

Units: pCi/kg

Location: Sector K, 17 km - Alcorn State University (Control) \*

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<u>Required LLD</u> →	<u>60</u>	<u>60</u>	<u>60</u>	<u>80</u>
960520	07/10/96	Collards	<25.5	<13.7	<35.0
960521	07/10/96	Thyme	<31.6	<16.6	<20.2
960522	07/10/96	Amaranthus	<24.2	<21.7	<26.2
960529GG	07/10/96	Collards	<41.0	<22.9	<23.5
960530GG	07/10/96	Thyme	<51.0	<37.4	<33.3
960531GG	07/10/96	Amaranthus	<35.4	<28.2	<28.1
961083	10/15/96	Rape	<29.3	<19.7	<26.3

\* See Program Modifications on Page 2 of this report.

Table 5.2

Sample Type: Broadleaf Vegetation

Collection: Monthly Grab

Analysis: Iodine-131 and Gamma

Units: pCi/kg

Location: Sector J, 0.6 km - Old Training Center (Indicator)

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<b>Required LLD →</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>80</b>
9600640	01/10/96	Collards	<16	<12	<13
9600641	01/10/96	Kale	<15	<12	<14
9600642	01/10/96	Cabbage	<15	<14	<11
9602729	02/09/96	Broccoli	<21	<15	<12
9602730	02/09/96	Kale	<22	<15	<15
9602731	02/09/96	Collards	<20	<16	<13
9604973	03/12/96	Kale	<24	<25	<29
9604974	03/12/96	Collards	<20	<24	<23
9604975	03/12/96	Henbit	<23	<19	<24
9606859	04/10/96	Kale	<19	<16	<18
9606860	04/10/96	Photenia	<24	<22	<19
9606861	04/10/96	Clover	<18	<15	<17
960171	05/13/96	Canna	<28.0	<20.7	<20.4
960174	05/13/96	Photenia	<43.6	<33.4	<49.3
960176	05/13/96	Collards	<18.7	<11.8	<19.2
960330	06/06/96	Photenia	<39.1	<33.8	<39.8
960323	06/06/96	Squash	<22.0	<20.4	<13.3
960327	06/06/96	Collards	<21.7	<21.3	<20.9
960320GG	06/06/96	Photenia	<42.7	<32.5	<42.1
960326GG	06/06/96	Collards	<39.8	<19.0	<35.4
960324GG	06/06/96	Squash	<29.2	<17.1	<17.1

Table 5.2

Sample Type: Broadleaf Vegetation

Collection: Monthly Grab

Analysis: Iodine-131 and Gamma

Units: pCi/kg

Location: Sector J, 0.6 km - Old Training Center (Indicator) \*

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<b>Required LLD →</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>80</b>
960523	07/10/96	Photenia	<55.9	<37.2	<47.8
960524	07/10/96	Squash	<18.2	<18.2	<16.5
960525	07/10/96	Turnip Greens	<19.9	<20.4	<24.0
960532GG	07/10/96	Photenia	<56.8	<27.5	<34.3
960533GG	07/10/96	Squash	<17.7	<14.5	<16.3
960534GG	07/10/96	Turnip Greens	<27.4	<14.0	<29.4
961084	10/15/96	Collards	<20.7	<14.3	<12.8

\* See Program Modifications on Page 2 of this report.

Table 5.3  
Sample Type: Broadleaf Vegetation  
Collection: Monthly Grab  
Analysis: Iodine-131 and Gamma  
Units: pCi/kg

Location: Sector H, 0.64 km - IBEW Union Hall (Indicator)

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<b>Required LLD →</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>80</b>
9600643	01/10/96	Cabbage	<13	<11	<9
9600644	01/10/96	Brussel Sprouts	<18	<14	<16
9600645	01/10/96	Collards	<16	<12	<15
9602732	02/09/96	Cabbage	<17	<14	<13
9602733	02/09/96	Swiss Chard	<16	<19	<17
9602734	02/09/96	Collards	<20	<16	<16
9604976	03/12/96	Collards	<23	<20	<17
9604977	03/12/96	Magnolia	<21	<17	<19
9604978	03/12/96	Palmetto	<20	<27	<20
9606862	04/10/96	Swiss Chard	<30	<24	<26
9606863	04/10/96	Collards	<12	<10	<12
9606864	04/10/96	Clover	<16	<18	<16
960173	05/13/96	Collards	<22.5	<16.6	<21.2
960177	05/13/96	Vetch	<35.9	<30.6	<36.2
960178	05/13/96	Sweet Gum	<49.9	<27.6	<36.5
960322	06/06/96	Squash	<42.6	<25.3	<37.6
960329	06/06/96	Sweet Gum	<53.8	<43.4	<52.5
960328	06/06/96	Collards	<20.3	<13.0	<20.1
960325GG	06/06/96	Sweet Gum	<48.2	<21.2	<27.6
960319GG	06/06/96	Collards	<34.8	<20.5	<13.4
960321GG	06/06/96	Squash	<12.9	<21.5	<26.8

Table 5.3

Sample Type: Broadleaf Vegetation

Collection: Monthly Grab

Analysis: Iodine-131 and Gamma

Units: pCi/kg

Location: Sector H, 0.64 km - IBEW Union Hall (Indicator)

Lab Number	Collection Date	Sample Type	I-131	Cs-134	Cs-137
	<b>Required LLD →</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>80</b>
960526	07/10/96	Squash	<57.1	<27.3	<29.8
960527	07/10/96	Kale	<27.2	<20.4	<17.7
960528	07/10/96	Turnip Greens	<45.4	<36.2	<37.9
960535GG	07/10/96	Squash	<41.6	<25.5	<22.9
960536GG	07/10/96	Kale	<53.1	<40.4	<35.6
960537GG	07/10/96	Turnip Greens	<19.6	<23.1	<18.2

Table 6.1  
Sample Type: Milk  
Collection: Semiannually  
Analysis: Iodine-131 and Gamma  
Units: pCi/l

Location: Alcorn State University (Control)

Lab Number	Collection Date	I-131	Cs-134	Cs-137	Ba-140	La-140
<u>Required LLD</u> →		<u>1.0</u>	<u>15</u>	<u>18</u>	<u>60</u>	<u>15</u>
960179	05/14/96	<0.90	<9.32	<13.1	<45.1	<4.39
960184 *	05/14/96	<0.90	<3.18	<3.13	<11.7	<4.64
**	**	**	**	**	**	**

\* Duplicate analysis.

\*\* See Program Modifications on Page 2 of this report.

Table 7.1  
Sample Type: Fish  
Collection: Semiannually  
Analysis: Gamma  
Units: pCi/kg

Location	Lab Number	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Cs-134	Cs-137
		<u>Required LLD</u> →	<u>130</u>	<u>260</u>	<u>130</u>	<u>130</u>	<u>260</u>	<u>130</u>	<u>150</u>
Upstream Ms River (Control)	960415	06/15/96	<7.60	<55.1	<25.8	<23.6	<53.3	<24.2	<28.0
Upstream Ms River (Control)	960417GG	06/15/96	<39.5	<72.2	<28.9	<50.9	<112.0	<25.4	<26.3
Downstream Ms River (Indicator)	960416	06/14/96	<25.4	<68.5	<10.1	<37.5	<65.5	<14.3	<35.9
Downstream Ms River (Indicator)	960418GG	06/14/96	<31.5	<88.5	<10.3	<38.4	<124.0	<24.6	<36.8
*	*	*	*	*	*	*	*	*	*

\* See Program Modifications on Page 2 of this report.



Table 8.1  
Sample Type: Sediment  
Collection: Semiannually  
Analysis: Gamma  
Units: pCi/kg

Location	Lab Number	Collection Date	Cs-134	Cs-137
	<u>Required LLD</u> →		<u>150</u>	<u>180</u>
Upstream Ms River (Control)	960297	06/04/96	<32.5	<45.3
Upstream Ms River (Control)	960300GG	06/04/96	<44.1	<56.6
Upstream Ms River (Control)	960851	09/03/96	<21.0	<23.3
Barge Slip (Indicator)	960298	06/04/96	<24.4	<32.0
Barge Slip (Indicator)	960301GG	06/04/96	<27.7	<31.7
Downstream Ms River (Indicator)	960299	06/04/96	<32.3	112 ± 23.4
Downstream Ms River (Indicator)	960302GG	06/04/96	<46.7	112 ± 28.2
Downstream Ms River (Indicator)	960850	09/03/96	<25.9	31.2 ± 13
*	*	*	*	*

\* See Program Modifications on Page 2 of this report.

Table 9.1

Sample Type: Thermoluminescent Dosimeters

Collection: Quarterly

Analysis: Direct Radiation

Units: mrem/Qtr

**Location: Inner Ring TLDs, Within Two (2) Mile Radius (ODCM Specifications)**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd QTR ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-16	9.5	9.2	12.7	10.5	10.5
M-17	8.7	9.0	10.8	9.4	9.5
M-19	8.8	8.6	11.5	9.4	9.6
M-20	8.1	7.8	9.9	**	8.6
M-21	11.4	10.5	14.3	10.2	11.6
M-22	9.4	7.7	10.5	8.1	8.9
M-23	8.7	8.5	11.4	9.5	9.5
M-25	7.6	8.7	9.8	7.0	8.3
M-27 *	10.8	12.0	13.3	**	12.0
M-28	9.8	9.7	12.9	10.4	10.7
M-41	4.5	5.8	7.1	**	5.8
M-45	7.2	6.8	10.5	**	8.2
M-86	7.8	8.0	10.7	**	8.8
M-92	5.4	7.9	9.1	**	7.5
M-93	9.8	10.7	12.6	**	11.0
M-94	8.4	9.8	11.0	9.6	9.7
<b>Mean</b>	<b>8.5</b>	<b>8.8</b>	<b>11.1</b>	<b>9.3</b>	

\* Location with highest annual mean.

\*\* See Program Modifications on Page 2 of this report.

Table 9.2

Sample Type: Thermoluminescent Dosimeters

Collection: Quarterly

Analysis: Direct Radiation

Units: mrem/Qtr

**Location: Outer Ring TLDs, Within Six (6) Mile Radius (ODCM Specifications)**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-36	8.2	7.9	10.1	8.3	8.6
M-40	11.5	8.4	13.6	10.1	10.9
M-47	6.8	7.1	10.8	**	8.2
M-48	9.1	8.4	12.4	10.3	10.1
M-49 *	10.7	9.6	13.9	11.5	11.4
M-50	9.6	8.4	12.3	10.3	10.2
M-51	8.2	7.4	10.8	**	8.8
M-55	11.2	9.7	12.9	13.4	11.3
M-56	10.2	9.0	13.1	**	10.8
M-57	10.6	10.0	13.2	12.6	11.3
M-58	4.8	5.9	7.0	**	5.9
M-59	6.4	8.3	10.2	**	8.3
M-88	6.4	(1)	8.9	**	7.7
M-89	7.0	8.6	10.2	**	8.6
M-90	6.8	6.4	9.3	**	7.5
M-91	9.4	9.8	11.5	**	10.2
Mean	8.6	8.3	11.3	10.9	

(1) No data; TLD was missing in field (see Sample Deviations on Page 1 of this report).

\* Location with highest annual mean.

\*\* See Program Modifications on Page 2 of this report.

Table 9.3

Sample Type: Thermoluminescent Dosimeters

Collection: Quarterly

Analysis: Direct Radiation

Units: mrem/Qtr

**Location: Special Interest Area TLDs (ODCM Specifications)**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-01 *	(1)	10.7	12.6	10.8	11.4
M-07	8.9	9.6	12.4	10.9	10.5
M-09	8.9	9.5	10.7	10.4	9.9
M-10	7.0	7.0	8.6	8.5	7.8
M-33	8.6	7.7	10.2	8.9	8.9
M-38	8.2	8.4	10.3	9.0	9.0
M-39	9.0	7.3	10.7	9.2	9.1
Mean	8.4	8.6	10.8	9.7	

**Location: Control TLD**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-14	8.9	10.0	13.2	10.6	10.7

**Location: Shield TLD**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-00	8.7	6.4	7.8	9.2	8.0

(1) No data; TLD was missing in field (see Sample Deviations on Page 1 of this report).

\* Location with highest annual mean.

Table 9.4

Sample Type: Thermoluminescent Dosimeters

Collection: Quarterly

Analysis: Direct Radiation

Units: mrem/Qtr

**Location: Protected Area Boundary TLDs**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 95 (mrem)
M-61	36.0	27.7	33.2	20.4	29.3
M-62	43.5	34.9	45.8	26.7	37.7
M-63	11.6	11.6	16.0	10.9	12.5
M-64	13.9	11.9	17.8	10.2	13.5
M-65	12.3	12.1	14.4	9.1	12.0
M-66	14.5	14.1	17.7	10.8	14.3
M-67	16.7	14.5	19.7	13.2	16.0
M-68	56.2	55.7	58.2	37.7	52.0
M-69 *	76.4	53.5	69.5	33.7	58.3
M-70	63.9	50.3	59.4	30.7	51.1
M-71	14.0	13.9	18.0	9.2	13.8
M-72	10.4	11.4	13.6	9.3	11.2
M-74	6.4	7.2	10.0	6.9	7.6
M-76	9.5	9.1	11.9	6.8	9.3
M-77	6.1	7.0	9.2	6.1	7.1
M-81	8.6	9.2	11.2	9.2	9.6
<b>Mean</b>	<b>25.0</b>	<b>21.5</b>	<b>26.6</b>	<b>15.7</b>	

**Location: Duplicate TLDs**

Location	1st Qtr ' 96 (mrem)	2nd Qtr ' 96 (mrem)	3rd Qtr ' 96 (mrem)	4th Qtr ' 96 (mrem)	Mean ' 96 (mrem)
M-31	8.4	9.2	11.9	10.6	10.0
M-32	8.4	7.2	8.9	9.2	8.4
M-60	10.2	9.1	13.3	12.4	11.3
<b>Mean</b>	<b>9.0</b>	<b>8.5</b>	<b>11.4</b>	<b>10.7</b>	

\* Location with highest annual mean.

Table 10.0  
Sample Type: Interlaboratory Comparison  
Frequency: Varies  
Analysis: Varies

Sample Type (units)	Study	Date	Analysis	Known Value <sup>a</sup>	RBS Value	RBS N-Dev <sup>b</sup>	RBS N-Range <sup>c</sup>
Air Filter (pCi/filter)	E0800-125	09/26/96	Beta	57.0 ± 17.3	56.97	-0.01	0.230
	E0884-125	12/12/96	Beta	87.6 ± 17.3	89.07	0.25	0.071
Charcoal Cartridge (pCi/cartridge)	E0640-125	3/12/96	I-131	66.0 ± 11.4	63.03	-0.78	0.161
	E0699-125	6/19/96	I-131	84.0 ± 14.5	81.17	-0.58	0.162
	E0801-125	9/26/96	I-131	60.0 ± 10.4	59.77	-0.07	0.305
	E0885-125	12/12/96	I-131	79.7 ± 13.8	82.37	0.58	0.141
Water (pCi/l)	E0637-125	3/12/96	Beta	98.0 ± 17.3	110.13	2.10	1.394
	E0638-125	3/12/96	H-3	2982 ± 621.1	2600.0	-1.85	0.212
	E0639-125	3/12/96	Cr-51	322 ± 27.9	295.67	-2.83	2.018
			Mn-54	31.0 ± 8.7	31.87	0.30	0.721
			Co-58	48.0 ± 8.7	46.17	-0.64	0.295
			Fe-59	83.0 ± 8.7	86.97	1.37	2.871
			Co-60	76.0 ± 8.7	78.47	0.85	0.343
			Zn-65	97.0 ± 16.8	94.43	-0.46	0.079
			I-131	36.0 ± 10.4	34.53	-0.42	0.620
			Cs-134	58.0 ± 8.7	51.67	-2.19	0.272
			Cs-137	64.0 ± 8.7	60.27	-1.29	0.874
			Ce-141	88.0 ± 8.7	82.77	-1.81	0.721
	E0696-125	6/19/96	Beta	174 ± 45.2	193.0	1.26	0.521
	E0697-125	6/19/96	H-3	4915 ± 851.3	4521.33	-1.39	0.111



Table 10.0  
Sample Type: Interlaboratory Comparison  
Frequency: Varies  
Analysis: Varies

Sample Type (units)	Study	Date	Analysis	Known Value <sup>a</sup>	RBS Value	RBS N-Dev <sup>b</sup>	RBS N-Range <sup>c</sup>
Water (pCi/l)	E0698-125	6/19/96	Cr-51	995 ± 86.2	932.0	-2.19	0.427
			Mn-54	530 ± 45.9	528.33	-0.11	0.223
			Co-58	164 ± 14.2	156.33	-1.62	1.008
			Fe-59	137 ± 11.9	129.0	-2.02	1.207
			Co-60	148 ± 12.8	149.67	0.39	0.639
			Zn-65	102 ± 17.7	95.83	-1.05	0.208
			I-131	20.0 ± 10.4	23.3	0.95	2.461
			Cs-134	294 ± 25.5	263.67	<b>-3.57<sup>e</sup></b>	0.241
			Cs-137	724 ± 62.7	706.67	0.83	0.359
			Ce-141	379 ± 32.8	345.67	<b>-3.05<sup>e</sup></b>	0.779
	E0769-125 (duplicate)	6/19/96	Cr-51	995 ± 86.2	938.0	-1.98	0.404
			Mn-54	530 ± 45.9	543.67	0.89	0.201
			Co-58	164 ± 14.2	161.67	-0.49	0.504
			Fe-59	137 ± 11.9	148.0	2.78	0.517
			Co-60	148 ± 12.8	154.33	1.48	0.718
			Zn-65	102 ± 17.7	103.33	0.23	0.290
			I-131	20.0 ± 10.4	21.63	0.47	0.098
			Cs-134	294 ± 25.5	262.0	<b>-3.77<sup>e</sup></b>	0.522
			Cs-137	724 ± 62.7	729.33	0.26	0.082
			Ce-141	379 ± 32.8	361.33	-1.61	0.249
	E0800-125	9/26/96	Beta	57.0 ± 17.3	56.97	-0.01	0.230

Table 10.0  
Sample Type: Interlaboratory Comparison  
Frequency: Varies  
Analysis: Varies

Sample Type (units)	Study	Date	Analysis	Known Value <sup>a</sup>	RBS Value	RBS N-Dev <sup>b</sup>	RBS N-Range <sup>c</sup>
Water (pCi/l)	E0798-125	9/26/96	Cr-51	646 ± 55.9	641.33	-0.25	0.731
			Mn-54	239 ± 20.7	251.67	1.84	0.297
			Co-58	174 ± 15.1	175.67	0.33	0.611
			Fe-59	50.0 ± 8.7	47.43	-0.89	0.721
			Co-60	151 ± 13.1	161.67	0.15	0.548
			Zn-65	93.0 ± 16.1	103.43	1.94	0.553
			I-131	50.0 ± 10.4	53.27	0.94	1.319
			Cs-134	295 ± 25.5	309.33	1.68	0.200
			Cs-137	225 ± 19.5	233.67	1.33	0.263
			Ce-141	423 ± 36.6	417.33	-0.46	0.251
	E0802-125 (duplicate)	9/26/96	Cr-51	646 ± 55.9	644.67	-0.07	0.914
			Mn-54	239 ± 20.7	251.67	1.84	0.148
			Co-58	174 ± 15.1	174.33	0.07	0.543
			Fe-59	50.0 ± 8.7	48.90	-0.38	0.213
			Co-60	151 ± 13.1	157.67	1.53	0.313
			Zn-65	93.0 ± 16.1	101.30	1.55	0.769
			I-131	50.0 ± 10.4	43.67	-1.83	0.788
			Cs-134	295 ± 25.5	305.33	1.21	0.200
			Cs-137	225 ± 19.5	231.33	0.98	0.053
			Ce-141	423 ± 36.6	416.67	-0.52	0.391

Table 10.0  
Sample Type: Interlaboratory Comparison  
Frequency: Varies  
Analysis: Varies

Sample Type (units)	Study	Date	Analysis	Known Value <sup>a</sup>	RBS Value	RBS N-Dev <sup>b</sup>	RBS N-Range <sup>c</sup>
Water (pCi/l)	E0882-125	12/12/96	Cr-51	209 ± 18.1	187.33	<b>-3.59<sup>e</sup></b>	1.272
			Mn-54	202 ± 17.5	211.67	1.66	0.351
			Co-58	119 ± 10.3	113.33	-1.65	0.199
			Fe-59	48.0 ± 8.7	48.00	0.00	0.685
			Co-60	108 ± 9.4	109.33	0.43	0.875
			Zn-65	91.0 ± 15.8	87.5	-0.67	0.448
			I-131	39.0 ± 10.4	36.07	-0.85	0.807
			Cs-134	172 ± 14.9	170.67	-0.27	0.137
			Cs-137	191 ± 16.5	189.33	-0.30	0.371
			Ce-141	272 ± 23.6	265.33	-0.85	0.608
	E0886-125 (duplicate)	12/12/96	Cr-51	209 ± 36.2	205.67	-0.55	2.035
			Mn-54	202 ± 17.5	217.67	2.69	0.468
			Co-58	119 ± 10.3	119.33	0.10	0.397
			Fe-59	48.0 ± 8.7	58.57	<b>3.66<sup>e</sup></b>	1.524
			Co-60	108 ± 9.4	113.67	1.82	0.547
			Zn-65	91.0 ± 15.8	100.10	1.73	0.227
			I-131	39.0 ± 10.4	32.37	-1.91	0.847
			Cs-134	172 ± 14.9	175.00	0.60	0.343
			Cs-137	191 ± 16.5	194.33	0.60	0.618
			Ce-141	272 ± 23.6	271.33	-0.08	0.261

Table 10.0  
Sample Type: Interlaboratory Comparison  
Frequency: Varies  
Analysis: Varies

Sample Type (units)	Study	Date	Analysis	Known Value <sup>a</sup>	RBS Value	RBS N-Dev <sup>b</sup>	RBS N-Range <sup>c</sup>
Sediment (pCi/each)	E0799-125	9/26/96	Cr-51	608 ± 52.7	575.67	-1.84	0.350
			Mn-54	225.6 ± 19.5	231.33	0.88	0.367
			Co-58	163 ± 14.1	161.67	-0.28	0.507
			Fe-59	46.0 ± 8.7	41.00	-1.73	1.170
			Co-60	142 ± 12.3	148.33	1.54	1.664
			Zn-65	88.0 ± 15.2	89.50	0.30	0.638
			Cs-134	277 ± 24	266.67	-1.29	0.512
			Cs-137	430 ± 37.2	397.67	-2.60	0.467
			Ce-141	398 ± 34.5	396.33	-0.15	0.178
	E0883-125	12/12/96	Cr-51	756 ± 65.5	729.00	-1.24	2.578
			Mn-54	728 ± 63.0	751.33	1.11	0.097
			Co-58	430 ± 37.2	407.00	-1.85	0.549
			Fe-59	174 ± 15.1	176.00	0.40	2.512
			Co-60	389 ± 33.7	390.67	0.15	0.334
			Zn-65	327 ± 56.6	345.00	0.95	0.434
			Cs-134	620 ± 53.7	588.00	-1.79	0.076
			Cs-137	873 ± 75.6	830.00	-1.71	0.149
			Ce-141	979 ± 84.8	960.33	-0.66	0.338

- (a) The "known" values are listed with a range reflecting control (3 sigma) limits.
- (b) The normalized deviation from the "known" value is computed 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 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) Statistical calculations performed using methods given in EPA-600/4-80-044.
- (e) The results reported were out of the control limits; refer to the discussion on program exceptions.

## PROGRAM EXCEPTIONS AND CORRECTIVE ACTIONS

### 1. **E0698-125 (6/19/96) Gamma in Water and E0769-125 duplicate (6/19/96) Cs-134**

Cs-134 results in 6/19/96 gamma in water sample E0698-125 and duplicate gamma in water sample E0769-125 were outside the control limits as defined in note "b" in the data table. Review of the previous three years of cross-check data indicated that a low bias for Cs-134 existed due to cascade (coincidence) summing effects.

A summing correction factor was calculated and applied to the Cs-134 yields in the software nuclide library for water. Re-analysis of the spectrum data with corrected yields produced results within the warning limits. Cs-134 results for 9/26/96 and 12/12/96 gamma in water studies were within the warning limits as defined in note "b" in the data table.

### 2. **E0698-125 (6/19/96) Gamma in Water Ce-141**

The Ce-141 result for the 6/19/96 gamma in water sample E0698-125 was slightly outside (-3.05) the control limit. Review of the three analysis results did not indicate an outlier. The Ce-141 result of the duplicate 6/19/96 gamma in water sample E0769-125 was within control limits. No reason was determined for the out-of-control limit result of Ce-141 in the second quarter study.

Results for Ce-141 in all other gamma in water studies for 1996 were within the warning limits. No corrective actions were taken due to the single out of control limit result for Ce-141 in the second quarter study.

### 3. **E0882-125 (12/12/96) Gamma in Water Cr-51**

The Cr-51 result for the 12/12/96 gamma in water study E0882-125 was outside (-3.59) the control limit. Review of the three results used for the average indicated an outlier result caused the low average.

The percent coefficients of variation calculation will be used in the future as a criteria to determine the presence of an outlier. Outlier results will be discarded, using just two results, or the sample will be analyzed a fourth time if possible.

## PROGRAM EXCEPTIONS AND CORRECTIVE ACTIONS

### 4. E0886-125 (12/12/96) Gamma in Water (Duplicate) Fe-59

The Fe-59 result for the 12/12/96 gamma in water sample E0886-125 was outside (+3.66) the control limit. Review of the three results used for the average indicated an outlier result caused the high average.

The percent coefficients of variation calculation will be used in the future as a criteria to determine the presence of an outlier. Outlier results will be discarded, using just two results, or the sample will be analyzed a fourth time, if possible.

### Impact Statement

There is no impact on past data indicated by these interlaboratory comparison program exceptions. Environmental samples are analyzed and reported with a 95% confidence level that the analytical result with its associated error encompasses the "true" value. As seen below, 95% of the cross-check results are within the acceptable control limits of the three normalized deviation.

### Normalized Deviation Control Limits

### Percent

0 - 1	53
1 - 2	34
2 - 3	8
>3	5



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**ATTACHMENT II**

**1996 Special Sample Results**

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**GRAND GULF NUCLEAR STATION**  
**SPECIAL SAMPLE RESULTS FOR 1996**

Sample Type	Lab Number	Sample Location	Sample Date	Isotope	Activity	Unit of Measurement
Groundwater	9604713	North Construction Well 03	03-06-96	Gross Beta	$3.9 \pm 3.2$	pCi/l
				Tritium	$570 \pm 170$	
				Gammas	<LLD	
	9604714	South Construction Well 04	03-06-96	Gross Beta	$15.2 \pm 3.6$	
				Tritium	$520 \pm 170$	
				Gammas	<LLD	
	9604713	North Construction Well 03 (Recount)	03-06-96	Tritium	$160 \pm 150$	
	9604714	South Construction Well 04 (Recount)	03-06-96	Tritium	<240	
	SPW-1837	North Construction Well 03	03-06-96	Gross Beta	$2.5 \pm 2.0$	
				Tritium	<98	
	SPW-1839	South Construction Well 04	03-06-96	Gross Beta	<2.4	
				Tritium	<98	
	9605456	North Construction Well 03	03-22-96	Tritium	<250	
	9605457	South Construction Well 04	03-22-96	Tritium	<250	
	SPW-1838	North Construction Well 03	03-22-96	Gross Beta	<2.4	
				Tritium	<97	
	SPW-1840	South Construction Well 04	03-22-96	Gross Beta	<2.4	
				Tritium	<97	

**GRAND GULF NUCLEAR STATION**  
**SPECIAL SAMPLE RESULTS FOR 1996**

Sample Type	Lab Number	Sample Location	Sample Date	Isotope	Activity	Unit of Measurement
Rainfall	9607463	SS-Rainfall	04-23-96	Tritium	<220	pCi/l
Sediment	9605184	Sediment Basin A	03-14-96	Mn-54	7.0 ± 2.0	pCi/kg
				Cs-137	22.0 ± 4.0	
				Other Gammas	<LLD	
	9605185	Sediment Basin B	03-14-96	Mn-54	9.0 ± 7.0	
				Co-60	21.0 ± 8.0	
				Cs-137	10.0 ± 6.0	
Sewage Effluent	9604715	Outfall 010 (Sewage Effluent)	03-06-96	Gross Beta	5.1 ± 3.1	pCi/l
				Gammas	<LLD	
	9605455	Outfall 007	03-21-96	Tritium	280.0 ± 150.0	
				Tritium	<122	
				Tritium	<240	
Stormwater	9606695	Outfall 007	04-03-96	Gross Beta	<3.1	