

GGNS
EARLY SITE PERMIT APPLICATION
PART 3 – ENVIRONMENTAL REPORT

2.0 ENVIRONMENTAL DESCRIPTION¹

2.1 Station Location

The Grand Gulf Nuclear Station is located in Claiborne County in southwestern Mississippi. The site is on the east bank of the Mississippi River at river mile marker 406, approximately 25 miles south of Vicksburg, Mississippi and 37 miles north-northeast of Natchez, Mississippi. The Grand Gulf Military Park borders a portion of the north side of the property. The community of Grand Gulf is approximately 1.5 miles to the north. The town of Port Gibson is about 6 miles southeast of the site.

The Universal Transverse Mercator Grid Coordinates for the location of the new reactor(s) on the site are approximately N3,543,261 meters and E684,018 meters.

The property boundary shown on Figure 2.1-1 encompasses approximately 2100 acres of property that makes up the Grand Gulf Nuclear Station (GGNS) site. The actual site property area may be slightly less than this value due to erosion of the east bank of the Mississippi River north of the existing GGNS barge slip (Figure 2.1-2). Stabilization of this section of the river bank has been completed. A site area of 2100 acres will be used throughout this report.

The site and its environs, consisting primarily of woodlands and farms, are about equally divided between two physiographic regions. The western half of the site is in the Mississippi Alluvial Valley, consisting of materials deposited by the Mississippi River and extending eastward from the river about 0.8 mile. This area is generally at elevations of 55 to 75 feet above mean sea level (msl). Two oxbow lakes, Hamilton Lake and Gin Lake, are located in the western portion of the site. These lakes were once the channel of the Mississippi River and had an average depth of approximately 8 to 10 feet according to Reference 2. The eastern half of the plant site (in the undeveloped areas surrounding the existing plant and its facilities) is rough and irregular, with steep slopes and deep-cut stream valleys and drainage courses. Ground elevations in this portion of the plant site range from about 80 feet above msl to more than 200 feet above msl inland. Elevations of about 400 feet above mean sea level occur on the hilltops east and northeast of the site. Grade elevation for the existing Grand Gulf Nuclear Station plant structures is 132.5 feet above mean sea level. (Reference 1)

2.1.1 References

1. Grand Gulf Nuclear Station Updated Final Safety Analysis Report, UFSAR.
2. Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8.

¹ This ESP Environmental Report makes use of material provided in the GGNS Final Environmental Report (FER) (Reference 2) where considered appropriate. When such material (text) is used (verbatim from the FER) in this Environmental Report, it is shown in italics.

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2.2 Land

The Grand Gulf Nuclear Station site is located within Claiborne County Mississippi. It is bordered on the west by the Mississippi River, on the north by Warren County, on the east by Hinds and Copiah Counties and on the south by Jefferson County.

The site is accessible by both river and road. The major highways in the area are found mainly east and south of the site, a number of county roads service the area. U.S. Highway 61 and State Highway 18 connect Port Gibson with Natchez, Jackson and Vicksburg.

This section describes, in general terms, the GGNS site and land in the vicinity of the GGNS site.

2.2.1 The Site and Vicinity

The property boundary shown on Figure 2.2-1 encompasses the approximately 2100 acres that make up the GGNS site. System Energy Resources, Inc. currently controls the entire GGNS site for the purpose of generating electricity; however, some of the area within the boundary may be used for other purposes, such as hunting and fishing. SERI has authorized Entergy Operations to maintain control of ingress to and egress from the GGNS site property.

The approximate number of acres potentially affected by a new facility at the GGNS ESP Site can be found in Table 2.2-1.

The GGNS site area is accessible by both river and road, although transportation routes are limited within the site vicinity. The major highway within the vicinity is U.S. Highway 61 which passes by the GGNS site to the east-southeast. U. S. Highway 61 parallels the Mississippi River from New Orleans, Louisiana to St. Louis, Missouri, and is approximately 4.5 miles from the site at the closest point. From the town of Port Gibson the highway goes north to Vicksburg, MS, and southwest to Natchez, MS. A section of the Natchez Trace Parkway passes approximately 6 miles southeast of the GGNS site running southwest towards Natchez, Mississippi, and to the northeast to Jackson, Mississippi (Figure 2.2-3). Mississippi Highway 18 runs east from Port Gibson to Jackson. There are a number of county and rural roads within the site vicinity (Figure 2.2-2).

The land within the vicinity of the site is mainly rural. The land use within the vicinity of the site is made up of forest and agriculture lands (Figure 2.2-3). The nearest population concentration is located in the town of Port Gibson, which lies 6 miles southeast of the site. There are a number of recreational land use areas within the vicinity of the site.

- The Grand Gulf Military Park - Located approximately 1-1/2 miles north of the site, contiguous to the GGNS site.
- The Warner-Tully YMCA Camp - Approximately 108 acres of land located approximately 3-1/2 miles northeast from the site. The YMCA camp is open from late May to the end of August. (Reference 3)
- Lake Claiborne - A private development of residential and recreational facilities located approximately 3-1/2 miles east of the site.
- Lake Bruin State Park - A 53 acre state park located on the shore of Lake Bruin, LA, approximately 9.5 miles west/southwest of the site.

The Mississippi River is an important transportation corridor, primarily for the shipment of industrial and commercial products and to a lesser extent, commercial boating. The Claiborne

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County Port Commission built a small port on the Mississippi River at river mile 404.8 in Claiborne County. The mean depth of channel and berth at Port Claiborne is 14 ft. Services provided at this port are mooring assistance, stevedore, dryage and deepwater berths. Port cargo includes forest products, pulpwood, feed grains, and agricultural products (Figure 2.1-1). (References 1, 5).

There is no rail service in the vicinity of the GGNS site and there are no active railroad tracks that traverse the GGNS site or the vicinity surrounding the site.

The nearest gas-transmission pipeline is 4.75 miles east of the site (Figure 2.2-4). Operating pressure of the 4-inch-diameter pipe is 225 psi. The pipeline was installed in 1955 at a minimum depth of 3 feet. The two closest isolation valves are located at 5.5 miles east and 7.5 miles east-northeast of the site. The pipeline is presently carrying natural gas, and there is no future plan to carry a different product. (Reference 10)

2.2.1.1 Surface Rights

System Energy Resources, Inc. (SERI) has acquired and will maintain surface ownership of all the land within the GGNS plant site property boundary, with the following exceptions (Reference 12):

1. South Mississippi Electric Power Association (SMEPA) has a 10 percent undivided interest in the GGNS Unit 1 power block area. This is a 94-acre tract containing the cooling towers, containment buildings, and other major plant structures. SMEPA also owns a 10 percent undivided ownership interest in two very long and narrow strips of land (7 1/2 and 5 acres, respectively) on which the GGNS Unit 1 water supply and discharge piping is located.
2. Entergy Mississippi, Inc. owns the 52-acre GGNS plant switchyard area on the site. However, under a 1999 agreement with MP&L (now Entergy Mississippi, Inc.), SERI has authority to exercise complete control and determine all activities on Entergy Mississippi, Inc. property and easements on the site, including exclusion of Entergy Mississippi, Inc. personnel and third parties. SERI has transferred such rights to Entergy Operations.

Entergy Operations has unrestricted access to the switchyard area. For GGNS Unit 1, Entergy Operations performs all routine switchyard activities, operates the main generator breakers and 34KV breakers, and maintains the main, ESF, and BOP transformers. Entergy Operations is also responsible for all security functions within Entergy Mississippi, Inc. property at GGNS.

3. A two-acre residential property which is totally surrounded by the plant site property boundary in the southwest sector of the site is privately owned (Figure 2.2-1).

There are no active railroads or navigable waterways that traverse the site. One county road runs through the GGNS plant site property; Bald Hill Road cuts through the south-southeast, south, south-southwest, and southwest sectors of the plant site. Another county road (unpaved) traverses the plant site property in the north, north-northwest, northwest, west-northwest, and west sectors, providing access to the two lakes on the property. Two Entergy Mississippi, Inc. transmission lines traverse the GGNS plant site property. There are no other industrial, commercial, institutional, or residential structures on the site.

Entergy Operations allows access to parts of the plant site property for recreational purposes. The site is posted to ensure awareness of access restrictions by individuals.

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2.2.1.2 Mineral Rights

The joint owners of the Grand Gulf Nuclear Station (GGNS) own or control 89 percent of the mineral rights within the GGNS Unit 1 plant exclusion area, and all the mineral rights within the power block area. Third parties own a small portion of the mineral interests on the site. (Reference 12)

There is no activity at the GGNS plant site to explore for, drill for, or otherwise extract minerals. Past unsuccessful exploratory activities on or near the GGNS plant site and the geological character of the subsurface structure in the vicinity of the GGNS plant site indicate that commercial mineral production appears unlikely in the foreseeable future. This has been confirmed in a geological appraisal, dated January 1987. (Reference 12)

In addition, under Mississippi law, prospective mineral developers have no legal right to use physical force or to create a public disturbance to gain access to a property in order to explore for or to extract minerals. Furthermore, they would be prohibited from drilling any oil or gas well until a permit is issued by the State Oil and Gas Board following a notice and public hearing. Since SERI and SMEPA own, and Entergy Operations controls, substantially all of the minerals on the site, SERI and Entergy Operations would attend any hearings and would have the opportunity to object to the drilling and/or the location of any potential well. (Reference 12)

2.2.1.3 Easements

SERI and SMEPA own all the surface rights at GGNS except the plant switchyard, which is owned by Entergy Mississippi, Inc. A number of easements over the GGNS property are in effect. (Reference 12)

2.2.2 Transmission Corridors and Offsite Areas

Entergy Mississippi, Inc. has transmission lines that traverse the GGNS plant site property. There are no other industrial, commercial, institutional, or residential structures on the site. There are two types of transmission lines, 500 kV and 115 kV within the vicinity that service the area. There are approximately 71 miles of transmission lines that include about 1,645 acres of rights-of-way. The transmission lines are made up of 3 segments: (Figure 2.2-5)

Transmission Line	Length
Baxter Wilson	= 22 miles
Franklin	= 43.6 miles
Port Gibson	= 5.5 miles
Total	= 71.1 miles

The land use within the transmission corridors consists of forest and agriculture lands. The 71.1 miles of transmission lines and the type of land use within the 3 segments can be found in Table 2.2-2 and Figure 2.2-3.

The existing GGNS switchyard was built with provision for a second unit's (Unit 2) equipment installation and operation. This portion of the switchyard would be used, with modifications as required, for a new facility's switching equipment and connection to existing transmission line(s). The existing transmission lines would be utilized for a new facility as discussed in Section 3.7.

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2.2.3 The Region

Transportation infrastructure within the region includes the Mississippi River, U.S Interstate Highway 20, of which a portion lies approximately 28 miles north of the GGNS site, and U.S. Interstate Highway 55 a portion of which lies approximately 40 miles east of the GGNS site. Interstate Highway 20 runs east-west connecting Vicksburg with Jackson, Mississippi to the east and Monroe, Louisiana to the west. Interstate Highway 55 runs north-south connecting Jackson with Memphis, Tennessee to the north and to Interstate Highway 10 just west of New Orleans to the south. U.S. Highway 65 runs north to south in Louisiana and lies approximately 9 miles to the west of the site, connecting to U.S. Highway 84 approximately 27 miles to the southeast of the site. Figure 2.2-6 shows the locations of airports, federal highways and railroads in the area.

The Mississippi River, which passes about 1.1 miles west of the existing plant, provides another route of transportation. The nearest river port facility is Port Claiborne at river mile 404.8 (Figure 2.1-1). A larger river port facility can be found north of the site near river mile 437 in Vicksburg, Mississippi; this port is a United States Customs port of entry.

The regional land use is mainly forest and agricultural lands. Land area usage information for Claiborne County and the adjoining counties is presented below (Reference 11).

County / Direction	County Land Area in Commercial Forests	County Land Area
Claiborne	68%	494 sq. mi.
Copiah / East, Southeast	70%	779 sq. mi.
Hinds / Northeast	37%	875 sq. mi.
Jefferson / South	72%	523 sq. mi.
Warren / North	56%	597 sq. mi.

There are two types of transmission lines, 500 kV and 115 kV, that serve the region. Natural gas pipelines are found throughout the region but only one gas line exists within the site vicinity. This pipeline lies about 4.75 miles east of the GGNS site and runs parallel to U.S. Highway 61 in a north-south direction. (Figure 2.2-4, Reference 10)

The state of Mississippi is divided into 9 districts for reporting agricultural information by the Mississippi Agricultural Statistics Service. The GGNS site area is located in District 7. The Counties included in this district are Adams, Amite, Claiborne, Copiah, Franklin, Hinds, Lincoln, Warren and Wilkinson. (Reference 5)

Year 2001 production estimates for corn, cotton, soybeans, and wheat for Claiborne County and District 7 are presented in Table 2.2-3. The average yields for these crops for the years 1997 through 2001 are presented in Table 2.2-4.

Information from the Claiborne County Extension office at the present time indicated that there are approximately 300 to 400 head of cattle within a 6 mile radius of the site, and most of the cattle are located southwest of the plant. There are no milk cows or swine within Claiborne County (Reference 7). Estimates of heads of livestock sold for 2002 in Claiborne County and District 7 are presented in Table 2.2-5.

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Agricultural crop yields and livestock production for Tensas Parish, Louisiana, and Louisiana agricultural District 3 (30) which lie across the Mississippi River to the west of the GGNS site are presented in Tables 2.2-6 through 2.2-8.

2.2.4 References

1. URL, Mississippi Development Authority September 2002, <http://www.mississippi.org/maps/resources.htm>.
2. URL, Mississippi Automated Resource Information System, September 2002, http://www.maris.state.ms.us/land_use.html.
3. URL, Mississippi Department of Transportation, September 2002, http://www.mdot.state.ms.us/business/maps/map_online.htm.
4. URL, Kansas City Southern Railroad, September 2002, http://www.kcsi.com/system_map.pdf.
5. URL, Mississippi Agricultural Statistics Services, USDA National Agricultural Statistics Service, Agricultural Statistics Data Base, 2002, <http://www.nass.usda.gov:81/ipedb/>.
6. URL, Louisiana State University AgCenter Research and Extension, October 2002, <http://www.lsuagcenter.com/>.
7. Covington, Clifton, Claiborne County Extension Office, personal communication October 16, 2002.
8. URL, Mississippi Department of Environmental Quality, Office of Geology, September 2002, <http://minerals.usgs.gov/minerals/pubs/state/ms.html>.
9. URL, Louisiana State University AgCenter Research and Extension, Tensas Parish Office, October 2002, <http://www.lsuagcenter.com/parish/tensas/agriculture.htm>.
10. Morgan, Nathan, Union Gas, Port Gibson, MS, personal communication, November 2002.
11. URL, Mississippi Development Authority Community Profiles, http://www.mississippi.org/doing_busn/site_selectors/comm_profiles.htm.
12. GGNS Updated Final Safety Analysis Report (UFSAR).
13. Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8.
14. Robert Goodson, County Agent with the LSU Ag Center Extension Service, personal communication, February 2003.
15. NASS Agricultural Statistics Database, Quick Stats, County Level Data for Louisiana, URL <http://www.nass.usda.gov:81/ipedb/>.

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2.3 Water

The site for the Grand Gulf Nuclear Station (GGNS) is on the east bank of the Mississippi River in the vicinity of river mile 406, approximately 25 miles south of Vicksburg, Mississippi, and 6 miles northwest of Port Gibson, Mississippi. The Universal Transverse Mercator (UTM) Grid Coordinates for the center of the location of the power block area for a new facility is approximately N3,543,261 meters and E684,018 meters. The site is bounded on the west by the Mississippi River and on the east by loessial bluffs forming part of the hilly region that extends from Vicksburg to Baton Rouge, Louisiana. The barge slip used during construction of GGNS Unit 1 is located at river mile 406.4. Plant grade for the GGNS Unit 1 facility is 132.5 ft. msl.

The following sections describe the hydrological, physical, chemical, and biological characteristics of the hydrologic environment in the vicinity of the Grand Gulf site. The hydrologic environment is divided into surface water and ground water environments. The characteristics of each of the two separate environments are described separately.

2.3.1 Hydrology

The existing GGNS Unit 1 plant utilizes a natural draft and an auxiliary linear mechanical draft cooling tower for dissipating the main condenser heat load. The plant makeup and service water is supplied by a series of radial collector wells located in the floodplain parallel to the Mississippi River. During normal operation of GGNS Unit 1, plant service water is discharged to the circulating water system to supply the required circulating water system makeup water. The circulating water system blowdown for the existing GGNS Unit 1 plant is discharged to the discharge basin and from there is discharged by a single pipeline to the Mississippi River. Emergency service water is provided from concrete basins. (Reference 2)

Plant makeup (cooling tower makeup and other raw water needs) for a new facility would be supplied from the Mississippi River via an intake structure located on the east bank of the river and on the north side of the existing barge slip. Emergency cooling water (ultimate heat sink) for a new facility would be provided from closed-cooling systems which utilizes enclosed basins with mechanical draft cooling towers, or similar heat removal mechanisms, and would not be reliant on the source of water from the river intake, with the possible exception of normal makeup.

Effluent from a new facility would be combined with that from the GGNS Unit 1 facility, and the combined effluent would be discharged into the river downstream of the intake such that recirculation to the embayment area and intake pipes would be precluded.

2.3.1.1 Surface Water

2.3.1.1.1 Mississippi River

The dominant hydrologic feature in the vicinity of the site is the Mississippi River (Figures 2.3-1 and 2.3-2). ... The drainage pattern of the Mississippi River is that of a river in a stage of maturity with meanders and oxbow lakes. The average water surface slope of the Mississippi River in the vicinity of the site is between 0.1 and 0.4 feet/mile.

The Mississippi River floodplain adjacent to the site is relatively low and flat with elevations ranging from 55 to 75 ft. At the plant site, the natural floodplain is about 60 miles wide. However, the flow is confined to a width of about two to four miles by high bluffs on the east bank and man-made levees on the west bank, with a top levee elevation ranging from 101 to 103 feet. The river has a width of about one-half to one mile during dry seasons. The width can increase to about four miles during floods. (Reference 2)

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The proposed location for a new facility (Figure 2.3-1) is on the bluffs approximately 1 mile east of the river and adjacent the GGNS Unit 1 site (grade elevation is 132.5 ft msl for Unit 1), well above the water levels in the Mississippi River as summarized below:

Item	Elevation (ft. msl)
U. S. Army Corps of Engineers design project flood elevation	102.1 (References 3 and 6) [96.2 ft as reported in Reference 2]
<i>Existing grade of west bank levee (GG Project design flood elevation)</i>	103
<i>100-yr flood elevation</i>	91.4
<i>Mean annual flood elevation</i>	76.5
Low Water Reference Plane for RM 406	37.5 (Reference 4) [34 ft as reported in Reference 2]
<i>Low water elevation (lowest recorded at Vicksburg projected to Grand Gulf)</i>	28

The Mississippi River is known to have undergone, and is presently undergoing, lateral shifting near the Grand Gulf region. This is evidenced by the presence of oxbow lakes, low lying swamps, and sand bars. The river divides itself around Middle Ground Island, rejoining at approximately River Mile 408 (Figures 2.3-2 and 2.3-3). In order to stabilize the river alignment, the Corps of Engineers has carried out extensive river control work in this area. This includes construction of submerged dikes across the western channel for diverting flow to the eastern channel, construction of revetments composed of an articulated concrete mattress under water, and stone (riprap) paving above the water. Figure 2.3-3 shows hydrographic details of the Mississippi River at Grand Gulf.

Figure 2.3-4 shows the rating curve for the Mississippi River at the Grand Gulf site. The rating curve at the site is based on the rating curve at Vicksburg. It is obtained by correlating the stages at Vicksburg and at the site during the period 1972 to 1974, and using the data from water surface profiles The discharges at the two locations are assumed equal, since there are no major tributary streams between these locations except the Big Black River, which has a runoff of less than 1 percent of the Mississippi River flows at Vicksburg.

The Corps of Engineers has completed revetments along the east and west river banks, including the east bank that borders the GGNS site, to maintain the river channel (Reference 4). The Grand Gulf revetments in the two sections from approximately river mile 400.5 to 405.0 and 408.5 to 409.6 were completed in the 1960s and 1970s. The intervening section, which includes the river stretch near the GGNS site, was left unprotected to undergo erosion until it attained an acceptable alignment. The section on the east bank along the GGNS site boundary was completed in stages from the mid-1970s to the early 1980s, with a small gap at the existing GGNS barge slip (References 1, 5). It is expected that these measures will stabilize the Mississippi River shoreline near the site. The Corps of Engineers has no plans for additional construction in the immediate vicinity of the site except for occasional maintenance of the

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existing structures (Reference 6). The Corps of Engineers continues to evaluate the need for additional shoreline work, and would be expected to make improvements as considered appropriate. However, those actions would not be expected to impact site suitability.

In addition to changes in river alignment, the cross section of the Mississippi River undergoes changes with the river discharge. Figure 2.3-5 shows channel cross sections, during and after the flood in 1973, about 1000 feet downstream of the barge slip into which the blowdown is discharged (Figure 2.3-1). These changes occur mainly in the river bottom far from the blowdown discharge structure. Furthermore, the bottom elevation of the barge slip at its junction with the river is 39.23 ft msl, about 40 feet above the river bed. The barge slip bed near the blowdown discharge structure is concrete lined and the side slopes are riprapped. No scouring is, therefore, expected near the blowdown discharge structure.

It will be required to coordinate with the Corps of Engineers and/or other appropriate regulatory agencies and obtain permits for construction of the embayment and intake structure when the final design of the intake structure and its exact location are defined. The design and placement of the embayment and intake structure will be in accordance with the Corps guidance, MDEQ and EPA requirements, and good engineering practice. The final location and design of the embayment and intake structure would be chosen such that there would be inconsequential interference, if any, with the pumping ability of the existing GGNS Unit 1 radial wells.

2.3.1.1.2 Local Streams

The upland region in which the Grand Gulf site is located contains numerous streams. The drainage is of the dendritic pattern, being characterized by irregular branching of tributary streams in many directions. Several such streams flow from the uplands into the oxbow lakes or the Mississippi River. The average channel gradients in the uplands are on the order of 40 to 60 feet/mile. Ground elevations range between 100 and 250 feet msl.

Of immediate relevance to the plant site are two small and steep streams, Stream A and Stream B (Figures 2.3-7 and 2.3-8). Stream A, to the north of the site and adjacent to the proposed power block location for a new facility is perennial, draining basin A with an area of 2.8 sq miles (Reference 1). Stream B, to the south and adjacent to the existing GGNS Unit 1 plant facilities is intermittent, draining basin B with an area of 0.6 sq miles (Reference 1). The surface runoff from streams A and B discharges into sediment basins A and B, then into Hamilton Lake in the floodplain of the Mississippi River.

The stream to the south, draining Basin B, was rerouted around the Unit 1 plant site and a 15-foot culvert was placed at its outlet to safely carry local floods and site drainage. The channel has been concrete-lined up to an expected water surface elevation resulting from a 100-year rainfall. For the most part the natural drainage patterns have not been changed; where modifications have been made, they are to increase drainage efficiency. The stream to the north, draining Basin A, which receives most of its water from the watershed outside the plant area was not rerouted. However, a 12-foot culvert was placed under the access road to connect Stream A to the Mississippi River flood plain. (Figure 2.3-8, References 1, 2)

The plant yard for a new facility would be graded such that runoff is directed away from existing site buildings, and away from buildings for a new facility. Use of the two streams for directing runoff from new facility areas and buildings is anticipated, to the maximum extent possible.

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2.3.1.1.3 Local Lakes

There are a number of lakes in the vicinity of the site as well as several swamps and slack-water areas. The lakes are mostly of the oxbow type. Those situated between the levees and the river channel have indirect or direct seasonal connections with the river and are submerged during floods. However, their hydrologic characteristics have no influence on the plant site. (Reference 2)

Hamilton and Gin Lakes are located on the site. They are surrounded by slack-water areas and have partially active connections with the Mississippi River. The areal extent and depth of water in these lakes vary seasonally. The size of Gin and Hamilton lakes is estimated to be approximately 55 acres and 64 acres, respectively, based on an aerial photograph of the site taken in December 2001 (Figure 2.4-2). The FER reported Hamilton and Gin Lakes to be relatively small and shallow. These lakes were once the channel of the Mississippi River and had an average depth of approximately 8 to 10 feet according to Reference 2.

Hamilton and Gin Lakes were connected by a stream channel running through the wetlands between the lakes. However, due to construction of the haul road, this connecting channel has been modified and the flow in the lakes is connected by a series of culverts under the haul road in the vicinity of the old stream channel. Figure 2.3-9 shows the lake and Mississippi River stage hydrographs in the vicinity of the site.

Gin and Hamilton Lakes have a direct connection with the Mississippi River when the water levels in the river are at or above elevation 63 and 56 ft msl, respectively. The Mississippi River at the site has a water level elevation of 56 to 63 ft msl on the average during February through June. On the basis of the flow duration analysis (Reference 7) of the Mississippi River near Vicksburg, Mississippi (period 1931-1967), it is estimated that the river water level at the Grand Gulf Nuclear Station will exceed elevation 56 ft msl and 63 ft msl about 36 percent of the time, respectively.

The Corps of Engineers bank stabilization measures at GGNS have been completed, and have not affected the connection of the above lakes to the Mississippi River. The bank stabilization measures consist of placing articulated concrete mattresses under water up to low water level and stone (riprap) paving above the water. (Reference 1)

A flooded man-made borrow pit is located north of the barge slip; the borrow pit was created during construction of the existing GGNS Unit 1 plant. The borrow pit does not appear to be hydrologically connected to Gin Lake or to Hamilton Lake except during periods of high water when all are inundated by the Mississippi River. The borrow pit includes an area of about 16 acres based on the photograph of Figure 2.4-2. Depth of this lake is not known.

Five small ponds in the upland portion of the site were probably originally constructed to water livestock. The ponds are small (approximately ¼- to ½-acre each).

2.3.1.1.4 Physical Properties of Surface Waters

Flow Velocity

The U. S. Army Corps of Engineers has made limited velocity measurements on the Mississippi River in the vicinity of the site. Pertinent data on the locations and velocities measured are presented in Table 2.3-1. Measured average velocities in the channel vary from 3.7 to 6.7 fps, corresponding to river discharges of about 425,000 and 1,493,000 cfs, respectively.

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Mississippi River current velocities at various depths were measured on September 25, 1975, at five stations located on a cross-river transect about 1,000 feet downstream of the barge slip as shown on Figure 2.3-10 (Reference 8). The velocities ranged from 1.3 fps near the bottom to a maximum of 3.5 fps near the surface. Surface velocities near the river banks were about 2 fps, whereas they were over 3 fps midstream. The river discharge was about 293,000 cfs with an average velocity of about 2 fps.

Velocity measurements based on observations from 1973 to 1989 were obtained from the Corps of Engineers (Reference 9) for Tarbert Landing (River Mile 306.6). Mean velocity measurements ranged from 2.6 fps to 7.6 fps at the surface, and from 2.3 fps to 6.8 fps at 60 percent depth.

Water Temperature

As part of the environmental field measurements programs, water temperature measurements were carried out for the Mississippi River near the Grand Gulf site and for Gin and Hamilton Lakes for the base period November 1972 to November 1973. During this period, the temperature ranged from 40 degrees F to 84 degrees F. The temperature values at the site were found to be almost identical to those recorded at Vicksburg, Mississippi, where long-term data exist. The Mississippi River water temperatures are, therefore, used for assessing long-term behavior of the water temperature. The water temperature of the Mississippi River at Vicksburg seldom falls below the freezing point.

Table 2.3-2 summarizes Corps of Engineers temperature ranges from 1962-1979. Table 2.3-3 summarizes USGS temperature data and discharge measurements recorded at the USGS station at Vicksburg for the period 1973 to 1999. For the period 1973 to 1999, the maximum temperature measured was 89.6 degrees F and the minimum was 34.7 degrees F. River temperature values at the site as reported in the GGNS FER are almost identical to those recorded at Vicksburg, Mississippi, where long-term data exist. The Mississippi River water temperatures at Vicksburg are, therefore, useful for assessing long-term impacts on the river.

Figure 2.3-11 presents vertical temperature profiles at four stations (for locations of these stations see Figure 2.3-10) based on temperature measurements taken on February 19, 1973. The rates of temperature change with depth are extremely small, and the river can be considered well-mixed from top to bottom.

Thermal monitoring was conducted as part of the 2002 National Pollutant Discharge Elimination System (NPDES) permit renewal application (Reference 10) as shown on Table 2.3-4. Monitoring locations are shown on Figure 2.3-12. This data confirms the results of the 1973 sampling that the rate of temperature change with depth in the main channel of the river is extremely small. In addition, the temperature readings upriver and downriver of GGNS show little variation.

Streamflow and Flood Characteristics

The Mississippi River has three major tributaries upstream of the site (the Missouri, Ohio, and Arkansas Rivers) and one downstream (the Red River). Floods occur in the Lower Mississippi River chiefly as a result of flooding in its tributaries. The flood season extends from mid-December to July. The number of peaks, duration of near-peak flow, and the flood volume during a year vary greatly. Rivers of the Mississippi basin have numerous flood control and navigational control structures including levees, navigational locks, and dams.

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Flood discharges at Vicksburg during six of the highest recent floods are summarized in Table 2.3-5. Updated information on floods at Vicksburg (Reference 6) indicates that no flood since the construction of GGNS have exceeded the discharge of the 1973 flood. Water surface profiles for the floods on the Mississippi River between Arkansas City and Red River Landing for the 1937 flood are shown in Figure 2.3-13. Based on these flood discharges and the profile for the 1937 flood, the highest recorded water level was about 40 ft below the GGNS Unit 1 plant grade of 132.5 ft.

Floods in the Lower Mississippi River are confined on the west bank by a system of levees. The levees are designed to contain the U. S. Army Corps of Engineers design project flood with design freeboards. In the vicinity of the Grand Gulf site the water surface elevation corresponding to the design project flood is 102.1 feet msl (References 3 and 6).

Hydrographs for the Mississippi River showing maximum, minimum, and average stages at Vicksburg, Mississippi, (based on data collected from 1932 to 2000) and at Natchez, Mississippi, (based on data collected from 1940 to 2000) are shown in Figures 2.3-14 and 2.3-15. Figure 2.4-16 illustrates the annual maximum instantaneous peak streamflow at Vicksburg from 1858 to 1999. Seasonal variations in streamflow of the Mississippi River are evident in the maximum daily flows observed at Vicksburg, Mississippi during the period 1932 - 1988 presented in Table 2.3-6. (References 1 and 7) *The major flows usually occur during the months of March and April.*

Low-water conditions at the site were studied on the basis of stream-flow records at Vicksburg Gaging Station. The minimum daily flows observed at Vicksburg, Mississippi during the period 1932 - 1979 are presented in Table 2.3-7. In addition, data on minimum river stages expressed in ft MSL are included. The minimum flow observed during the period of record was 99,400 cfs on November 1, 1940. The corresponding historical low-flow elevation at the site is about 28 ft. During the same year, the mean 30-day low flow was 108,000 cfs.

The minimum daily flows from Reference 11 observed at Vicksburg, Mississippi during the period 1932 - 1988 are also presented in Table 2.3-7. The minimum flow observed during the period 1932 to 1988 for the USGS station was 100,000 cfs on November 1, 1939. The minimum flow observed during the period from 1930 to 2000 was 93,800 cfs on August 31, 1936, according to Corps of Engineers data¹ (Reference 12). This data is consistent with the data used in the analysis for GGNS Unit 1 licensing.

Table 2.3-8 gives the 1-, 7-, and 30-day low flows for different recurrence intervals at Vicksburg (obtained from the U. S. Geological Survey). The 7-day, 10-year low flow is 129,000 cfs.

According to information provided by the U.S. Army Corps of Engineers, the Low Water Reference Plane for river mile 406 is 37.5 feet msl (Reference 4). The Low Water Reference Plane is based on the average stage from 1982-1991 representing the discharge equaled or exceeded 97 percent of the time (Reference 3).

No systematic data on the long-term flow characteristics of streams A and B are available on a long-term basis. However, some flow measurements were made during 1973 (References 8 and 13), and these are summarized in Table 2.3-9. During rainstorms, the two streams convey the surface runoff from the plant and the surrounding area. The quantity and quality of the

¹ Data for the year 2000 is still described as preliminary by the Corps of Engineers.

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surface runoff into these streams will not be affected significantly during plant operation, since the patterns of natural drainage have not been significantly changed.

GGNS is required to conduct surface water sampling and flow measurements in accordance with NPDES permit number MS0029521, Reference 14. The outflow from sediment basins A and B was measured once every quarter, and the instantaneous flow data for 1999-2001 is presented in Table 2.3-10, sheets 4 and 5. The yearly maximum flow for sediment basin A (outfall 013) ranged from 0.410 million gallons per day (MGD) in 1999 to 4.400 MGD in 2001, and the yearly average flow ranged from 0.218 MGD in 1999 to 2.135 MGD in 2001. The yearly maximum flow for sediment basin B (outfall 014) ranged from 0.270 MGD in 1999 and 2001 to 0.450 MGD in 2000, and the yearly average flow ranged from 0.190 MGD in 1999 to 0.315 MGD in 2000.

Wetlands

Reconnaissance visits to GGNS were made in August and October of 2002 to assess wetlands and other ecological resources. The oxbow lakes, borrow pit, upland ponds, and stream channels all support associated wetlands. Details of this assessment are provided in Section 2.4, and a brief summary follows.

Bottomland hardwood forests like those observed at GGNS may also be characterized as seasonally flooded wetlands. This habitat type covers approximately 885 acres, or most of the GGNS site bottomland between the Mississippi River and the bluff line.

Emergent wetlands are located near the periphery of Gin and Hamilton Lakes. In August 2002, emergent wetlands along the shorelines occupied approximately 30 acres.

Scrub-shrub wetlands occur in two distinct areas. One of these wetland areas developed relatively recently on a former bottomland field. The other scrub-shrub wetlands occur on the north, northwest, and south ends of Gin Lake and on the west bank of Hamilton Lake, and encompass approximately 10 acres.

Stream A and Stream B support permanently flooded wetlands. Ephemeral drainage channels on the upland areas on the eastern portion of the site support seasonally flooded wetlands of very small size.

2.3.1.2 Ground Water

2.3.1.2.1 Regional Conditions

The region of ground water investigations discussed herein encompasses the area east of the Mississippi River within approximately a 25-mile radius of the plant site (Figure 2.3-2). The region includes most of Claiborne County and bordering areas of Warren, Hinds, Copiah, and Jefferson Counties, Mississippi. The area west of the Mississippi River is excluded from this study because the river forms an effective hydrologic boundary. (Reference 2)

Geologic formations dip south across the region at an average of 26 ft per mile and strike approximately east-west. The regional water table slopes southward and generally conforms to the attitude of geologic structure and land surface. The water table is 50 to 100 ft below land surface in the upland areas and is at or near the surface in the lowland areas (Reference 15). The stratigraphic position of the regional geologic formations, along with a brief description of their physical and waterbearing characteristics, is presented in Table 2.3-11. (Reference 2)

The principal sources of ground water occur in the Holocene Mississippi River alluvium, Pleistocene terrace deposits, and the Miocene series, primarily the Catahoula Formation. Other

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less prominent aquifers occur in the Citronelle Formation (Pliocene-Pleistocene), Forest Hill Formation (Oligocene), and the Cockfield Formation (Eocene) (References 7 and 15). *Water-bearing formations below the Catahoula are rarely used in the vicinity because of their great depth and generally poor quality of the water.*

Holocene Mississippi River Alluvium

The Mississippi River alluvium is the most prolific waterbearing unit in the region. The alluvium, up to 200 ft in thickness, generally consists of a basal, coarse-sand and gravel zone grading upward into silt and clay. Recharge is derived from precipitation in areas where surficial deposits are permeable and from adjacent formations. (Reference 2) The Mississippi River, tributary streams, and lakes also contribute recharge during high-water levels. (Reference 16)

Ground water availability is restricted to the Mississippi River Valley because the aquifer is about 75 miles wide between Vicksburg, Mississippi, and Monroe, Louisiana. Groundwater level measurements from 1965 to 1994 for a well completed in the alluvial aquifer in Vicksburg are presented in Table 2.3-12 and a hydrograph is presented in Figure 2.3-17.

Pleistocene Terrace Deposits

Terrace deposits underlie the Holocene alluvium locally and blanket the upland areas bordering the Mississippi River and its larger tributaries. In the uplands, the terrace deposits are commonly overlain by Pleistocene loess. Terrace deposits are similar in lithology to Holocene alluvium and vary regionally from 0 to 120 ft in thickness. Rural domestic wells are completed at shallow depths in these deposits along the Mississippi River and its main tributaries and yield several gallons per minute (Reference 15). Recharge to the terrace deposits is from underflow and downward seepage through overlying loess. (Reference 2)

Miocene Series

Aquifers of the Miocene series underlie the entire region. The Miocene series consists of three stratigraphic units: Pascagoula, Hattiesburg, and Catahoula Formations. The Pascagoula and Hattiesburg Formations are important as aquifers only in the extreme southeastern portion of the region. Permeable zones within the Catahoula Formation are the source of water for the majority of public and private wells in Claiborne, Copiah, and Jefferson Counties, and they supply several small wells in southern Hinds and Warren Counties. The depth to Miocene aquifers varies greatly over the region from near surface in the north to about 1100 ft in southern areas. The Catahoula Formation consists of lenticular deposits of sand, clayey silt, and sandy-silty clay, locally cemented. Sand layers are predominantly fine-grained and range in thickness from a few inches to more than 100 ft (Reference 15). The recharge area for the Catahoula lies to the north in Warren and Hinds Counties beneath the alluvial plain and loess bluffs. (Reference 2)

Groundwater level measurements from 1910 to 1996 for a well completed in the lower Catahoula formation in Port Gibson are presented in Table 2.3-13, and a hydrograph is presented in Figure 2.3-18.

In 1988 the EPA issued a final determination that the Southern Hills Regional Aquifer System was the sole or principal source of drinking water for 14 counties in southwest Mississippi (Figure 2.3-19), including Claiborne, Copiah, Hinds, Jefferson, and Warren Counties (Reference 17). The Pascagoula, Hattiesburg, and Catahoula formations are part of the Southern Hills Regional Aquifer System (Reference 18) Sole Source Aquifer.

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Federal financially assisted projects which have the potential to contaminate the designated sole source aquifer are subject to EPA review. Federal financial assistance is defined as any financial benefits provided directly as aid to a project by a department, agency or instrumentality of the federal government in any form, including contracts, grants, and loan guarantee (Reference 19). The U.S. Department of Energy (DOE) is participating with U.S. power generating companies to conduct a regulatory demonstration project for Early Site Permit (ESP) applications to the Nuclear Regulatory Commission (NRC) in accordance with 10 CFR Part 52. The Secretary of Energy unveiled the Nuclear Power 2010 initiative aimed at building new nuclear power plants in the United States before the end of the decade. The President's National Energy Policy calls for the expansion of nuclear energy as part of the nation's energy policy as part of the means to achieve energy security in America while finding clean, affordable alternatives to carbon emitting power plants. Implementation of the Nuclear Power 2010 regulatory demonstration activities is an important first step toward achieving expanded use of nuclear energy. DOE has been working with the nuclear industry in an effort to identify the issues and barriers affecting future near-term deployment of new nuclear power plants. DOE has chosen a two-phase government/industry cost-shared project to demonstrate the ESP licensing process. Entergy is participating in this government/industry cost-shared project (DOE Agreement Number DE-FC07-02ID14413) and is, therefore, receiving federal funds in support of this ESP application process.

2.3.1.2.2 Plant Site Conditions

Description of Aquifers and Recharge Sources

Geologic and foundation exploratory borings indicate that the site is mantled by permeable Holocene and Pleistocene sediments. Holocene alluvial sand, clay, and gravel deposits are located immediately under the floodplain or western portion of the site, with several feet of organic silty clay forming the surface over most of the area. Alluvium thickness, as determined by borings, generally ranges from 95 to 182 ft. The greatest thickness of gravel generally occurs at the base of the alluvial deposits just above the Catahoula formation. (Reference 2) In the area between the Mississippi River and Hamilton and Gin Lakes, alluvial sands and gravels extend to depths of about 100 feet below the surficial clay deposits.

East of the lakes, the sand and gravel deposits become thinner and intermingle with silt and clay lenses. A clay lens (remnant of an ancient Mississippi River meander) lies beneath Hamilton and Gin Lakes. It extends downward to within 20 feet of the top of the Catahoula at some locations, thus limiting the thickness of the alluvial sands and gravels. Ground water within the floodplain alluvium occurs under unconfined conditions, with water levels generally within 5 to 20 feet of ground surface. The Mississippi River controls ground water levels in the floodplain to a large extent. Figure 2.3-20 shows boring and piezometer locations.

Hydrogeologic cross sections of the floodplain area are shown on Figures 2.3-21 and 2.3-22.

The eastern upland area of the site is blanketed by 22 to 82 feet of Pleistocene loess. The loess deposits generally lie above the regional water table. However, saturated zones were encountered at a few locations just above the contact between the loess and the underlying terrace deposits. These are localized occurrences in areas where terrace clay lenses form impermeable surfaces on which downward migrating water accumulates.

The loess deposits are underlain by 0 to 151 feet of Pleistocene terrace deposits consisting of discontinuous lenses and layers of sand, gravel, silt, and clay. Ground water within the terrace deposits occurs under unconfined and perched conditions. Perched water tables were encountered at various depths in the areas indicated on Figure 2.3-22. In the general vicinity of

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the station, the Catahoula forms a ridge-like feature which rises to about El. 90 feet msl. The top of this feature is about 20 feet above the regional water table elevation. At certain locations on this feature, it appears that recharge from precipitation percolates through the terrace deposits and accumulates on the relatively impermeable Catahoula surface before reaching the regional water table. At other locations, such as OW201 and OW208 (Figure 2.3-20), perched water tables result where terrace clay lenses form impermeable basins in which downward migrating ground water collects.

The Catahoula is continuous across the entire site and lies beneath the alluvium and terrace deposits, and, at a few locations, directly beneath the loess. It consists of lenticular beds of fine sand, silty clay and clayey silt, with occasional silt and fine sand seams, locally indurated. Ground water occurs in the sand strata in the upper portion of the formation. Water-bearing zones within the lower portion of the formation consist of thin, fine-grained sand layers (usually less than 10 feet thick) which are contained between thick clay or clayey silt layers.

Values of permeability (hydraulic conductivity), total and effective porosity, bulk density, storage coefficient, and dispersion and distribution (sorption) coefficients for the various deposits represented at the site are given in Tables 2.3-14 and 2.3-15. Table 2.3-16 provides information on hydraulic conductivities and transmissivities of terrace deposits.

In the floodplain alluvium, the primary source of recharge is infiltration of precipitation; however, the Mississippi River provides recharge during high river stages. It is unlikely that any appreciable recharge is derived from Hamilton and Gin Lakes due to a thick clay/silt layer beneath the lakes. The primary source of recharge to the terrace deposits is via percolation through the overlying loess. The Mississippi River recharges the terrace deposits locally during high water (Reference 2). Water-bearing zones within the Catahoula receive recharge from percolation through overlying terrace or alluvium.

Ground Water Levels and Movement

There are three levels of ground water in the site area:

- 1) the regional water table in the Mississippi River alluvium and adjacent terrace deposits,*
- 2) perched water tables in the terrace deposits, and*
- 3) the potentiometric level of the confined aquifer within the Catahoula Formation (Figure 2.3-22).*

Ground water levels measured in selected piezometers and observation wells (Tables 2.3-17 and 2.3-18) are presented by hydrographs in Figure 2.3-23 (5 sheets) for the period 1972 through mid 1979. Observation well and piezometer locations are shown on Figure 2.3-20. Hydrographs of the water levels of Hamilton and Gin Lakes and the Mississippi River for the corresponding period are shown in Figure 2.3-9. (Reference 2)

In the site area the regional ground water table slopes gently westward, with local gradients dipping toward the major tributary valleys. The gradient steepens toward Hamilton and Gin Lakes. West of the lakes, the ground water table slopes toward the river at a gradient that varies with the prevailing river stage (Figure 2.3-20). The regional ground water table within the site property ranges from about El. 60 to 80 ft msl during normal river elevations. The normal ground water gradient in the floodplain and the bluffs is temporarily reversed during flood stages of the Mississippi River. Figure 2.3-24 shows the configuration of the ground water table at the site during the spring flood of 1973. The ground water contours represent the highest ground water levels recorded at the site during the period January 1972 to May 1976. (Reference 2)

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Perched water zones occur in the area indicated on Figure 2.3-20 that corresponds to the area underlain by a ridge-like feature formed by the Catahoula Formation. The perched water levels range from El. 90 to 130 ft msl in the site area. The highest perched water level (130 ft) was recorded at observation well OW-201, located near the eastern site property line. Observation wells OW-6, OW-6A, OW-6B, OW-6C, OW-115A, OW-115B, OW-116, and OW-118 were constructed in the perched water zone in the vicinity of the existing GGNS Unit 1 power block area. The highest perched water level recorded in these wells was El. 112 ft msl at OW-6A (Figure 2.3-23, sheets 4 and 5). The observation wells and piezometers in the existing GGNS Unit 1 power block area were destroyed during excavation. Additional observation wells were later installed to monitor the perched water levels during plant construction (Figure 2.3-25). Hydrographs of these wells (#1 through #8, Figure 2.3-25), for the period 1974-1975, are shown in Figure 2.3-26 (5 sheets). The highest perched water level recorded during this period was El. 113 ft msl at the [Unit 1] ultimate heat sink location. These wells were also destroyed as excavation and installation of the tie back wall ... progressed. These wells were replaced with six new monitor wells (MW-1 through MW-6), which were installed in the sand backfill inside the tie back wall (Figure 2.3-25) in 1976. Hydrographs for the replacement observation wells are shown on Figure 2.3-27 for the period September 1976 through January 1979 Hydrographs are not shown for observation wells MW-1 and MW-2, because these wells are located inside the portion of the GGNS Unit 2 excavation that was not backfilled during the period of record. Water levels during the period were below El. 93.2 feet and El. 90.5 feet, respectively (Reference 20). Hydrographs of water levels in MW-1 through MW-7 for the period 1979 to 1991 were developed for a ground water study completed in 1992 (Reference 20 ...). (Reference 2)

In 1986, five wells (MW-8 through MW-12) were installed to monitor water levels in the circulating water pipe trench (CWPT) backfill and in the terrace deposits east of the [existing GGNS Unit 1] power block. The wells were installed to determine the cause of elevated ground water levels in DW-8. In addition, a supplemental dewatering well (DW-8a) was installed in the terrace deposits in the vicinity of DW-8. The locations of these wells are shown on Figure 2.3-25. (Reference 2)

[Fourteen] additional monitoring wells (MW-13 through MW-26) were installed in the backfill and terrace deposits in the existing GGNS Unit 1 cooling tower area and in the northern portion of the site in 1990. However, in 2001, four monitoring wells, MW-16, MW-17, MW-19 and MW-20 were subsequently removed for the installation of the Auxiliary Cooling Tower. The wells were installed in conjunction with studies to better define sources of ground water recharge and ground water flow patterns across the site. The locations of these wells are shown on Figure 2.3-25. Hydrographs of water levels in these wells were developed for a ground water study completed in 1992 (Reference 20 ...). (Reference 2)

An assessment of the hydrographs shows that ground water levels within the existing GGNS Unit 1 power block and cooling tower areas at GGNS are at elevations greater than the surrounding regional levels. Ground water levels are generally between El. 100 and 105 feet in the northern portion of the area and between El. 105 feet and 110 feet in the southern portion of the existing GGNS Unit 1 power block. The elevated ground water levels roughly coincide with locations where the top of the Catahoula is above 70 ft. in elevation and follow the northwest trend of the Catahoula "ridge". The top of the Catahoula Formation exceeds 70 feet in elevation throughout most of the existing GGNS Unit 1 power block area and exceeds 100 feet between the power block and the cooling tower. This rise in elevation obstructs the regional ground water flow causing the ground water flow to diverge north and south of the site area. (Reference 2)

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The top of the Catahoula formation is at a lower elevation in the proposed area for the power block of a new facility, and ranges between 50 feet elevation above msl on the eastern side of the area to 20 feet elevation below msl on the western side of the area. Therefore, the ground water levels are expected to be generally lower in the area of the new facility in comparison to those measured in the area of GGNS Unit 1 power block and cooling tower. A hydrogeologic cross section which indicates the approximate east and west boundaries of the proposed construction area for the power block of the new facility is shown on Figure 2.3-22.

The water levels shown on the hydrographs have also been influenced by operation of the dewatering wells during much of the period from their installation in 1979 and 1980 through 1991. The pumping masked the determination of the source and effects of recharge. Before March 1990, the pumping rates of these wells are not recorded, and, therefore, the degree to which they affected water levels could not be determined. However, for selected periods when the pumps were not in operation, and for the period after March 1990 when pumping rates for the dewatering wells were known, the hydrographs provided data that could be used to assess and predict long term ground water level patterns. (Reference 2)

The water levels in observation wells and piezometers constructed within the Catahoula Formation range from about El. 55 to 80 ft msl during normal river elevations. The highest water level recorded in observation wells or piezometers in the Catahoula during the period 1972 through 1979 was El. 113 ft msl at P-117A; however, the hydrograph of P-117A (Figure 2.4-23, Sheet 5) indicates that the piezometer was not functioning properly. Therefore, the El. 113 ft msl water level does not represent actual ground water conditions. Water levels higher than the overall regional water level and considerable water level variation during the period 1984 through 1991 have been experienced within the Catahoula Formation at OW-10, one of three regional monitoring wells open to the Catahoula Formation (Table 2.3-19). Water levels as high as El. 154.5 ft have been measured in this well. The cause of the fluctuation in water levels is generally attributable to damaged casing, damage to the surface seal, or ponding of water outside the casing (Reference 22). Water levels have gradually returned to typical regional water levels within a period of several months after repairs to the well casing or improvements in surface drainage were made. Similar fluctuations have not occurred in the other two monitoring wells used to measure water levels in the Catahoula Formation. (Reference 2)

The ground water levels in the site area are slightly modified as a result of the effects of radial collector well field pumpage, topographic modifications, relocation of surface drainage systems, and structure installation. A ground water contour map of the site area indicating expected average ground water conditions during the operating life of the existing GGNS Unit 1 plant is provided in Figure 2.3-28. (Reference 2) The contour map shows that average water levels are between El. 105 and 110 ft immediately south of the existing GGNS Unit 1 power block and between El. 100 and 105 ft in the northern portion of the existing GGNS Unit 1 plant area. Water levels are higher east of the cooling tower due to the low permeability of the geologic materials in that area.

Table 2.3-20 provides a summary of water levels in DW-7, DW-8, MW-12, and MW-13 based on monthly measurements from 1996 to 2001 (Reference 23). These wells are located in the Terrace deposits around the existing GGNS Unit 1 power block. The water levels in the dewatering wells are not completely representative due to effects of pumping that tend to have a localized effect of lowering the groundwater level.

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2.3.2 Water Use

2.3.2.1 Surface Water

Area Use

According to information on water use for 1995 (Reference 24), total surface water withdrawals in Claiborne County were 0.47 million gallons per day (MGD), broken down as follows:

Quantity (MGD)	Usage
0.35	Irrigation
0.12	Livestock

No surface water usage in Claiborne County was reported for public supply, domestic self-supplied systems, mining, hydroelectric power, thermoelectric power, industrial or commercial uses. Detailed data pertaining to surface water use in Claiborne County and in adjacent Mississippi counties are presented in Tables 2.3-21a through 2.3-21i (Reference 24).

The nearest downstream user of Mississippi River water is Southeast Wood Fiber located at the Claiborne County Port facility, approximately 0.8 miles downstream of the Grand Gulf site. The maximum intake requirement for this facility is estimated to be less than 0.9 MGD for industrial purposes; however, none of this intake is used as potable water (Reference 25). There are only three public water supply systems in the state of Mississippi that use surface water as a source, and none of these are located within 50 miles of the GGNS site (Reference 26). There are no downstream or upstream intakes within 100 miles of the GGNS site that use the Mississippi River as a potable water supply (References 25 and 27). Tables 2.3-22 and 2.3-23 identify the nearby surface water users of the Mississippi River and the maximum rate of withdrawal from the Mississippi River. Since users on the Louisiana side of the river are outside the region of interest for the GGNS ESP Site evaluation (i.e., greater than 50 miles), maximum withdrawal rates for these users are not provided in Table 2.3-23.

The Corps of Engineers maintains a 9-foot depth at low water on the Mississippi River for navigational uses. The primary navigational use of the river is for freight shipments, with 204,321,000 short tons of freight traffic in 2000 for the section of the river between the mouth of the Ohio River to Baton Rouge (Reference 28). The Delta Queen Steamboat Company operates three paddle wheel tour boats on the Mississippi River, the Delta Queen, the Mississippi Queen and the American Queen. These three tour boats are scheduled to pass the GGNS site a minimum of 26 times during the 2003 season (Reference 29).

There is limited commercial fishing in the area, with most occurring on the Mississippi River, the Big Black River, and the Bayou Pierre River. Catfish is the most abundant catch. There are approximately twelve commercial fisherman who currently fish in the area (Reference 30).

Most sport fishing occurs in the months of April through September, with Saturday being the busiest day of the week. As many as 200-250 fishermen may be in the vicinity on weekends from April through September. The number of fishermen may drop to less than 150 on weekdays and depending on weather conditions (Reference 30).

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Plant Use

Makeup to the normal heat sink cooling towers, balance of plant cooling systems (e.g., plant service water), and other raw water makeup needs for a new facility would be supplied by an intake structure located on the east bank of the Mississippi River at the location of the existing barge slip. The intake structure would include intake screens, pumps, etc., to convey the river water to a system of clarifiers or other type cleanup equipment before its use in the facility.

Normal makeup flow rate to the new facility would be approximately 50,320 gpm, and maximum expected makeup flow is approximately 85,000 gpm. Figure 2.3.29 is a water use diagram that illustrates specific uses of this makeup water, and amounts required. Using the most conservative minimum flow value at Vicksburg of 93,800 cfs (Section 2.3.1.1.4), the facility withdrawal would be about 0.2% of the minimum flow. Intake and embayment final design will consider the influence of sedimentation and littoral drift on the ability to provide the necessary makeup water.

The normal heat sink circulating water system for the new facility will be a closed-cycle type system using either hyperbolic natural draft cooling towers or mechanical draft cooling towers. Circulating water system flow through the cooling towers, on a per unit basis, is estimated at 865,000 gpm (Table 3.0-1).

Effluent from a new facility would be combined with that from the existing GGNS Unit 1 facility, and would be discharged into the river downstream of the intake such that recirculation to the embayment area and intake pipes would be precluded. Dilution and distribution of the discharge heat as well as other effluent constituents are affected by both the design of the discharge structure and the flow characteristics of the receiving water. Detailed design of the discharge structure would include appropriate consideration of the river conditions at the location of the discharge.

The Corps of Engineers and the State of Mississippi do not currently restrict the quantity of water that can be withdrawn from the Mississippi River. The Mississippi Department of Environmental Quality issues permits for surface water withdrawals that are effective for 10 years. The permit may then be renewed for an additional 10 years (Reference 25).

The new facility owner would be required to coordinate with the Corps of Engineers and obtain permits from appropriate regulatory agencies for construction of the embayment and intake structure when the final design of the embayment and intake structure and its exact location are defined. The design and placement of the embayment and intake structure will be in accordance with the Corps of Engineers guidance, MDEQ and EPA requirements, and good engineering practice.

Emergency cooling water for a new facility would be provided from separate enclosed cooling system(s) which utilize basins with mechanical draft cooling towers, and which would not be reliant on the source of water from the river intake, with the possible exception of normal (non-emergency operation) makeup water supply. Therefore, low river water conditions would not impact the ability of the emergency cooling water systems and the ultimate heat sink to provide the required cooling for normal operations, anticipated operational occurrences and emergency conditions.

The final location for the embayment and intake structure would be chosen such that there would be inconsequential interference, if any, with the pumping ability of the surrounding existing GGNS Unit 1 radial wells. The existing GGNS Unit 1 radial well No. 5 is located about 250 ft. to the south of the existing barge slip and has one lateral line which extends directly

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beneath the barge slip inlet area. This lateral line is located at a depth of about (-) 40 ft. msl, which is well below the depth of excavation which would be required for a river intake (estimated at about 10 ft. msl).

2.3.2.2 Ground Water

Area Use

According to information on water use for 1995 (Reference 24), total groundwater withdrawals in Claiborne County were 33.9 MGD, broken down as follows:

Quantity (MGD)	Usage
1.25	Public Supply
0.23	Domestic (Self-Supplied)
0.12	Irrigation
0.08	Livestock
32.05	Thermoelectric Power (GGNS)
0.17	Commercial

No groundwater usage was reported in Claiborne County for mining, hydroelectric power, or industrial uses. Detailed data pertaining to groundwater use in Claiborne County and in surrounding counties for 1995 are presented in Tables 2.3-21a through 2.3-21i.

Public water supply wells in Claiborne County (excluding GGNS) are supplied by the Catahoula formation with well depths ranging from 166 to 960 feet (Reference 32). Table 2.3-24 provides information on public and industrial wells in Claiborne and surrounding counties (Reference 33). Nine active public water supply systems were located in Claiborne County as of May 2002, not including GGNS (Reference 34). The closest area of concentrated ground water withdrawal is the Port Gibson municipal water system about five miles southeast of the site. Pumpage for Port Gibson is provided by five wells completed in the Catahoula Formation and withdrawals average 0.85 MGD (Reference 35). The Port Gibson municipal system is the largest in the county, serving a population of 4,845, and details of the Port Gibson wells are provided in Table 2.3-25.

Aside from GGNS, the primary use of ground water in Claiborne County is for public supply purposes with a small percentage used for domestic water, irrigation, and livestock. Within a two-mile radius of the plant site, essentially all ground water is used for domestic purposes. Therefore, aside from plant use, future ground water demands in the vicinity of the site may be estimated on the basis of projected population growth.

According to the population projections (SSAR 2.1.3), the population within a two-mile radius of the plant is projected to be 58 people by the year 2070 (excluding GGNS plant personnel). Based on published USGS sources (Reference 36), users of self-supplied water systems typically use 45 gpd. If the entire projected population utilizes groundwater as a source, the estimated groundwater withdrawal within a two-mile radius of the plant by the year 2070 will be 2,610 gpd. Table 2.3-26 provides a listing of water wells within a four-mile radius of GGNS (Reference 33).

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Plant Use

Plant service water for the existing GGNS Unit 1 plant is supplied from radial collector wells located in the floodplain that parallels the Mississippi River. The collector wells are designed to derive water from the Mississippi River via induced infiltration. (Reference 2)

Three wells completed within the Catahoula formation are currently used to supply water for general site purposes including potable, sanitary, air conditioning and landscape maintenance. Two of the wells are in routine use and have electric pumps, and the third well is a backup well with a diesel pump. The backup well (north construction well) was installed in 1976 to supply water for construction purposes, and the remaining two wells (north drinking water well and south drinking water well) were installed in 1995 and 1996 to replace a well that had become inoperable. During GGNS Unit 1 refueling outages, the two wells operate at near full capacity. Therefore, these existing wells would not have adequate production to supply the water needs for a new facility.

GGNS Unit 1 currently submits an Annual Water Use Survey to the Mississippi Department of Environmental Quality (MDEQ). According to the most recent data available for the 2001 calendar year (Reference 37), the facility currently has 18 water wells with a total of 1.13E+10 gallons pumped in 2001. This total includes the four radial collector wells rated at 21,332 gpm; three wells used for general site purposes rated at 513, 535, and 577 gpm; and dewatering wells.

Makeup (cooling tower makeup and other raw water needs) for a new facility would be supplied from the Mississippi River via an intake located on the east bank of the river and on the north side of the existing barge slip. Groundwater may be utilized for other general plant purposes including potable, sanitary, fire protection, air conditioning, and landscape maintenance. The expected average consumption of groundwater for these uses (for a new facility) is approximately 1,310 gpm (Table 3.0-1). The expected maximum consumption of groundwater for these uses is approximately 3,570 gpm (Table 3.0-1). The installation of additional wells in the Catahoula formation for these purposes would be necessary.

Construction activities for the existing GGNS facilities required approximately 500,000 gpd (gallons per day), or 350 gpm of water, for concrete batch plant operation, dust suppression, and sanitary needs (Reference 2).

It is anticipated that construction of a new facility would require a similar quantity of water. The recommended planning number for tapwater consumption for workers in hot climates is 3 gpd for each worker (Reference 38). Based on the maximum construction worker population of 3,150 people indicated in Table 3.0-1, the tapwater consumption is estimated at 9,450 gpd. The installation of an additional well may be required for construction purposes. A state permit will be required for the groundwater well installation(s).

2.3.3 Water Quality

Ground water and surface water samples were collected in 1972 as part of the initial assessment for the existing GGNS Unit 1 plant for chemical analyses to evaluate the chemical character of local water resources (References 8 and 39). Ground water samples were obtained from test and observation wells on site and from selected private wells within the limits of the well survey. Surface water samples were taken from the Mississippi River and Bayou Pierre. (Reference 2)

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Recent sampling data was obtained from published sources and from results of ongoing monitoring programs at GGNS and is discussed below.

2.3.3.1 Surface Water

Results of chemical analyses of 1972 surface water samples and a description of the sampling locations are presented in Table 2.3-31. (Reference 2) The surface water samples are low in dissolved solids and less mineralized than ground water sampled in the site locality.

Surface water quality data for the Mississippi River was also obtained from USGS sampling points near GGNS. The USGS data includes information for Vicksburg dating from 1961 to 1999, for river mile 390 in 1976, for river mile 405 in 1980, and for river mile 402 in 1996. This surface water sampling data is provided in Tables 2.3-27, 2.3-28, 2.3-29, and 2.3-30.

The 1998 Section 303(d) list of impaired waterbodies for Mississippi was reviewed (Reference 40) for locations within Claiborne County. No impaired waterbodies were listed in Claiborne County.

GGNS is required to conduct surface water sampling in accordance with water pollution control permit number MS0029521, Reference 41. Figure 2.3-12 shows the outfall sampling locations, and Table 2.3-10 provides recent sampling data.

Outfall 1 discharges into the Mississippi River via the GGNS Unit 1 discharge basin. For 2000-2001, the daily maximum temperature (measured continuously) at this outfall occurred in July 2000. Monthly average water temperatures were lowest in the winter months (December 2001 and December 2000), and were highest in the summer months (July 2001 and August 2000).

Outfall 13 includes effluent from sediment Basin A that enters an unnamed tributary thence into Hamilton Lake. The flow rate, pH, and total suspended solids (TSS) are measured quarterly, and for 1999-2001 the maximum flow measured was 4.400 MGD. The average flow ranged from 0.218 MGD in 1999 to 2.135 MGD in 2001. The minimum pH measured during this period was 7.07, and the maximum was 8.45. The maximum TSS concentration was 97.00 parts per million (ppm).

Outfall 14 includes effluent from sediment Basin B that enters an unnamed tributary thence into Hamilton Lake. The flow rate, pH, and total suspended solids (TSS) are measured quarterly, and for 1999-2001 the maximum flow measured was 0.450 MGD. The average flow ranged from 0.190 MGD in 1999 to 0.315 in 2000. The minimum pH measured during this period was 7.79, and the maximum was 8.77. The maximum TSS concentration was 26.00 ppm.

Other outfalls are located on the site, but these outfalls ultimately feed into the outfalls and streams included in the above discussion.

2.3.3.2 Ground Water

Results of chemical analyses of groundwater samples and a description of the sampling locations are presented in Table 2.3-31.

Chemical analyses of samples taken from the Mississippi River alluvial aquifer indicate the water is a sodium-calcium bicarbonate type, high in total dissolved solids (358 to 604 ppm). Samples of ground water from the terrace deposits are a calcium-magnesium bicarbonate type with a total dissolved solids (TDS) content of 277 to 442 ppm. The total dissolved solids concentration of a water sample from the Catahoula Formation is 460 ppm.

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Additional USGS well sampling data for wells in the Catahoula Formation in Claiborne County and the Mississippi River alluvial aquifer in Claiborne County and Warren County are presented in Table 2.3-32.

Water quality sampling was conducted for the Mississippi River and for the radial wells completed in the alluvial aquifer in 1988, as summarized in Table 2.3-33. This data indicates that water quality in the alluvial aquifer had not changed significantly since the initial sampling was conducted in 1972. In 1972, TDS ranged from 358 to 604 ppm, and in 1988 TDS ranged from 461.9 to 557.9 ppm. In 1972, the pH ranged from 7.3 to 8.0, and in 1988 the pH ranged from 7.04 to 7.24.

Three groundwater wells completed in the Catahoula Formation are currently used to supply water for general site purposes including potable, sanitary, air conditioning, and landscape maintenance. Two wells are used on a routine basis and the third well is used as a backup. A fourth well was plugged due to silting problems. These wells are located on the western boundary of the bluffs area near the Energy Services Center (ESC) building (Figure 2.1-1), and pre-treatment sampling is conducted on a routine basis. Recent water quality sample data for these wells is included in Table 2.3-34. This data indicates that water quality in the Catahoula aquifer had not changed significantly since the initial sampling was conducted in 1972. In 1972, TDS was 460.0 ppm, and in recent sampling TDS ranged from 420.0 to 435.0 ppm. In 1972 the pH was 8.3, and in recent sampling pH ranged from 7.1 to 8.2.

2.3.4 References

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2.4 Ecology

The primary reference for this section is the GGNS Final Environmental Report (FER) issued by Mississippi Power and Light in 1973 (Reference 1). The FER summarizes ecological field data collected at the site from June 1972 to August 1973 prior to construction of Unit 1.

Reconnaissance visits to the site were made during the weeks of August 19-24 and October 29-November 1, 2002. The purpose of these visits was two-fold: (1) to describe wetlands and other “waters of the United States” within the GGNS site, and (2) to qualitatively assess the ecological resources on the GGNS site for comparison with the characterizations presented in the FER, to assist in determining if the ecological conditions had significantly changed during the intervening years since the GGNS Unit 1 FER surveys were done. Some general observations were also made during the site visits regarding the types of animals present on the site. The conclusion from these qualitative assessments is that the descriptions in the FER adequately describe the condition at the GGNS site, for the purposes of this ESP application. It was evident that there was little additional development on the site in previously undisturbed areas, and that the vast majority of the site has been left undisturbed in the intervening years (Figure 2.4-2).

Figure 2.4-1 is an aerial photograph of the GGNS site and vicinity taken in 1971, prior to construction of Unit 1. For comparison, Figure 2.4-2 is an aerial photograph taken in 2001. It shows Unit 1 and the proposed construction areas for a new facility. It is interesting to note that the main channel of the Mississippi River on the north side of the barge slip has moved to the east in the intervening 30 years as evidenced by the property line extending into the river. The United States Army Corps of Engineers (USACE) has stabilized the banks of the river with the construction of revetments, so further erosion of the eastern bank is not anticipated (Section 2.3.1.1.1).

Wetlands and other waters of the U.S. fall within the jurisdictional control of the USACE, which regulates any activity resulting in discharge and fill to such waters. Wetlands, as defined by the U.S. Fish and Wildlife Service Wetland Delineation Manual (Reference 2), are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Waters of the U.S. are broadly defined as waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including: waters which are subject to the ebb and flow of the tide; the territorial sea; interstate waters and wetlands; all other waters (such as intrastate lakes, rivers, streams and wetlands), if their use, degradation or destruction could affect intrastate or foreign commerce; tributaries to waters or wetlands identified above; and wetlands adjacent to waters identified above.

There was no new quantitative field data collected during the reconnaissance visits to the GGNS site. In this Environmental Report, current features of the GGNS site are described where recent observations differ from or contribute new information to the descriptions in the FER. Therefore, detailed species lists and other discussions that simply reiterate the FER are not presented here. The focus is instead on the overall quality of habitats on the GGNS site and on changes that may have occurred within them since the earlier study.

2.4.1 Terrestrial Ecology

GGNS is located in a rural area of southwestern Mississippi along the east bank of the Mississippi River. The GGNS site is roughly bisected by a north-south trending line of bluffs

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located parallel to and about 1.1 miles east of the river at the north end of the site and about 2.4 miles east of the river at the south end of the site. Because of the bluffs, terrain at the GGNS site varies from seasonally inundated bottomlands west of the bluff line along the river, to uplands atop the bluffs. About one-half of the total acreage at GGNS is bottomland, including forested, shrub, and emergent marsh wetlands. The other half of the site supports upland habitat types in areas not cleared during construction of Unit 1.

Seven vegetation types were identified on the site in the FER, in addition to aquatic habitats such as lakes, ponds, streams, and the Mississippi River. These vegetation types are (1) (upland) oak-American elm bluff deciduous forest, (2) (upland) oak-sweetgum bluff deciduous forest, (3) bottomland sugarberry-green ash deciduous forest, (4) non-forested bottomland, (5) (bottomland) swamp privet-black willow shrub swamp, (6) (upland) bluff fields, and (7) bottomland fields.

The first two of these plant communities are distinguished from each other by minor differences in species composition. These differences are unimportant when describing the habitat value of the forest stands. Accordingly, they are combined in this report as upland forest.

The FER distinguished between non-forested bottomland at GGNS and bottomland fields. Thus, the non-forested bottomland was presumably marsh. No open marsh along the bank of the Mississippi River was observed during the 2002 reconnaissance visits. However, emergent marsh occurs along the shoreline at the south and north ends of Hamilton Lake and the south end of Gin Lake (Section 2.4.1.1.2.1).

Other recent observations suggest that the vegetation types present on the site in the early 1970s are also the types generally present today. Although no quantitative studies were performed, the spatial distribution of some vegetation types has either expanded or contracted, depending on the area. For example, cleared fields in both upland (presumably grazing land) and bottomland (presumably crop land) areas on site in the 1970s are now developing into the early stages of forest through secondary plant succession. Secondary succession describes the natural process whereby land once cleared by man for pasture or cropland (or other forces such as wildfire or storm) slowly regenerates into forest based on seeds carried to the area from elsewhere. In most cases, forest succession is relatively orderly and, therefore, predictable. In the case at GGNS, upland fields appear to be succeeding into loblolly pine stands while an abandoned field in the bottomland now supports a dense, monotypic growth of sycamore saplings.

A remnant stand of upland mixed pine-hardwoods was observed in an area adjacent to the eastern end of the plant site and north of the existing electrical switchyard (Figure 2.4-3). The FER did not discuss this vegetation community; however, its apparent age suggests that it was present during the original forest sampling program. This further suggests that the mixed pine-hardwood community was then, like now, very limited in extent at GGNS.

2.4.1.1 Terrestrial Habitats

Onsite terrestrial habitats now, as in the 1970s, can, in general, be classified as upland and bottomland forest, upland and bottomland clearings (now succeeding into forest), and upland and bottomland wetlands. The current distribution of terrestrial habitat types is shown in Figure 2.4-3.

Also shown on Figure 2.4-3 are areas cleared of vegetation during construction of Unit 1. In addition to the site of the Unit 1 power reactor and its support buildings, parking lots, lay-down areas, and other structures. Cleared areas on site include a Heavy Haul Road, a two lane, hard-

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surface roadway built to connect the plant site to the barge slip on the river. Construction materials delivered by barge were transported along this road to the plant site.

Also cleared were the sites of five radial wells along the Mississippi River bank that supply cooling water to the existing plant. They are connected to Heavy Haul Road by an unimproved roadway. Other unimproved roads link Hamilton and Gin Lakes and provide access to the lakes for recreational fishermen. Also cleared were areas for a borrow pit, served by another unimproved road, now largely overgrown, and a firing range used by plant security personnel. As illustrated in Figure 2.4-3, most of the cleared area at GGNS is in the upland portion of the site.

During 1972 and 1973, as reported in the FER, at least 420 species of vascular plants representing 285 genera and 105 families were observed on the GGNS site. There were sixty-four species of trees, all except three species being deciduous. The species composition of understory vegetation growing on the site varied seasonally with the largest number of plants occurring during the summer. Two forest types were identified on the site during the preconstruction investigation: bottomland deciduous hardwood (palustrine, forested, seasonally flooded wetland), including Grand Gulf Island forest, and loessial bluff deciduous hardwood. Swamp privet was the only dominant tree species that was not commercially valuable in the bottomland deciduous hardwood forest, while all dominant species in the loessial bluff deciduous hardwood forest were commercially valuable. Plants that were commonly found in the forests on GGNS are listed in Table 2.4-1.

Subjective evaluation of wildlife habitat is based on the assumptions that (a) vegetation structure including species composition and physiognomy (the outward appearance of the stand) is sufficient to define its suitability for wildlife, (b) a positive relationship exists between vegetation diversity and wildlife species diversity, and (c) vegetation species composition and primary productivity directly influence wildlife population density.

When compared to other vegetation types, hardwood forests usually demonstrate especially diverse species composition. Generally, as these stands increase in age, they also develop a vertical herb, forb, shrub, mid-story and canopy structure. Diverse species composition and well-developed vertical structure provide numerous ecological "niches" that are occupied by especially diverse wildlife populations. Bottomland hardwoods are also highly productive in part because of annual inundation by flood water that continually replenishes soil nutrients.

Species and structural diversity of a hardwood forest is of special importance to satisfying the ecological requirements of numerous bird species. Additionally, such stands provide migration corridors and stop-over habitat for neo-tropical and short-distance migrants. Likewise, they provide travel corridors for mammals and habitat for other resident ground-level dwellers.

Of special significance in hardwood habitats is production of beechnuts, acorns, and other similar food-stuffs, collectively termed "mast". Mast is eaten by a variety of wildlife species. And, as they age, hardwoods also develop numerous cavities of varying size, as was observed at GGNS, that are important as dens or roosts.

Field data on mammals were gathered in 1973 by direct field observations, hunter bag check trapping, nightlight counts and tallying road kills. Table 2.4-2 presents the common species of mammals encountered during the 1972-73 survey. The whitetail deer was the largest mammal occurring on the GGNS site during the 1972-73 survey. Field observations indicated that deer were numerous on the site.

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White-tailed deer were hunted on the site during the 1972-1973 hunting season according to the FER. Public access for hunting was not permitted during construction. Hunting was resumed after construction but was again curtailed after September 11, 2001. GGNS facility employees, members of the GGNS bow hunting club, are allowed to hunt on the site property using only archery equipment. During the October 2002 reconnaissance visit to the GGNS site two areas were observed in which disking and seeding with grass appeared to have occurred fairly recently. One was in a natural clearing in a bottomland stand east of Radial Water Well No. 1. The other was in a former bottomland field northwest of the plant site near Gin Lake. In both cases, the treated acreage was small relative to the overall size of the property. Both were probably created to attract deer to the area for harvest. There are private hunt clubs located immediately adjacent to GGNS.

Numerous signs, predominantly tracks, indicate the continuing presence of a substantial deer population in both upland and bottomland forests. Indications of relatively recent use of the bottomlands and onsite streams by beaver were also observed. Present in both upland and bottomland were numerous tracks of raccoon, skunk, and other unidentified small mammals. Wild turkey tracks occurred in uplands. Bottomlands are used by hogs. Whether these are feral domestic hogs or javalena is unknown. Thus, both bottomland and upland habitats at GGNS evidently support a relatively diverse and abundant wildlife population now as they did in the 1970s.

Field observations using several different systematic methods were employed to inventory birds on the site during the 1972-1973 censuses. With the exception of two species, the white ibis and Louisiana heron, all bird species observed on or near the site were regular inhabitants in the area (Reference 3). Common bird species observed seasonally in both the loessial bluff and bottomland forest communities are identified in Table 2.4-3. Bird species seasonally occurring within 50 feet of the edge of a field were considered to inhabit the field-forest ecotone and are also presented in Table 2.4-3

Water-dependent bird species observed in 1973 on Hamilton and/or Gin Lakes are presented in Table 2.4-4. Of these species, only the wood duck, great blue heron, and belted kingfisher were permanent residents. With the exception of the American coot and the pied-billed grebe, the remaining species of water birds were primarily summer residents. The American coot and the pied-billed grebe occurred in the area only during the fall, winter, and early spring. Utilization of the lakes by water-dependent species was seasonal. During the summer and early fall of 1972 and late spring of 1973, fewer than ten individuals of any single species were concurrently observed on the lakes (Reference 1).

Table 2.4-5 identifies the vultures, hawks, falcons, and owls observed on or near the GGNS site in 1973. This table includes upland game birds. Black and turkey vultures were permanent residents on the site. The red-tailed hawk and red-shouldered hawk were permanent residents on the site; the broad-winged hawk was resident on the site only during the summer; and the marsh hawk, American kestrel and sharp-shinned hawk occurred on the site only during migration. With the exception of the marsh hawk (an inhabitant of grasslands and marshes), woodlands and wooded margins were the preferred habitat for the hawks observed. The Mississippi kite was abundant in the Grand Gulf area and was observed on the site from April until September. The largest breeding populations of the Mississippi kite in the United States occurred along the Lower Mississippi River valley; the kite nests in tall trees, particularly cottonwood, growing along stream bottoms. All of the owl species were observed on or near the site during the preconstruction study period, and all were permanent residents in this section of Mississippi (Reference 3). The permanent residents of upland game birds that occurred on site

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were the mourning dove, bobwhite, and wild turkey. The mourning dove was also the most abundant of the upland game species. Although the Grand Gulf site contained suitable wild turkey habitat (hardwood forest), only two wild turkeys were observed on the site.

The numerous mid-level and canopy-dwelling bird species observed during the 2002 reconnaissance visits were consistent with those reported in the FER. None were unusual or unexpected, although numerous Rock dove (*Columbia livia*), also known as the domestic or feral pigeon were observed. This species was not reported in the FER. Rock dove is an introduced species and is attracted to man-made structures of all sorts. They were observed perched atop and flying near the emergency service water reservoirs at GGNS where they probably nest.

2.4.1.1.1 Bottomlands

Bottomland hardwood forests like those at GGNS may also be characterized as palustrine, forested, seasonally flooded wetlands. This habitat type covers approximately 885 acres, or most of the GGNS site bottomland between the Mississippi River and the bluff line. It surrounds the borrow pit north of the barge slip and extends throughout the area along both sides of Heavy Haul Road, except where the roadsides are mowed and maintained. As with other wetland types on site, the habitat characteristics of bottomland hardwood areas fluctuate seasonally as levels of inundation vary.

In the case of bottomland forest at GGNS (as with old bottomland stands elsewhere), the ground-level herb, forb, and shrub layer is typically sparse due to the closed canopy. Canopy closure prevents sunlight from penetrating to the forest floor. Additionally, annual inundation by Mississippi River floodwater in spring, and at other times during the year, retards growth of ground-level vegetation.

Typically, openings created by storms, natural tree-fall, logging, and/or cultivation eliminate or thin the canopy and allow penetration of sunlight. Sunlight promotes the growth of sedges, grasses, and other ground-level vegetation like Panicum (*Panicum spp.*), Lizard's tail (*Saururus cernuus*) and Trumpet creeper that were observed there.

Openings also allow development of an ecotone (or edge) between the clearing and the forest. Ecotones are usually inhabited by species not necessarily resident in either the clearing or the forest. This increases the overall biodiversity of the site. The FER stated that large fields and other forest openings occupied about 10% of the bottomland area in the 1970s. Due to canopy closure and secondary succession, openings now probably constitute a lower percentage of the bottomland at GGNS than they did earlier.

Like other hydric soils, bottomland soil at GGNS is a complex of Bowdre silty clay, Tunica silty clay loam, and Crevasse fine sandy loam (Soil Survey of Claiborne County, Mississippi, 1963). These areas were moist at the time of the 2002 reconnaissance visits. The soil texture was silty clay or silty clay loam.

2.4.1.1.2 Other Wetlands

Cowardin et al. (Reference 2) describe wetlands by system, class, and subclass. The fresh water systems are riverine, lacustrine, and palustrine. The riverine and lacustrine systems encompass freshwater lakes and streams. The palustrine system includes nontidal wetlands dominated by trees, shrubs, or emergent vegetation. Lacustrine systems are situated in topographic depressions or dammed river channels. They exceed 20 acres in size and lack 30% aerial coverage of emergent vegetation.

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The palustrine system includes five vegetated classes considered wetlands: (1) aquatic bed, (2) moss-lichen, (3) emergent (dominated by plants that rise above the surface of the water), (4) scrub-shrub (dominated by sapling trees and shrubs), and (5) forested.

Water regime modifiers include temporarily flooded, saturated, seasonally flooded, semi-permanently flooded and permanently flooded. This method of describing wetlands was not used in the 1970s when the FER was prepared. However, it has since become widely used and recognized as authoritative.

2.4.1.1.2.1 Emergent Wetlands

Palustrine, emergent, seasonally flooded wetlands are located near the periphery of both Gin Lake and Hamilton Lakes (Figure 2.4-3). These wetlands are limited in aerial extent and dominated by grasses and sedges (*Panicum rigidulum* and *Carex spp.*). The level of inundation varies seasonally and from year to year, hence its subclassification as seasonally flooded.

Soils in these areas are a complex of Bowdre silty clay, Tunica silty clay loam, and Crevasse fine sandy loam (Reference 4). Both Bowdre and Tunica series soils appear on the hydric soils list for Claiborne County. These areas were completely saturated at the time of the August, 2002 reconnaissance.

The bottomland areas at GGNS, including the emergent wetlands are flooded annually in the spring and, unpredictably, at other times when storms cause flooding in the lower Mississippi River basin. Watermarks on trees in the adjacent forest vary from 10-20 feet in height.

In August 2002, emergent wetlands along the shorelines occupied approximately 30 acres (Figure 2.4-3).

2.4.1.1.2.2 Scrub-Shrub Wetlands

A wetland identified as palustrine, seasonally flooded scrub-shrub developed relatively recently on a former bottomland field east of Gin Lake (Figure 2.4-3), probably cultivated in the past for forage. The 1971 aerial photograph (Figure 2.4-1) show this field to be free of woody vegetation. American sycamore (*Platanus occidentalis*) seedlings now dominate this approximate 70 acre area. The sycamores are probably less than ten years old and are uniformly about twenty feet in height. In November 2002, the perimeter of this area was found to have been recently cultivated to enhance deer habitat or to attract deer to the area for harvest. In recent years, farming at GGNS has ceased and formerly cleared sites are undergoing secondary succession. Woody vines such as southern dewberry (*Rubus trivialis*), and tall grasses, including Broomsedge bluestem (*Andropogon virginicus*), now also occupy these sites.

Soils in this area are commerce silt loam (Reference 4). Commerce soils are hydric and typically found on natural levees of the Mississippi River. At the time of the 2002 investigation, the soils were completely saturated with standing water in places.

Other scrub-shrub wetlands identified on the GGNS site are dominated by Black willow and Swamp privet and were documented in the FER. These wetlands occur on the north, northwest, and south ends of Gin Lake and on the west bank of Hamilton Lake. Willow now makes up a larger component of the shrub layer than does Swamp privet. Little herbaceous understory occurs on these sites, probably because of recurrent flooding in the spring. Button bush (*Cephalanthus occidentalis*) also occurred near the south end of Gin Lake. Shrub wetlands, dominated by the willow-privet plant community, encompass approximately 10 acres at the GGNS site. This acreage is less than the amount described in the FER, probably due to succession of some of the shoreline area into bottomland forest.

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Soils in these areas are a complex of hydric Bowdre silty clay, tunica silty clay loam, and crevasse fine sandy loam (Reference 4) as discussed above. These areas were moist to completely saturated at the time of the 2002 investigation.

2.4.1.1.3 Uplands

Like bottomlands forest areas, upland forest habitats on the site suffer from canopy closure restricting growth of understory vegetation. Unlike bottomland forests, upland stands are not usually inundated for prolonged periods so flooding is less a limiting factor on growth of the herb and forb layer than is canopy closure. Accordingly, upland hardwoods at GGNS exhibit a more diverse plant community than bottomlands, both in structure and species composition.

The FER documented the occurrence of large upland fields and forest openings that occupied about 15% of the bluff area of the GGNS site in the 1970s. Construction of Unit 1 reduced the area of upland fields, thus they now constitute a lower percentage of the overall bluff area.

An upland hardwood stand immediately southwest of the cooling tower at GGNS has a closed canopy of predominantly old growth trees. This is a typical condition at the site where the forests have aged since studied in the 1970s. Unlike other areas on the property, however, this stand also exhibited evidence of past timber harvest. For example, numerous stumps occurred adjacent to the single-lane roadway in the forest. This roadway was probably a haul road over which loggers transported harvested trees.

Timber harvest in this stand and elsewhere at GGNS appears to have been suspended years ago, probably concurrent with original construction of Unit 1 on the site. Additionally, the logging operation appeared to be one of selective cutting (also termed "high-grading") during which trees of high commercial quality or economic value are individually removed.

Selective cutting is of limited value in rejuvenating hardwood stands because removal of individual trees usually fails to create openings of sufficient size at ground level to significantly increase ground cover. In this case, many of the marked trees on the site have also aged to the point where they are probably no longer of interest for commercial use. Although many trees were dead or dying, mast was plentiful.

2.4.1.2 Terrestrial Species of Special Interest

The FER reported the American alligator as the only Federally-listed threatened or endangered species inhabiting the site in the 1970s. However, the state and Federal lists of T/E species or others of "special interest" have expanded since then. Additionally, the alligator population has since expanded throughout its range. It is now a nuisance species in some locations and hunted in others. Accordingly, its status has been demoted from endangered to "threatened by similarity of appearance".

During the 2002 reconnaissance visits, two alligators were observed, one in a small pond immediately adjacent to the waste water treatment unit on the GGNS site and the other small individual in the flooded borrow pit. Because alligators pose a nuisance and safety hazard to the GGNS site, plant management indicated that local wildlife agencies are occasionally asked to capture and relocate large alligators. According to plant management, this occurred during the summer of 2002.

To further investigate the possible occurrence of other species of special interest, the following federal and state agencies were contacted: the Jackson, Mississippi and Lafayette, Louisiana, Ecological Services Field Offices of the U.S. Fish and Wildlife Service (References 5 and 6), the Southeast Regional Office of the National Marine Fisheries Service (Reference 7), the

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Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) (Reference 8), and the Louisiana Department of Wildlife and Fisheries (LDWF) (Reference 9). These agencies reported on the possible occurrence of nine terrestrial species of special interest on or near GGNS (Table 2.4-6). Copies of these correspondences are presented in Appendix 2.4A.

Additionally, LDWF documented the potential occurrence of a colonial water bird nesting site in the area. MDWFP and LDWF provided locations of the sightings of several of the species. Those nearest GGNS are shown on Figure 2.4-4. With the exception of the alligator, not included in the list provided by USFWS because its status has been downgraded throughout its range, none of the Federal or state-listed species were observed during the 2002 reconnaissance trips. Each of the special interest species listed by these agencies is also discussed individually below.

2.4.1.2.1 Louisiana Black Bear

Two subspecies of black bear historically occupied Mississippi: the Louisiana black bear in the south and the American black bear in the north. The subspecies are indistinguishable by sight.

The FER reports sighting individual black bears on the site four times between February and April 1977, as well as observations of bear tracks and other sign. Based on the location of the GGNS site and considering the historic range of the subspecies, one must assume that the sightings were of the Federally threatened Louisiana black bear, also listed in Mississippi as “critically imperiled” within the state.

Hardwood forests at GGNS constitute prime bear habitat that is contiguous with other fairly large expanses of hardwood forest adjacent to the site. In addition to berries and other food plants, the numerous large, old trees in the forest provide cavities in standing timber and hollow logs for use by bears as dens. Additionally, shrubs and fallen trees serve as escape cover.

The relatively large area of the site that is restricted from public access protects the bear from legal or illegal hunting, and the low traffic volume on roads in and around the GGNS site protects bears from collisions with cars.

Black bear populations throughout the Lower Mississippi River Valley are reportedly increasing. In addition, black bears are highly adaptable and survive in a variety of situations where protected from over-hunting and other negative interactions with humans. Because bears coexist easily with humans when provided areas in which they can avoid contacts, the possibility that resident black bears still inhabit the site is high.

2.4.1.2.2 Florida Panther

The historic range of the panther or puma was from eastern Texas and the Lower Mississippi River Valley east through most of the southeastern United States. Thus, its range once included the GGNS site.

The FER reported a cougar sighting on site in June 1973, and other periodic sightings from southeastern Mississippi with the qualification that “there are no authenticated records of cougar occurring in Mississippi during this century” (Reference 15). Similarly, the USFWS commented on numerous sightings “throughout its historic range” while stating that no viable populations of the Florida panther now occur outside of Florida.

Florida panther habitat usually consists of large tracts of forest (both upland and bottomland) with adequate prey and little human disturbance. Accordingly, the GGNS site and adjacent areas appear to offer acceptable habitat and a readily available prey base of wild hogs and

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white-tailed deer. However, observations on site in the 1970s as well as those documented more recently by USFWS elsewhere are probably those of individual young cougars dispersing outward from its now restricted core range. Additionally, the range of the species has probably contracted further since the early 1970s.

The Florida panther is federally listed as endangered throughout its range. Mississippi lists the species as one that historically occurred throughout the state. However, correspondence from the USFWS and LDWF failed to comment on the panther, indicating that neither agency considers the species a possible resident in the area. Thus, there is little likelihood that cougars now actually inhabit the site or occur there regularly as transients.

2.4.1.2.3 Bald Eagle

Once considered a federally endangered species, the status of the bald eagle was downgraded to threatened. It is also listed by Louisiana as endangered and as a rare and local breeder. While known to nest in the Lower Mississippi River Valley, MDWFP (Reference 8) did not include the eagle in correspondence identifying species of special interest in the GGNS site area.

The FER comments on the bald eagle as a species which “could occur” on site and mentions known nesting in bottomlands north of the Big Black River prior to 1960. Eagles construct large, conical nests near the top of tall pines, cypress, and other mature, but sturdy, trees. The same nest is often used by a pair of eagles from year to year or by another pair if abandoned until the nest tree dies or is felled by a storm. Nest sites usually have a clear view of open water. Accordingly, eagle nests are highly visible, especially during aerial reconnaissance conducted during winter, when deciduous trees are largely devoid of leaves.

Since the abrupt decline of eagle populations during the 1950s and 1960s due largely to DDT contamination, bald eagle populations in the southeast have dramatically increased. Eagles nesting on site would be largely protected from shooting, development and habitat alteration, and other human disturbance that usually accounts for mortality and reduced breeding success elsewhere.

Nesting on the GGNS site is possible, though unlikely due to the absence of suitable mature trees in the bottomland adjacent to the river. Additionally, the location of a bald eagle nest site provided by LDWF is about six miles west of GGNS on a large oxbow lake called Lake St. Joseph. Therefore, presence of bald eagles during the nesting season should be considered possible in the absence of an aerial and ground survey designed specifically to confirm or deny the presence of nest trees.

2.4.1.2.4 Interior Least Tern

The Least tern is one of the smallest terns with respect to body size. Its North American population consists of an interior segment, nesting in the GGNS site area and elsewhere along river sandbars, and a coastal segment. The interior segment is Federally-listed as endangered and listed by LDWF as “critically imperiled”. The coastal segment is not listed. Decline of the interior population is usually attributed to elimination of breeding habitat, modification of rivers and artificial control of river flow, and recreational use of river sandbars during the breeding season.

The Least tern is not discussed in the FER. In addition, sandbar nesting habitat isn’t available on or in the immediate area of the GGNS site on the east bank of the Mississippi River. However, field observation suggests that such habitat is abundant on the west bank of the river

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near the site and on Middle Ground Island, immediately adjacent to the northwest corner of the site. Since these terns apparently favor island nesting areas, its presence on site is unlikely but is possible on Middle Ground Island and elsewhere near the site.

There are three locations for Least tern nesting on the Mississippi River, as documented by LDWF (Reference 9): two about 9 and 17 miles northwest and northeast of the site, respectively, and one about 15 miles southwest of the site.

2.4.1.2.5 White Ibis

The white ibis is listed as a rare and local breeder or non-breeding transient by MDWFP. Its occurrence at Hamilton and/or Gin Lakes during the summer was documented in the FER. The USFWS and LDWF did not list the species in correspondence concerning potential occurrence of special interest species in the area. The bird is very common throughout most of the year in southern Louisiana and coastal Texas, and probably is common in Mississippi during the same periods in proper habitat.

While white ibis sometimes nest on the ground, preferred breeding habitat consists of shrub, cypress, and marsh vegetation, typically on barrier islands and other inland islands. Like Wood storks, white ibis breed colonially, often in mixed species colonies. Like storks, ibis colonies are usually highly observable.

White ibis are waders. Their preferred food consists primarily of aquatic invertebrates and fish. Crayfish dominate their diet in freshwater habitats. Thus, like the wood storks observed at Hamilton and/or Gin Lakes in the 1970s, white ibis in this area are probably transient, summer residents who opportunistically feed in the shallow waters around the periphery of the lakes.

2.4.1.2.6 Wood Stork

The wood stork is a transient, non-breeding species in the GGNS site area according to MDWFP (Reference 8). The USFWS (Reference 5) and LDWF (Reference 9) did not list the species in their correspondence.

The occurrence of the stork (incorrectly termed the “wood ibis”) at Hamilton and/or Gin Lakes during the summer is documented in the FER. Results of the annual Breeding Bird Census (Reference 10) now show low counts of the species in west-central Mississippi. The seasonal status of the species is documented by the National Audubon Society’s 103rd annual Christmas Bird Count. This report recorded no observations in the area but high concentrations in central and south Florida (Reference 11).

The birds typically construct very large nests in relatively large colonies in flooded, mature cypress or mangrove swamps very high above the ground. They are also the largest wading birds that breed in North America. Thus, their presence as breeders is usually highly observable. Although storks elsewhere are known to utilize other species when cypress and mangrove habitat is unavailable, the lack of mature specimens of these trees at GGNS decreases the likelihood that storks nest on or near the site. Thus, the storks documented in the FER were probably opportunistically feeding in the shallow water at the edge of the lake(s).

Storks are also wading birds that frequent areas in which receding water levels concentrate their preferred prey species, such as small fish, as occurs in the onsite lakes during summer and fall. The species should be considered a probable transient at GGNS during the summer.

In correspondence concerning special interest species, LDWF (Reference 9) commented on the presence of a water bird nesting colony near Somerset, Louisiana, about 15 miles northwest of

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the site. This is presumably the closest known colonial water bird nesting site to GGNS. LDWF provided no information on its composition as a single species or mixed species breeding site.

2.4.1.2.7 Mississippi Map Turtle

This turtle is not included on area lists provided by USFWS or LDWF. However, MDWFP (Reference 8) considers it a possibly secure species locally. Additionally, the FER comments on the species then being common in the area.

While in the field at the site in November 2002, several turtle shells were found in the bottomlands. The shells were bleached of color patterns and in otherwise poor condition. Additionally, identification of turtles to species is sometimes impossible without examining a live or freshly killed specimen because color patterns on the shell and skin are sometimes important in positive identification. In the case of the Mississippi map turtle, for example, distinctive characteristics include a yellow crescent on the head behind the eye and the appearance of the iris of the eye as a pure white unbroken ring surrounding a black pupil.

Despite these limitations on positive identification, one of the shells we observed was consistent in general size and shape with that of a map turtle, probably of the genus *Graptemys*, the same genus as the Mississippi map turtle. Accordingly, their presence as a resident of the GGNS site should be assumed.

2.4.1.2.8 Webster's Salamander

Webster's salamander is considered rare and local in distribution by MDWFP but is not listed as a species of special interest by either the USFWS or LDWF. It is known primarily from east-central Alabama and west-central Georgia with disjunctive populations in south-central Mississippi, the Tunica Hills of Louisiana, and elsewhere.

No specimens of this species or any other salamander during field investigations on the site were documented in the FER although numerous salamanders probably occur there. Optimal habitat for Webster's salamander is described as mesic (or wet), mixed hardwood forests on north-facing slopes with rock outcrops on or near the surface. Such stands are commonly located adjacent to perennial streams. However, a closed canopy also provides the necessary moisture regime when located over moist debris, decaying logs, and a well-developed humus layer in which the animals actually live.

GGNS does not fall within the known (or suspected) range of the species. However, areas on the site probably offer suitable habitat. Its presence should be considered unlikely.

2.4.1.2.9 Square-Stemmed (or Allegheny) Monkeyflower

The monkeyflower is an upright perennial member of the snapdragon family with smooth and nearly square stems that grow to 1-3 feet tall. Flowers are blue to purple and look something like a monkey face. The shape of the stem and the appearance of the flower obviously provide its common name. Preferred habitat consists of wet meadows, stream banks, and damp ditches so it may be considered a wetlands indicator.

The monkeyflower is of widespread distribution, occurring everywhere throughout the United States except in the Rocky Mountains and the Florida Everglades. LDWF (Reference 9) reports the species at a location along the west bank of the Mississippi River northeast of St Joseph, Louisiana. This location is about 11 miles southwest of the plant. While not discussed in the FER, the monkeyflower is widely distributed and suitable habitat apparently exists on site, therefore, its presence at GGNS should be assumed.

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2.4.1.3 Critical Terrestrial Habitat

None of the resource agencies contacted (see Appendix 2.4A) commented on the occurrence of any critical terrestrial habitat on or near the GGNS site. Similarly, there are no wildlife sanctuaries, refuges, or preserves on the GGNS site or in the immediate area.

2.4.2 Aquatic Ecology

The FER reported that the Mississippi River, the Big Black River (a tributary to the Mississippi), and two oxbow lakes, Hamilton and Gin, are the major features of the aquatic environment on and near GGNS. In addition, they document five small stock ponds (under two acres) and two perennial streams. They describe the latter as having “normally negligible flow”.

The FER also documented systematic sampling of fish, benthic macroinvertebrates, and plankton in the two rivers and the oxbow lakes and fish sampling in two of the upland ponds and one of the streams. In addition, they characterized the periphyton and macrophyton assemblages of the lakes and documented sport and commercial fishing in the area.

2.4.2.1 Aquatic Habitats

For purposes of sampling and description in the FER, the two oxbow lakes were treated as a single macrohabitat. The Mississippi River system, however, was divided into backwater, river bank, main channel, and tributary macrohabitats. The GGNS site does not front on the Big Black River to the north nor Bayou Pierre River to the south. Thus, aquatic habitat at GGNS is limited to the Mississippi River, the oxbow lakes, the flooded borrow pit, upland ponds, Streams “A” and “B”, and ephemeral drainages.

The FER documented the occurrence of 86 species of fish, more than 100 plankton taxa, and over 50 benthic macroinvertebrate taxa in these habitats. The common fish documented in the FER are presented in Table 2.4-7.

2.4.2.1.1 Mississippi River

Backwater habitats in the Mississippi River are located in the slow moving, quiet waters on the inside of large bends, in coves on the leeside of sandbars and islands, in the lower reaches of sluggish tributaries, and in other similar areas. These backwaters are characterized by zero to low velocity current, relatively shallow waters, and loosely consolidated silty clay sediments of low plasticity. The FER documents an abundant and productive biologic community of fishes, benthos, and plankton in the backwaters. This biological assemblage is probably present now.

In areas of moderate to swift current, banks of the Mississippi River are usually steep and generally composed of consolidated, highly plastic clay. Clay bank stability varies greatly, depending on local soil geology, the amount and type of terrestrial vegetation, and the degree of scouring currents. In areas of stable clay outcroppings, large populations of burrowing mayflies and other invertebrate taxa become established. Where the bank is constantly eroding, however, benthic organisms are unable to establish a stable population.

Because of the large area it encompasses, the river channel is the dominant aquatic habitat at GGNS. This habitat is characterized by deep water, strong (and turbulent) currents, and coarse-grained substrate, typically consisting of gravelly sand sediments. The severity of this habitat imposes restrictions on living organisms. As documented in the FER, the bottom was found to be virtually non-productive of benthic organisms, and the water column was found to contain fewer fish than other habitats. Other than the installation of additional revetments along the east bank, no significant changes to the river channel or banks which would be expected to alter the

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ecological characteristics of this riparian habitat have occurred. Therefore, a similar diversity and distribution of species should currently be present.

According to the Mississippi State University Extension Service (Reference 12), commercial fishing persists in the Mississippi River near GGNS. There are apparently a small number of local fish markets that harvest big and small mouth buffalo fish from this reach of the river for sale.

There is limited commercial fishing within the study area. Most of this occurs on the Mississippi River, the Big Black River and the Bayou Pierre River, with catfish being the most abundant catch. There are approximately 12 commercial fishermen who fish within the area. (Reference 13)

2.4.2.1.2 Gin and Hamilton Lakes and Flooded Borrow Pit

Gin Lake and Hamilton Lake are natural oxbow lakes formed when the Mississippi River abandoned a former channel. A flooded man-made borrow pit now exists north of the barge slip at GGNS. This pit was formed by excavating fill material during the construction of Unit 1, thus it was not present in the 1970s (Figures 2.4-1 and 2.4-2). Like the borrow pit, the oxbow lakes are lacustrine, littoral, unconsolidated bottom wetlands. The lakes are probably not deep enough to be classified as limnetic (greater than 2 meters in depth), although the borrow pit probably exceeds this depth.

Neither lake nor the borrow pit supports emergent vegetation, except on the shorelines. Shorelines are classified independently as wetland (Section 2.4.1.1.2). The lakes retain water when floods recede from the bottomlands to the current channel of the Mississippi River. Hamilton Lake also receives water from Streams “A” and “B” which carry storm water from the existing plant area.

Hamilton and Gin Lake are connected through a culvert beneath Heavy Haul Road. The borrow pit appears to not be hydrologically connected to either of the lakes except during high water when all are subsumed by the river.

The size of Gin and Hamilton lakes is estimated to be approximately 55 acres and 64 acres, respectively, based on an aerial photograph of the site taken in December 2001 (Figure 2.4-2). The FER reports Hamilton and Gin Lakes to be relatively small and shallow. These lakes were once the channel of the Mississippi River and had an average depth of approximately 8 to 10 feet according to Reference 2. The borrow pit includes an area of about 16 acres based on the photo of Figure 2.4-2. Depth of this (borrow pit) lake is not known.

As discussed in the FER, oxbow lakes are similar to river backwater in physical characteristics, with shallow depth, no current, and loosely consolidated, highly plastic clay sediments. They generally support productive biotic assemblages.

Access to the lakes by road is provided for local recreational fishermen who use small boats and catch bluegill, catfish, and other species. After September 11, 2001, fishing access was denied, however, this denial was lifted in 2002.

During the November 2002 reconnaissance visit, trotlines were observed suspended in trees near these lakes. The trotlines were fixed to tree trunks far above the normal water level in the lakes at a height consistent with spring floods. A trotline consists of a horizontally deployed, relatively heavy gauge line normally tied between two posts, in this case trees, or between buoys. Vertical drop lines tied to the horizontal member at short intervals end with baited fishing hooks. The hooks then suspend below the surface of the water.

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The current species diversity in Hamilton and Gin Lakes most likely does not differ significantly from that reported in the FER. While the borrow pit lake appears to be deeper than Hamilton and Gin Lakes, in the absence of sampling studies, there is no reason to assume that the species composition of the aquatic fauna differs significantly from that of the other lakes.

Water-dependent bird species observed in 1973 on Hamilton and/or Gin Lakes are presented in Table 2.4-4 (Section 2.4.1.1). During the 2002 reconnaissance visit to GGNS a small flock of white pelicans (*Pelecanus erythrorhynchos*) was observed feeding at the borrow pit. Additional reconnaissance revealed the presence of a narrow peninsula extending into the lake from its western edge that was being used by the pelicans as a loafing area.

The FER did not list the white pelican as an inhabitant of the site in the early 1970s, although, it documents use of the area by numerous other water bird and waterfowl. However, pelican populations have expanded throughout their range since then. Other than not being listed earlier, the occurrence of pelicans on the property is not unusual since the oxbow lakes provide good feeding habitat.

2.4.2.1.3 Upland Stock Ponds

The upland ponds, probably constructed to water cattle and other livestock, are small (0.25 to 0.50 acre each) and unproductive. The FER concluded that previous owners apparently stocked the ponds with bluegill and channel catfish. Two of the five ponds present in 1973 were filled in during construction.

2.4.2.1.4 Streams "A" and "B"

Stream "A" extends west from the GGNS sanitary waste water treatment facility and supports a palustrine, emergent, permanently flooded wetland. The FER stated that the stream then had negligible flow and characterized the habitat as "unproductive". Currently, this drainage receives continual flow from plant storm water and process discharge from the waste treatment plant. A sedimentation basin backs water up at the head of the draw and is marked "Outfall 13." (Figure 2.3-12)

At this location, willow, rattlebrush (*Sesbani spp.*), and cattail (*Typha spp.*) flourish and appear to be persistent. Below "Outfall 13," the drainage is steeply banked with a rocky channel. It does not appear to retain water for any length of time. As this drainage nears the physiographic change from bluffs to bottomland, it widens and becomes part of the bottomland forest.

A very similar situation exists along Stream "B", which extends west from the cooling towers on the south side of the Heavy Haul Road. A sedimentation basin has been constructed there as well (Figure 2.3-12). Outfall "14" then releases water into the drainage channel. However, very little emergent vegetation exists along the shores of this pond owing to steep banks.

Flow into the drainage channel derives from storm water runoff. Flow appears to be relatively steady, but does not slow down and support hydrophytic vegetation until farther west where it eventually widens out toward Hamilton Lake.

Soils in both streambeds are Adler silt loam (Reference 4). Adler soils are not considered hydric. However, the soil is likely functioning now as a hydric soil due to the relative permanence of the inundation. At the time the soil was mapped, the area was an ephemeral drainage channel, with flow occurring sporadically only after rain storms.

When sampled in 1972-73, these streams contained fish and other species, many of which entered the streams during spring floods. These biota were then confined to isolated pools

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during dry weather. Water control structures placed in the streams during construction now provide more or less permanent pools.

Like the floodplain oxbow lakes, there is no reason to believe that the diversity of fish and other aquatic organisms in the streams now differs significantly from that reported in the FER. In addition to unidentified minnows or small fish, both streams support small numbers of unidentified bivalves and snails as evidenced by observation of shells along the banks of the streams. Therefore, the streams should be expected to support the same basic biotic assemblage of minnows and sunfish now that they did when sampled in the 1970s.

2.4.2.1.5 Ephemeral Drainages

In addition to aquatic habitats characterized as wetland, numerous ephemeral drainage channels occur on the upland bluffs on the eastern portion of the GGNS site. Topographic maps and field surveys suggest that approximately 24,140 linear feet of ephemeral drainage channels exist across the entire GGNS site (Figure 2.4-3).

Several support non-persistent palustrine, emergent, seasonally flooded wetlands of very small size (Figure 2.4-3). Immediately east of the existing cooling tower is an example of such a wetland. Vegetated with Pepper smartweed (*Polygonum hydropiperoides*) in the herb layer and Black willow in the overstory, this area appears to remain saturated or inundated with only a few inches of water for much of the year.

2.4.2.2 Aquatic Species of Special Interest

Resource agencies reported (Section 2.4.1.2) the possible occurrence of eight aquatic species of special interest at or near GGNS (Table 2.4-8). The relevant agencies and appropriate references regarding consultation are discussed below.

Three of these species (Pallid sturgeon: Federally-listed as endangered and state-listed as “critically imperiled”; Chestnut lamprey: rare and of limited local distribution in Mississippi; and Paddlefish: also rare and local in both states) were collected in the 1970s at the site as documented in FER.

2.4.2.2.1 Paddlefish

The paddlefish is now classified as rare or uncommon in Mississippi. However, the FER documented “large numbers” of juvenile paddlefish in both Hamilton and Gin Lakes during July, 1973. Additionally, LDWFs (Reference 9) reported record of a paddlefish on May 6, 1988 was about eight miles northwest of the site in Yucatan Lake, a large oxbow lake. Based on the fact that paddlefish have inhabited both lakes in the past, they are assumed to be present in both lakes today.

While the paddlefish is apparently uncommon in the lower Mississippi River, populations elsewhere in its range are subject to recreational fishing. Paddlefish meat is typically described as highly edible and the roe is sold commercially as a substitute for caviar.

2.4.2.2.2 Pallid Sturgeon

The pallid sturgeon is Federally-listed as endangered and state-listed as critically imperiled or endangered in Louisiana.

The pallid sturgeon report of LDWF (Reference 9) dated December 13, 1972, could be the fish collected and reported by MP&L (1973). According to Reference 9, the specimen was forwarded to the University of Michigan for addition to its permanent collection.

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The U.S. Fish and Wildlife Service, Mississippi Museum of Natural Science, and Lower Mississippi River Conservation Committee, initiated trawl surveys for pallid sturgeon in the Mississippi River on September 5, 2001 (Reference 14). The collection effort was focused in the vicinity of Vicksburg, MS, from Delta Point (approximately river mile 436) to Marshall Cutoff (approximately river mile 452). This area is approximately 38 miles upriver from the GGNS site and contains a variety of channel habitat types, including islands, dikes, a closed secondary channel, a partially closed secondary channel, point bars, buckshot bank, revetted bank, deep bends, and a shallow crossover. A total of 9 adult pallid sturgeon and 7 intermediates that were tentatively identified as pallid sturgeon were caught. The captures were associated with moderate to strong currents, sand and sand/gravel substrates, 20-40 ft. depths, and usually some type of “structure” such as “reefs”, dropoffs, or secondary channels.

Therefore, the pallid sturgeon should be considered a possible, but unlikely, resident of the area.

2.4.2.2.3 Chestnut Lamprey

There are no recent records of the chestnut lamprey in the GGNS site area. Therefore, the lamprey, a rare and uncommon species in Mississippi, should also be considered a possible, but unlikely, resident of the area.

2.4.2.2.4 Gulf Sturgeon

There are no confirmed reports of the gulf sturgeon, Federally-listed as endangered, from the mainstream of the Mississippi River. The only record from the Mississippi drainage is from the Big Sunflower River. Other Mississippi populations of this fish apparently occur in the Pascagoula and Pearl River systems (Reference 16).

As an anadromous species, this sturgeon spends most of its life cycle in the ocean (or Gulf of Mexico), only returning to freshwater streams to breed. Accordingly, it is, at best, a seasonal migrant or transient in the Mississippi River at GGNS.

2.4.2.2.5 Bayou Darter

The Bayou darter is endemic to Mississippi but occurs exclusively in the Bayou Pierre River, south of the site, and its larger tributaries. It has not been shown to occur at GGNS.

2.4.2.2.6 Blue Sucker

The FER reported the collection of fifteen blue suckers, a rare or uncommon species in Mississippi, in the Big Black River north of the site. The species was not found in onsite drainages then, nor is it now likely to occur there due to the absence of suitable habitat.

2.4.2.2.7 Black Buffalo Fish

The black buffalo is a rare or uncommon species in Mississippi. Like the Bayou darter and blue sucker, also rare to uncommon in the Mississippi River and other large, interior North American rivers, preferred habitat for this species seems to include moderate to swiftly-flowing, non-turbid streams with clean sand, rock, or gravel substrates.

This type of habitat is not available in the streams on site, although the black buffalo may inhabit the Mississippi River adjacent to the site where other species of buffalo fish are caught commercially.

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2.4.2.2.8 Crystal Darter

The crystal darter, considered to be critically imperiled in Mississippi, also prefers clean and unpolluted streams with water depth of about three feet. Like other species discussed above, suitable darter habitat does not occur on site or in the Mississippi River.

2.4.2.3 Critical Aquatic Habitat

None of the resource agencies contacted (see Appendix 2.4A) commented on the occurrence of any critical aquatic habitat on or near the GGNS site.

2.4.2.4 Waters of the United States

As discussed above, waters of the U.S. are broadly defined as waters that are, were, or could be used in interstate or foreign commerce. They include all waters which are subject to the ebb and flow of the tide, the territorial sea, interstate waters and wetlands, and all other waters (such as intrastate lakes, rivers, streams and wetlands) if their use, degradation or destruction could affect intrastate or foreign commerce. Also included are tributaries to waters or wetlands identified above, and wetlands adjacent to these waters.

The Mississippi River is obviously used in interstate and foreign commerce. Streams "A" and "B" as well as the ephemeral drainages at GGNS have the ability to carry large amounts of water during rainstorms. Accordingly, all are classified as waters of the United States according to the above definition and are, therefore, under the regulatory jurisdiction of the USACE. Sediment retention basins A & B are considered modifications of Streams A & B, so Streams A & B and the sediment retention basins A & B are considered waters of the State (Reference 17).

2.4.3 References

1. Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2 Final Environmental Report (FER), as amended through Amendment No. 8.
2. Cowardin, Lewis M., Virginia Carter, and Edward T. LaRoe, 1979, Classification of Wetlands and Deepwater Habitats of the United States, U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.
3. Robbins, C. S., B. Brunn, and H. S. Zim, 1966, "Birds of North America," Golden Press, New York.
4. Soil Survey of Claiborne County, Mississippi, 1963, United States Department of Agriculture Soil Conservation Service in cooperation with Mississippi Agricultural Experiment Station, Jackson, Mississippi.
5. U.S. Fish and Wildlife Service (USFWS), 2002. Letter dated August 20, 2002, from Kathy W. Lunceford, Mississippi Environmental Coordinator, Jackson, Mississippi.
6. U.S. Fish and Wildlife Service (USFWS), electronic-mail from Louisiana Fish and Wildlife Biologist (B. Firmin), Lafayette, Louisiana, August 29, 2002.
7. National Marine Fisheries Service (NMFS), 2002, Letter dated October 3, 2002, from Georgia Cranmore, Assistant Regional Administrator for Protected Resources, St. Petersburg, FL.
8. Mississippi Department of Wildlife, Fisheries and Parks (MDWFP), 2002, Letter dated September 15, 200, from Bryon Moudy, Biological GIS Technician, Mississippi Natural Heritage Program, Jackson, Mississippi.

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9. Louisiana Department of Wildlife and Fisheries (LDWF), 2002, Letter dated October 2, 2002, from Gary Lester, NHP Coordinator, Baton Rouge.
10. U.S. Department of the Interior, 2002, North American Breeding Bird Survey (Online), available at <http://www.pwrc.usgs.gov/bbs>.
11. National Audubon Society, 2002, The Christmas Bird Count Historical Results (Online), Available at <http://www.audubon.org/bird/cbc>.
12. Mississippi State University Extension Service (MSUES), 2002, personal communication, November 25, 2002, with C. Covington, Port Gibson, Mississippi.
13. Ainsworth, John, Mississippi Wildlife Fisheries and Parks, Personal Communications, Brookhaven, MS October 2002 URL, <http://www.mdwfp.com/>.
14. Hartfield, Paul, Todd Slack, and Daniel Drennen, 2001, Trawl Collections From The Mississippi River in the Vicinity of Vicksburg, MS, 2001-2001, Personal Communication, email from Karen Kilpatrick, U.S. Fish and Wildlife Service, January 6, 2003.
15. Wolfe, J. E., 1971, "Mississippi Land Mammals," Mississippi Game and Fish Commission.
16. Mississippi Museum of Natural History "Gulf Sturgeon" undated fact sheet.
17. Don Crawley, Entergy Operations, Inc., personal communication (record of telecon) with D. Bean, Enercon Services, Inc., dated June 17, 2003.

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**APPENDIX 2.4A
AGENCY CONSULTATION
CORRESPONDENCE**

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September 15, 2002

Christina Adams
Enercon Services, Inc.
8866 Gulf Freeway, Suite 380
Huston, TX 77017-6531

Re: **Proposed Grand Gulf Nuclear Station Expansion
Port Gibson, Mississippi**

Dear Ms. Adams:

In response to your request for information dated August 14, 2002, I have searched our database for occurrences of state or federally listed or proposed endangered or threatened plants and animals on the site referenced above.

There are several Federally Listed Species and Species of Special Concern in or within two mile of the construction site. Please refer to the following list and attached map for identification and location. It is critical that these species or their habitat not be harmed in construction efforts.

Scientific Name	Common Name	FED	STATE	SRANK
<i>PLETHODON WEBSTERI</i>	WEBSTER'S SALAMANDER			S3
<i>EUDOCIMUS ALBUS</i>	WHITE IBIS			S3B,SZN
<i>MYCTERJA AMERICANA</i>	WOOD STORK	LE	LE	SZN
<i>ICHTHYOMYZON CASTANEUS</i>	CHESTNUT LAMPREY			S3
<i>SCAPHIRHYNCHUS ALBUS</i>	PALLID STURGEON	LE	LE	S1
<i>POLYODON SPATHULA</i>	PADDLEFISH			S3
<i>CYCLEPTUS ELONGATUS</i>	BLUE SUCKER			S3
<i>ICTIOBUS NIGER</i>	BLACK BUFFALO			S3
<i>CRYSTALLARIA ASPRELLA</i>	CRYSTAL DARTER		LE	S1
<i>URSUS AMERICANUS LUTEOLUS</i>	LOUISIANA BLACK BEAR	LT	LE	S1
<i>PUMA CONCOLOR CORYI</i>	FLORIDA PANTHER	LE	LE	SH
<i>GRAPTEMYS PSEUDOGEOGRAPHICA</i> <i>KOHNI</i>	MISSISSIPPI MAP TURTLE			S4?

The Mississippi Natural Heritage Program (MNHP) has compiled a database that is the most complete source of information about Mississippi's rare, threatened, endangered or otherwise significant plants, animals, plant communities and natural features. The quantity and quality of data collected by MNHP are dependent on the research and observations of many individuals and organizations. In many cases, this information is not the result of comprehensive or site-specific field surveys; most natural

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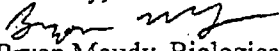
MISSISSIPPI
DEPARTMENT OF WILDLIFE, FISHERIES AND PARKS

SAM POLLES, Ph.D.
Executive Director

areas in Mississippi have not been thoroughly surveyed and new occurrences of plant and animal species are often discovered. Heritage reports summarize the existing information known to the MNHP at the time of the request and cannot always be considered a definitive statement on the presence, absence or condition of biological elements on a particular site.

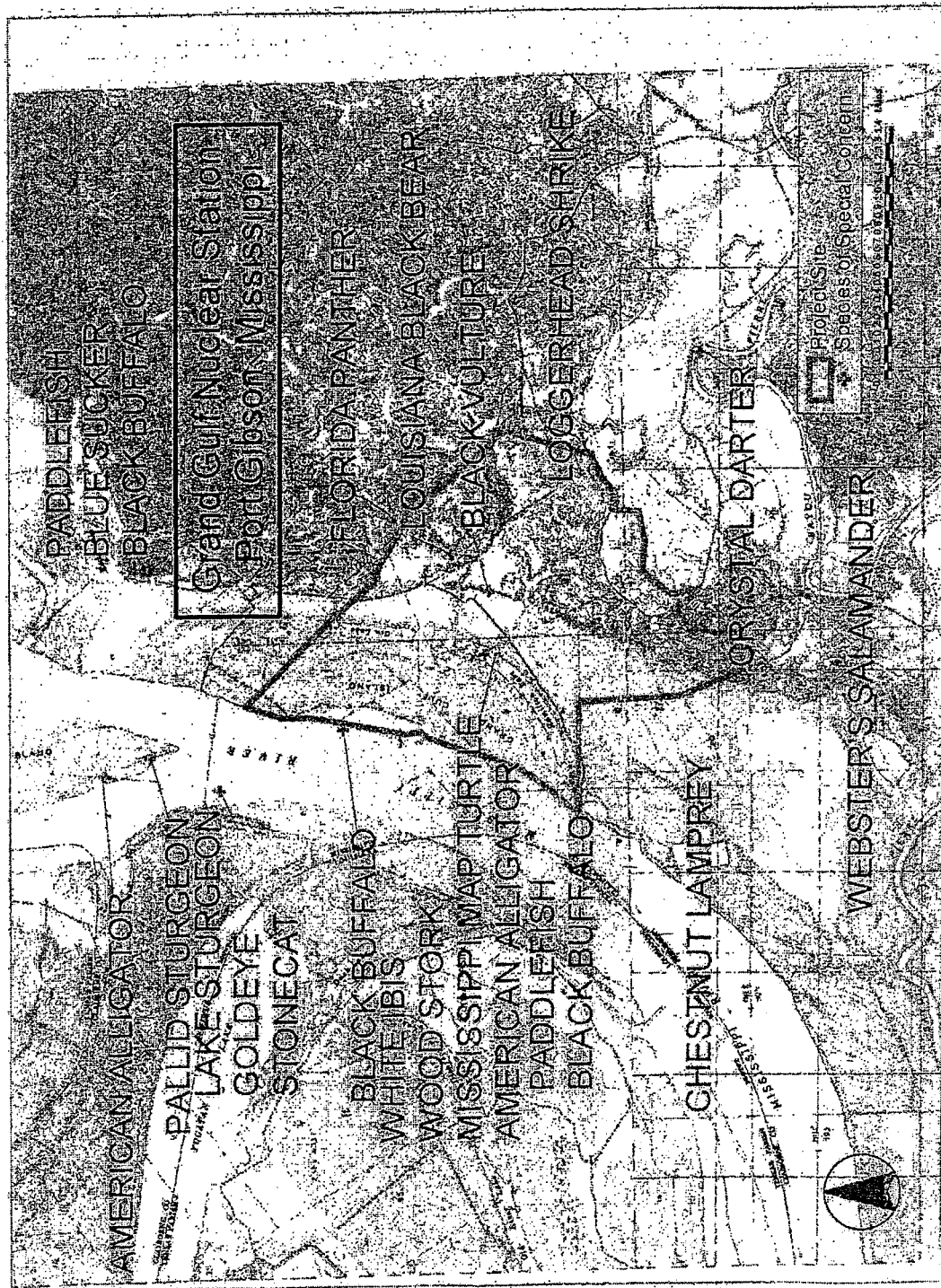
Please feel free to contact us if we can provide additional information.

Sincerely,


Bryon Moudy, Biological GIS Technician
Mississippi Natural Heritage Program

Mississippi Museum of Natural Science •• 2148 Riverside Drive •• Jackson, Mississippi 39202-1353 •• (601) 354-7303

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**MISSISSIPPI NATURAL HERITAGE PROGRAM
SPECIAL ANIMALS LIST**

NATURAL HERITAGE PROGRAM
Mississippi Department of Wildlife, Fisheries, and Parks
Museum of Natural Science
2148 Riverside Drive
Jackson, Mississippi 39202-1353
(601) 354-7303

Edition of November, 2000

Approximately 1500 species of animals, including representatives of the groups gastropoda, bivalvia (mussels), malacostraca (amphipods, crawfish, shrimp, isopods), insects, cephalaspidomorphi (lamprey), osteichthyes (fishes), amphibians, reptiles, birds, and mammals, are tracked by the Mississippi Natural Heritage Program. Many of these are quite common. Some, however, are known or suspected to occur in low numbers; these are designated as species of special concern, and are listed on the following pages. There are 331 special concern animals, which include 25 gastropods, 50 bivalves, 38 crawfish and shrimp, 27 insects, 1 lamprey, 74 fish, 17 amphibians, 35 reptiles, 49 birds, and 15 mammals. An additional 31 species are designated "watch" status with the potential of becoming species of special concern.

This list is designed for the primary purposes of: 1) in environmental assessments, "flagging" of sensitive species that may be negatively affected by proposed actions; 2) determination of protection priorities of natural areas that contain such species; and 3) determination of priorities of inventory and protection for these plants, including the proposed listing of species for federal protection.

DEFINITION OF RANKS

HERITAGE RANKS: The Natural Heritage Program uses the Heritage ranking system developed by The Nature Conservancy. Each species is assigned two ranks; one representing its range wide or global status (CRANK), and one representing its status in the state (SRANK). A guide to ranking criteria and symbols follows:

- S1 Critically imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation.
- S2 Imperiled in Mississippi because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation.
- S3 Rare or uncommon in Mississippi (on the order of 21 to 100 occurrences).
- S4 Widespread, abundant, and apparently secure in the state, but with cause for long-term concern (more than 101 occurrences).
- S5 Demonstrably widespread, abundant, and secure in the state.
- SH Of historical occurrence in Mississippi, perhaps not verified in the past 20 years, and suspected to be extant. An element would also be ranked SH if the only known occurrence(s) were destroyed, or if it had been sought extensively and unsuccessfully looked for. Upon verification of an extant occurrence, SH-ranked elements would typically receive an S1 rank.
- SR Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting the report.
- SU Possibly in peril in Mississippi but status uncertain; need more information. May also be represented by S?.
- S? Unranked: Element is not yet ranked in the state.
- SX Element is believed to be extirpated from the state.
- SE Exotic: An exotic established in the state; may be native in nearby regions (e.g. pecans along the eastern seaboard of the U.S.).

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- SA Accidental: accidental or casual in the state (i.e., infrequent and far outside usual range).
- SZ Zero occurrences in the state. Not of practical conservation concern in the state, because there are no definable occurrences, although the taxon is native and appears regularly in the state.
- SP Potential: Element potentially occurs in the state but no occurrences reported.
- SR Reported: Element reported in the state but without persuasive demonstration which would provide a basis for either accepting or rejecting (e.g. misidentified specimen) the report.
- SRF Reported falsely: Element erroneously reported in the state and the error has persisted in the literature.
- HYB: Hybrid: Element represents hybrid of species.
- SSYN Synonym
- Breeding Status: (Applicable to migratory species, mainly birds, but also includes sea turtles, some fish, and some insects).
B = Breeding Status
N = Non-breeding Status
- Qualifiers:
? = Inexact
C = Captive or Cultivated only
- CRANK criteria follow those of SRANK except for species having several subspecies. In these cases, a subrank made up of the letter "T" plus a number or letter (1,2,3,4,5,H,U,X,?) is added to the CRANK.
- STATE STATUS: Animals on the state endangered species list are protected by state law.
- FEDERAL STATUS: From *Federal Register*.
- LE ENDANGERED. A species which is in danger of extinction throughout all or a significant portion of its range.
- LT THREATENED. A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- C CANDIDATE SPECIES. Species for which the U.S. Fish and Wildlife Service currently has substantial information supporting the biological appropriateness of proposing to list as endangered or threatened. Proposed rules have not yet been issued because they have been precluded at present by other listing activity. Development and publication of proposed rules is anticipated, however, and the U.S. Fish and Wildlife Service encourages Federal Agencies and other appropriate parties to give considerations to such taxa in environmental planning.
- C2 CANDIDATE CATEGORY 2. The Service identified Category 2 candidates as taxa for which information in the possession of the Service indicated that proposing to list as endangered or threatened was possibly appropriate, but for which sufficient data on biological vulnerability and threat were not currently available to support proposed rules. The quality of information varied greatly among the former Category 2 species, but they all shared one trait - sufficient information to justify issuance of a proposed rule was lacking. The designation of Category 2 species as candidates resulted in confusion about the conservation status of these taxa. To reduce that confusion, and to clarify that the Service does not regard these species as candidates for listing, the Service has discontinued the designation of Category 2 species as candidates. The Service remains concerned about these species, but further biological research and field study are needed to resolve the conservation status of these taxa. The Service encourages other Federal agencies to give consideration to these taxa in environmental planning.
- The designation of Category 3 is discontinued, but the Service has retained all Category 3 information in case future reviews are conducted on these taxa.
- 3A SUBCATEGORY 3A. Species for which the U.S. Fish and Wildlife Service has persuasive evidence of extinction. If rediscovered, however, such taxa warrant high priority for addition to the List of Endangered and Threatened Wildlife.

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- 3C SUBCATEGORY 3C. Species that are now considered to be more abundant and/or widespread than previously thought. Should new information suggest that such taxon is experiencing a numerical or distributional decline, or is under a substantial threat, it may be considered for transfer to category 1 or 2.

Cite the list as:

Mississippi Natural Heritage Program, 2000. Special Animals Tracking List. Museum of Natural Science, Mississippi Department of Wildlife, Fisheries & Parks, Jackson, Mississippi. 12 pp.

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**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE**

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312, FAX 570-5517
<http://caldera.sero.nmfs.gov>

OCT - 3 2002

F/SER3:SKB

Ms. Christina Adams
Environmental Scientist
Enercon Services, Inc.
8866 Gulf Freeway, Suite 380
Houston, TX 77017

Dear Ms. Adams:

We have reviewed your July 18, 2002, letter and maps regarding the Early Site Permit (ESP) application for potential expansion of the Grand Gulf Nuclear Station near Port Gibson, Mississippi. You requested preliminary guidance regarding potential project impacts to listed species under the purview of National Marine Fisheries Services (NOAA Fisheries) pursuant to section 7 the Endangered Species Act (ESA). NOAA Fisheries understands that the Nuclear Regulatory Commission (NRC) will later submit the final licensing application. We have assigned number I/SER/2002/01175 to this consultation; please refer to it in future correspondence on this action.

Based on the information you provided, NOAA Fisheries has determined:

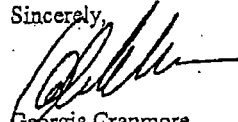
1. The threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), jointly managed and listed (56 FR 49653, September 30, 1991) by NOAA Fisheries and the U.S. Fish and Wildlife Service, historically occurred from the Mississippi River to Tampa Bay. Gulf sturgeon have been occasionally documented in the Mississippi River since the mid-1930s; however, the river may not maintain a permanent population. Because the project area is within historic Gulf sturgeon range, we are concerned about potential impacts on the species. When available, we would be interested in details regarding the intake structure that will remove water from the Mississippi River and methods employed to avoid entrainment and impingement of Gulf sturgeon. We would also be interested in information regarding the discharge water temperature upon its return to the river.
2. The project location (nearby Port Gibson on the Mississippi River) is not within the proposed Gulf sturgeon critical habitat (67 CFR 39106, June 6, 2002). However, because the rule is not yet final, proposed areas and boundaries may be modified. Therefore, we recommend that Enercon Services, Inc. refer to the final critical habitat rule when preparing the license application.



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We look forward to continued cooperation with the Enercon Services, Inc. and NRC in conserving our endangered and threatened resources. If you have any questions, please contact Dr. Stephania Bolden, fishery biologist, by e-mail at stephania.bolden@noaa.gov or at 727/570-5312. Please remember that section 7 consultations are between Federal agencies and therefore the NRC must be involved: please clear any correspondence to NOAA Fisheries on this project through them, or at least copy them with your correspondence.

Sincerely,



Georgia Cranmore
Assistant Regional Administrator
for Protected Resources

cc: NRC
F/SER4

Ref: I/SER/2002/01175
o:\section7\informal\sturgeon\GrandGulfNuclear
File: 1514-22.M

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213
August 20, 2002.

Ms. Christina Adams
Enercon Services, Incorporated
8866 Gulf Freeway, Suite 380
Houston, Texas 77017

Dear Ms. Adams:

The U.S. Fish and Wildlife Service (Service) has reviewed the information in your letter dated August 14, 2002, regarding an Early Site Permit application for expansion of the Grand Gulf Nuclear Station near Port Gibson, Claiborne County, Mississippi. Your company is requesting information regarding federally listed species and their habitats that might occur in the vicinity of the proposed project area. Our comments are submitted in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The following listed species or their habitats could be found in the project area:

The threatened bald eagle (*Haliaeetus leucocephalus*) is the only species of "sea eagle" regularly occurring on the North American continent. The bald eagle is predominantly a winter migrant in the southeast; however, increasing occurrences of nesting have been observed. The bald eagle nests in the transitional area between forest and water. They construct their nests in dominant living pines or bald cypress trees. Eagles often use alternate nests in different years with nesting activity occurring between September and January of each year. Young are usually fledged by midsummer.

The endangered interior least tern (*Sterna antillarum*) migrates up the Mississippi River and lays its eggs directly on the sandbars associated with the river. Hundreds of these birds may nest together to form a colony.

Also, the endangered pallid sturgeon (*Scaphirhynchus albus*) is found in the lower Mississippi River, although it is rare throughout its range. These fish require large, turbid, free-flowing riverine habitats, and feed mainly on other fish. They are usually found near the bottom of streams or lakes in sand flats or gravel bars. Little information is known on spawning or migration habits of these fish, although spawning likely occurs in the spring and summer months.

The breeding/spawning season for terns and sturgeons is approximately April through July.

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The threatened Louisiana black bear is one of 16 subspecies of the American black bear. Although bear habitat consists mostly of bottomland hardwood forests, they are opportunistic omnivores and will frequent agricultural areas. Historical habitats have been reduced by 80% throughout its range. The remaining habitat has been reduced by forest fragmentation and human encroachment.

Historically, the Louisiana black bear occurred throughout southern Mississippi, all of Louisiana, and eastern Texas. Currently, there are only two known breeding bear subpopulations: the Tensas River basin and the Atchafalaya River basin. However, there have been reported sightings along the Mississippi River corridor in Mississippi and Louisiana.

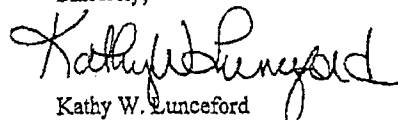
All of the above listed species are very sensitive to human disturbance. Therefore, before the use or transportation of any heavy construction equipment, or the removal of any vegetation within potential habitats, the Service recommends a qualified biologist conduct a visual survey for these species. Areas surveyed should also include ingress and egress areas, equipment storage areas, and staging areas. If any of these species are identified, a survey by a qualified biologist must be completed before commencement of any work activities.

In addition, the threatened Bayou darter (*Etheostoma rubrum*) is found only in Bayou Pierre and its tributaries. The darter prefers stable gravel riffles or sandstone exposures with large sized gravel or rock. Habitat loss or degradation has been a major contributor to the reduction in bayou darter numbers. Mining has contributed to the destruction of riparian vegetation along Bayou Pierre and its tributaries, and has resulted in bank sloughing, bank collapse, and increased water turbidity.

Although we anticipate that the proposed activities would have no direct impacts on the Bayou darter, erosion control measures should be taken to prevent any runoff from entering Bayou Pierre or its tributaries.

If you have any additional questions, please feel free to contact this office, telephone: (601) 321-1132.

Sincerely,



Kathy W. Lunceford
Mississippi Environmental Coordinator

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James H. Jenkins, Jr.
Secretary

Department of Wildlife & Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(225) 765-2800

M.J. "Mike" Foster, Jr.
Governor

Name Ms. Christina Adams
Company Emerson Services, Inc.
Street Address 8366 Gulf Freeway, Suite 380
City, State, Zip Houston, TX 77017
Project Grand Gulf Nuclear Station
Date October 2, 2002
Invoice Number 02100202

Personnel of the Habitat Section of the Fur and Refuge Division have reviewed the preliminary data for the captioned project. In reviewing our database, the following rare, threatened, or endangered species or critical habitats were found within the area of the captioned project that lies in Louisiana.

Bald Eagle (*Haliaeetus leucocephalus*)
Pallid Sturgeon (*Scaphirhynchus albus*)
Paddlefish (*Polyodon spathula*)
Interior Least Tern (*Sterna antillarum athalassos*)
Square-Stemmed Monkey-Flower (*Mimulus ringens*)
Waterbird Nesting Colony

Below are some recommendations from the department along with United States Endangered Species Act Status, Global and State Rarity Ranks, and locations of each species in the project area and the date of the last observation. The Last Observation is the date the element occurrence was last observed extant at the site; not necessarily the date the site was last visited. Please be aware that location information for element occurrences are given as point data and do not reflect local extent of the occurrence. We are unable to provide polygons identifying critical habitat around these points. In addition, the accuracy of the location information may be limited. Please refer to the precision data field which defines the precision to which the element occurrence as described can be located on a topographic map.

S= Seconds (Accuracy of locality mappable within a three-second radius)

M=Minute (within a one minute radius, approximately 2 km or 1.5 miles from centerpoint)

G=General (to quad or place name precision only, precision within about 8 km or 5 miles)

Bald Eagle (Federal Status Listed Threatened, State Status Listed Endangered, G4, S2N, S3B)

1. 320137N 0910901W, last observed 1999, Precision = S

Human activities, both short-term and long-term, and alteration of habitat may affect the reproductive success of nesting eagles. In the Southeast, the nesting period of most eagle pairs will fall between October 1 and May 15. Disturbance during this critical period may lead to nest abandonment and/or cracked or chilled eggs, and exposure of small young to the elements. Human activity (including aircraft

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operation) near a nest late in the nesting cycle may cause flightless birds to jump from the nest tree. We recommend that there be no activity within a 1,500-foot radius (457meters) from the nest tree at any time (nesting area). A buffer zone should be arranged to be contiguous to feeding area and provide protected access between nests and the food source; it should be approximately circular and with a minimum boundary of 1 mile (1,609 meters) from the nest tree. In general, no major activities should occur during the nesting period. Even intermittent use or activities of short duration are likely to provide such a disturbance (ex. Logging, seismographic activities w/explosives, mining, low level aircraft operations). Acceptable minor activities within this buffer zone include hiking, bird watching, camping, and recreational off-road vehicle use.

Additional recommendations for the Bald Eagle:

- Existing nests are often rebuilt and occupied after years of inactivity and, therefore, cannot be removed or destroyed even though they have been seemingly abandoned. Non-nest trees within the nesting area should also be protected until the nest tree is destroyed by the elements.
- Eliminate the use of toxic chemicals in the watersheds of lakes and rivers where eagles feed.
- Discourage the construction of buildings along shorelines where eagles feed.
- There must be no clear-cut and high-grade logging along the shoreline of feeding waters. This will prevent the removal of large trees preferred by eagles for hunting, roosting, and loafing perches.
- If possible, prevent or reduce shoreline erosion to protect roost or perch trees.
- Within the nesting area, no large tree should be removed. Within the buffer zone, a minimum of three to five large trees should be saved for potential roost and perch trees. Characteristically, these should be the largest trees in the timber stand which provide safety from any threat from the ground. Trees with open crowns and stout lateral limbs are preferable.

Pallid Sturgeon (Federal and State Status Listed Endangered, G1, S1)

1. 320215N 0910410W, last observed 1972-12-13, Precision = M

Requires large, turbid, free-flowing riverine habitat; occurs in strong current over firm or sandy substrate and spawns from July to August. Feeds opportunistically on aquatic insects, crustaceans, mollusks, eggs of other fish, and sometimes other fish. Threatened by habitat modification (construction of large dams, channelization), which has severely reduced or eliminated successful reproduction.

Paddlefish (G4, S3)

1. 320350N 0910945W, last observed 1988-05-06, Precision = G

Found in slow-flowing water of large and medium sized rivers, river-margin lakes, and oxbows. Prefers depths greater than 1.5 m. and spawns in shallow water over gravel during early spring in high water temperatures (11-14°C). Threatened by siltation of spawning habitats, pollution, back-to-back impoundments, and dams.

Interior Least Tern (Federal and State Status Listed Endangered, G4T2Q, S1B)

1. 315307N 0911337W, last observed 1996-07, Precision = M
2. 321455N 0905845W, last observed 1998-08-15, Precision = S
3. 320735N 0910247W, last observed 1997-07, Precision = M

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The range of the Interior Least Tern is Northeastern Louisiana where it nests on sandbars in the Mississippi River. Nesting colonies of this bird can move from year to year. Runoff, stream channelization, and reservoirs are the primary threat to the nesting habitat of this small tern. Precautions are recommended for any runoff or other water management practices that might effect the area in which these terns are nesting.

Water Bird Nesting Colony

1. 321052N 0911156W, last observed 1996-06-04, Precision = S

Square-stemmed Monkey Flower (G5, S3)

315615N 0911156W, last observed 1983-11-03, Precision = S.

The following state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are known at the specified site within Louisiana's boundaries:

Lake Bruin State Park

Winter Quarters State Commemorative Area

This office does not comment on some of the information that you asked for. Below are some suggested sources for additional information:

1. For additional information about the species mentioned about try the NatureServe Explorer, an On Line Encyclopedia of Life found at www.natureserve.org
2. For additional information regarding freshwater fishes try Glen Thomas, Louisiana Department of Wildlife and Fisheries Inland Fish Division Program Manager of Research (225)-765-2343
3. For 2002 information regarding the Bald Eagle, contact Louisiana Department of Wildlife and Fisheries Biologist Tom Hess at 337-538-2276. The LNHP Bald Eagle data has not yet been updated for 2002.

The Louisiana Natural Heritage Program has compiled data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features throughout the state of Louisiana. Heritage reports summarize the existing information known at the time of the request regarding the location in question. The quantity and quality of data collected by the LNHP are dependent on the research and observations of many individuals. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Louisiana have not been surveyed. This report does not address the occurrence of wetlands at the site in question. Heritage reports should not be considered final statements on the biological elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The Louisiana Natural Heritage Program requires that this office be acknowledged in all reports as the source of all data provided here. If you have any questions or need additional information, please call Louisiana Natural Heritage Program Data Manager Jill Kelly at (225) 765-2643.

Sincerely,


Gary Lester, NHP Coordinator

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EXPLANATION OF RANKING CATEGORIES EMPLOYED BY NATURAL HERITAGE PROGRAMS NATIONWIDE

Each element is assigned a single global rank as well as a state rank for each state in which it occurs. Global ranking is done under the guidance of NatureServe, Arlington, VA. State ranks are assigned by each state's Natural Heritage Program, thus a rank for a particular element may vary considerably from state to state. Federal ranks are designated by the U.S. Fish & Wildlife Service under the provisions of the Endangered Species Act of 1973.

FEDERAL RANKS (USESA FIELD):

LE = Listed Endangered

LT = Listed Threatened

PE = Proposed endangered

PT = Proposed Threatened

C = Candidate

PDL = Proposed for delisting

E (S/A) or T (S/A) = Listed endangered or threatened because of similarity of appearance

XE = Essential experimental population

XN = Nonessential experimental population

No Rank = Usually indicates that the taxon does not have any federal status. However, because of potential lag time between publication in the Federal Register and entry in the central databases and state databases, some taxa may have a status which does not yet appear.

(Rank, Rank) = Combination values in parenthesis = The taxon itself is not named in the Federal Register as having U.S. ESA status; however, all of its infraspecific taxa (worldwide) do have official status. The statuses shown in parentheses indicate the statuses that apply to infraspecific taxa or populations within this taxon. *THE SPECIES IS CONSIDERED TO HAVE A COMBINATION STATUS IN LOUISIANA*

(PS) = partial status = Status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population has U.S. ESA status, but the entire species does not. *THE SPECIES DOES NOT HAVE A STATUS IN LOUISIANA*

(PS: Rank) = partial status = Status in only a portion of the species' range. The value of that status appears because the entity with status does not have an individual entry in NatureServe. *THE SPECIES MAY HAVE A STATUS IN LOUISIANA*

GLOBAL ELEMENT RANKS:

G1 = critically imperiled globally because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extinction

G2 = imperiled globally because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extinction throughout its range

G3 = either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction throughout its range (21 to 100 known extant populations)

G4 = apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery (100 to 1000 known extant populations)

G5 = demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery (1000+ known extant populations)

GH = of historical occurrence throughout its range; i.e., formerly part of the established biota, with the possibility that it may be rediscovered (e.g., Bachman's Warbler)

GU = possibly in peril range-wide, but status uncertain; need more information

G? = rank uncertain. Or a range (e.g., G3G5) delineates the limits of uncertainty

GQ = uncertain taxonomic status

GX = believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered

T = subspecies or variety rank (e.g., G5T4 applies to a subspecies with a global species rank of G5, but with a subspecies rank of G4)

STATE ELEMENT RANKS:

S1 = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation

S2 = imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extirpation

S3 = rare and local throughout the state or found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations)

S4 = apparently secure in Louisiana with many occurrences (100 to 1000 known extant populations)

S5 = demonstrably secure in Louisiana (1000+ known extant populations)

(B or N) may be used as qualifier of numeric ranks and indicating whether the occurrence is breeding or nonbreeding

SA = accidental in Louisiana, including species (usually birds or butterflies) recorded once or twice or only at great intervals hundreds or even thousands of miles outside their usual range

SH = of historical occurrence in Louisiana, but no recent records verified within the last 20 years; formerly part of the established biota, possibly still persisting

SR = reported from Louisiana, but without conclusive evidence to accept or reject the report

SU = possibly in peril in Louisiana, but status uncertain; need more information

SX = believed to be extirpated from Louisiana

SZ = transient species in which no specific consistent area of occurrence is identifiable

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2.5 Socioeconomics

2.5.1 Demography

The population data presented in this section are primarily based on the 2000 U.S. Census (Reference 1). When economic, employment, or population trends were analyzed over time, comparisons were made between data from the 1990 U.S. Census (Reference 2) and the 2000 U.S. Census. The LandView 5¹ software was used to develop demographic data presented in this section of the report. The census data was augmented by information from other agencies and public organizations from the states of Mississippi and Louisiana (References 3 and 4). The area encompassed by a 50-mile radius from the center of the proposed power block location, includes all or a portion of the following 25 counties and parishes in Mississippi and Louisiana.

Mississippi Counties		Louisiana Parishes	
Adams	Madison	Caldwell	Franklin
Amite	Rankin	Catahoula	Madison
Claiborne	Sharkey	Concordia	Richland
Copiah	Simpson	East Carroll	Tensas
Franklin	Warren		West Carroll
Hinds	Wilkinson		
Issaquena	Yazoo		
Jefferson			
Lincoln			

Figure 2.5-1 shows a map of the area within 10 miles of the GGNS site. On this map, the proposed location of the power block for the new facility is located in the center with concentric circles surrounding the GGNS ESP Site at distances of 1, 2, 3, 4, 5 and 10 miles. The circles are divided into 22.5-degree segments with each segment centered on one of the 16 cardinal compass points (e.g., north, north-northeast, etc.). Within each area defined by the concentric circles and radial lines, the resident population for 2002 is indicated. The estimated population for 2002, and the projected population for 2030 (the projected first year of operation), and for each decade for five decades through the year 2070 (the projected end of the initial plant license period) are estimated based on the 2000 census, and are given in Table 2.5-1. The

¹ LandView® reflects the collaborative efforts of the U.S. Environmental Protection Agency (EPA), the U.S. Census Bureau, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS) to provide the public readily accessible published federal spatial and demographic data. It is composed of two software programs: the LandView® database manager and the MARPLOT® map viewer. These two programs work in tandem to create a simple computer mapping system that displays individual map layers and the demographic and spatial information associated with them.

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population data for the areas within ten miles of the site was based on census block points from the LandView 5 software.

The projected populations for the years 2030 through 2070 for each segment are based on averages of the population growth projections obtained from the Louisiana State University and the Mississippi Center of Policy Research and Planning for the Louisiana parishes and Mississippi counties, respectively. (References 3 and 4) Discussion regarding the population projection methodology used by the states of Mississippi and Louisiana is provided in SSAR Section 2.1.3.1.

There are no residences within the exclusion area boundary (Figure 2.2-1) as defined for the proposed location of a new facility.

Population characteristics for the low population zone² (LPZ), the plume exposure emergency planning zone³ (EPZ), and the region⁴ surrounding the GGNS site are listed in Table 2.5-2 and Table 2.5-3. Population percentages for age, race, and sex are listed in Tables 2.5-2 and 2.5-3. Income distributions for the LPZ, the EPZ, and the region are listed in Table 2.5-4. Regional median household income data obtained from the 2000 U.S. Census are included in Table 2.5-5.

Figure 2.5-2 depicts the area within 10 to 50 mile radius from the site. On this map concentric circles at 10, 20, 30, 40 and 50 miles from the site are shown. The circles are divided into 22.5-degree segments with each segment centered on one of the 16 cardinal compass points (e.g., north, north-northeast, etc.). The projected resident population for 2002 is indicated on the figure. Additionally, the 2002 projected population, and the population projection for each decade for five decades from 2030 (the projected first year of plant operation) to 2070 (the projected end of the initial plant license), are given in Table 2.5-6 for each area formed by the intersection of the concentric circles with the radial lines. The basis for estimating the projected population distributions are similar to those described for the population distribution for the EPZ.

Resident and transient population, particularly within the LPZ is subject to seasonal variations (due to the Grand Gulf Military Park, hunting camps, and fishing) and daily workday variations (due to GGNS Unit 1 employment and other activities of an occasional nature). There is one forest product company, Anderson-Tully of Vicksburg MS, that owns and leases land within five to ten miles of the GGNS site and has 12 people on logging crews that occasionally work in this area (Reference 5).

Based on information obtained from the U.S. Census 2000 LandView 5 data, the 2002 resident population within the LPZ is 51 people. Age, sex, and racial distributions of people within the LPZ are listed in Table 2.5-2 and Table 2.5-3.

² The low population zone (hereafter referred to as the “LPZ”) is defined as the area located within a two-mile radius of the GGNS Unit 1 reactor containment.

³ The plume exposure emergency planning zone (hereafter referred to as the “EPZ”) is a modified 10-mile radius area surrounding the GGNS site. Consistent with GGNS Unit 1 Emergency Plan and Part 4 of this application, the 10-mile radius is extended to an approximate 14-mile radius to the northwest, west, and southwest of the GGNS site to include the towns of Newellton and St. Joseph, LA. Figure 2.5-10 illustrates the boundary of the GGNS Unit 1 EPZ.

⁴ The “region” is defined as the area located within a 50-mile radius of the GGNS site.

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2.5.2 Community Characteristics

The community surrounding the GGNS site is located in a rural economically isolated region of Mississippi. Claiborne, Copiah, and Jefferson Counties in Mississippi and Tensas Parish, Louisiana are classified as persistent poverty counties (Reference 32). This designation indicates a rural non-metropolitan area in which at least 20 percent of the population lived in poverty in 1960, 1970, 1980, and 1990 (Reference 6). The poverty in this region is worse, when county poverty estimates are compared to State averages. The 2000 U.S. Census indicates the percent of individuals below the poverty level in Claiborne County is 32.4% compared to the State of Mississippi with 19.9% of individuals below the poverty level (Reference 7). Claiborne County and Tensas Parish income and poverty data obtained from the 2000 U.S. Census is provided in Table 2.5-7.

2.5.2.1 Area Economic Base

In 2001, Mississippi ranked 49 out of 50 states for the lowest median family income in the nation (Reference 8). Income data including median household income, median family income, and per capita income, were reviewed for Claiborne County and compared to income data for the state of Mississippi (Reference 7). This review indicates that individuals in Claiborne County have significantly lower incomes in comparison to the averages for Mississippi (Table 2.5-7).

Approximately 750 people work at the Grand Gulf Nuclear Station Unit 1 facility. Plant staffing is round the clock, with approximate numbers of personnel on site as indicated below for the normal day crews and night crews (Reference 30).

GGNS Unit 1 Approximate Staffing Levels				
Time Period	Normal Week Day	Normal Weekend Day	Outage Week Day*	Outage Weekend Day
Day	660	70	800*	210
Night	90	60	170*	140

* Outage weekday estimated based on difference between outage weekend day and normal weekend plus normal week day staff. This assumes outage weekday and weekend day staffing is constant (no specific data was provided for outage weekday staff levels).

The annual average wage for the year 2000 in Claiborne County and contiguous Mississippi counties are listed in Table 2.5-8. Pay rates include management personnel.

Table 2.5-9 presents regional labor force employment statistics according to the major industry categories for the years 1990 and 2000. The data indicates the majority of the work force, in Claiborne County and adjacent counties, is employed in educational and health services. The largest employers in the manufacturing sector in the region include lumber, electronic component manufacturers, food processing, apparel producers and transportation equipment manufacturers (Table 2.5-10).

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Comparisons between the 1990 and 2000 area employment statistics by industry type (Table 2.5-9) indicates that the total number of jobs for Claiborne County and the four adjacent counties decreased by 9 percent. Several industries experienced severe job decline between 1990 and 2000, including: agriculture, forestry and fishing jobs (down 38.5 percent); professional, scientific, and management jobs (down 34.5 percent); and retail trade (down 29.8%). In contrast, employment in transportation and warehousing increased by 20 percent and educational and health services employment increased by 10.7 percent. A study conducted by the Rural Health Works in Mississippi, estimates that employment in the health care sector represents 5.3 percent of the total workforce within Claiborne County. The study also concludes that the impact of local health care services typically represents a much larger sector of rural economies than for urban communities (Reference 12).

The December 2002 area labor force data (Table 2.5-11) shows Claiborne County had a higher unemployment rate of 12.4 percent as compared to the surrounding area, composed of the four contiguous counties (i.e. Copiah County, Hinds County, Jefferson County, and Warren County), and Tensas Parish, LA. The surrounding area had an average unemployment rate of 8.3 percent, and the State of Mississippi had an unemployment rate of 6.1 percent. (References 9 and 10) A comparison of 1990 U.S. Census data to the 2000 U.S. Census data reveals that two of the four adjacent counties (Hinds County and Warren County), and Tensas Parish, exhibited increases in employment rates ranging from 3.1 percent to 22.9 percent. Copiah and Jefferson Counties experienced small declines in employment rates of 1.1 percent and 3.0 percent, respectively. In contrast, Claiborne County experienced a 14.3 percent drop in employment rates from 1990 to 2000. The area employment trends for Claiborne and the adjacent counties, and for Tensas Parish, LA, for the years 1990 and 2000 are listed in Table 2.5-12.

2.5.2.2 Area Political Structure and Nuclear Facility Taxation

Claiborne County is a political jurisdiction of the State of Mississippi. An elected five-member Board of Supervisors governs the county. Other elected county officials include: Chancery Clerk, County Circuit Clerk, County Assessor/Collector and County Sheriff. Mississippi Code Title 27 addresses taxation of nuclear generating plants and the distribution of tax revenues from nuclear plants (Reference 11). This code states that any nuclear generating plant located in the state, which is owned or operated by a public utility is exempt from county, municipal and district ad valorem taxes. In lieu of the payment of county, municipal and district ad valorem taxes, the nuclear power plant pays the State Tax Commission a sum based on the assessed value of the nuclear generating plant.

The Grand Gulf Nuclear Station is taxed a sum equal to 2% of the assessed value, but not be less than twenty million dollars (\$20,000,000), annually. Of this amount, \$3,040,000 is allocated to Claiborne County, provided that Claiborne County upholds its commitment to the Grand Gulf Nuclear Station offsite emergency plan.

The State Tax Commission transfers \$160,000 annually to the City of Port Gibson provided that the City maintains its commitment to the Grand Gulf Nuclear Station offsite emergency plan.

Ten (10) percent of the remainder of the payments are transferred from the Mississippi Tax Commission to the General Fund of the state. The balance of the tax revenue from GGNS is transferred to the counties and municipalities in the state of Mississippi where electric service is provided. The tax revenues are distributed in proportion to the amount of electric energy consumed by the retail customers in each county with no county receiving an excess of twenty percent of the funds. (Reference 11) This distribution based on energy consumed also includes Claiborne County.

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Depending on the type of plant (merchant plant which would be unregulated, or a regulated – by the Public Service Commissions (PSC) of Mississippi and Louisiana - plant) the tax structure may be similar to the above for GGNS Unit 1 (for a regulated plant), or be some mutually agreeable amount for an unregulated merchant plant.

2.5.2.3 Demographic Information

Port Gibson, located approximately 6 miles to the southeast, is the closest town to the GGNS site, and has a population of 1,840 based on the 2000 U.S. Census. The majority of the population in this area is African American. Four towns with higher population densities are located within the 50-mile radius of the GGNS site. Vicksburg, Mississippi, located 25 miles to the north-northeast, had a 2000 U.S. Census population of 26,407. Clinton, Mississippi located to the northeast and Natchez, Mississippi, located to the southwest had 2000 U.S. Census populations of 23,347 and 18,464, respectively. Jackson, Mississippi, the largest nearby metropolitan area, located about 55 miles northeast of the site had a 2000 U.S. Census population of 184,256. Projected population information for the area surrounding the GGNS site is discussed in Section 2.5.1.

The cumulative resident population for 2000 was calculated using the data from LandView 5 software provided by the U.S. Census Bureau. The population density for Claiborne County is 24.3 persons per sq. mile; for the state of Mississippi, it is 60.6 persons per sq. mile. (Reference 1)

2.5.2.4 Social Structure Information

Population data for the areas surrounding GGNS indicate low population densities and a rural setting. The larger population centers to the north, northeast, and southwest provide employment, services, and entertainment for the region. Rural communities, similar to Port Gibson are located throughout the outlying areas, and provide limited services.

2.5.2.5 Housing Information

Regionally, 301,747 occupied housing units were reported in the 2000 U.S. Census (Table 2.5-13). Table 2.5-13 presents information on regional occupied housing stability characteristics by county. Table 2.5-14 provides regional housing information by county. Examination of this data indicates 18.2 % of families have lived in the same housing unit for at least one year. Long-term statistics demonstrate housing stability in the region. For example, 22.5% of the population have lived in the same housing unit since 1979. U.S. Census Data for 2000 indicates 567 vacant housing units are located within Claiborne County, representing 13% of the total housing in the county. Regionally, 31,967 housing units were reported as vacant for the 2000 U.S. Census. Based upon the vacancy numbers, no housing shortage appears to exist in the region.

2.5.2.6 Educational System

Ten undergraduate schools and one university are located within the EPZ for the GGNS site. In total, 6,277 students attended these institutions in the 2001/2002 school year (Reference 13). The student and faculty/teacher populations for each of these schools are listed in Table 2.5-15. Claiborne County, the four adjacent counties and Tensas Parish, LA, contain 116 primary and secondary schools with a student population of 60,281 (Table 2.5-16). In addition, 14 schools of higher education with a student population of 22,535 were identified within the counties listed in Table 2.5-16. (Reference 13)

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2.5.2.7 Public and Private Recreational Facilities

The Grand Gulf Military Park is located approximately 1-1/2 miles north of the proposed location of the power block of the new facility and is contiguous to the GGNS site property. The park is open daily from 8:00 a.m. to 5:00 p.m. and had over 88,000 visitors in 2001. School groups, Boy Scouts, YMCA groups and other community groups use Grand Gulf Military Park for field trips, historical and nature studies. The highest volume of guests visit the park on Sundays while Saturday is typically the second largest attendance day. The park is most heavily populated during the months of June and July, when 250 to 300 persons visit the site per day depending on the weather conditions. (Reference 15)

The Warner-Tully YMCA Camp consists of 108 acres of land located approximately 3-1/2 miles north from the site. Approximately 800 campers use the Warner-Tully camp facilities each year. The YMCA camp is open from late May to the end of August. (Reference 16)

Lake Claiborne is a private development of residential and recreational facilities. It is located approximately 3-1/2 miles east of the site. Lake Claiborne, Inc. has a total of about 450 members who have access to the lake and picnic area. There are 51 permanent residents in the development. A maximum of 200 people use these facilities on a summer weekend. (References 22 and 31)

Lake Bruin State Park consists of 53 acres located on the shore of Lake Bruin, Louisiana, approximately 9.5 miles southwest of the site. From July 2001 to June 2002, the park had approximately 36,000 visitors. (Reference 18)

There are approximately 150 hunting camps within Claiborne County. These camps are primarily used for deer hunting and other types of hunting, as well as sport fishing. The camps are too numerous to get an accurate number of hunters who use them. Each camp, depending on the size of the camp, could have up to 20-30 hunters on a weekend day during hunting season. (References 17 and 19)

There are several hunting clubs located across the Mississippi River from the GGNS site in Tensas Parish, Louisiana. Approximately 400 hunters are members of these clubs, primarily deer and duck hunters. (Reference 20)

Deer season in Mississippi traditionally opens early in October for archery and late November for guns. The season continues through early January. The greatest number of hunters, approximately 500 to 600, is invariably present on the first day of gun season. After the opening weekend, approximately 70% of the hunting population utilize the camps until the end of the season in early January. (References 17 and 19) Louisiana deer season is similar in duration to that of Mississippi, beginning in early October and ending in late January. (Reference 33)

Sport fishing in the area occurs in the months of April through September with Saturday the busiest day of the week. As many as 200-250 fishermen may be within the vicinity on weekends during the months noted above. The number of fishermen may drop to less than 150 during the week, and depending on the weather conditions. (Reference 19)

The Delta Queen Steamboat Company operates three paddle wheel tour boats on the Mississippi River, The Delta Queen, The Mississippi Queen and the American Queen. The Delta Queen is scheduled to pass the GGNS site a minimum of five times during the 2003 season with a full complement of 174 passengers and 75 crew. The Mississippi Queen is scheduled to pass the GGNS site a minimum of 8 times during the 2003 season with a full complement of 416 passengers and 156 crew. The American Queen is scheduled to pass the

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GGNS site a minimum 13 times during the 2003 season with a full complement of 436 passengers and crew of 161. (Reference 21)

2.5.2.8 Local Land Use Planning and Zoning

Claiborne County has no local Planning or Zoning Department. Instead, the county belongs to a statewide Planning and Zoning Development District comprised of eight (8) separate districts. Claiborne County is located within District 6, which includes Adams, Claiborne, Franklin, Jefferson, Lawrence, Walthall, and Wilkerson Counties. The Mississippi Development Authority assists communities with planning and zoning issues and business development. (Reference 22)

Due to the low projected population grown and population density surrounding the GGNS site, no local land use or zoning changes are planned within the LPZ of the site. The land immediately adjacent to the site is predominantly agricultural and forested.

2.5.2.9 Social Services and Public Facilities

Port Gibson Water Works supplies Port Gibson with municipal water and sewer services. Approximately 95% of Port Gibson's population is connected to the municipal water and sewer system, which is presently at 90 percent capacity. Operational averages for the water and sewer services provided by Port Gibson Water Works are provided below.

Source	Maximum Capacity (gpd)	Average Consumption (gpd)	Peak Consumption (gpd)	Storage Capacity (gal)	Sanitary Sewer Capacity (gal)
Wells	1 million	800,000	950,000	750,000	200,000

GGNS has its own water/sewage facility. The facility currently operates at about 1/3 capacity during normal operation and 2/3 capacity during outages. The facility consumes 100,000 gpd of water and 50,000 gpd for the activated sludge system. (Reference 35)

The Claiborne County Sheriff's department handles the present duties for law enforcement within the immediate 5 mile radius of GGNS site. Additional law enforcement resources from the town of Port Gibson assist when needed. GGNS maintains its own security force to handle the security within the GGNS site property boundaries. Fire capabilities are maintained by Claiborne County fire department along with the volunteer fire department from the town of Port Gibson. GGNS Unit 1 maintains an emergency response team on site, including a Fire Brigade to respond to fires within the plant buildings and structures. Emergency planning responsibilities are assigned to a number of departments and agencies. Federal, state and local officials will implement appropriate protective actions in case of an emergency. (References 23 and 24)

The Claiborne County Hospital has 32 beds. The staff consists of five doctors, ten registered nurses, six nurses' aides, and three X-ray technicians. (Reference 34) Information for hospitals located in the adjoining counties is listed below. (Reference 9)

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County / Parish	Number of Hospitals	Number of Beds
Copiah	1	49
Hinds	6	2,468
Jefferson	1	30
Warren	2	354
Tensas Parish, LA	2	89

2.5.2.10 Highway and Transportation System

Transportation routes are limited within the site vicinity. The major highway within the vicinity is U.S. Highway 61 that passes by the GGNS site to the east-southeast. U. S. Highway 61 parallels the Mississippi River from New Orleans, Louisiana to St. Louis, Missouri, and is approximately 4.5 miles from the site at the closest point. From the town of Port Gibson the highway goes north to Vicksburg, MS, and runs southwest to Natchez, MS.

The Natchez Trace Parkway lies to the east and south of Port Gibson and runs southeast to Natchez and northeast to Clinton. Figures 2.5-3 and 2.5-4, show estimated traffic count with road classification, and roadway development priority, respectively (Reference 26). Bald Hill Road is scheduled for reconstruction from Grand Gulf Road to Headly Road (Figure 2.2-2) to accommodate commercial traffic to/from Port Claiborne. (Reference 25)

A highway construction plan to extend the present path of Highway 18 is in the early planning stages. This proposed extension will connect Highway 18 to Grand Gulf Road, providing additional access to the GGNS site. (Reference 25) There are a number of other county and rural roads within a five mile radius of the site (Figure 2.2-2).

A Kansas City Southern freight train passes within 28 miles to the north-northeast of the site twice daily. The train runs from Vicksburg to Meridian, Mississippi, then returns to Vicksburg. The train carries a crew of five. (Reference 27)

2.5.2.11 Distinctive Characteristics

The region around GGNS is an area rich in Civil War history. The Grand Gulf Military Park lies north of the site and is listed on the National Register of Historic Places (National Register). Several civil war battle sites are identified within this region and the National Register lists several restored homes and businesses whose original construction dates back to the Civil War.

2.5.3 Historic Properties

Grand Gulf Nuclear Station is located in a richly historic section of Mississippi. Claiborne County was one of the first counties organized in the State and boasts many historic features, including antebellum homes, Civil War battlefields, and Indian relics. Grand Gulf Nuclear Station obtained its name from the Grand Gulf Military Park located immediately north of the site. There are 35 sites in Claiborne County that are listed on the National Register of Historic Places, some of which are located within a 10-mile radius of the site. The majority of these sites are historic buildings, homes, churches and or cemeteries. A list of features listed on the National Register of Historic Places is included in Table 2.5-17. Approximate locations for historic features listed on the National Register of Historic Places is listed on Figure 2.5-5.

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An initial survey by the Mississippi Department of Archives and History in June 1972 disclosed only one nonexpendable archaeological resource within the Gulf Nuclear Station site and its associated transmission routes. This was a Marksville period (150 BC -- 300 AD.) Indian burial mound which lay about 1000 feet directly south of the meteorological tower. The excavation and data recovery was performed in the winter of 1972-1973 under the direction of Mr. James H. Stone, then Assistant Administrator of the Division of Historic Sites and Archaeology of the Mississippi Department of Archives and History. Upon completion of the salvage archaeological excavation, the Department deemed it unnecessary to preserve the site since the mound no longer existed.

Documentation from the FER indicated three battle areas within a five-mile radius of the GGNS site. Two of these sites - the Grand Gulf Military Park and the Port Gibson Battlefield - are listed in the National Register of Historic Places. The Port Gibson Battlefield is located approximately two miles south of the Grand Gulf Nuclear Station site. (Reference 29)

2.5.4 Environmental Justice

Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act. This executive order ensures that minority and/or low-income groups do not bear a disproportionate share of adverse environmental consequences of a proposed project.

This environmental justice section provides an indication of the low-income and minority populations within the region surrounding the GGNS site. “Low-income” is defined as a household living at or below the national poverty level. A “minority” individual is defined as an individual who is American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or, Hispanic.

The characteristics of the population within the region, an area with a 50-mile radius around the GGNS site, were determined by examining 2000 Census data (Reference 1) as discussed in Sections 2.5.1 and 2.5.2.

A minority population is defined to exist if the percentage of minorities within a Census Block Group (CBG) exceeds the percentage of minorities in the State, in which the CBGs are located, by 20 percentage points or more, or if the percentage of minorities in the CBG is 50 percent or greater. A low-income population is defined to exist if the percentage of households within a Census Tract⁵ living below the poverty level exceeds the percentage of low-income households within the state by 20 percentage points, or if the percentage of low-income households in the Census Tract is 50 percent or greater. (Reference 39)

Portions of Mississippi counties and Louisiana parishes in the region with minority populations that meet the criteria above are indicated in Figures 2.5-6 and 2.5-7, respectively. Overall, minority individuals account for approximately 46% of the population within the 50-mile radius (Table 2.5-3).

As detailed in Section 2.5.2, the region surrounding the GGNS site is generally a rural, economically isolated community, roughly split by the Mississippi River between Mississippi and Louisiana. Claiborne, Copiah, and Jefferson Counties in Mississippi, and Tensas Parish,

⁵ Because of difficulties in obtaining income data from the 2000 Census that is compatible with the LandView program used for this analysis, income data is presented per Census Tract instead of Census Block Group.

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Louisiana, all within the region, are classified as persistent poverty counties (Reference 36). This designation indicates a rural non-metropolitan area in which at least 20 percent of the population lived in poverty in 1960, 1970, 1980, and 1990 (Reference 37). The poverty in this region is worse, when county or parish poverty estimates are compared to state averages. For example, regarding relevant Mississippi counties, the 2000 U.S. Census (Reference 1) indicates the percent of individuals below the poverty level in Claiborne County is 32.4% as compared to the State of Mississippi with 19.9% of individuals below the poverty level (Reference 38). Claiborne County and Tensas Parish income and poverty data obtained from the 2000 U.S. Census is provided in Table 2.5-7. The few areas of Mississippi and Louisiana, in the region surrounding the GGNS site, which meet the “low-income population” criteria defined above are indicated in Figures 2.5-8 and 2.5-9, respectively.

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2.6 Geology

A detailed description of the geological, seismological, and geophysical characteristics of the GGNS Site and the ESP Site region (200 mile radius), vicinity (25 mile radius), area (5 mile radius) and the site location (0.6 mile radius) is provided in the ESP Site Safety Analysis Report, Part 2 of the Application.

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2.7 Meteorology and Air Quality

This section describes the general climate of the Grand Gulf Nuclear Station (GGNS) site and the surrounding regional meteorological conditions. This section also documents the range of meteorological conditions that would likely exist during the construction and operation of a new facility. Data presented includes a climatological summary of normal and extreme values of several meteorological parameters for the National Weather Service stations located in Jackson and Vicksburg, Mississippi.

2.7.1 General Climate

General climate data provided here is based on Climatic Atlas of the United States, (U.S. Department of Commerce, 1968 - Reference 32), "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years" (U.S. Weather Bureau, 1961 - Reference 20), "Two to Ten Day Precipitation for Return Periods of 2 to 100 Years in the Contiguous United States" (U.S. Weather Bureau, 1964 - Reference 21), the ASHRAE Fundamentals Handbook, 2001 (Reference 34), and "Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States." (NOAA, 1977 – Reference 35)

The climate of southwestern Mississippi is humid and subtropical with a short cold season and a relatively long warm season. The predominant air mass over the region during most of the year is maritime tropical with origins over the Gulf of Mexico. In the winter, occasional southward movements of continental polar air from Canada bring colder and drier air into Mississippi. However, cold spells seldom last more than 3 or 4 days. (Reference 4)

In summer, climate is almost wholly dominated by the westward extension of the Bermuda High, a subtropical, semi-permanent anticyclone. The prevailing southerly winds provide a generous supply of moisture and this, combined with thermal instability, produces frequent afternoon and evening showers and thundershowers. The convective thundershowers of the summer season are more numerous than frontal type thunderstorms. However, the thunderstorms associated with the occasional polar front activity in late winter and early spring are more severe and sometimes produce tornadoes. (Reference 4)

Mississippi is south of the average track of winter cyclones, but occasionally one moves across the State. In some winters, a succession of such cyclones will develop in the Gulf of Mexico or in Texas and move over or near the State. Mississippi is also occasionally in the path of tropical storms or hurricanes. (References 1 and 4)

Snowfall is not a rare event in Mississippi. During the 65 years from 1898 through 1957 and 1997 through 2001, measurable snow or sleet fell on some part of the State in all but three years. During these 65 years, snow or sleet fell in January in 40 years and, in February, in 32 years. Along the latitude of the site (approximately 32° north), snow falls in approximately 30 percent of the years. (References 1 and 3)

An ice storm (also called glaze ice) is the accretion of generally clear and smooth ice, formed on exposed objects by the freezing of a film of supercooled water deposited by rain, drizzle, or possibly condensed from supercooled water vapor. The weight of this ice is often sufficient to greatly damage telephone and electric power lines and poles. (Reference 4)

Most glaze is the result of freezing rain or drizzle falling on surfaces with temperatures between 25 °F and 32 °F. The glaze belt of the United States includes all of the area east of the Rocky Mountains. However, in the Southeast and Gulf Coast sections of the country, below freezing temperatures seldom last more than a few hours after glaze storms. (References 4 and 15)

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2.7.2 Regional Climatology

The description of the regional climatology at the time of licensing of GGNS Unit 1 was based primarily on climatological records for Vicksburg and Jackson, Mississippi. This description utilizes that data as appropriate and is augmented by more recent data for the Vicksburg station and the GGNS site meteorological tower.

Topographical considerations and examination of the records indicate that meteorological conditions at Vicksburg and Jackson are representative of the general climate of the region encompassing the site. Since Vicksburg is the closer of the two stations and borders the Mississippi River, the tables and figures included are based primarily on Vicksburg data when the period of record and observational procedures are considered adequate. Otherwise Jackson data are presented. (Reference 4)

Recent improvements in the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) data systems provide easy access to local meteorological data records since the middle of 1996. GGNS site data is also available for this period. In several cases, such as the recurrence rate of rare events based on many decades of observation, the original GGNS Unit 1 data is preferable. For example, the last few years have been unusually dry in the region, so it would be more accurate and more conservative, in terms of maximizing rainfall predictions, to use the Unit 1 licensing data, rather than to draw long term rainfall conclusions on data from the last five years.

2.7.2.1 Wind

The general direction of airflow across the region is from the southerly sectors during much of the year, although the prevailing direction may be from one of the northerly sectors during some months. The net air movement can be deduced from the annual resultant wind values for the GGNS site shown in Table 2.7-1. The average windspeed at the site ranged from 3.7 miles per hour (mph) to 4.4 mph between 1996 and 2003. The average windspeed at Vicksburg between 1997 and 2003 ranged from 7.0 mph to 7.6 mph, as shown in Table 2.7-2.

2.7.2.2 Temperature

The temperature regime of the site region can be described by the data shown in Table 2.7-3; four years of GGNS site data from 2000 to 2003, and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) design data (Reference 34) for Jackson, Mississippi. As can be seen from the table, the ASHRAE design values for the Jackson area are very close to those developed from the GGNS site data.

2.7.2.3 Atmospheric Moisture

Climatic records of humidity in Vicksburg are shown in Table 2.7-5. These data show that relative humidity in the region is high throughout the year. Nighttime relative humidities are highest in summer and fall and lowest in winter. Daytime humidities are highest in winter. Seasonal variations are in the vicinity of 5 to 10 percent. Highest relative humidities occur in the early morning hours (0000 – 0600), averaging greater than 80 percent during all months. Lowest relative humidities occur during early and mid afternoon with averages ranging from approximately the mid-50s to the mid-60s for all months.

2.7.2.4 Precipitation

Mean annual precipitation in the region ranges from about 50 inches in northwestern Mississippi to 65 inches in the southeastern part of the State. During the freeze-free season, rainfall ranges

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from about 24 inches in the northwest to about 37 inches in the southeast, but during winter the precipitation maximum is centered in the northwest with the minimum on the coastal counties. The fall months are typically the driest of the year. (Reference 4) Yearly average precipitation at the GGNS site for 2000 and 2001 is approximately 45 inches (Table 2.7-6) and at Vicksburg for the period of 1997 to 2001 was about 50 inches (Table 2.7-7).

Local site meteorological conditions are expected to result almost entirely from synoptic-scale atmospheric processes. (Reference 4) That is, the local site does not have a unique micro-climate but rather the local meteorology is consistent with the regional meteorology. There are two exceptions caused by local effects due to the Mississippi River.

First, there is higher humidity directly adjacent to the Mississippi River, and so the Vicksburg humidity data is more appropriate for site estimates than the Jackson data.

Second, there is some evidence of channeling of extremely low level (less than 70 feet above grade) winds from the west into a trajectory along the River. This phenomenon has no effect on dispersion of effluents from the plant since the site is east of the area affected. (Reference 4)

2.7.2.5 Severe Weather

This section describes severe weather phenomena in the region. Most recent data is taken from the NCDC Storm Event database that covers the period of 1950 through 2002 (Reference 5), but even longer data periods are used for some phenomena in order to document the occurrence of rare events.

2.7.2.5.1 Hurricanes

During the period 1899 to 2000 there were 117 documented cyclones that affected the Middle Gulf Coast (Louisiana, Mississippi, Florida, Texas and Alabama). Of these, 39 (33.3 percent) were Category 1, 30 (25.6 percent) were Category 2, 36 (30.8 percent) were Category 3, 10 (8.5 percent) were Category 4 and 2 (1.8 percent) were Category 5 hurricanes. Table 2.7-8 presents a monthly breakdown of the 117 cyclones and provides a definition of the storm categories.

Tropical cyclones, including hurricanes, lose strength as they move inland from the coast and the greatest concern for an inland site is possible flooding due to excessive rainfall. The extremes for rainfall presented below include possible hurricane effects. (Reference 4)

The small diameter, extremely intense Camille hurricane (1969), whose center passed less than 10 miles to the east of Jackson Municipal Airport, generated gusts at Jackson of only 67 mph. The top winds in this hurricane at points on the coast were estimated at over 170 mph. (References 4 and 7)

2.7.2.5.2 Tornadoes

Tornadoes also occur in the region. A highly destructive tornado struck Vicksburg in December 1953. In addition, on April 17, 1978, a tornado struck GGNS. A detailed report of this event was submitted to the NRC (References 4 and 8). The tornadoes reported during the years 1950-2002 in the vicinity of Claiborne, Warren and Hinds Counties in Mississippi and Tensas Parish in Louisiana are shown on Table 2.7-9.

During the period 1950 to April 2002, a total of 108 tornadoes touched down in these four counties/parishes that have a combined area of 2,545 square miles (Reference 9). References 10 and 11 confirm that local tornadoes have a mean path area of 0.43 square mile. The site

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recurrence frequency of tornadoes can be calculated using the point probability method as follows:

Total area of tornado sightings = 2,545 sq. mi.

Average annual frequency = 108 tornadoes/52.3 years = 2.07 tornadoes/year

Annual frequency of a tornado striking a particular point $P = [(0.43 \text{ mi}^2) (2.07 \text{ tornadoes/year})] / 2545 \text{ sq. mi.} = 0.00035$

Mean recurrence interval = $1/P = 2,860$ years

NUREG/CR-4461, Tornado Climatology of the Contiguous United States, Rev. 1, published in April 2005 (Reference 36) contains location-specific tornado information. This reference identifies that the Grand Gulf plant site at approximately 32°N, 91°W, has experienced 592 tornadoes from 1950 – 2003 in a 2 degree box (roughly 16,000 mi^2). This gives a point strike frequency by the above formula of $3.0 \times 10^{-4} \text{ yr}^{-1}$, in good agreement with the local county data. The 95% upper limit for a point structure in the Central US is stated to be $3.9 \times 10^{-4} \text{ yr}^{-1}$.

2.7.2.5.3 Thunderstorms

Table 2.7-10 presents the thunderstorm data for the region from 1955 through April 2002. Approximately 62 percent of the thunderstorms in this area occur during the warm months (March-July), indicating that the majority are warm air-mass thunderstorms. From 1955 - April 2002, 421 thunderstorms are listed for this area, with Hinds County receiving approximately 40 percent, Claiborne County receiving 12 percent, Warren County receiving 32 percent, and Tensas Parish receiving 16 percent of the thunderstorms. The total of 298 storms shown in the table is less than the sum of the individual totals (421) for each of the three counties and Tensas Parish because some of the individual storms extended into more than one county.

2.7.2.5.4 Lightning

Data on lightning stroke density is extremely sparse. Analysis has shown that the density per square mile is approximately one-half of the number of storm days from the isokeraunic map. This was partially confirmed by a two-year count in a region with 27 storm days per year where the average stroke density was approximately 15 strokes per square mile per year (References 4 and 12).

The annual mean number of thunderstorm days in the site area is estimated to be 66 based on interpolation from the isokeraunic map (Reference 13); therefore it is estimated that the annual lightning stroke density in the GGNS site area is 33 strokes per square mile. (Reference 4)

2.7.2.5.5 Hail

From 1955 – April 2002, 279 hailstorms occurred in the region annually, with Hinds County receiving approximately 57 percent, Claiborne County receiving 6 percent, Warren County receiving 19 percent, and Tensas Parish receiving 18 percent of the hailstorms, as shown in Table 2.7-11. For this table, each occurrence of hail was counted as an individual event, even if two counties recorded hail simultaneously. The most probable months of occurrence of hail are March and April. Property damage occurs infrequently, with 6 recorded events in Warren County, 14 in Hinds County, 4 in Claiborne County, and 2 in Tensas Parish in this 47-year period.

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2.7.2.5.6 Severe Winter Storm Events

The occurrences and durations of recorded ice storms and heavy snow storms in the three counties and one parish in the vicinity of the GGNS site for the eight-year period 1993-2001 is shown in Table 2.7-12. From these data, conservatively including the heavy snowstorm of 1997, the frequency of ice storms in the Grand Gulf area is estimated to be 4 in 8 years, or 0.5 storms per year.

The ice storm reported from December 22, 1998 at 8:00 PM through December 25 at 5:00 AM, was the longest lasting storm with a total duration of 57 hours. Property damage was estimated at \$16.6 million. It should be noted that, while the ice storm duration was 57 hours, that period was over an area of 27 counties. Vicksburg reported the following history: 2 hours of trace rain (~0.01 inches), followed by one dry hour, and then eight hours of rain for a total of 0.4 inches at the start of the storm, then a period of 15 hours with only a trace of precipitation, and then 11 hours of rain totaling 0.85 inches, followed by only a trace of precipitation for the remainder of the storm. A conservative approach would be to neglect the dry/trace precipitation periods and assume this represents a 19-hour ice storm duration. Reference 4 also discussed combining periods of ice storms in this manner and developed a 12-hour maximum based on the ten years 1954 through 1963. Based on a maximum duration of 12 hours in 10 years of data, and this maximum value of 19 hours in 18 years of data, the maximum probable duration in 100 years would be 27 hours assuming a logarithmic extrapolation; i.e.,

$$27 = 12 + (19-12) \cdot \log(100-10) / \log(18-10).$$

The total number of glaze storms reported in the broad general area surrounding the plant site during the period 1917 through 1953 inclusive, ranged from 1 to 7. It is estimated that approximately 30 percent of these caused ice coatings in excess of 0.5 inches in some portions of the area. (Reference 4) As noted above, Vicksburg received approximately 1.27 inches of precipitation during the 1998 ice storm.

Rainfall in the recent 5-year period discussed below is from a period of relatively low rainfall (Reference 18). Therefore, it is conservative to use earlier data periods to develop the probable maximum winter precipitation values. Table 2.7-13 shows that the maximum rainfalls at Vicksburg in the 5-year period 1997-2001 are well below the 5-year recurrence rate presented in the GGNS UFSAR Table 2.3-74. This UFSAR data is based on a 15-year period.

The observed maximum precipitation amounts (water equivalent) during any consecutive 48-hour period at Jackson, Mississippi for the indicated winter (November through March) seasons is given in Table 2.7-14. (Reference 17) The data were analyzed by the Gumbel-Lieblein method described by Thorn in Reference 16 with the following results: (Reference 4)

<u>Return Period (Years)</u>	<u>Max. 48 Hr Winter Precip. Water Equivalent (inches)</u>
10	4.60
25	5.50
50	6.15
100	6.80
500	8.20
1000	8.80

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The 48-hour winter PMP, as defined in Hydrometeorological Report (HMR) No.53 dated April 1980 (Reference 55), is generated from the maximum 24-hr winter month PMP (Figure 27, March) of 30 inches, and the maximum 72-hr winter month PMP (Figure 37, March) of 39 inches. HMR 53 notes in Section 7.3 that winter point rainfall “would reasonably be not much different from the 10-mi² values” so no correction is applied for smaller areas. HMR 53 also recommends interpolation with a smooth depth-duration curve from (0,0) for intermediate time periods between 24 and 72 hours. Doing this gives a 48-hour winter PMP of 35 inches of rainwater.

Maximum frozen precipitation is not described in HMR 53. The NCDC storm database (Reference 5) was researched and, as documented in Section 2.3.1.2.2, there have been 4 ice storms in local counties and parishes in the 11 year period from 1993 to 2003. In these 11 years of data, the maximum precipitation during an ice storm has been 1.27” in a 1998 storm in Vicksburg. The precipitation records of Vicksburg were reviewed for the 12/14/1997 and 1/27/2000 events; the precipitation amounts reported were 0.26” and 0.86”. The 1996 storm is described in the storm database as leaving 0.5” to 1” of ice. Using the Gumbel distribution and the method of moments as suggested by Wilks (Reference 56), the 100-yr return frozen precipitation is 1.9”, based on the 11 years of ice thickness data of 1.27”, 1”, 0.86”, 0.26” and seven years of 0” of Reference 5. It is considered reasonable and conservative to use this value, 1.9” of frozen precipitation, for the 48-hour probable maximum winter precipitation (PMWP) for the ESP site.

The maximum reported snow and/or ice depths at Jackson and Vicksburg, Mississippi were reviewed from three sources. The current NCDC storm event database (Reference 5) identifies that the greatest snowfall in its period of data, 1993 to September 2002, occurred on December 14, 1997. That storm deposited 8 inches of snow in certain areas in a snow event that covered Claiborne, Hinds and Warren Counties. Reference 23 records that a site in the Vicksburg area saw a total of 10.1 inches of snowfall in January 1919. Reference 19 identifies the maximum 24-hour snowfall at Jackson as 10.6 inches in January 1940. Since this data review covers at least 83 years back to 1919, it is possible to conclude with 83 percent confidence that the 100-year snowfall maximum is 10.6 inches.

In the Jackson/Grand Gulf area, snow melts and/or evaporates quickly, usually within 48 hours, and before additional snow is added. Since the plant site is subjected to a subtropical climate with mild winters, prolonged snowfalls or large accumulations of snow or ice on the ground and structures are not anticipated.

2.7.3 Regional Air Quality

Air quality in the vicinity of the GGNS ESP site is generally good, including compliance with the newly promulgated U.S. Environmental Protection Agency 8-hour ozone standard of 0.08 ppm. For example, maximum ozone concentration in Hinds County, MS in 1999 was 0.08 ppm and in Warren County, MS, the maximum ozone concentration was 0.07 ppm (Reference 33). These levels are generally a reflection of the predominantly rural character of the region. Contact with the Mississippi Department of Environmental Quality indicates that these three counties are in an air quality attainment status for all criteria pollutants, including the 8-hour ozone standard.

For Jackson, MS, the closest Standard Metropolitan Statistical Area (SMSA) to the site, the fourth highest ozone concentration in 1999 was 0.083 ppm. The 10-year trend (1990-1999) in ozone concentrations in Jackson is increasing (Reference 33). The somewhat higher ozone levels in the Jackson SMSA are likely a result of increasing population and increasing economic activity.

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The Grand Gulf Unit 1 UFSAR also contains an evaluation of smog based on Jackson data over the years 1955 through 1964. Grand Gulf is well removed from Jackson metropolitan area and Vicksburg, and is, therefore, not prone to heavy smog. Table 2.7-100 shows haze records by month from Vicksburg for the period of 1997 - 2001. There were about 194 hours/yr on average of haze during this period.

2.7.4 Local Meteorology

The following sections contain information on wind, air temperature, atmospheric water vapor, precipitation, and fog in the vicinity of the ESP site.

2.7.4.1 Wind Distribution (All Meteorological Conditions)

Wind data is available from both the Vicksburg meteorological station and the Grand Gulf meteorological tower. Both sets of data are discussed here to provide a fuller description of winds in the area.

2.7.4.1.1 Vicksburg Wind Data

Tables 2.7-62 through 2.7-73 provide monthly percent joint frequency distributions for wind directions and speeds, based on a 5-year period of record from 1997 through 2001, for Vicksburg. Table 2.7-74 provides an annual summary of the data. On an annual basis, Vicksburg wind data collected in the five years 1997 through 2001 show central north is the most frequent (13.8 percent) wind direction. The wind is from the southeast through central south 30.8 percent of the time. Westerly (W-SW - W-NW) and easterly (E-NE - E-SE) winds are least frequent with frequencies of 9.1 percent and 16.2 percent, respectively. Southerly components prevail in spring, summer and winter, while northerly components prevail in the fall (Tables 2.7-62 through 2.7-73).

Winds average greater than 8.1 mph from January through April, and 7.7 mph or less from May through December. Mean annual wind speed is 7.4 mph (Table 2.7-74).

The Vicksburg meteorological station winds are presented graphically in Figures 2.7-8 through 2.7-13. These wind roses cover the period from 1997 through 2001 and represent the frequency of winds coming from a particular direction by the length of the line in that direction. Vicksburg records a usual pattern of winds coming from the north or south. At Vicksburg, winds from the west occur as infrequently as winds from the east. However, in the year 2001 most winds came from the eastern half of the compass rose (Figure 2.7-13).

2.7.4.1.2 Grand Gulf Wind Data

The same wind data assessment was applied to GGNS site data collected at the Grand Gulf meteorological tower for the period from 2001 through 2003 (Reference 2). Monthly relative frequencies of wind direction and speed for the GGNS site are shown in Tables 2.7-75 through 2.7-86, and data for all years is given in Table 2.7-87. Winds average greater than 4.5 mph from November through April and 4.0 mph or less from May through September. Mean annual wind speed is 4.3 mph.

Wind roses are presented for the GGNS site in Figures 2.7-1 to 2.7-4 for the 3-year period from 2001 through 2003. The normal wind pattern shows winds primarily from the right half of the rose (N to E to S), with the highest frequency originating in the NE or SE. In all years, few winds blew from the west. In general, the wind roses from Vicksburg and Grand Gulf show the same trend towards prevailing winds from the NE and SE.

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2.7.4.1.3 Wind Direction Persistence

Hourly weather observation records from the National Weather Service at Vicksburg, Mississippi for the years 1997 through 2001 were examined for wind direction persistence. The longest persistence periods from a single sector (22.5 degrees), three adjoining sectors (67.5 degrees), and five adjoining sectors (112.5 degrees) were determined from each sector (and calm) during each year. The results are shown in Tables 2.7-88 through 2.7-90. During the period, the single sector persistence was greatest (28 hours) for the central north direction. The average maximum persistence (17.6 hours) was also greatest for the central north direction. For the persistence in three adjoining sectors, the central south sector had the longest period of persistence (109 hours) and the largest average maximum persistence (63.8 hours), as shown in Table 2.7-89. The longest persistence period (105 hours) from five adjoining sectors occurred in the S-SE sector (Table 2.7-89). The central north sector showed the greatest average maximum persistence (57.2 hours).

Wind persistence data similar to the above are shown in Tables 2.7-91 through 2.7-93 for the Grand Gulf site. The statistics shown in these tables cover a three-year period from 2001 through 2003. Table 2.7-91 shows that the longest single sector persistence period was 32 hours from the northeast sector. The northeast sector also had the greatest average maximum persistence. For the persistence in three adjoining sectors, the N-NE sector had the longest period of persistence (102 hours) and the largest average maximum persistence as shown in Table 2.7-92. The persistence data for five adjoining sectors (Table 2.7-93) shows the central N-NE sector with the longest persistence period (122 hours) and the greatest average maximum persistence.

Table 2.7-94 presents a comparison of the maximum persistence period for the GGNS site in hours with historic data from Jackson and Table 2.7-95 presents a comparison of the maximum persistence periods for Vicksburg and GGNS. While there are differences in the preferred sectors, the data demonstrate that it is not likely that any single wind direction would persist for a substantial period of time.

2.7.4.2 Air Temperature

Table 2.7-96 indicates that recent temperature extremes for Vicksburg have ranged from 107 °F (August and September 2000) to 16 °F (January 2001) (Reference 3). Table 2.7-97 also indicates that temperature extremes for GGNS have ranged from 104.2 °F (August 2000) to 17.3 °F (January 2000) (Reference 2). The data shows good agreement between the two locations.

Figures 2.7-14 and 2.7-15 present the site hourly temperatures for the years 2000 and 2001 (Reference 2). A comparison of the two years is made in Figure 2.7-16, where the maximum and minimum temperatures measured in 96-hour intervals are plotted against the start date of the interval.

Other observed temperature extremes were sought from nearby national weather service stations to find minimum and maximum values for a longer observation period. Extreme values include 110°F in the 1967-2004 record at the Vicksburg Military Park, 107°F in the 1896-2003 record at Jackson, -5°F in the Jackson data, and -8°F in St. Joseph in a 1930-2001 database. (Reference 38)

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2.7.4.3 Atmospheric Moisture

Mean relative humidities for four time periods per day at Vicksburg are shown in Table 2.7-5 (Reference 3).

All of Mississippi experiences high humidity during much of the year. At Vicksburg humidities of 90 percent or higher have occurred at any hour of the day. They are most frequent in the early morning hours. In the summer, at times there develops a combination of high temperatures together with high humidities; this usually builds up progressively for several days and becomes oppressive for one or more days. Humidities of less than 50 percent occur on some days each month, usually in the early afternoon hours. Humidities drop under 30 percent on about one-quarter of the October and November days; the number of days with such low humidities diminishes in the other months. In July and August there may be none (References 4 and 19).

2.7.4.4 Precipitation

2.7.4.4.1 Rain

Average monthly precipitation at the GGNS site follows a seasonal trend, reaching a maximum mean in March (10.02 inches) and a minimum mean in November (0.02 inches). Maximum annual mean precipitation has been 46.85 inches. For Vicksburg, the maximum mean precipitation is in December (9.94 inches) and a minimum mean in May (0.38 inch). The maximum annual precipitation in Vicksburg is 59.76 inches.

The GGNS site rainfall data covers the time period from 2000-2001 and the Vicksburg data covers the time period from 1997-2001 (References 2 and 3). Monthly and annual mean and extreme precipitation amounts for the GGNS site and Vicksburg, Mississippi (References 2 and 3) are presented in Tables 2.7-6 and 2.7-7, respectively. Tables 2.7-98 and 2.7-99 provide monthly frequency distribution of rainfall rates at the Grand Gulf site and Vicksburg, respectively.

In general, the Vicksburg data appears to be representative of the GGNS site area. The variations between the two locations from month to month, particularly during the summer months, are likely reflective of the occurrence of heavy shower and thunderstorm activity common in the area.

The maximum short period precipitation was determined for the GGNS Unit 1 UFSAR (Reference 4). As discussed previously, that data is still valid and conservative as compared to recent experience. The maximum point precipitation values are given in Table 2.7-13 for the 2-hour to 10-day durations shown. These were interpolated from the maps of USWB Technical Papers 40 and 49 (References 20, and 21). Technical Memorandum NWS HYDRO-35 (Reference 34) was consulted for updated (from Technical Paper 40) 30-minute and 1-hour duration precipitation values shown in Table 2.7-13. For comparison purposes, the recent 5-year maximum short period precipitations are listed in the table for Vicksburg, Mississippi.

Table 2.7-100 was obtained from Reference 22. It presents maximum observed short period precipitation data for Vicksburg. A comparison of the two tables suggests that 100-year frequency precipitation events may have occurred during the period of record (1893-1961) for periods of 3, 6, 12 and 24-hour durations. (Reference 4)

A comparison of the more recent data record, the five years from 1997 through 2001, shows that the more recent period has had fewer heavy rainfall events than would be expected for a random 5-year period.

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2.7.4.4.2 Snow

Annual average snowfall in the Grand Gulf area is estimated to be 1 to 2 inches. This estimate is based on 36 years of record (1930-1966) at Vicksburg (Reference 23) and 39 years of record (1936-1975) at Jackson (References 4 and 19). This data is assumed to be more representative of the long term site meteorology due to the relatively dry recent years, although, during 1997 through 2001, the Vicksburg meteorology station reported snow conditions for several hours in November through March as presented in Table 2.7-101.

The maximum monthly amount in Vicksburg was 10.0 inches in February 1960 and this total fell within a 24-hour period. The maximum annual amount was also 10.0 inches. At another site in the Vicksburg area, a total of 10.1 inches of snow fell in January 1919 (References 4 and 23). The maximum recorded in the current NCDC storm event database is 8 inches on December 14, 1997 (Reference 5). This database includes snowstorms for the period 1993 through September 2002.

The maximum monthly amount at Jackson was 10.6 inches in January 1940 during a 24-hour period. The maximum annual amount was 11.6 inches and occurred in the 1939-1940 season. (References 4 and 19)

2.7.4.5 Fog

Fog is an aggregate of minute water droplets suspended in the atmosphere near the surface of the earth. According to international definition, fog reduces visibility to less than 0.62 miles.

Table 2.7-102 indicates that, over the period 1997 to 2001, Vicksburg has averaged approximately 92 hours/year of fog, with October through January having the greatest frequency of fog. Vicksburg records are considered representative of the Grand Gulf site due to its proximity and to its similar location relative to the east bank of the Mississippi River.

Note that the GGNS Unit 1 UFSAR (Reference 4) estimated that moderate fog will occur approximately 1 percent (88 hours) of the time at Grand Gulf, and heavy fog will occur approximately 0.6 percent (53 hours) of the time, which is consistent with the Table 2.7-102 data.

2.7.4.6 Atmospheric Stability

Atmospheric stability data for the GGNS site were generated as part of a plume behavior study. This stability data was generated in Reference 24, based on three years of surface observations at the GGNS site and sky cover data from the Vicksburg NCDC meteorology station. Hourly observation data were converted into stability classes and frequency by season using the SACTI software code (Reference 25). The resulting stability classes for Grand Gulf are presented by season and wind direction in Tables 2.7-16 through 2.7-19, and annual frequency data is presented in Table 2.7-15.

The frequency and strength of inversion layers are also investigated with nine years of weather balloon data collected at the Jackson Airport. Weather balloons are released twice daily at 6:00 a.m. and 6:00 p.m. to collect temperatures at increasing elevations. The monthly data are provided in Tables 2.7-20 through 2.7-31 in terms of percentages of mornings and afternoons containing inversions, average inversion layer elevation, and the maximum strength of the inversions. Table 2.7-32 provides annual average data for the period. An inversion is defined as any three elevation readings showing temperatures increasing with elevation. The inversion layer height is the point (found by interpolation between readings) at which temperature again

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starts to decrease with elevation. The maximum inversion strength is the maximum temperature rise divided by elevation difference within the inversion layer. (Reference 14)

The weather balloon data does not address how long inversion layers may persist. For this purpose, the GGNS UFSAR data, based on the period 1955 through 1964, is used in Tables 2.7-33 through 2.7-44. The tables show the number of discrete periods when inversion conditions existed one hour, or two or more consecutive hours. Short periods contained within a longer period are not considered as discrete occurrences. These tables show the data for each of the 10 years in order to show the variations from year to year. They also show the monthly mean distribution calculated from the 10 years. (Reference 4)

The monthly means are summarized in Tables 2.7-45 and 2.7-46. They have been summed to provide an annual mean.

Tables 2.7-47 through 2.7-60 show similar inversion data for the Grand Gulf site. These inversion occurrences were determined from E, F or G stability classifications resulting from onsite delta-temperature measurements. The period covered by the data is from August 1972 through July 1974 and January 1976 through December 1976. (Reference 4)

2.7.4.7 Mixing Heights

Monthly mixing heights for Jackson, Mississippi are shown in Table 2.7-61. These were obtained from the NCDC and are based on the ten-year period 1992 through 2001 (Reference 4), which are based on a four-year record at Jackson. The average mixing heights in the mornings are lowest during the fall, and the average mixing heights in the afternoon are lowest in the winter.

2.7.4.8 Topographical Description of the Surrounding Area

The proposed location for a new facility is approximately 6,300 feet east of the Mississippi River. The Town of Port Gibson, Mississippi is located approximately six miles to the southeast; the Town of St. Joseph, Louisiana is approximately 13 miles to the southwest, and the Big Black River discharges into the Mississippi River approximately three miles to the north.

The surrounding terrain is generally hilly and wooded to the south and east, with several hilltops over 350 feet above mean sea level (MSL) to the south. To the north and west, the terrain is generally flat and wooded, with an elevation less than 100 feet above mean sea level. Numerous lakes of various sizes and isolated marshes dot the landscape. There is a rather abrupt (irregular) 100 to 200 foot rise in terrain approximately one mile east of the river bank. Figures 2.7-17 through 2.7-19 present topographic cross sections and a site area map. (Reference 4)

According to Regulatory Guide 1.3, credit for elevated release of contaminants is allowed only if the release point is at a height of at least 2.5 times the height of the tallest nearby structure that could affect dispersion. Since discussion of effects of topography on diffusion estimates is required only for elevated releases, and the diffusion analyses for a new facility at the Grand Gulf site assume a ground level release, these effects have not been estimated.

2.7.5 Onsite Meteorological Measurements Program

The onsite meteorological measurements program has been designed to meet requirements at least as stringent as those required by Regulatory Guide 1.23.

The onsite meteorological measurement program has evolved over the years from temporary monitoring towers installed prior to construction to a state-of-the-art system installed in late 2000

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and early 2001. In March of 1972 two temporary towers were installed, one on the bluff and one in flood plane, near the Mississippi River Bank. A permanent tower was installed in August 1972 approximately 5000 ft N-NW of the center of the Unit 1 reactor, adjacent to the temporary tower. Both temporary towers were removed in March of 1973.

The permanent tower was 162 ft high and supported instrumentation for wind speed and direction and temperature at 33 ft and 162 ft. The instrumentation on this tower was upgraded in 1983 to meet the requirements of NUREG-0654 as part of the initial licensing conditions for GGNS Unit 1. A back-up tower was also installed to provide data on wind speed and direction and sigma-theta.

Data collection since the startup of the system (August 1972) has met Regulatory Guide 1.23 (Rev. 0) requirements except the relative humidity data as discussed in Section 2.7.5.1. A new relative humidity sensor was installed in December 2000 as indicated in Section 2.7.5.2.

2.7.5.1 Onsite Meteorological Measurements Program – Pre-2000 Modifications

The following describes the GGNS site meteorological tower and instrumentation as of 1983 and prior to modifications in year 2000 (text in Section 2.7.5.1 is taken from a previous revision of Reference 4, GGNS UFSAR).

The permanent tower is 162 feet high and has the following equipment installed at each of the indicated levels (all heights above grade):

Surface	Tipping bucket rain gauge Delta temperature translator (utilizes 33- and 162-foot temperature sensors)
33 feet	Wind speed sensor, Wind direction sensor, Temperature sensor, Dew point sensor
162 feet	Wind speed sensor, Wind direction sensor, Temperature sensor

Table 2.7-103 shows the specifications of the meteorological equipment at Grand Gulf. All data collected since the starting date of August 2, 1972, have met Regulatory Guide 1.23 requirements except the relative humidity data. Maintenance and operational difficulties were experienced with the relative humidity sensors. The sensors were replaced by two Tech-Ecology Met Set 5-T Dewpoint systems in December 1976.

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All parameters are measured by duplicate sensors at each level.

Meteorological data from the permanent tower will be supplemented with information from the backup meteorological system. This system will monitor wind speed, wind direction, and sigma theta. The information from the backup system will be supplied to the control room via a telemetry system. This information will be utilized to ensure data availability should a temporary loss of information from the permanent tower occur. Table 2.7-103 outlines the specifications for the backup meteorological equipment.

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All information recorded by the meteorological instruments on the permanent tower are stored both in digital and analog forms. The analog traces serve as backup to the digital system. Data from the temporary tower instrumentation were recorded by analog trace only.

The permanent (main) tower serves as a representative observation station (i.e., meteorological conditions at that location are considered to be representative of the site). The 162-foot meteorological tower with base elevation of 156 feet (MSL) is located approximately 5,300 feet northwest of the control building of the station as shown in Figure 2.1-1. The nearest bluffs are 362 feet to the west of the meteorological tower. There are trees 35 feet high along these bluffs. Approximately 50 feet below the bluffs the flood plain extends 4,500 feet to the west to meet the Mississippi River at an elevation of 65 feet (MSL). To the south and to the east, the nearest trees are 689 feet and 396 feet from the tower, respectively. Tree heights in these directions are between 50 to 60 feet. A country road passes the meteorological tower 400 feet to the north. The meteorological tower is surrounded by a fence which is 7 feet high and 70 feet away from the base of the tower. An instrument shack about 8 feet high is installed near the base of the tower. The immediate vicinity of the tower is covered by Bermuda grass which is mowed as necessary. The soil beneath the grass is loess.

The percentage of data recovery during the first annual cycle ... for [the] combination of sensor systems used in preparation of joint frequency distributions ... and used in diffusion analyses [50/10 meters (162/33 feet) T, 10 meters (33 feet) wind direction and speed], [was] 98.73 percent of all possible sets of hourly values from August 1, 1972 through July 31, 1973 Data recovery from each of the other sensing systems exceeded 90 percent for the year.

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2.7.5.1.1 Meteorological Data Processing

2.7.5.1.1.1 Introduction

The data processing procedure for Grand Gulf meteorological data involves three basic steps:

- a. Data collection
- b. Data editing and consolidation
- c. Data analysis

Computer software has been developed to process the collected data according to steps b. and c. above. This section includes a summary of the data collection methods and description of the processing and analysis of the data.

2.7.5.1.1.2 Data Collection

The onsite meteorological data are recorded in both analog and digital form.

2.7.5.1.1.2.1 Analog Data

The analog traces are recorded on strip charts which act mainly as a backup and verification for the digital data. The data are recorded continuously on six chart rolls, one for each of the following sets of parameters:

1. 50-meter (162 foot) wind speed and direction (sensor A)
2. 50-meter (162 foot) wind speed and direction (sensor B)
3. 10-meter (33 foot) wind speed and direction (sensor A)

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4. 10-meter (33 foot) wind speed and direction (sensor B)
5. 10-meter (33 foot) temperature and 50-meter (162 foot)/ 10-meter (33 foot) T, surface precipitation, and 10-meter (33 foot) dew point temperature (sensor A)
6. 10-meter (33 foot) temperature and 50-meter (162 foot)/ 10-meter (33 foot) T, surface precipitation, and 10-meter (33 foot) dew point temperature (sensor B)

All wind speeds are recorded in miles per hour. Wind directions are recorded on a 0-[360 degree] scale. Temperatures are recorded in F (degrees Fahrenheit). The precipitation is a step trace, each step representing 0.01 inches.

2.7.5.1.1.2.2 Digital Data

The digital data is received by the plant data computer at a rate of one reading per second. It is recorded each time the value varies by a specified deadband. Each piece of data is checked to assure it is between the minimum and maximum instrument limits. This quality indication and the time is recorded with each value.

An average is calculated each hour from the one second readings. The quality of the samples is reflected in the quality of the average. This quality indication and the time the average was calculated is recorded with each hourly value.

The meteorological data are available to the main control room and personnel via the plant computer. A one second reading and an hourly average is available for each of the following parameters:

1. Wind speed - 10-meter (33 foot) and 50-meter (162 foot) elevations
2. Wind direction - 10-meter (33 foot) and 50-meter (162 foot) elevations
3. Temperature - 10-meter (33 foot) elevation
4. Differential temperature (T) - 10-meter (33 foot) and 50-meter (162 foot) elevations
5. Dew point - 10-meter (33 foot) elevation
6. Precipitation - ground level

2.7.5.1.1.2.3 Data Processing

The meteorological data is gathered from the plant data computer recordings on request. The quality of the hourly averages is used to determine the data reliability. The data is then available for correction or change and reliability is evaluated again.

The hourly readings are used to calculate joint frequency distributions from wind speeds and wind direction data for the 10 meter and 50 meter levels. These frequency distributions are summarized on request for each Pasquill Stability Class.

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2.7.5.1.2 Meteorological Instrumentation Inspection and Maintenance

GGNS has established procedures for the inspection and maintenance of the onsite meteorological instrumentation. This responsibility is shared between the Operations and Maintenance Departments.

Routine inspections are made to ensure proper operation of equipment and that no damage to the tower, shack, or any other structure or equipment has occurred. The recording medium are

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checked for proper operation and changed biweekly. The standby generator is tested for auto start on a routine basis.

Semiannual visual inspections of the tower and equipment are made to determine the conditions of sensors, cabinets, wiring, structures, and individual components. Semi-annual checks for proper instrumentation readings are made at various points. A check for the "As-Found" and "Final" data condition are made to verify proper operation of the equipment. A check on the battery bank and battery charger is made along with the proper operation of the standby generator and its inverter. The tower cables are adjusted for proper tension, and the following instrumentation is calibrated:

1. 2 - Differential temperature sensor, El. 33', 162' (10, 50 meters)
2. 2 - Dew point - El. 33' (10 meters)
3. 2 - Wind speed - El. 33', 162' (10 meters, 50 meters)
4. 2 - Wind direction - El. 33', 162' (10 meters, 50 meters)
5. Rain gauge – Surface

2.7.5.2 Onsite Meteorological Measurements Program – Post-2000 Modifications

Both the main 162 ft (50-meter) tower and backup 33 ft (10-meter) tower were replaced around December of 2000, due to obsolescence and increased maintenance costs. The 162 ft (50-meter) tower has the following equipment installed at each of the indicated levels (all heights above grade):

The following describes the GGNS site meteorological tower and instrumentation as of implementation of modifications in year 2000 (text in this Section 2.7.5.2 is taken from Reference 4, GGNS UFSAR).

Surface	Tipping bucket rain gauge Delta temperature (utilizes 33- and 162-foot temperature sensors)
33 feet	Wind speed sensor Wind direction sensor Relative humidity sensor
162 feet	Wind speed sensor Wind direction sensor Temperature sensor

The specifications for the new instrumentation are provided in Table 2.7-104.

The main tower serves as a representative observation station (i.e., meteorological conditions at that location are considered to be representative of the site). The 162-foot meteorological tower with base elevation of 156 feet (MSL) is located approximately 5,300 feet northwest of the control building of the station as shown in Figure 2.1-1. The nearest bluffs are 362 feet to the west of the meteorological tower. There are trees approximately 50 feet high along these bluffs.

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Approximately 50 feet below the bluffs, the flood plain extends 4,500 feet to the west to meet the Mississippi River at an elevation of 65 feet (MSL). To the south and to the east, the nearest trees are approximately 489 feet and 396 feet from the tower, respectively. Tree heights in these directions are between 50 to 60 feet. A country road passes the meteorological tower 600 feet to the north. The meteorological tower is surrounded by a fence which is 8 feet high. An instrument shack about 8 feet high is installed approximately 400 feet north of the tower.

Data recovery from the new meteorological tower instrumentation, based on evaluation of data from March 2001 to March 2002, was 98 percent.

2.7.5.2.1 Meteorological Data Processing

The data processing procedure for Grand Gulf meteorological data involves three basic steps:

- a. Data collection
- b. Data editing and consolidation
- c. Data analysis

Computer software has been developed to process the collected data according to steps b. and c. above. This section includes a summary of the data collection methods and description of the processing and analysis of the data.

2.7.5.2.1.1 Data Collection

The onsite meteorological data are recorded in digital form.

All wind speeds are recorded in miles per hour. Wind directions are recorded on a 0-360° scale. Temperatures are recorded in F (degrees Fahrenheit). The precipitation is a step trace, each step representing 0.01 inches. Relative humidity is recorded on a 0 100% scale. Sigma Theta is calculated and recorded in degrees.

The digital data package is received by the plant data computer every $\leq$ ten seconds. It is recorded each time the value varies by a specified deadband. Each piece of data is checked to assure it is between the minimum and maximum instrument limits. This quality indication and the time is recorded with each value.

An average is calculated every fifteen minutes and each hour from the readings. The quality of the samples is reflected in the quality of the average. This quality indication and the time the average was calculated is recorded with each value.

The meteorological data are available to the main control room and personnel via the plant computer. A $\leq$ ten second reading, a fifteen minute average, and an hourly average is available for each of the following parameters:

1. Wind speed – 10-meter (33 foot) and 50-meter (162 foot) elevations
2. Wind direction – 10-meter (33 foot) and 50-meter (162 foot) elevations
3. Temperature – 10-meter (33 foot) and 50-meter (162 foot) elevations
4. Differential temperature (T) – 10-meter (33 foot) and 50-meter (162 foot) elevations
5. Relative Humidity – 10-meter (33 foot) elevation (ten second and hourly only)
6. Precipitation – ground level

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7. Sigma Theta – 10-meter (33 foot) and 50-meter (162 foot) elevations (fifteen minute and hourly only)
8. Aspirator flow – 10-meter (33 foot) and 50-meter (162 foot) elevations (fifteen minute and hourly only)

2.7.5.2.1.2 Data Processing

The meteorological data is gathered from the plant data computer recordings on request. The data can also be acquired from data storage modules in the meteorological monitoring tower shack. The quality of the hourly averages is used to determine the data reliability. The data is then available for correction or change and reliability is evaluated again.

The hourly readings are used to calculate joint frequency distributions from wind speeds and wind direction data for the 10 meter and 50 meter levels. These frequency distributions are summarized on request for each Pasquill Stability Class.

2.7.5.2.2 Meteorological Instrumentation Inspection and Maintenance

GGNS has established procedures for the inspection and maintenance of the onsite meteorological instrumentation. This responsibility is shared between the Operations and Maintenance Departments.

Routine inspections are made to ensure proper operation of equipment and that no damage to the tower, shack or any other structure or equipment has occurred.

Semiannual visual inspections of the tower and equipment are made to determine the conditions of sensors, cabinets, wiring, and individual components. Semi-annual checks for proper instrumentation readings are made at various points. A check for the “As-Found” and “Final” data condition are made to verify proper operation of the equipment. A check on the batteries and battery charger is made. The tower cables are adjusted for proper tension, and the following instrumentation calibrated on the primary tower:

1. 2-Temperature sensor, El. 33', 162' (10, 50 meters)
2. 1-Relative Humidity– El. 33' (10 meters)
3. 1-Wind speed – El. 33', 162' (10 meters, 50 meters)
4. 1-Wind direction – El. 33', 162' (10 meters, 50 meters)
5. Rain gauge – Surface near primary tower

The following instruments are calibrated on the back-up tower:

1. 1 – Temperature sensor, El. 33' (10 meters)
2. 1 – Wind speed, El. 33' (10 meters)
3. 1 – Wind direction, El. 33' (10 meters)

For this ESP application, calculations to determine diffusion estimates for both short- and long-term conditions were completed using data from the meteorological instrumentation in service prior to the most recent replacement in December 2000, as described in Section 2.7.5.1. Data recovery for the period evaluated in the calculations (Sections 2.7.6 and 2.7.7) is indicated in Table 2.7-105.

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2.7.6 Short-Term Diffusion Estimates

2.7.6.1 General

The consequence of a design basis accident in terms of personnel exposure is a function of the atmospheric dispersion conditions at the site of the potential release. Atmospheric dispersion consists of two components: 1) atmospheric transport due to organized or mean airflow within the atmosphere and 2) atmospheric diffusion due to disorganized or random air motions. Atmospheric diffusion conditions are represented by relative air concentration (X/Q) values. (Reference 28)

The efficiency of diffusion is primarily dependent on winds (speed and direction) and atmospheric stability characteristics. Dispersion is rapid within Stability Classes A through D and much slower for Classes E through G. That is, atmospheric dispersion capabilities decrease with progression Classes A to G, with an abrupt reduction from Classes D to E. (Reference 4)

Relative concentrations of released gases, X/Q values, as a function of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population (LPZ), were determined by the use of the computer code PAVAN (Reference 26). This code implements the guidance provided in Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," August 1979. (Reference 4) The X/Q calculations are based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all distances for which X/Q values are calculated. (References 26 and 28)

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, PAVAN provides the X/Q values as functions of direction for various time periods at the exclusion area boundary (EAB) and the low population zone (LPZ). The meteorological data needed for this calculation included wind speed, wind direction, and atmospheric stability. (Reference 4) The meteorological data used for this analysis was collected from the onsite monitoring equipment from January 2002 through December 2003. These two years were averaged and are reported in Tables 2.7-106 through 2.7-112 for Stability Classes A through G, respectively. Other plant specific data included tower height at which wind speed was measured (10.0 m) and distances to the EAB (841 m) and LPZ (3219 m).

The following text is taken from the GGNS UFSAR, Reference 4.

Within the ground release category, two sets of meteorological conditions are treated differently. During neutral (D) or stable (E, F, or G) atmospheric stability conditions when the wind speed at the 10-meter level is less than 6 meters per second (m/s), horizontal plume meander is considered. X/Q values are determined through the selective use of the following set of equations for ground-level relative concentrations at the plume centerline:

$$X/Q = \frac{1}{U_{10}(\pi u_y u_z + A/2)} \quad \text{Equation 1}$$

$$X/Q = \frac{1}{U_{10}(3\pi u_y u_z)} \quad \text{Equation 2}$$

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$$X/Q = \frac{1}{U_{10} \pi S_y u_z} \quad \text{Equation 3}$$

where:

- X/Q is relative concentration, in sec/m³
- U_{10} is wind speed at 10 meters above plant grade, in m/sec
- u_y is lateral plume spread, in meters, a function of atmospheric stability and distance
- u_z is vertical plume spread, in meters, a function of atmospheric stability and distance
- S_y is lateral plume spread with meander and building wake effects, in meters, a function of atmospheric stability, wind speed, and distance
- A is the smallest vertical-plane cross-sectional area of the reactor building, in square meters

PAVAN calculates X/Q values using Equations 1, 2, and 3. The values from Equations 1 and 2 are compared and the higher value is selected. This value is then compared with the value from Equation 3, and the lower value of these two is selected as the appropriate X/Q value.

During all other meteorological conditions, unstable (A, B, or C) atmospheric stability and/or 10-meter level wind speeds of 6 m/s or more, plume meander is not considered. The higher value calculated from equation 1 or 2 is used as the appropriate X/Q value.

From here, PAVAN constructs a cumulative probability distribution of X/Q values for each of the 16 directional sectors. This distributions is the probability of the given X/Q values being exceeded in that sector during the total time. The sector X/Q values and the maximum sector X/Q value are determined by effectively "plotting" the X/Q versus probability of being exceeded and selecting the X/Q value that is exceeded 0.5% of the total time. This same method is used to determine the 5% overall site X/Q value.

The X/Q value for the EAB or LPZ boundary evaluations will be the maximum sector X/Q or the 5% overall site X/Q , whichever is greater (Reference 28). All direction-dependent sector values are also calculated.

2.7.6.2 Calculations and Results

Reference 28 divides release configurations into two modes, ground release and stack release. A ground level release includes all release points that are effectively lower than two and one-half times the height of the adjacent solid structures. Since specific building arrangement details (i.e., building height and area) are unknown until a specific plant type is selected, the building area and height were not used in the calculation. This is conservative since the building wake effect will tend to reduce the calculated X/Q . Also, since the release point, or stack height, is unknown until a specific plant type is selected, the release mode was classified as a ground release.

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PAVAN requires the meteorological data in the form of joint frequency distributions of wind direction and wind speed by atmospheric stability class. The meteorological data used was obtained from the GGNS site meteorological data collected from 2002 through 2003.

The stability classes were based on the classification system given in Table 2 of Regulatory Guide 1.23 (Safety Guide 23), as follows:

Classification of Atmospheric Stability
(Reference 31, Table 2)

Stability Classification	Pasquill Categories	σ_{θ}^*	Temperature change with height (°C/100m)
Extremely unstable	A	25.0°	<-1.9
Moderately unstable	B	20.0°	-1.9 to -1.7
Slightly unstable	C	15.0°	-1.7 to -1.5
Neutral	D	10.0°	-1.5 to -0.5
Slightly stable	E	5.0°	-0.5 to 1.5
Moderately stable	F	2.5°	1.5 to 4.0
Extremely stable	G	1.7°	> 4.0

* Standard deviation of horizontal wind direction fluctuation over a period of 15 minutes to 1 hour.

Joint frequency distribution tables were developed from the meteorological data with the assumption that if data required as input to the PAVAN program (i.e., lower level wind direction, lower wind speed, and temperature differential) was missing from the hourly data record, all data for that hour was discarded. Also, the data in the joint frequency distribution tables was rounded for input into the PAVAN code.

Building area is defined as the smallest vertical-plane cross-sectional area of the reactor building, in square meters. As stated above, this parameter was not used and the building area was entered as zero.

Building height is the height above plant grade of the containment structure used in the building-wake term for the annual-average calculations. As stated above, this parameter was not used and the building height was entered as zero.

The tower height is the height at which the wind speed was measured. Based on the lower measurement location, the tower height used was 10 meters.

A ground level release includes all release points that are effectively lower than two and one-half times the height of adjacent solid structures (Reference 28). Therefore, as stated above, a ground-release analysis was assumed.

The cumulative frequency of X/Q at the EAB (841 m) can be found in Table 2.7-113. Table 2.7-114 presents the cumulative frequency at the LPZ (3219 m). A summary of results is provided below. Median (50 percent) values may be used in making realistic estimates of the

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environmental effects of potential radiological accidents; conservative estimates may be based on calculated 5 percent values.

ESP X/Q VALUES (sec/m ³) (Based on 2002-2003 Meteorological Data)					
	0 – 2 Hrs	0 – 8 Hrs	8 – 24 Hrs	24 – 96 Hrs	96 – 720 Hrs
EAB (841 m, SW)	5.95E-04				
LPZ (3219 m, SW)		8.83E-05	6.16E-05	2.82E-05	9.15E-06

Tables 2.7-115 and 2.7-116 report the directional-dependent sector X/Q values at the EAB and LPZ respectively.

2.7.6.3 Relative Concentration Estimates at the Control Room Emergency Intake

A specific plant design has not yet been selected for construction at the GGNS ESP Site, therefore, determination of dispersion and diffusion coefficients at the Control Room emergency intake has not been completed.

2.7.6.4 Ingress/Egress Diffusion Estimates

A specific plant design has not yet been selected for construction at the GGNS ESP Site for this Early Site Permit Application; therefore, determination of diffusion estimates for site ingress/egress has not been done.

2.7.7 Long Term Diffusion Estimates

2.7.7.1 General

For a routine release, the concentration of radioactive material in the surrounding region depends on the amount of effluent released, the height of the release, the momentum and buoyancy of the emitted plume, the wind speed, atmospheric stability, airflow patterns of the site, and various effluents removal mechanisms. Annual average relative concentration, X/Q, and annual average relative deposition, D/Q, for gaseous effluent routine releases were, therefore, calculated.

2.7.7.2 Calculation Methodology and Assumptions

The XOQDOQ Computer Program (Reference 27) which implements the assumptions outlined in Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Release from Light-Water-Cooled Reactors" (Reference 30) developed by the USNRC, was used to generate the annual average relative concentration, X/Q, and annual average relative deposition, D/Q. Values of X/Q and D/Q were determined at points of maximum potential concentration outside the site boundary, at points of maximum individual exposure and at points within a radial grid of sixteen 22 1/2° sectors and extending to a distance of 50 miles. Radioactive decay and dry deposition were considered.

Meteorological data for the period from 2002 through 2003 was used, and receptor locations were determined from the locations given in the GGNS 2001 Land Use Census. Hourly meteorological data was used in the development of joint frequency distributions, in hours, of

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wind direction and wind speed by atmospheric stability class. The wind speed categories used were consistent with the GGNS site short-term (accident) diffusion X/Q calculation discussed above, and the GGNS Offsite Dose Calculation Manual (ODCM) meteorological evaluation (Reference 29). Calms were distributed as the first wind speed class.

Joint frequency distribution tables were developed from the hourly meteorological data with the assumption that if data required as input to the XOQDOQ program (i.e., lower level wind direction and wind speed, and temperature differential as opposed to upper level wind direction and wind speed) was missing from the hourly data record, all data for that hour would be discarded. This assumption maximizes the data being included in the calculation of the X/Q and D/Q values.

The analysis assumed a combined vent located at the center of the proposed facility location. At ground level locations beyond several miles from the plant, the annual average concentration of effluents are essentially independent of release mode; however, for ground level concentrations within a few miles, the release mode is very important. Gaseous effluents released from tall stacks generally produce peak ground-level air concentrations near or beyond the site boundary. Near ground level releases usually produce concentrations that decrease from the release point to all locations downwind. Guidance for selection of the release mode is provided in Regulatory Guide 1.111 (Reference 30). In general, in order for an elevated release to be assumed, either the release height must be at least twice the height of adjacent buildings or detailed information must be known about the wind speed at the height of the release. For this analysis, a new facility's routine releases were conservatively modeled as ground level releases.

Building cross-sectional area and building height are used in calculation of building wake effects. Regulatory Guide 1.111 (Reference 30) identifies the tallest adjacent building, in many cases the reactor building, as appropriate for use. Several plant types were evaluated for the GGNS early site permit and building dimensions vary; therefore, for conservatism, building wake effects were not considered.

Consistent with Regulatory Guide 1.111 (Reference 30) guidance regarding radiological impact evaluations, radioactive decay and deposition were considered. For conservative estimates of radioactive decay, an overall half-life of 2.26 days is acceptable for short-lived noble gases and a half-life of 8 days for all iodines released to the atmosphere. At sites where there is not a well-defined rainy season associated with a local grazing season, wet deposition does not have a significant impact. In addition, the dry deposition rate of noble gases is so slow that the depletion is negligible within 50 miles. Therefore, in this analysis only the effects of dry deposition of iodines were considered. The calculation results with and without consideration of dry deposition are identified in the output as "depleted" and "undepleted".

No terrain recirculation factor was applied. This is consistent with the GGNS position on Regulatory Guide 1.111 (Reference 30) as stated in the UFSAR (Section 3A). This regulatory position states that, since the meteorological data does not show any conclusive or systematic up and down or cross valley flow, it would be inappropriate to apply recirculation factors as indicated in Regulatory Guide 1.111. (Reference 30)

Receptor locations for the Grand Gulf site were evaluated as specified in NUREG-1555 which states: "X/Q and/or D/Q at points of potential maximum concentration outside the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22½ degree sectors (centered on true north, north-northeast, northeast, etc.) and extending to a distance of 80 km (50 mi.) from the station. A set of data points should be located within each

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sector at increments of 0.4 km (0.25 mi.) to a distance of 1.6 km (1 mi.) from the plant, at increments of 0.8 km (0.5 mi.) from a distance of 1.6 km (1 mi.) to 8 km (5 mi.), at increments of 4 km (2.5 mi.) from a distance of 8 km (5 mi.) to 16 km (10 mi.), and at increments of 8 km (5 mi.) thereafter to a distance of 80 km (50 mi.). Estimates of X/Q (undecayed and undepleted; depleted for radioiodines) and D/Q radioiodines and particulates should be provided at each of these grid points.”

2.7.7.3 Results

Results of the analysis, based on 2 years of data collected on site, are presented in Tables 2.7-117 through 2.7-120.

2.7.8 References

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18. NOAA News Release, 5/16/2002, Warm Temperatures and Severe Drought Continued in April Throughout Parts of the United States.
19. Local Climatological Data, Annual Summary with Comparative Data for Jackson, Mississippi, U. S. Department of Commerce, NOAA, 1964-1975.
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22. Jennings, A. H., Maximum Recorded United States Point Rainfall for 5 Minutes to 24 Hours at 296 First Order Stations, U. S. Weather Bureau Technical Paper 2, Washington, D. C., 1963.
23. Local Climatological Data, Annual Summary with Comparative Data for Vicksburg, Mississippi, U. S. Department of Commerce, ESSA, 1966.
24. Calculation ENTO002-CALC-003, Plume Characteristics Of Proposed New Cooling Towers At Grand Gulf, Rev. 2.
25. User's Manual: Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, April 1984.
26. NUREG/CR-2858, PNL-4413, PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations, November 1982.
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28. Regulatory Guide 1.145, Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants, August 1979.
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2.8 Noise

2.8.1 Ambient Background Noise Survey

The GGNS site is located in a remote area that consists primarily of woodlands and farms. Due to the remoteness of the site, there are few human activities within a 5-mile radius. A two-acre residential property (totally surrounded by the plant site property boundary in the southwest sector of the site) is privately owned. Lake Claiborne, a private development of residential and recreational facilities, is located approximately 3-1/2 miles east of the site. The Grand Gulf Military Park borders a portion of the north side of the property, and the community of Grand Gulf is approximately 1-1/2 miles to the north. The Claiborne County Port Commission built a small port on the Mississippi River at river mile 404.8 in Claiborne County, about 0.6 miles south of the site property boundary and 2.1 miles south-southwest of the plant site. There are no other public or private schools, hospitals, commercial plants, sports facilities, or residential development parks within 5 miles of the site.

The following noise surveys were conducted in 1973 during the construction of Units 1 and 2¹ and the results were presented in the GGNS Final Environmental Report. Test locations are shown in Figure 2.8-1.

Ambient Background Noise Survey (July 27-28, 1973)

Ambient background noise levels were measured at eight accessible, representative locations on and near the property line of the site and in nearby populated areas (Figure 2.8-1). Point 8, not shown on Figure 2.8-1, was located at the entrance to Addison Junior High School² on the northwestern edge of Port Gibson, Mississippi, about 7 miles southeast of the site. Each location was monitored four times a day during diurnal and nocturnal hours on one weekday and one weekend day. Measurements were typically made in the morning (0830 hours), noon (1200 hours), afternoon (1800 hours), and night (2230 hours). These time periods were considered adequate and sufficient to cover differences due to human activities and insect and animal behaviors, and to obtain representative data for a typical summer day.

Equipment

A General Radio Model 1933 Sound Analysis System, equipped with a 1-inch electric-condenser microphone and its windscreen, and a Simpson Model 2745 Graphic Level Recorder were used during the ambient and construction noise surveys to measure and record noise levels. The measuring and recording equipment were calibrated as a unit with a General Radio Type 1562-A external calibrator. Calibration was performed prior to each monitoring period.

Measurements at each monitoring location during the four monitoring periods each day consisted of a 5-minute reading on the A-weighted scale and an octave band analysis. The A-weighted scale was designed to duplicate the human ear in its response to sound. The octave band analysis, performed immediately following each 5-minute dB(A) measurement, consists of a 20-second reading on each of the 10 octave bands comprising the human audio spectrum.

¹ While the construction of GGNS Unit 2 was eventually terminated, a substantial portion of the power block structures were built.

² Addison Junior High School is no longer in use. It was replaced by Port Gibson Middle School which is located on the south side of Port Gibson, MS.

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The diel variation of ambient background noise levels (solid line) at each monitoring location was compared with the average noise level (dashed line) of all seven locations on and near the property line in Figure 2.8-2. At all locations, ambient noise levels were greater at night than during the day. These increased nocturnal noise levels can be attributed almost entirely to the crickets that were most active at night.

Noise levels at near-site populated or recreational areas (points 1, 2, and 3) were generally somewhat higher than the mean noise level from all seven near-site locations. At point 3, located approximately 100 yards from the Shady Rest Grocery, the only local restaurant in the area at the time, ambient noise levels were louder on Friday during both the day and night than on Saturday afternoon, primarily because of increased human activity at the restaurant.

On the bank of the Mississippi River, point 7 was noticeably quieter than the mean site noise level because there was little traffic or human activity nearby. However, riverboats pass by frequently on the Mississippi; the noise level of one typical boat was measured at a steady 67 dB(A) for the few minutes it took to pass the monitoring point.

Measured ambient noise levels at all other monitoring locations were very similar to the mean site levels. The overall average noise level for the Grand Gulf site during the survey was 50.2 dB(A).

Ambient Background Noise Survey Conclusions

Since typical summer weather prevailed during the sampling periods (the weather was clear and hot with slight breezes both days, with the exception of a very short rain shower on Saturday afternoon), it can be assumed that normal agricultural, commercial, and recreational activities were conducted during the ambient background noise survey. The amount of human activity appeared to be similar on both days. The slight differences in noise levels between Friday and Saturday were probably due to random sampling error over the short time period monitored.

Insects had a greater influence on the overall site noise level than did the people in the area.

Given that the environs surrounding the site have not changed significantly since the noise surveys above were done, the results of the ambient background noise survey are deemed to be applicable to the current site and its surroundings.

Discussion of the impacts of construction and operation of the existing GGNS plant on the noise levels surrounding the site are presented in Sections 4.1, 4.4, 5.1, and 5.8 of this report. Impacts of new facility construction and operation with regards to noise are discussed in Sections 4.1, 5.3, and 5.8.

2.8.2 References

1. Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8.

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2.9 Related Federal Project Activities

The purpose of this section is to identify federal activities directly related to the proposed project in order to: (1) determine the need for other federal agencies (i.e., cooperating agencies) to participate in the preparation of the environmental impact statement; and (2) assess the interrelationship and cumulative environmental impacts of the proposed project and related federal activities.

In accordance with NUREG-1555 (Reference 1), the scope of this review is limited to federal actions that are directly related to the proposed project. Therefore, actions related only to granting of licenses, permits, or approvals by other federal agencies were not included in the scope of this review.

No directly related federal activities or relevant cooperating agencies that affect plant siting or water supply were identified at this time.

2.9.1 References

1. U.S Nuclear Regulatory Commission, 1999, Environmental Standard Review Plan (NUREG-1555), October.

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TABLE 2.2-1

ACREAGE AFFECTED BY VARIOUS FACILITIES
ASSOCIATED WITH GRAND GULF NUCLEAR STATION

	Area (acres)	Area (hectares)
TOTAL SITE ³	2100	850
CURRENT GGNS UNIT 1 SITE USE		
Station Area (Includes) ³ Permanent Bldgs. Cooling Tower Areas Standby service water cooling towers and basins	94	38
Switchyard ³	52	21
Plant Service Water Supply And Discharge Line, And Heavy Haul Road	38 ¹	15
Radial Wells, access road, swgr. house	15 ¹	6
Barge Slip and Associated Facilities	8 ¹	3
Borrow Pit	16 ⁴	6.5
Transmission Line Corridors ¹ Port Gibson 115kV Baxter Wilson Franklin	67 521 1057	27 211 428
PROPOSED NEW CONSTRUCTION AREAS ²		
A	40	16
B	10	4
C	60	24
D	45	18
E	95	38
F	90	36
G	55	22
TOTAL FOR NEW CONSTRUCTION AREAS	395	158

NOTES:

1. Approximate – Based on Current Site Layout and GGNS FER Table 4.1-1 (Reference 13)
2. Approximate – (Based On Site Layout of Figure 2.2-1)
3. From GGNS UFSAR Section 2.1.2.1.1
4. Based on approximate measurement from Figure 2.4-2.

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TABLE 2.2-2
LAND USE WITHIN TRANSMISSION LINE CORRIDOR
(CORRIDOR LENGTH IN MILES)

TRANSMISSION LINE ROUTES				
Land Use	Baxter Wilson	Franklin	Port Gibson	Total
Agriculture	9.0	14.0	5.0	28
Forestry	12.0	29.6	0.5	42.1
Residential	0.0	0.0	0.0	0.0
Industrial	1.0	0.0	0.0	1.0
Total Miles	22.0	43.6	5.5	71.1

SOURCE: References 7 and 13

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TABLE 2.2-3

CLAIBORNE COUNTY AND DISTRICT 7 CROP ESTIMATES FOR 2001

County	Crop	Acreage Planted	Acreage Harvested	Yield per Acre (Bushels)	Production (Bushels)
Claiborne	Corn (For Grain)	4,300	4,300	143.0	615,000
District 7	Corn (For Grain)	39,400	37,300	131.7	4,912,000
Claiborne	Cotton	Not reported		Not reported	Not reported
District 7	Cotton	43,700		707 lbs/acre	63,500 Bales (480 lbs/bale net wt.)
Claiborne	Soybean	Not reported		Not reported	Not reported
District 7	Soybean (For beans)	27,200	25,600	32.9	841,000
Claiborne	Wheat – All	2,100	2,100	43.7	91,800
District 7	Wheat - All	7,200	7,200	46.5	335,000

SOURCE: Reference 5

NOTES:

1. District 7 includes Adams, Amite, Claiborne, Copiah, Franklin, Hinds, Jefferson, Lincoln, Warren and Wilkinson Counties in Mississippi.

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TABLE 2.2-4

AVERAGE CROP YIELDS FOR CLAIBORNE COUNTY, MS AND DISTRICT 7
1997 – 2001

County	Crop	Number of Years	Average Yields (Bushels)
Claiborne	Corn (For Grain)	5	114.5
District 7	Corn (For Grain)	5	108.2
Claiborne	Cotton	1	846 pounds
District 7	Cotton	5	723 pounds
Claiborne	Soybean	1	29.7
District 7	Soybean	5	28.0
Claiborne	Wheat – All	1	43.7
District 7	Wheat – All	5	46.2

SOURCE: Reference 5

NOTES:

1. District 7 includes Adams, Amite, Claiborne, Copiah, Franklin, Hinds, Jefferson, Lincoln, Warren and Wilkinson Counties in Mississippi.

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TABLE 2.2-5

LIVESTOCK COMMODITY ESTIMATES FOR 2002 FOR
CLAIBORNE COUNTY, MS AND DISTRICT 7

	All Cattle and Calves	Beef Cows	Milk Cows
Claiborne	12,800	6,800	None
District 7	158,000	78,000	7,000

SOURCE: Reference 5

NOTES:

1. District 7 includes Adams, Amite, Claiborne, Copiah, Franklin, Hinds, Jefferson, Lincoln, Warren and Wilkinson Counties in Mississippi.

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TABLE 2.2-6

TENSAS PARISH, LA, AND DISTRICT 3 CROP ESTIMATES FOR 2001

Parish	Crop	Acreage Planted	Acreage Harvested	Yield per Acre (Bushels)	Production (Bushels)
Tensas	Corn (For Grain)	34,000	33,200	157	5,210,000
District 3	Corn (For Grain)	201,000	195,500	156	30,460,000
Tensas	Rice – All	--	2,349	155	363,630 cwt
District 3	Rice – All	77,400	77,100	5,950 lbs	4,590,000 cwt
Tensas	Soybean	12,000	11,500	32	370,000
District 3	Soybean	167,000	160,000	33	5,330,000
Tensas	Wheat – All	9,600	9,200	58	530,000
District 3	Wheat – All	95,000	89,000	54	4,800,000
Tensas	Sorghum (For Grain)	13,900	13,000	97	1,260,000
District 3	Sorghum (For Grain)	74,000	68,000	80	5,425,000

SOURCE: References 6, 9 and 15.

NOTES:

1. District 3 includes East Carroll, West Carroll, Franklin, Madison, Morehouse, Richland and Tensas, Parishes in Louisiana.

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TABLE 2.2-7

AVERAGE CROP YIELDS FOR TENSAS PARISH, LA, AND DISTRICT 3
1997 – 2001

County	Crop	Number of Years	Average Yields (Bushels)
Tensas	Corn (For Grain)	5	117
District 3	Corn (For Grain)	5	122
Tensas	Rice – All	3	5,083 lbs
District 3	Rice – All	5	5,226 lbs
Tensas	Soybean	5	27
District 3	Soybean	5	27
Tensas	Wheat – All	5	46
District 3	Wheat – All	5	46
Tensas	Sorghum (For Grain)	5	81
District 3	Sorghum (For Grain)	5	73

SOURCE: References 6, 9 and 15

NOTES:

1. District 3 includes East Carroll, West Carroll, Franklin, Madison, Morehouse, Richland and Tensas, Parishes in Louisiana.

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TABLE 2.2-8A

LIVESTOCK COMMODITY ESTIMATES FOR 2002 FOR
TENSAS PARISH, LA, AND DISTRICT 3

	All Cattle and Calves	Beef Cows	Milk Cows
Tensas	1,000	600	None reported
District 3	59,000	33,000	500

SOURCE: References 6, 9 and 15

NOTES:

1. District 3 includes East Carroll, West Carroll, Franklin, Madison, Morehouse, Richland and Tensas, Parishes in Louisiana.

TABLE 2.2-8B

TENSAS PARISH LA LIVESTOCK PRODUCTION FOR 2001

Livestock	Numbers
Cattle and Calves	1,000
Milk Cows	None reported
Sheep	25
Goats	50
Swine	100

SOURCE: References 6 and 9

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TABLE 2.3-1
(FER TABLE 2.4.6)

VELOCITY, DISCHARGE, AND WATER SURFACE ELEVATIONS FOR MISSISSIPPI RIVER AT SITE

River Mile	Date	Total Width, Feet	Total Average Depth, Feet	Total Area, Feet ²	Average Velocity, fps	Discharge, cfs	Slope, fpm	Temperature, °F	ALWP, Feet	Water Surface Elevation, Feet
408.40	12-14-71	2,450	34.9	82,525	5.97	510,805	0.6912	48	34.20	54.50
	3-18-71	2,425	61.4	148,900	5.23	778,121	0.5862	47	34.20	73.65
	10-6-70	2,628	20.2	53,073	4.08	216,642	0.6475	70	34.20	59.63
407.6	12-14-71	3,350	31.6	105,750	5.11	540,748	0.7133	48	34.00	53.95
	3-18-71	3,600	53.0	190,925	5.86	1,119,309	0.5044	47	34.00	73.22
	10-6-70	3,600	35.4	127,375	4.75	605,089	0.4326	71	34.00	56.66
406.8	12-14-71	3,050	31.1	94,800	6.19	586,514	0.1280	48	33.70	53.50
	3-19-71	3,925	56.2	220,450	6.77	1,492,672	0.3524	47	33.70	72.87
	10-14-70	3,026	35.1	106,221	4.16	442,136	0.2353	66	33.70	49.12
406.0	3-31-70	3,292	46.0	151,482	4.46	675,368	0.3007	49	33.50	59.03
	10-14-70	3,262	33.9	110,522	3.89	430,175	0.2353	66	33.50	48.93
	3-19-71	3,405	54.9	187,075	6.44	1,205,089	0.3524	47	33.50	72.58
395.6	12-20-71	3,500	41.8	146,400	5.25	769,121	-0.0179	50	31.80	56.96
	3-23-71	3,927	49.3	193,715	5.31	1,029,399	0.0574	49	31.80	67.02
	10-16-70	3,789	29.9	113,463	3.75	425,273	0.2840	65	31.80	44.79

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TABLE 2.3-2
(UFSAR TABLE 2.4-15)

RANGES OF WATER TEMPERATURES FOR THE MISSISSIPPI RIVER
AT VICKSBURG, MISSISSIPPI - DEGREES F

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1962	34-41	44-50	43-48	48-60	64-78	77-80	82-86	82-84	80-84	64-73	52-60	41-52
1963	33-40	35-38	40-52	54-65	66-70	72-80	81-85	83-86	72-82	70-74	56-65	36-52
1964	34-44	42-43	44-51	52-65	66-78	74-82	82-85	80-86	75-84	62-71	49-63	42-44
1965	40-47	35-42	39-44	46-62	62-74	75-76	81-84	80-84	73-80	62-70	58-61	45-51
1966	34-47	35-44	42-54	54-63	61-70	72-79	80-87	78-86	73-82	60-68	49-65	42-51
1967	38-46	41-47	41-54	56-66	62-68	69-82	76-82	79-84	70-78	62-70	51-55	42-49
1968	35-42	39-44	39-50	51-65	66-71	70-79	79-84	81-85	71-79	64-73	50-62	43-49
1969	38-44	41-45	43-50	50-62	62-73	73-79	81-85	79-84	74-81	58-73	50-57	43-48
1970	30-40	39-42	45-49	51-65	63-73	74-80	80-84	79-84	78-84	62-72	48-61	44-50
1971	40-41	39-42	44-50	49-63	65-70	70-82	80-86	79-84	76-86	70-77	51-70	47-50
1972	42-50	40-46	46-53	53-62	62-74	75-80	77-85	83-84	79-83	57-75	47-60	40-47
1973	38-44	41-43	46-55	54-61	64-77	72-82	82-86	81-84	75-80	66-75	56-61	43-57
1974	37-47	44-48	46-57	54-69	67-74	73-76	76-86	81-83	69-83	64-68	52-67	45-49
1975	43-47	42-50	40-50	48-60	61-72	70-78	77-79	76-84	68-83	61-69	48-62	42-52
1976	38-43	40-50	51-55	57-64	61-67	69-79	78-84	80-84	75-79	58-73	46-55	42-46
1977	34-37	35-45	44-55	57-65	66-78	77-82	80-84	76-83	71-78	56-70	49-60	38-48
1978	35-38	30-38	38-44	48-58	58-64	68-80	82-84	80-85	74-80	60-72	54-60	42-50
1979	32-42	32-40	38-48	51-58	59-70	69-76	76-80	78-81	69-79	61-70	47-59	40-46

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TABLE 2.3-3

USGS WATER TEMPERATURE MEASUREMENT FOR MISSISSIPPI RIVER AT
VICKSBURG, MISSISSIPPI

SAMPLE DATE	SAMPLE TIME	WATER TEMP, ° C	WATER TEMP, ° F	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT, FEET
4/12/73	14:15	12	53.6	1760000	
4/12/73	14:30	12	53.6	1760000	
4/12/73	14:45			1760000	
4/12/73	15:10			1760000	
5/3/73	0:01			1900000	
5/3/73	13:50	17	62.6	1900000	
5/17/73	11:50			1930000	
6/7/73	0:01			1360000	
6/7/73	11:20				
7/13/73	10:00			634000	
8/9/73	10:00			512000	
9/6/73	11:00	27	80.6	338000	
10/4/73	10:30	24.5	76.1	361000	
11/1/73	11:00	17	62.6	540000	
12/4/73	12:00	13	55.4	1050000	
12/17/73	13:00	7.5	45.5	1260000	
1/15/74	14:00	8	46.4	1230000	
1/30/74	13:30	9	48.2	1430000	
3/12/74	12:30	12.5	54.5	956000	
4/10/74	14:00	13	55.4	1020000	
5/7/74	14:00	20	68	822000	
6/5/74	14:00	24	75.2	1050000	
7/9/74	12:00	26	78.8	899000	
8/15/74	12:00	28	82.4	339000	
9/6/74	12:00	24	75.2	480000	
10/8/74	12:00	19	66.2	355000	
11/8/74	12:00	16.8	62.24	419000	
12/3/74	12:00	8.5	47.3	664000	
1/14/75	12:00	6	42.8	928000	
2/10/75	11:00	6	42.8	1100000	
3/7/75	13:00	9.5	49.1	1200000	
4/3/75	13:00	10.5	50.9	1680000	
5/14/75	14:00	14.5	58.1	1270000	
6/5/75	13:00	25	77	774000	
7/15/75	13:00	28	82.4	511000	
7/31/75	18:00	29	84.2	408000	

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TABLE 2.3-3 (Continued)

SAMPLE DATE	SAMPLE TIME	WATER TEMP, ° C	WATER TEMP, ° F	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT, FEET
4/12/73	14:15	12	53.6	1760000	
8/5/75	12:00	27.5	81.5	388000	
9/9/75	14:00	29	84.2	400000	
10/15/75	12:00	21.5	70.7	341000	
11/6/75	12:00	17	62.6	441000	
12/12/75	12:00	8	46.4	633000	
1/15/76	13:00	3.5	38.3	921000	
2/10/76	13:00	3.5	38.3	719000	
3/2/76	12:00	11	51.8	961000	
4/6/76	12:00	15	59	831000	
5/5/76	13:00	17	62.6	637000	
6/2/76	12:00	22	71.6	429000	
7/7/76	13:00	26	78.8	474000	
7/28/76	12:00	29	84.2	342000	
8/11/76	11:00	27.5	81.5	299000	
9/8/76	11:00	26	78.8	233000	
10/12/76	11:30	19	66.2	242000	
11/1/76	12:00	12	53.6	305000	
12/7/76	11:00	6.5	43.7	240000	
1/4/77	11:00	1.5	34.7	234000	
2/8/77	12:00	1.5	34.7	210000	
3/8/77	12:00	7.5	45.5	738000	
4/5/77	11:00	14	57.2	812000	
5/3/77	12:00	19.5	67.1	499000	
6/1/77	11:00	27.5	81.5	308000	
6/28/77	12:00	29	84.2	259000	
8/2/77	12:00	29.6	85.28	281000	
9/7/77	12:00	28	82.4	301000	
10/4/77	12:00	23	73.4	489000	
11/1/77	10:00	17.5	63.5	403000	
12/5/77	11:00	10	50	770000	
1/4/78	11:00	3.5	38.3	719000	
2/3/78	14:00	1.5	34.7	753000	
3/7/78	11:30	5.5	41.9	468000	
3/28/78	11:30	6.5	43.7	1210000	
5/5/78	11:00	13	55.4	830000	
6/13/78	12:00	23	73.4	610000	
7/11/78	13:00	31	87.8	498000	
8/1/78	11:00	30	86	431000	

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TABLE 2.3-3 (Continued)

SAMPLE DATE	SAMPLE TIME	WATER TEMP, ° C	WATER TEMP, ° F	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT, FEET
4/12/73	14:15	12	53.6	1760000	
9/6/78	10:30	27.5	81.5	340000	
10/3/78	14:00	25	77	378000	
11/7/78	13:00	17	62.6	280000	
12/4/78	15:00	11	51.8	490000	
1/3/79	15:00	5	41	839000	
2/7/79	12:30	2	35.6	919000	
3/6/79	13:00	5	41	1170000	
4/3/79	12:30	11.5	52.7	1400000	
5/1/79	12:00	16.5	61.7	1660000	
6/5/79	13:00	22.5	72.5	930000	
7/3/79	11:30	27	80.6	621000	
8/7/79	12:00	28.5	83.3	747000	
9/25/79	13:30	23	73.4	701000	
10/2/79	11:00	22.5	72.5	721000	
11/6/79	13:30	16	60.8	382000	
12/11/79	12:00	7.5	45.5	905000	
1/8/80	11:30	6	42.8	780000	
2/5/80	11:00	3.5	38.3	578000	
4/4/80	13:00	11.5	52.7	1270000	
4/28/80	13:00	15	59	1190000	
6/3/80	13:00	24.5	76.1	620000	
6/27/80	11:00	26	78.8	580000	
7/29/80	13:00	27	80.6	325000	
8/26/80	13:00	29.5	85.1	422000	
10/8/80	11:00	20	68	302000	
11/3/80	13:00	15	59	243000	
12/1/80	13:30	9	48.2	318000	
1/13/81	12:00	3	37.4	176000	
2/3/81	14:00	6	42.8	192000	
2/25/81	15:00	6.5	43.7	393000	
3/25/81	11:00	10	50	334000	
4/28/81	12:00	19.5	67.1	621000	
5/28/81	12:00	18.5	65.3	850000	
6/24/81	12:00	27	80.6	876000	
7/29/81	11:00	29	84.2	520000	
9/22/81	12:00	23.5	74.3	322000	
10/29/81	12:00	15	59	332000	
1/6/82	12:00	6	42.8	482000	

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TABLE 2.3-3 (Continued)

SAMPLE DATE	SAMPLE TIME	WATER TEMP, ° C	WATER TEMP, ° F	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT, FEET
4/12/73	14:15	12	53.6	1760000	
3/10/82	11:00	7	44.6	1090000	
5/24/82	12:00	24	75.2	545000	
7/15/82	12:00	27	80.6	679000	
12/6/82	14:00	12.5	54.5	911000	
1/11/83	11:30	6	42.8	1380000	41.75
4/26/83	13:00	12.5	54.5	1470000	42.5
7/6/83	12:30	27.5	81.5	594000	22.8
11/17/83	12:00	13	55.4	365000	12
1/17/84	12:00	2.5	36.5	490000	17
5/23/84	12:00	20	68	1580000	45.5
7/18/84	14:00	28	82.4	720000	26
11/9/84	12:00	15.5	59.9	773000	26.75
1/23/85	15:00	2.5	36.5	740000	
3/28/85	12:00	13	55.4	1290000	
7/23/85	11:30	29	84.2	365000	12.25
11/5/85	16:30	15.5	59.9	568000	20.5
1/15/86	14:00	4	39.2	450000	14
4/10/86	13:00	16.5	61.7	624000	22.5
7/16/86	14:00	29.5	85.1	550000	17.4
11/19/86	14:00	12	53.6	886000	29.5
1/28/87	15:00	5	41	591000	20.1
4/22/87	14:00	15	59	948000	30.7
8/13/87	15:30	28.5	83.3	274000	7.6
12/15/87	11:00	9.5	49.1	379000	11
2/10/88	13:00	5	41	918000	29.25
4/20/88	12:30	16.5	61.7	882000	30.75
6/2/88	12:00	24.5	76.1	281000	8
11/16/88	12:30	14	57.2	222000	3.5
2/15/89	13:00	6	42.8	790000	25.25
3/27/89	14:00	12	53.6	938000	35.5
6/23/89	12:00	25	77	876000	31.75
11/14/89	10:00	16.5	61.7	182000	10.5
6/23/90	16:00	26.5	79.7	1050000	36.75
11/30/90	11:30	14	57.2	316000	9.3
2/15/91	13:00	7	44.6	847000	29.8
5/31/91	13:00	25.5	77.9	876000	32.8
7/26/91	14:00	29.5	85.1	373000	13.3
11/15/91	13:30	10	50	374000	11.7

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TABLE 2.3-3 (Continued)

SAMPLE DATE	SAMPLE TIME	WATER TEMP, ° C	WATER TEMP, ° F	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT, FEET
4/12/73	14:15	12	53.6	1760000	
1/10/92	13:00	7	44.6	744000	25.48
4/3/92	13:00	10.5	50.9	872000	30.2
7/24/92	12:25	28.5	83.3	570000	20.38
10/23/92	11:30	18	64.4	300000	7.29
1/22/93	12:30	5	41	1100000	35.96
4/30/93	12:00	15.5	59.9	1280000	42.6
7/23/93	12:30	29	84.2	938000	35.4
10/15/93	12:00	18	64.4	853000	31.83
2/4/94	12:00	4	39.2	1030000	33.04
5/20/94	12:00	20	68	1260000	42.3
8/26/94	12:00	28	82.4	356000	13.28
6/16/97	14:30	22.2	71.96	951000	37.05
6/16/97	14:35	22.2	71.96		
8/2/99	9:45	32	89.6	410000	15.7
Minimum		1.5	34.7	176000	
Maximum		32	89.6	1930000	

SOURCE:

USGS <http://waterdata.usgs.gov/nwis/gw> (Reference 42)

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TABLE 2.3-4

NPDES THERMAL MONITORING DATA

Date Performed	Discharge Outlet Temperature			Barge Slip Outlet Temperature			Upriver Temperature (Point 1)			Downriver Temperature (Point 7)		
	Surface		5 feet	Surface		5 feet	Surface		5 feet	Surface		5 feet
	°C	°F	°C	°C	°F	°C	°C	°F	°C	°C	°F	°C
8/21/2001	34.6	94.28	NA ¹	31.5	88.7	29.8	29.3	84.74	29.4	29.2	84.56	29.2
12/6/2001	20	68	12.7	11.8	53.24	11.7	11.7	53.06	11.6	11.7	53.06	11.7
			54.86						52.88			53.06

NOTES:

1. 5 foot sample was not available due to low river stage
2. Sampling points are shown on Figure 2.3-12

SOURCE:

GGNS 2002 NPDES Permit Renewal Application, 2001 Winter and Summer Thermal Monitoring Reports (Reference 10)

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TABLE 2.3-5
FLOOD DISCHARGES AT VICKSBURG, MISSISSIPPI DURING SIX HIGHEST RECENT FLOODS

Year	Vicksburg, MS Station					
	1913	1927	1937	1945	1950	1973
Maximum Discharge, 1000 cfs	1783	2278	2080	1922	1876	1962

NOTES:

1. Updated information on floods at Vicksburg (Corps of Engineers) indicates that no floods since the construction of GGNS have exceeded the discharge of the 1973 flood. (Reference 6)

SOURCE:

Modified from FER Table 2.4.1, and 2002 Corps of Engineers Data (Reference 6)

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TABLE 2.3-6

MAXIMUM DAILY STREAMFLOW IN THE MISSISSIPPI RIVER
AT VICKSBURG (1932-1988)
USGS STATION 07289000

<u>Water Year</u>	<u>Date</u>	<u>Maximum Daily Discharge, cfs</u>
1932	2/26/32	1,410,000
1933		1,360,000
1934		874,000
1935		1,410,000
1936		1,270,000
1937	2/17/37	2,080,000
1938		1,190,000
1939	3/9/39	1,410,000
1940		1,070,000
1941		814,000
1942		1,170,000
1943		1,640,000
1944	5/13/44	1,610,000
1945		1,920,000
1946	1/26/46	1,480,000
1947		1,300,000
1948		1,400,000
1949		1,560,000
1950	2/23/50	1,880,000
1951		1,350,000
1952		1,360,000
1953	5/27/53	983,000
1954	5/8/54	703,000
1955		1,280,000
1956	3/3/56	1,110,000
1957	6/7/57	1,310,000
1958		1,190,000
1959		977,000
1960		1,100,000
1961	5/30/61	1,580,000
1962	4/2/62	1,440,000
1963		1,330,000

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TABLE 2.3-6 (Continued)

<u>Water Year</u>	<u>Date</u>	<u>Maximum Daily Discharge, cfs</u>
1964	4/2/64	1,270,000
1965		1,280,000
1966	2/28/66	1,110,000
1967	5/29/67	1,040,000
1968	4/12/68	1,160,000
1969		1,400,000
1970		1,300,000
1971		1,320,000
1972		1,150,000
1973	5/12/73	1,960,000
1974	2/9/74	1,530,000
1975	4/13/75	1,840,000
1976	3/7/76	1,020,000
1977	4/19/77	980,000
1978		1,350,000
1979		1,690,000
1980		1,370,000
1981	6/2/81	956,000
1982		1,210,000
1983		1,790,000
1984		1,600,000
1985		1,430,000
1986		1,310,000
1987	3/14/87	1,230,000
1988		1,140,000

SOURCE:
USGS Water Resources Investigation Report 93-4076 (Reference 11)

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TABLE 2.3-7

MINIMUM DAILY STREAMFLOW OBSERVED ON THE MISSISSIPPI RIVER
AT VICKSBURG, MS (1932 TO 1988)
USGS STATION 07289000

Water Year ⁺	Date*	Minimum Daily Discharge*, cfs	Date**	Minimum Daily Discharge**, cfs	Stage, ft msl**
1932	11/19/1931	127,000	Nov. 19	127,000	49.12
1933	10/3/1932	156,000	Oct. 3	156,000	51.32
1934		142,000	Aug. 18	142,000	47.87
			Nov. 29, 30		
1935		157,000	Nov. 3	157,000	48.58
1936		101,000	Aug. 29, 31	101,000	42.73
			Sept. 1, 2		
1937	9/30/1937	156,000	Sept. 30	156,000	46.36
1938	12/21/1937	141,000	Dec. 21	141,000	43.12
1939		128,000	Sept. 29	128,000	42.08
1940	11/1/1939	100,000	Nov. 1	99,400	39.35
1941	10/31/1940	118,000	Oct. 31	118,000	39.42
1942	10/7/1941	268,000	Oct. 7	268,000	49.13
1943		214,000	Sept. 25 – 27	214,000	48.52
1944	1/1/1944	156,000	Jan. 1	156,000	43.72
1945		178,000	Nov. 7 – 13	178,000	45.42
1946	9/14/1946	188,000	Sept. 14	188,000	46.42
1947	10/17/1946	182,000	Oct. 17	182,000	45.52
1948		156,000	Oct. 18, 25	156,000	44.32
1949	10/8/1948	150,000	Oct. 8	150,000	45.22
1950		223,000	Dec. 2, 3	223,000	48.82
1951		248,000	Nov. 8, 9	248,000	51.92
1952		183,000	Sept. 30	183,000	47.42
1953	11/3/1952	132,000	Nov. 3	132,000	44.02
1954		136,000	Nov. 24-28	136,000	41.87
1955	9/23/1955	143,000	Sept. 23	143,000	43.72
1956		128,000	Jan. 27, 28	128,000	40.62
1957	10/28/1956	133,000	Oct. 28	133,000	42.12
1958	10/17/1957	230,000	Oct. 17	230,000	49.22
1959	9/28/1959	162,000	Sept. 28	162,000	43.87
1960	10/1/1959	175,000	Oct. 1	175,000	44.22
1961		187,000	Nov. 5, 6	187,000	46.32

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TABLE 2.3-7 (Continued)

Water Year ⁺	Date*	Minimum Daily Discharge*, cfs	Date**	Minimum Daily Discharge**, cfs	Stage, ft msl**
1962		217,000	Aug. 29, 30	217,000	48.82
1963	9/30/1963	163,000	Sept. 30	163,000	44.22
1964	1/8/1964	126,000	Jan. 8	126,000	40.52
1965		179,000	Nov. 9	179,000	45.62
1966	9/21/1966	202,000	Sept. 21	202,000	47.12
1967	11/7/1966	197,000	Nov. 7	197,000	46.52
1968	9/14/1968	204,000	Sept. 14	204,000	49.02
1969	10/1/1968	237,000	Oct. 1	237,000	50.72
1970	9/19/1970	222,000	Sept. 19	222,000	51.12
1971	8/26/1971	249,000	Aug. 26	249,000	52.72
1972	10/20/1971	208,000	Oct. 20	208,000	50.12
1973	9/26/1973	291,000	Sept. 26	291,000	55.32
1974	10/1/1973	312,000	Oct. 16	289,000	52.90
1975	10/16/1974	289,000	Oct. 14	303,000	55.72
1976	9/30/1976	170,000	Sept. 30	170,000	46.35
1977	10/1/1976	175,000	Aug. 14	178,000	46.64
1978	9/1/1978	303,000	Nov. 17	217,000	49.34
1979	11/17/1978	217,000	Nov. 2	371,000	58.73
1980	8/11/1980	286,000			
1981	1/29/1981	160,000			
1982		241,000			
1983	9/22/1983	211,000			
1984	10/18/1983	199,000			
1985	8/14/1985	200,000			
1986	9/9/1986	263,000			
1987	8/22/1987	240,000			
1988	7/13/1988	138,000			

SOURCE:

* USGS Water Resources Investigation Report 93-4076 (Reference 20)

** USGS Water Supply Papers and U.S. Army Corps of Engineers (UFSAR Table 2.4-16)

NOTES:

⁺ Example: Water year for 1932 begins October 1, 1931, and ends September 30, 1932.

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TABLE 2.3-8
(UFSAR TABLE 2.4-18)

LOW-FLOW VALUES, CFS, FOR 1, 7, AND 30 DAYS FOR SELECTED RETURN PERIODS
FOR MISSISSIPPI RIVER AT VICKSBURG, MISSISSIPPI

Duration (Days)	Return Period, Years		
	5	10	100
1	142,000	125,000	93,000
7	147,000	129,000	95,000
30	161,000	141,000	100,000

NOTES:

1. Obtained from USGS statistical output for Vicksburg gaging station based on the period of record of 1933-1979. (Reference 2)

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TABLE 2.3-9
(FER TABLE 2.4.5)

MAXIMUM DISCHARGE OF STREAM DRAINING BASIN A AT STATION 2*

Date	Max. Discharge, cfs
Feb. 3, 1973	25
March 4, 1973	30
March 10, 1973	140
March 16, 1973	400
March 24, 1973	390
April 7, 1973	30
April 24, 1973	210
April 26, 1973	60
May 2, 1973	375
June 12, 1973	10

NOTES:

* For location of Station 2, see Figure 2.3-7.

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TABLE 2.3-10

GGNS SURFACE WATER DISCHARGE AND WATER QUALITY DATA

MONITORING PERIOD END DATE	OUTFALL NUMBER	WATER TEMP. DEG. F		pH		FLOW (MGD)	
		MAX	AVG	MAX	MIN	MAX	AVG
12/31/01	001	91.2	77.0	7.42	7.14	11.70	6.28
11/30/01	001	90.8	86.7	8.04	6.92	10.70	8.39
10/31/01	001	94.1	82.9	7.19	7.06	13.50	9.19
9/30/01	001	96.3	88.1	7.42	7.14	24.66	14.71
8/31/01	001	96.4	87.1	8.42	7.12	22.30	13.43
7/31/01	001	97.9	90.8	7.35	7.05	20.20	15.88
6/30/01	001	95.0	88.5	7.41	7.08	19.80	12.96
5/31/01	001	94.3	82.1	8.17	7.18	17.90	9.71
4/30/01	001	97.7	74.0	7.69	7.41	16.00	7.52
3/31/01	001	91.9	82.4	7.79	7.27	19.20	15.58
2/28/01	001	95.9	83.1	7.84	7.04	18.10	13.83
1/31/01	001	92.5	80.0	8.17	6.87	18.80	10.82
12/31/00	001	93.9	79.8	7.60	6.98	19.90	15.74
11/30/00	001	99.1	86.4	8.49	7.08	25.10	17.01
10/31/00	001	103.1	91.7	8.43	7.16	29.52	16.31
9/30/00	001	105.1	94.4	7.89	7.06	30.10	17.75
8/31/00	001	105.8	99.0	7.76	7.14	27.91	15.86
7/31/00	001	106.0	98.8	8.79	7.39	22.51	12.36
6/30/00	001	103.1	96.7	7.44	7.17	28.81	13.76
5/31/00	001	102.9	94.5	8.31	7.06	23.48	13.47
4/30/00	001	98.8	89.2	8.36	7.83	25.78	13.29
3/31/00	001	97.9	88.9	8.51	8.25	24.71	11.00
2/29/00	001	97.7	86.5	8.54	8.36	24.76	10.81
1/31/00	001	97.2	82.8	8.39	7.67	25.08	9.67

NOTES:

1. Outfall 001 discharges into the Mississippi River at the discharge basin – Outfall location shown on Figure 2.3-12
2. MGD = millions of gallons per day

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TABLE 2.3-10 (Continued)

MONITORING PERIOD END DATE	OUTFALL NUMBER	pH		FLOW (MGD)		TOTAL RESIDUAL CHLORINE (PPM)		TOTAL SUSPENDED SOLIDS (PPM)		OIL AND GREASE (PPM)	
		MAX	MIN	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG
12/31/01	007	8.44	8.42	0.2232	0.2232	0.37	0.25	2.00	1.00	BDL	BDL
11/30/01	007	7.68	7.56	0.2232	0.1368	0.66	0.64	2.00	1.00	BDL	BDL
10/31/01	007	8.11	7.32	0.2232	0.2232	0.58	0.53	1.00	0	BDL	BDL
9/30/01	007	8.48	8.42	0.2232	0.2232	0.42	0.30	2.00	1.00	BDL	BDL
8/31/01	007	8.53	7.34	0.2232	0.1368	0.53	0.27	BDL	BDL	BDL	BDL
7/31/01	007	7.65	7.35	0.0504	0.0504	0.25	0.21	BDL	BDL	BDL	BDL
6/30/01	007	8.53	8.08	0.0504	0.0504			4.00	2.00	BDL	BDL
5/31/01	007	8.65	8.00	0.2232	0.1368	0.37	0.27	49.00	26.50	BDL	BDL
4/30/01	007	8.28	8.26	0.0504	0.0504	0.32	0.27	15.00	7.50	1.0	0.95
3/31/01	007	8.32	8.27	0.2232	0.1368	0.45	0.39	BDL	BDL	0.1	0.95
2/28/01	007	8.48	8.11	0.0504	0.0504	0.56	0.33	BDL	BDL	1.5	0.8
1/31/01	007	8.56	8.38	0.2232	0.1368	0.30	0.15	8.00	4.00	BDL	BDL
12/31/00	007	8.25	7.50	0.0504	0.0504	0.35	0.35	BDL	BDL	BDL	BDL
11/30/00	007	8.44	7.27	0.0504	0.0504	0.13	0.12	BDL	BDL	1.6	0.8
10/31/00	007	8.94	8.76	0.0504	0.0504	0.28	0.14	BDL	BDL	BDL	BDL
9/30/00	007	8.92	8.56	0.5472	0.2988			BDL	BDL	BDL	BDL
8/31/00	007	8.62	7.78	1.2232	0.1368	0.17	0.16	BDL	BDL	BDL	BDL
7/31/00	007	8.98	8.49	0.2232	0.1368	0.18	0	BDL	BDL	BDL	BDL
6/30/00	007	8.47	8.28	0.2232	0.1368	0.36	0.28	BDL	BDL	BDL	BDL
5/31/00	007	8.93	8.81	0.0504	0.0504	0.29	0.15	BDL	BDL	1.0	0.9
4/30/00	007	8.98	8.77	0.0504	0.0504	0.36	0.29	BDL	BDL	1.0	0.9
3/31/00	007	8.75	8.74	0.2232	0.1368	0.36	0.26	BDL	BDL	1.5	0.8
2/29/00	007	8.82	8.82	0.0504	0.0504	0.39	0.32	BDL	BDL	2.0	2.0
1/31/00	007	8.73	8.58	0.0504	0.0504	0.44	0.43	1.00	0.5	2.3	2.1

NOTES:

1. Outfall 007 discharges into sediment Basin B – Outfall location shown on Figure 2.3-12

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TABLE 2.3-10 (Continued)

MONITORING PERIOD END DATE	OUTFALL NUMBER	pH		FLOW (MGD)		TOTAL RESIDUAL CHLORINE (PPM)		TOTAL SUSPENDED SOLIDS (PPM)		BIOLOGICAL OXYGEN DEMAND (BOD)		FECAL COLIFORM, GENERAL	
		MAX	MIN	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG
12/31/01	010	8.22	8.20	0.052	0.027	BDL		20.00	11.50	11.4	10.8	BDL	
11/30/01	010	7.81	7.79	0.057	0.035	BDL		6.00	2.67	39.0	24.4	BDL	
10/31/01	010	7.95	7.44	0.045	0.037	BDL		10.00	6.00	12.6	9.9	BDL	
9/30/01	010	8.15	8.10	0.050	0.041	BDL		3.00	2.50	2.4	2.4	BDL	
8/31/01	010	8.41	7.46	0.060	0.040	BDL		2.00	1.00	3.6	3.2	BDL	
7/31/01	010	7.36	7.29	0.055	0.031	BDL		BDL		3.6	0.0	BDL	
6/30/01	010	8.13	8.05	0.034	0.022	BDL		2.00	1.00	3.6	3.0	BDL	
5/31/01	010	8.23	7.80	0.050	0.029	BDL		5.00	6.00	5.3	4.0	10	3
4/30/01	010	8.08	7.48	0.055	0.051	BDL		10.00	6.00	4.8	4.4	24000	26
3/31/01	010	8.33	7.90	0.074	0.052	BDL		34.00	3.50	6.0	4.2	BDL	
2/28/01	010	8.60	8.08	0.051	0.033	BDL		2.00	2.00	9.0	8.9	10	3
1/31/01	010	8.09	8.08	0.046	0.028	BDL		17.00	11.50	8.7	7.4	BDL	
12/31/00	010	7.76	7.40	0.054	0.031	BDL		7.00	5.00	7.2	4.5	BDL	
11/30/00	010	7.70	7.40	0.059	0.044	BDL		6.00	3.50	3.0	1.5	BDL	
10/31/00	010	8.70	8.42	0.044	0.032	BDL		7.00	6.00	7.5	4.5	BDL	
9/30/00	010	8.54	8.53	0.040	0.024	BDL		6.00	4.50	13.5	9.5	BDL	
8/31/00	010	8.80	7.86	0.045	0.022	BDL		7.00	6.50	3.3	1.7	BDL	
7/31/00	010	8.89	8.36	0.059	0.025	BDL		8.00	7.00	3.9	2.9	BDL	
6/30/00	010	8.62	8.28	0.042	0.022	BDL		4.00	3.00	34.5	13.0	10300	59
5/31/00	010	8.90	8.50	0.053	0.017	BDL		1.00	1.00	12.0	6.6	BDL	
4/30/00	010	8.63	8.58	0.051	0.022	BDL		4.00	3.00	27.0	18.0	BDL	
3/31/00	010	8.64	8.37	0.041	0.029	BDL		7.00	6.00	13.5	11.0	BDL	
2/29/00	010	8.94	8.83	0.028	0.022	BDL		9.00	6.50	31.5	24.8	BDL	
1/31/00	010	8.90	8.39	0.038	0.023	BDL		2.00	1.00	27.0	15.9	320	18

NOTES:

1. Outfall 010 includes sanitary wastewater discharged into sediment Basin A – Outfall location shown on Figure 2.3-12

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TABLE 2.3-10 (Continued)

MONITORING PERIOD END DATE	OUTFALL NUMBER	FLOW (MGD)		pH		TOTAL SUSPENDED SOLIDS (PPM)	
		MAX	AVG	MAX	MIN	MAX	AVG
12/31/01	013	4.400	2.135	8.15	7.07	12.00	12.00
12/31/00	013	1.600	0.790	8.45	7.07	97.00	36.50
12/31/99	013	0.410	0.218	8.22	7.40	43.00	20.50

NOTES:

1. Outfall 013 includes effluent from sediment Basin A that enters Hamilton Lake – Outfall location shown on Figure 2.3-12

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TABLE 2.3-10 (Continued)

MONITORING PERIOD END DATE	OUTFALL NUMBER	FLOW (MGD)		pH		TOTAL SUSPENDED SOLIDS (PPM)	
		MAX	AVG	MAX	MIN	MAX	AVG
12/31/01	014	0.270	0.202	8.54	7.50	26.00	6.20
12/31/00	014	0.450	0.315	8.77	7.79	12.00	5.00
12/31/99	014	0.270	0.190	8.24	7.17	6.00	2.75

NOTES:

1. Outfall 014 includes effluent from sediment Basin B that enters Hamilton Lake – Outfall location shown on Figure 2.3-12

SOURCE:

U. S. EPA Envirofacts Database, 2002; State of Mississippi Water Pollution Control Permit No. MS0029521 issued September 19, 1997 (Reference 14)

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TABLE 2.3-11

GEOLOGIC FORMATIONS OF CLAIBORNE, COPIAH, HINDS, JEFFERSON, AND WARREN COUNTIES, MISSISSIPPI

Stratigraphic Unit	Thickness, Feet	Physical Character	Water-Bearing Properties
Alluvium (Holocene)	0-200	Fine to coarse grained sand, silt, clay, and gravel	Deposits in tributary streams yield up to 100 gpm, Mississippi River alluvium may yield up to 5000 gpm; Source for GGNS radial wells; wells in Warren County report yields of 75 to 1400 gpm
Loess (Pleistocene)	0-80	Tan to brown calcareous silt, clay, and gravel	Unimportant as an aquifer
Terrace Deposits (Pleistocene)	0-120	Fine to coarse grained sand, chert, and quartz gravel, numerous clay and silt lenses and layers	Domestic supplies of several gpm in uplands along Mississippi River and larger tributaries
Citronelle Formation (Pliocene-Pleistocene)	0-100	Sand, chert, and quartz gravels	Yields of several gpm from shallow wells in southeastern Jefferson County; important aquifer in Crystal Springs area, Copiah County; large wells report yields of 250 to 700 gpm; not present in Claiborne County; included in the Southern Hills Aquifer system sole source aquifer designation
Pascagoula Formation <u>Hattiesburg Formation</u> Catahoula Formation (Miocene)	0-400 0-900	Clay and sand, locally indurated, and gravel	Important aquifers in southwestern Mississippi (included in the Southern Hills Aquifer system sole source aquifer designation), a source for all types of wells, yields range from 100 to 700 gpm; Aquifer tests in wells in the Catahoula Formation in Claiborne County had yields ranging from 20 to 240 gpm; reported yields of 240 to 560 gpm
Vicksburg Group, Units Undifferentiated (Oligocene)	160	Clay, marl, limestone	Unimportant as an aquifer

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TABLE 2.3-11 (Continued)

Stratigraphic Unit	Thickness, Feet	Physical Character	Water-Bearing Properties
Forest Hill Formation (Oligocene)	80-220	Gray fine sands and carbonaceous clays	Source for many small diameter wells in southwestern Hinds and Warren Counties; few rural wells in northern Claiborne County; source for public supply and industrial wells in Copiah, Hinds, and Warren Counties
Yazoo Clay (Eocene)	400-500	Light bluish-gray and pale gray, calcareous, fossiliferous clay	Aquiclude
Moodys Branch Formation (Eocene)	10-45	Greenish-gray sand and marl	Unimportant as an aquifer
Cockfield Formation (Eocene)	100-385	Gray clays, sandstones, and siltstones	Source for many wells in Hinds and northern Warren County; wells in Warren County report yields from 80 to 700 gpm; Cockfield aquifers contain salt water south of the Big Black River
Cook Mountain Formation (Eocene)	100-400	Shale, sandy limestone, and chalk	Aquiclude
Sparta (or Kosciusko) Formation (Eocene)	300-1020	Gray clays and shales, siltstone, and sandstone	Important source for many wells in Jackson area, Hinds County with reported yields of 15 to 1260 gpm; supplies few small wells in Warren County
Wilcox Group, undifferentiated (Eocene)	1150-3310	Shale, siltstone, and sandstone	Importance limited to Jackson area, contains salt water elsewhere; one well reported to flow above ground surface

SOURCES:
GGNS UFSAR Table 2.4-19.

U. S. Geological Survey, "Summary of Aquifer Tests in Mississippi, June 1942 through May 3, 1988," Water Resources Investigation Report No. 90-4155, 1991; U. S. Geological Survey, Jackson, Mississippi, 2002 (References 2, 42, and 33).

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TABLE 2.3-12

USGS GROUND WATER LEVELS – VICKSBURG
WELL COMPLETED IN THE MISSISSIPPI RIVER ALLUVIAL AQUIFER
STATION NO. 322310090530202

Date Level Measured	Level in Feet Below Land Surface
2/1/65	25.18
3/15/65	13.31
10/1/65	22
10/18/65	22.5
12/13/65	22.08
6/23/66	17.59
11/22/66	28.03
12/20/66	26.97
5/12/67	17.75
7/31/67	21.4
5/16/68	12.75
2/7/69	10.98
5/1/69	10.34
11/13/69	36.8
7/14/70	37.53
10/28/70	35.65
2/25/71	32.2
10/6/71	39.13
4/4/72	26.11
10/19/72	36.01
8/8/73	28.26
10/10/73	35.13
5/24/74	24.44
5/30/74	21.22
7/18/74	27.28
8/27/74	37.74
10/14/74	39.74
2/14/75	20.47
5/28/75	10.25
8/28/75	35.8
10/10/75	31.07
1/9/76	27.14
4/19/76	22.61
8/10/76	35.59
10/7/76	38.14
1/24/77	38.77
5/6/77	35.44
11/11/77	39.36

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TABLE 2.3-12 (Continued)

Date Level Measured	Level in Feet Below Land Surface
5/11/78	23.38
7/19/78	34.8
10/11/78	39.38
2/15/79	35.7
5/31/79	16.61
8/13/79	25.41
11/14/79	36.43
2/11/80	31.19
5/8/80	29.06
8/26/80	38.47
9/11/80	42.2
12/11/80	38.81
2/12/81	53.98
3/6/81	47.83
5/21/81	42.41
7/24/81	33.34
8/21/81	36.14
3/23/82	44.9
7/1/82	29.11
8/6/82	33.2
9/13/82	38.26
9/20/82	35.51
11/8/82	35.91
12/8/82	31.25
1/20/83	14
1/31/83	22.19
3/3/83	26.41
3/15/83	22.66
4/18/83	18.13
6/23/83	19.6
7/18/83	26.96
11/9/83	42.38
1/17/84	35.32
3/26/84	28
6/19/84	24.63
10/12/84	41.88
10/14/84	33.88
3/11/85	25.36
6/17/85	30.05
9/10/85	41.03
11/13/85	38.2
1/7/86	34.25

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TABLE 2.3-12 (Continued)

Date Level Measured	Level in Feet Below Land Surface
2/4/86	37.02
3/24/86	36.12
7/1/86	34.45
10/10/86	41.93
12/30/86	30.88
3/23/87	27.74
6/17/87	35.2
10/6/87	38.13
12/29/87	39.5
3/21/88	33.21
6/6/88	38.72
10/3/88	48.18
1/3/89	41.45
3/2/89	33.97
3/27/89	23.34
4/20/89	26.01
5/11/89	31.58
8/4/89	26.54
10/23/89	37.52
1/30/90	35.44
3/26/90	23.12
5/3/90	20.28
6/5/90	18.85
7/19/90	25.33
10/1/90	37.83
3/7/91	14.44
5/28/91	23.87
7/22/91	35.59
8/29/91	39.23
10/1/91	42.16
12/2/91	40.01
1/21/92	29.87
3/30/92	29.07
6/1/92	31.48
10/5/92	34.92
12/1/92	32.57
2/9/93	25.06
6/15/93	21.15
7/27/94	27.15

SOURCE: USGS, URL <http://waterdata.usgs.gov/ms/nwis/gwlevels> (Reference 44)

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TABLE 2.3-13

USGS GROUND WATER LEVELS - PORT GIBSON
WELL COMPLETED IN THE LOWER CATAHOULA FORMATION
STATION NO. 315718090291501

Date Level Measured	Level in Feet Below Land Surface
1/1/1910	55
11/8/1931	93.3
4/20/1961	89.09
5/25/1961	94.81
6/10/1961	92.39
7/10/1961	91.7
8/5/1961	86.92
9/10/1961	83.6
10/20/1961	89.19
11/20/1961	91.29
12/20/1961	88.88
1/15/1962	96.7
2/28/1962	89.89
3/10/1962	88.7
4/15/1962	87.6
5/25/1962	94.97
6/5/1962	90.38
7/25/1962	94.5
8/15/1962	91.5
9/30/1962	96.4
10/20/1962	97.4
11/15/1962	92.91
12/15/1962	99.1
1/25/1963	97.8
2/5/1963	94
3/15/1963	92.68
4/30/1963	96.08
5/25/1963	95.91
6/20/1963	92.25
7/25/1963	90.39
8/10/1963	97.68
9/10/1963	100.38
1/28/1964	90.87
5/20/1964	90.57
7/20/1964	91.47
10/19/1964	89.05
1/19/1965	86.42
4/8/1965	85.57

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TABLE 2.3-13 (Continued)

Date Level Measured	Level in Feet Below Land Surface
7/12/1965	85.7
9/28/1965	87.34
1/11/1966	85.24
4/27/1966	91.2
7/14/1966	92.85
10/17/1966	90.6
1/10/1967	85.8
4/11/1967	90.1
7/31/1967	95
11/8/1967	93.3
1/18/1968	85.9
5/1/1968	90.52
8/21/1968	86.8
10/31/1968	94.65
1/6/1969	93.2
6/18/1969	87.5
10/7/1969	89.15
2/3/1970	85.7
3/16/1970	83.45
7/6/1970	84.81
10/26/1970	84.11
1/11/1971	85.01
4/7/1971	85.42
7/20/1971	84.98
10/14/1971	85.3
1/14/1972	84.13
4/13/1972	85.39
7/10/1972	89.24
10/19/1972	92.91
1/19/1973	90.89
4/13/1973	85.55
10/30/1973	92.88
1/7/1974	92.9
5/10/1974	94.33
7/22/1974	99.59
11/6/1974	95.85
2/18/1975	93.8
6/4/1975	91.77
10/30/1975	94.4
1/19/1976	105.94
3/22/1976	93.66

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TABLE 2.3-13 (Continued)

Date Level Measured	Level in Feet Below Land Surface
8/16/1976	121.7
2/2/1977	114.6
3/17/1977	120.12
4/5/1977	118.4
10/7/1977	121.27
6/6/1978	121.9
10/12/1978	125.52
3/30/1979	122.95
5/14/1980	122.43
7/8/1980	123.37
4/9/1981	123.64
10/5/1981	125.35
4/12/1983	116.04
10/20/1983	111.48
4/17/1984	119.27
7/9/1984	117.08
10/17/1984	116.1
4/10/1985	118
11/7/1985	121.34
3/19/1986	119.99
10/9/1986	115.54
4/23/1987	117.4
10/6/1987	116.38
5/4/1988	118.04
10/11/1988	123.9
4/13/1989	112.1
10/10/1989	108.99
5/1/1990	108.25
4/23/1991	95.46
10/15/1991	96.65
3/30/1992	96.17
10/26/1992	109.63
3/18/1993	108.21
10/19/1993	111.78
4/12/1994	110.4
12/12/1994	110.43
9/26/1995	109.89
5/30/1996	110.4
10/15/1996	113.39

SOURCE: USGS, URL <http://waterdata.usgs.gov/ms/nwis/gwlevels> (Reference 44)

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TABLE 2.3-14
(FER TABLE 2.4.10)

PERMEABILITY TEST RESULTS

<u>Test Well #1</u>				
Location	Depth, ft.	Formation	Drawdown Permeability, cm/sec	Recovery Permeability, cm/sec
TW#1	153	Terrace	-	2.4×10^{-1}
OW29A	130	Terrace	2.6×10^{-1}	2.8×10^{-1}
OW29B	153	Terrace	2.8×10^{-1}	2.6×10^{-1}
OW69A	100	Terrace	2.1×10^{-1}	-
OW69B	95	Terrace	1.4×10^{-1}	2.1×10^{-1}
OW73	110	Terrace	1.4×10^{-1}	-
OW9	100	Terrace	2.4×10^{-1}	-

Variable Head Permeability Tests

Location	Depth, ft.	Formation	Drawdown Permeability, cm/sec
P34B	40	Terrace	4.0×10^{-3}
P34C	55	Terrace	8.0×10^{-2}
P 4	275	Catahoula	6.3×10^{-9}
TW-3	121	Terrace	2.6×10^{-4}

Laboratory Consolidation Test

Location	Depth, ft.	Formation	Unified Classification	Permeability, cm/sec
B-110	114-116	Catahoula	CL	4.3×10^{-8}
B-110	137-139	Catahoula	CL	2.4×10^{-8}
B-120	114-116	Catahoula	CL	5.8×10^{-8}
B-120	134-136	Catahoula	CL	2.2×10^{-8}
B-120	144-146	Catahoula	SC	2.9×10^{-8}
B-4	19-20	Alluvium	CH	7.8×10^{-8}
B-4	49-51	Alluvium	ML	5.9×10^{-8}

NOTES:

1. Well, Piezometer, and Boring Locations are shown in Figure 2.3-20.

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TABLE 2.3-15
(FER TABLE 2.4.11)

SITE HYDROGEOLOGIC PARAMETERS

	Terrace Deposits	Clay-Silt Alluvium	Sand-Gravel Alluvium
Total Porosity	0.40	0.48	0.35
Effective Porosity	0.25	0.25	0.25
Bulk Density (gm/ml)	2.07	1.87	1.87
Storage Coefficient	0.15	0.10	0.15
Longitudinal Dispersion Coefficient (ft ² /yr.)	1.87	0.018	1.32
Distribution Coefficient (ml/gm)			
Sr ⁹⁰	8.79	7.24	7.24
Cs ¹³⁷	314.85	259.29	259.29

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TABLE 2.3-16
(UFSAR TABLE 2.4-26a)

HYDRAULIC CONDUCTIVITIES OF TERRACE DEPOSITS

Well I.D.	Hydraulic Conductivity (ft/day)	Saturated Thickness of Geologic Unit (ft.)	Transmissivity (ft ² /day)
DW-8A	19	18	340
MW-8	4.9	21	100
MW-9	3.2	23	74
MW-10	91	10	910
MW-13	0.15	43	6.5
MW-14	0.24	48	12
MW-15	3	36	110
MW-16	37	59	2,200
MW-17	29	21	610
MW-18	0.2	28	5.6
MW-19	23	58	1,300
MW-20	300	49	15,000
MW-21	150	54	8,100
MW-22	180	31	5,600
MW-23	7.1	50	360
MW-24	0.83	21	17
MW-25	23	14	320
MW-26	13	16	210
OW-05	0.46	69	32
OW-202	0.14	73	10
OW-209A	0.36	42	15
OW-29A	0.96	100	96
Geometric Mean	5		180
			(Round to 200)

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TABLE 2.3-17
(FER TABLE 2.4-13)

PIEZOMETER INVENTORY

Piezometer Number	Hole Depth, ft	Elevation Top of Casing, ft msl	Perforated Interval, ft msl	Casing Diameter, in	Formation	Water Level Elevation, ft msl									
						Highest Water Level					Lowest Water Level				
						1972	1973	1974	1975	1976	1972	1973	1974	1975	1976
P4	275	79.1	-188 to -213	1	C	62	89	83	78	64	55	57	62	61	61
P5	142	156.2	18 to 15	3	C	77	82	82	83	81	75	72	79	79	79
P11	51	82.53	34 to 31	3	T	75	88	82			69	72	77		
P17	105	153.26	57 to 47	3	T	71	71	71			70	70	71		
P34A	29	95.76	71 to 66	1	A	77	90	84			70	74	79		
P34B	40	95.78	55 to 53	3	T	75	84	82			70	73	80		
P34C	55	96.19	39 to 36	3	T	75	84	82			70	70	78		
P34D	110	95.10	8 to -16	1	C	73	86	79			66	71	75		
P37	42	96.82	58 to 53	3	A	77	84	84			72	74	79		
P57	173	93.48	-81	3	C	68	81	74			61	67	68		
P95	195	160.59	-31 to -37	3	C	70	81	76			66	67	71		
P111	249	192.40	-16 to -58	3	C	71	80	78			69	71	75		
P117A	178	144.68	-30 to -35	3	C	70	110	113			69	70	110		
P117B	118	143.83	33 to 24	3	C	75	84	82			73	75	79		
P201	191	193.36	1 to 0	3	T	82	83	83			71	76	79		
P209	150	195.8													

NOTES:

1. A – Alluvium, C – Catahoula, T – Terrace Deposits
2. Piezometer locations are shown in Figure 2.3-20.

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TABLE 2.3-18
(FER 2.4.14)

OBSERVATION WELL INVENTORY

Well Number	Depth, (feet)	Elevation Top of Casing, (feet msl)	Perforated Interval, (feet msl)	Casing Diameter, (inch)	Formation	Water Level Elevation, (feet msl)									
						Highest Water Level					Lowest Water Level				
						1972	1973	1974	1975	1976	1972	1973	1974	1975	1976
OW4	80	77.86	7 to -3	3	A	75	89	79	75		70	71	75	75	
OW5	110	157.08	54 to 44	3	T	77	83	82	83	81	72	73	78	80	79
OW6	116	207.24	90	4	T	105	95				92	94			
OW6A	115	208.22	91	1	T	112	112				108	111			
OW6B	110	207.46	107 to 97	3	T	111	106	105			72	104	105		
OW6C	114	207.13	101 to 91	3	T		98	98				98	98		
OW7	100	158.49	56	1 1/4	T	76	84	83	84	80	102	75	80	76	79
OW8	93	81.77	-11	1 1/4	A	72	88	77			66	70	74		
OW9	100	157.04	65 to 55	3	T	75	84	83			70	72	77		
OW10	98	156.98	78 to 58	1 1/4	C	87	84	85	86	84	75	77	81	82	83
OW12	100	156.56	63 to 53	3	T	75	84	83			72	73	77		
OW29A	130	162.84	29	3	T	73	84	84	82	76	70	73	74	74	71
OW29B	153	160.64	6	1	T	77	84	87			69	73	77		
OW35	57	103.09	53 to 43	1 1/4	A	80	83	81			66	72	77		
OW43	80	74.12	4 to -6	1	A	73	89	81	74		50	52	50	60	
OW69A	100	85.22	-5 to -15	1	A	75	89	82	81	77	69	72	73	74	74
OW69B	95	83.36	-2 to -12	1	A	75	89	83			69	72	77		
OW73	110	121.68	9	1	T	73	84	81			70	73	77		
OW94	135	174.88	48 to 38	3	T	74	84	84			72	74	79		
OW95	115	160.55	53 to 43	3	T	75	85	84			72	75	78		

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Table 2.3-18 (Continued)

Well Number	Depth, (feet)	Elevation Top of Casing, (feet msl)	Perforated Interval, (feet msl)	Casing Diameter, (inch)	Formation	Water Level Elevation, (feet msl)									
						Highest Water Level					Lowest Water Level				
						1972	1973	1974	1975	1976	1972	1973	1974	1975	1976
OW107	65	164.21	102 to 97	1	T										
OW108	60	156.08	106 to 96	3	T										
OW112	105	194.05	97 to 87	3	T	95	95	95			94	94	94		
OW115A	72	152.38	89 to 79	1	T		97	96				95	95		
OW115B	73	153.45	88 to 78	3	T		97	97				95	95		
OW116	100	196.47	105 to 95	3	T	96	96	96			94	95	95		
OW117	50	144.52	103 to 93	3	T										
OW118	39	122.91	92 to 82	3	T	106	107	107			96	101	103		
OW118B	39	124.22	93 to 83	3	T		106	106				101	102		
OW121	125	157.29	30	3	T	76	85	81			70	71	76		
OW201	131	193.05	70 to 60	3	T	130	120	97	93		107	98	90	91	
OW202	157	195.52	36	3	T	76	85	82	95	80	73	75	78	79	79
OW208	117	199.71	95 to 80	3	T										
OW209A	105	195.63	88	3	T				90	89				88	88
OW209B	150	198.15	56 to 46	3	C	84	82	80			78	76	76		
TW#1	153	159.25	50 to 10	8	T	71	84	83			67	70	75		

NOTES:

1. A – Alluvium, C – Catahoula, T – Terrace Deposits
2. Piezometer locations are shown in Figure 2.3-20.

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TABLE 2.3-19
(UFSAR TABLE 2.4-29)

GROUNDWATER LEVELS MONITORING WELLS

Well Number	Well Depth (ft.)	Elevation Top of Casing (ft. msl.)	Perforated Interval (ft. msl.)	Casing Diameter (in.)	Formation	Aquifer
P4	275	79.1	-188 to -213	1	Catahoula	Regional
OW4A	80	78.3	7 to -3	3	Alluvium	Regional
OW29A	130	162.7	29	3	Terrace	Regional
OW202	157	193.8	36	3	Terrace	Regional
OW7	100	158.5	56	1.25	Terrace	Regional
OW5	110	157.0	54 to 44	3	Terrace	Regional
OW10	98	158.5	78 to 58	1.25	Catahoula	Regional
OW4	80	77.7	7 to -3	3	Alluvium	Regional
OW69A	100	82.5	-5 to -15	1	Terrace	Regional
OW209A	105	198.2	88	3	Terrace	Regional
P5	142	156.2	--	--	--	Regional
P209	150	195.8	--	--	--	Regional
MW-1	44.5	137.0	91.2 to 93.2	6	Fill	Perched
MW-2	43.2	133.7	88.5 to 90.5	6	Fill	Perched
MW-3	42.9	135.5	90.6 to 92.6	6	Fill	Perched
MW-4	39.6	133.6	92.0 to 94.0	6	Fill	Perched
MW-5	37.8	134.2	91.9 to 93.9	6	Fill	Perched
MW-6	37.9	134.5	94.6 to 96.6	6	Fill	Perched
MW-7	56	140.0		6	Fill	Perched
DW-1	55.2	136.5	81 to 86	10	Fill	Perched
DW-2	48.3	138.8	81 to 86	10	Fill	Perched
DW-3	48.4	134.8	81 to 86	10	Fill	Perched
DW-4	42.8	132.8	81 to 86	10	Fill	Perched
DW-5	55.4	134.4	82.9 to 87.9	10	Fill	Perched
DW-6	59.7	132.7	84.3 to 89.3	10	Fill	Perched
DW-7	46.3	134.3	90.0 to 95.0	10	Fill	Perched
DW-8	40.3	134.3	101.2 to 106.2	10	Fill	Perched

NOTES:

1. For well locations, see Figs. 2.3-20 and 2.3-25.

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TABLE 2.3-20

GROUNDWATER LEVEL DATA FOR ONSITE WELLS, 1996-2001

Well Number	Top of Casing Elevation	Well Depth	Date of Measurement	Depth to Water	Water Level (feet above MSL)
MW-12	134.38	24.79	1/15/96		
			to		
			1/20/97	Dry	
			2/18/97	23.6	110.78
			3/20/97	22.6	111.78
			4/22/97	23.9	110.48
			5/22/97	24.1	110.28
			6/26/97	23.2	111.18
			7/19/97	23.9	110.48
			8/22/97		
			to		
			12/17/97	Dry	
			1/15/98	23.72	110.66
			2/19/98	21.74	112.64
			3/20/98	21.35	113.03
			4/20/98	22.88	111.5
			5/19/98	23.84	110.54
			6/18/98	24.05	110.33
			7/24/98		
			to		
			12/9/98	Dry	
			1/14/99	24.04	110.34
			2/11/99	20	114.38
			3/18/99	20.3	114.08
			4/15/99	20.51	113.87
			5/13/99	22.45	111.93
			6/17/99	24	110.38
			7/15/99	24.07	110.31
			8/12/99		
			to		
			12/19/00	Dry	
			1/29/01		
			to		
			12/28/01	no measurements, construction in the area	
Max				24.1	114.38
Min				20	110.28

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TABLE 2.3-20 (Continued)

Well Number	Top of Casing Elevation	Well Depth	Date of Measurement	Depth to Water	Water Level (feet above MSL)
MW-13	133.65	67.93	1/15/96	24.7	108.95
			2/13/96	23.8	109.85
			3/18/96	23.1	110.55
			4/18/96	22.8	110.85
			5/21/96	22.7	110.95
			6/19/96	22.5	111.15
			7/18/96	22.8	110.85
			8/20/96	23.7	109.95
			9/18/96	24.6	109.05
			10/18/96	25.5	108.15
			11/20/96	25.1	108.55
			12/18/96	24.5	109.15
			1/20/97	23.7	109.95
			2/18/97	22.87	110.78
			3/20/97	21.87	111.78
			4/22/97	23.17	110.48
			5/22/97	23.37	110.28
			6/26/97	22.47	111.18
			7/19/97	23.17	110.48
			8/22/97		
			to		
			12/17/97	Dry	
			1/15/98	22.99	110.66
			2/19/98	21.01	112.64
			3/20/98	20.62	113.03
			4/20/98	22.15	111.5
			5/19/98	23.11	110.54
			6/18/98	23.32	110.33
			7/24/98		
			to		
			12/9/98	Dry	
			1/14/99	23.31	110.34
			2/11/99	19.27	114.38
			3/18/99	19.57	114.08
			4/15/99	19.78	113.87
			5/13/99	21.72	111.93
			6/17/99	23.27	110.38
			7/15/99	23.34	110.31
			8/12/99		
			to		
			12/19/00	Dry	

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TABLE 2.3-20 (Continued)

Well Number	Top of Casing Elevation	Well Depth	Date of Measurement	Depth to Water	Water Level (feet above MSL)
MW-13 (Cont.)			1/29/01 to 12/28/01	no measurements, construction in the area	
Max				25.5	114.38
Min				19.27	108.15
DW-7	134.3	42.52	12/19/00	32.31	101.99
			1/29/01	31.75	102.55
			2/24/01	31.45	102.85
			3/7/01	31.05	103.25
			4/3/01	30.6	103.7
			4/27/01	30.54	103.76
			5/24/01	30.72	103.58
			6/22/01	30.85	103.45
			7/26/01	31.06	103.24
			8/27/01	31.25	103.05
			9/25/01	31.04	103.26
			10/30/01	31.26	103.04
			11/26/01	31.49	102.81
			12/28/01	31.06	103.24
Max				32.31	103.76
Min				30.54	101.99
DW-8	134.3	40.6	1/15/96	29.5	104.8
			2/13/96	28.6	105.7
			3/18/96	29	105.3
			4/18/96	28.8	105.5
			5/21/96	28.6	105.7
			6/19/96	28.1	106.2
			7/18/96	27.5	106.8
			8/20/96	28	106.3
			9/18/96	29	105.3
			10/18/96	29.5	104.8
			11/20/96	29.8	104.5
			12/18/96	29.9	104.4
			1/20/97	29.5	104.8
			2/18/97	28.7	105.6
			3/20/97	27.6	106.7

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TABLE 2.3-20 (Continued)

Well Number	Top of Casing Elevation	Well Depth	Date of Measurement	Depth to Water	Water Level (feet above MSL)
DW-8 (Cont.)			4/22/97	27.5	106.8
			5/22/97	27.2	107.1
			6/26/97	26.4	107.9
			7/19/97	26.8	107.5
			8/22/97	27.75	106.55
			9/15/97	28.1	106.2
			10/17/97	28.8	105.5
			11/20/97	29	105.3
			12/17/97	29.1	105.2
			1/15/98	27.85	106.45
			2/19/98	26.4	107.9
			3/20/98	25.98	108.32
			4/20/98	26.2	108.1
			5/19/98	26.67	107.63
			6/18/98	27.16	107.14
			7/24/98	27.98	106.32
			8/24/98	28.47	105.83
			9/17/98	28.84	105.46
			10/16/98	29.16	105.14
			11/11/98	29.42	104.88
			12/9/98	29.05	105.25
			1/14/99	27.74	106.56
			2/11/99	26.17	108.13
			3/18/99	26.26	108.04
			4/15/99	25.89	108.41
			5/13/99	26.34	107.96
			6/17/99	27.09	107.21
			7/15/99	26.81	107.49
			8/12/99	27.56	106.74
			9/8/99	28.36	105.94
			10/12/99	29.18	105.12
			11/9/99	29.64	104.66
			12/14/99	29.96	104.34
			1/12/00	30.03	104.27
			2/10/00	30.16	104.14
			3/31/00	30.45	103.85
			5/1/00	29.41	104.89
			6/8/00	29.8	104.5
			7/12/00	29.88	104.42
			7/27/00	30.08	104.22
			8/31/00	30.49	103.81

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TABLE 2.3-20 (Continued)

Well Number	Top of Casing Elevation	Well Depth	Date of Measurement	Depth to Water	Water Level (feet above MSL)
DW-8 (Cont.)			9/5/00	30.49	103.81
			9/28/00	30.8	103.5
			10/31/00	Dry	
			11/20/00	Dry	
			12/19/00	30.58	103.72
			1/29/01	29.82	104.48
			2/24/01	29.52	104.78
			3/7/01	29.23	105.07
			4/3/01	28.45	105.85
			4/27/01	28.82	105.48
			5/24/01	29.2	105.1
			6/22/01	29.35	104.95
			7/26/01	29.73	104.57
			8/27/01	29.88	104.42
			9/25/01	29.58	104.72
			10/30/01	29.88	104.42
			11/26/01	30.24	104.06
			12/28/01	29.45	104.85
Max				30.8	108.41
Min				25.89	103.5

SOURCE:

Entergy Operations, Inc., "GGNS Rainfall and Ground Water Level Data," Annual Reports for 1996 – 2001 (Reference 45)

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TABLE 2.3-21a

1995 WATER USE TOTALS, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	33.9	0.47	34.37	20.18
Copiah	4.32	0.46	4.78	1.33
Hinds	14.21	34.13	48.34	10.45
Jefferson	1.42	0.08	1.5	0.42
Warren	13.62	38.89	302.87	177.11

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21b

1995 IRRIGATION WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0.12	0.35	0.47	0.4
Copiah	0	0.01	0.01	0.01
Hinds	0	0	0	0
Jefferson	0	0	0	0
Warren	0.07	0.2	0.27	0.23

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21c

1995 LIVESTOCK WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0.08	0.12	0.2	0.2
Copiah	0.14	0.23	0.37	0.36
Hinds	0.2	0.48	0.68	0.64
Jefferson	0.04	0.08	0.12	0.11
Warren	0.26	0.1	0.36	0.29

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21d

1995 MINING WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0	0	0	0
Copiah	0.41	0.22	0.63	0.15
Hinds	0.02	0	0.02	0
Jefferson	0	0	0	0
Warren	0	0	0	0

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21e

1995 THERMOELECTRIC POWER WATER USE – ALL FUEL TYPES
MISSISSIPPI COUNTIES SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	32.05	0	32.05	19.23
Copiah	0	0	0	0
Hinds	0.86	0.39	1.25	0.39
Jefferson	0	0	0	0
Warren	0	49	49	0.25

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21f

1995 INDUSTRIAL WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0	0	0	0
Copiah	0.1	0	0.1	0.02
Hinds	0.77	0.09	0.86	0.15
Jefferson	0	0	0	0
Warren	2.23	18.9	21.13	3.59

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21g

1995 DOMESTIC WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0.23	0	0.23	0.3
Copiah	0.28	0	0.28	0.72
Hinds	2.03	0	2.03	8.94
Jefferson	0.29	0	0.29	0.28
Warren	0.57	0	0.57	2.21

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21h

1995 COMMERICAL WATER USE, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Total Withdrawals	Consumptive Use
Claiborne	0.17	0.17	0.05
Copiah	0.05	0.05	0.07
Hinds	0.93	0.93	0.33
Jefferson	0	0	0.03
Warren	0	0	0.2

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-21i

1995 PUBLIC SUPPLY, MISSISSIPPI COUNTIES
SURROUNDING GRAND GULF SITE

County Name	Groundwater Withdrawals	Surface Water Withdrawals	Total Withdrawals
Claiborne	1.25	0	1.25
Copiah	3.34	0	3.34
Hinds	9.4	33.17	42.57
Jefferson	1.09	0	1.09
Warren	10.49	0	10.49

NOTES:

1. Water quantities expressed in million gallons per day (mgd).

SOURCE: Reference 36

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TABLE 2.3-22
SURFACE WATER INTAKES ON THE MISSISSIPPI RIVER, MISSISSIPPI

Company Name	County	Location		Approx River Mile	Upstream or Downstream		Maximum Rate, gpm	Use
		Latitude	Longitude					
Southeast Wood Fiber	Claiborne	31°59'38"	91°04'55"	404.8	Downstream		600	Industrial
Mississippi Power and Light, Baxter Wilson	Warren	32°17'09"	90°55'49"	433	Upstream		445,200	Industrial
Ameristar Casino	Warren	32°18'54"	90°54'03"	436	Upstream		400	Commercial
Entergy Mississippi, Gerald Andrus Plant	Washington	33°21'34"	91°07'07"	537	Upstream		206,000	Industrial
River View Land Co.	Coahoma	34°16'15"	90°47'21"	635	Upstream		9,000	Recreation
Gist Farms	Coahoma	34°21'34"	90°41'52"	648	Upstream		1,500	Irrigation

SOURCE:
Mississippi Dept. of Environmental Quality, Office of Land and Water Resources, 2002 (Reference 25)

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TABLE 2.3-23

SURFACE WATER INTAKES ON THE MISSISSIPPI RIVER, PUBLIC WATER SUPPLY SYSTEMS, LOUISIANA

Company Name	Parish	Latitude	Longitude	Upstream or Downstream
Allied Signal (now Honeywell)	Ascension	30°12'55"	91°03'19"	Downstream
Shell Chemical	Ascension	30°10'39"	91°00'25"	Downstream
Ormet Corporation	Ascension	30°07'53"	90°55'13"	Downstream
Dow Chemical	Iberville	30°18'43"	90°13'33"	Downstream
East Jefferson	Jefferson	29°57'11"	90°09'46"	Downstream
Gretna Water Works	Jefferson	29°55'25"	90°03'40"	Downstream
West Jefferson (two intakes)	Jefferson	29°54'26"	90°05'54"	Downstream
		29°54'25"	90°05'57"	
Westwego Waterworks	Jefferson	29°54'54"	90°08'23"	Downstream
New Orleans – Algiers (two intakes)	Orleans	29°56'27"	90°03'17"	Downstream
		29°56'34"	90°03'19"	
New Orleans – Carrollton Waterworks (two intakes)	Orleans	29°57'03"	90°08'16"	Downstream
		29°57'17"	90°08'23"	
Belle Chase Water District	Plaquemines	29°51'13"	89°58'54"	Downstream
Dalcour Waterworks	Plaquemines	29°51'45"	89°55'24"	Downstream
Point a la Hache Water System	Plaquemines	29°35'05"	89°48'25"	Downstream

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TABLE 2.3-23 (Continued)

Company Name	Parish	Latitude	Longitude	Upstream or Downstream
Port Sulphur (two intakes)	Plaquemines	29°34'24"	89°48'10"	Downstream
		29°21'26"	89°26'16"	
St. Bernard Waterworks	St. Bernard	29°55'30"	89°57'35"	Downstream
Domino Sugar	St. Bernard	29°56'39"	90°00'10"	Downstream
St. Charles WD No. 1	St. Charles	29°59'07"	90°23'52"	Downstream
St. Charles WD No. 2	St. Charles	29°56'05"	90°21'35"	Downstream
Star/Motiva Enterprises Dock 1	St. James	30°06'33"	90°54'41"	Downstream
Gramercy Waterworks	St. James	30°02'32"	90°41'06"	Downstream
Lutcher Waterworks	St. James	30°02'13"	90°41'34"	Downstream
St. James WD No. 1 - Convent	St. James	30°00'16"	90°47'48"	Downstream
St. James WD No. 1 - Vacherie	St. James	30°00'40"	90°45'48"	Downstream
Kaiser Aluminum	St. James	30°03'07"	90°39'54"	Downstream
Star/Motiva Enterprises Dock 2	St. James	30°06'44"	90°54'44"	Downstream
St. John WD No. 1 - Edgard	St. John	30°02'50"	90°34'44"	Downstream
St. John WD No. 1 – La Place	St. John	30°03'15"	90°34'49"	Downstream
E.I. Dupont	St. John	30°03'00"	90°31'18"	Downstream
Marathon/Ashland	St. John	30°03'00"	90°35'40"	Downstream

SOURCES: Louisiana Dept. of Environmental Quality, Louisiana Dept. of Health and Hospitals, 2002

GGNS UFSAR (Reference 2 and Reference 27)

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TABLE 2.3-24

PUBLIC SUPPLY AND INDUSTRIAL WELLS
CLAIBORNE, COPIAH, HINDS, JEFFERSON, AND WARREN COUNTIES, MISSISSIPPI

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
E006	S02T12NR01E (on-site)	Claiborne	118	--	--	MS River Alluvial	5000
F003	SWS18T12NR02E	Claiborne	206	54	2/1/55	Catahoula Formation	**
F053	NWS12T12NR02E	Claiborne	152	92	9/1/76	Catahoula Formation	**
F064	S06T12NR02E	Claiborne	150	90	12/14/95	Catahoula Formation	564
F066	S12T12NR02E	Claiborne	163	--	--	Catahoula Formation	506
G011	S07T12NR03E	Claiborne	415	272.45	10/20/81	Catahoula Formation	**
G027	S07T12NR03E	Claiborne	415	257	7/31/80	Catahoula Formation	**
G035	S45T12NR03E	Claiborne	472	187	1/27/94	Catahoula Formation	300
G038	S48T12NR03E	Claiborne	434	--	--	Catahoula Formation	280
H034	SWNWS27T12NR04E	Claiborne	408	41	9/1/80	Catahoula Formation	**
K041	S60T11NR01E	Claiborne	460	199	10/21/81	Catahoula Formation	**
K049	S60T11NR01E	Claiborne	450	203	6/3/88	Catahoula Formation	244
L004	S04T11NR02E	Claiborne	177	102	2/1/61	Catahoula Formation	**
L013	S04T11NR02E	Claiborne	202	89	10/1/63	Catahoula Formation	**
L051	SESWS12T11NR02E	Claiborne	346	165	4/1/75	Catahoula Formation	**
L057	NWSES03T11NR02E	Claiborne	196	136	7/1/77	Catahoula Formation	**
L058	S04T11NR02E	Claiborne	185	148	7/5/77	Catahoula Formation	**
L074	NES05T11NR02E	Claiborne	166	101	8/16/84	Catahoula Formation	**
L080	NESES03T10NR02E	Claiborne	270	115	10/31/79	Catahoula Formation	**
L083	SWNWS20T10NR02E	Claiborne	260	144.8	2/9/98	Catahoula Formation	300
N001	SESES07T11NR04E	Claiborne	100	57	10/1/61	Catahoula Formation	**
N009	NWS05T11NR04E	Claiborne	480	115	5/1/66	Catahoula Formation	**
N042	NWS05T11NR04E	Claiborne	470	132.27	10/27/81	Catahoula Formation	**
O028	SESES12T10NR04E	Claiborne	960	269	8/19/86	Catahoula Formation	420
B002	NWNES07T02N04W	Copiah	250	72.3	2/22/96	Catahoula Formation	**
B011	NESES06T02NR04W	Copiah	380	77	2/1/82	Catahoula Formation	**
D002	S25T02NR02W	Copiah	113	73	8/1/71	Citronelle Formation	**
D005	S25T02NR02W	Copiah	92	69	1/1/59	Citronelle Formation	**

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
D022	SWSWS25T02NR02W	Copiah	111	54.9	2/19/96	Catahoula Formation	**
D023	SWNWS25T02NR02W	Copiah	107	53.2	2/19/96	Citronelle Formation	**
D076	SWNES25T02NR02W	Copiah	320	225	8/15/85	Catahoula Formation	220
D087	NWNWS27T02NR02W	Copiah	515	229.35	2/21/96	Catahoula Formation	**
D089	NENES27T02NR02W	Copiah	515	115	6/1/75	Catahoula Formation	**
D100	NWSWS25T02NR02W	Copiah	128	56.7	4/15/91	Citronelle Formation	265
D101	SENES35T02NR02W	Copiah	137	78.5	4/20/91	Citronelle Formation	377
D103	NESES26T02NR02W	Copiah	500	--	--	Forest Hill Sand	25
E007	NES31T02NR01W	Copiah	116	61.9	2/19/96	Citronelle Formation	**
E008	NWNES31T02NR01W	Copiah	107	--	--	Citronelle Formation	**
E044	NENWS31T02NR01W	Copiah	144	80	10/1/72	Citronelle Formation	**
E058	NENWS27T02NR01W	Copiah	310	171	6/11/82	Catahoula Formation	**
E070	SEENES31T02NR01W	Copiah	119	--	--	Citronelle Formation	192
E071	SESWS29T02NR01W	Copiah	180	62.2	2/19/96	Citronelle Formation	250
E073	SWSES14T02NR01W	Copiah	170	--	--	Catahoula Formation	10
G018	NWSES05T01NR04W	Copiah	60	--	--	Citronelle Formation	**
J029	NWNES15T01NR02W	Copiah	215	80.9	2/20/96	Catahoula Formation	**
J054	SWWSWS15T01NR02W	Copiah	170	38.4	2/22/96	Catahoula Formation	**
J066	NESWS15T01NR02W	Copiah	184	52.65	10/29/81	Catahoula Formation	**
J068	NESES05T01NR02W	Copiah	356	160	9/11/86	Miocene Series, Undifferentiated	250
J069	NENES15T01NR02W	Copiah	233	89.2	2/20/96	Catahoula Formation	418
J074	NENWS34T01NR02W	Copiah	240	95.35	2/20/96	Catahoula Formation	40
J076	NWSWS09T01NR02W	Copiah	533	228.6	3/1/98	Catahoula Formation	351
K018	NESWS14T01NR01W	Copiah	208	163	6/1/72	Catahoula Formation	**
K032	NENWS10T01NR01W	Copiah	269	114.4	2/22/96	Catahoula Formation	**
K034	SESES10T01NR01W	Copiah	190	--	--	Catahoula Formation	550
K035	SESES10T01NR01W	Copiah	200	--	--	Catahoula Formation	**
K037	SWWSWS17T01NR01W	Copiah	190	--	--	Catahoula Formation	**
K041	NESES06T01NR01W	Copiah	220	--	--	Citronelle Formation	**
L025	SWWSWS31T01NR02E	Copiah	424	--	--	Catahoula Formation	50
L027	SWSWS31T01NR02E	Copiah	585	--	7/12/90	Catahoula Formation	100

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
L028	NES30T01NR01E	Copiah	200	33.6	1/22/92	Catahoula Formation	276
O005	NESES21T10NR07E	Copiah	465	104.75	2/20/96	Catahoula Formation	**
O009	NENES21T10NR07E	Copiah	430	40	8/1/73	Catahoula Formation	**
O011	SWNWS29T10NR07E	Copiah	554	132	3/27/95	Catahoula Formation	222
P009	NENES10T10NR08E	Copiah	333	178.55	4/19/93	Catahoula Formation	**
P059	SESES01T10NR08E	Copiah	300	140.7	2/20/96	Catahoula Formation	**
P060	NWNWS10T10NR08E	Copiah	291	235.5	2/20/96	Catahoula Formation	**
P062	NENWS09T10NR08E	Copiah	475	228	3/22/83	Catahoula Formation	**
P064	NESES12T10NR08E	Copiah	355	143	8/1/71	Catahoula Formation	**
P074	NWNWS10T10NR08E	Copiah	293	192	10/23/86	Catahoula Formation	500
P075	NWNWS10T10NR08E	Copiah	288	192	10/23/86	Catahoula Formation	564
P076	NES12T10NR08E	Copiah	331	143	10/28/92	Catahoula Formation	500
P077	SENWS10T10NR08E	Copiah	280	178	10/13/93	Catahoula Formation	435
Q011	SWNWS07T10NR09E	Copiah	346	166.8	2/20/96	Catahoula Formation	**
Q022	SWSES09T10NR09E	Copiah	600	197.51	5/8/97	Catahoula Formation	**
Q025	SWSWS06T10NR09E	Copiah	312	160	11/13/97	Catahoula Formation	682
Q027	NWSES29T10NR09E	Copiah	308	95	7/29/99	Catahoula Formation	70
R027	SENWS02T10NR10E	Copiah	760	29	4/18/95	Forest Hill Sand	125
R028	NWNWS01T10NR10E	Copiah	724	14.3	4/18/95	Forest Hill Sand	201
R029	NWNWS06T10NR02E	Copiah	570	40	11/28/94	Catahoula Formation	90
V019	SWNES34T09NR08E	Copiah	332	109.3	2/21/96	Catahoula Formation	**
V022	SENWS35T09NR08E	Copiah	285	81	1/28/81	Catahoula Formation	**
V025	NESWS34T09NR08E	Copiah	360	106.3	2/21/96	Catahoula Formation	**
V029	NWSES35T09NR8E	Copiah	364	63.4	10/19/89	Catahoula Formation	400
V030	NWSES35T09NR08E	Copiah	320	40.3	2/21/96	Catahoula Formation	400
V031	NESWS35T09NR08E	Copiah	382	98.6	1/22/90	Miocene Series, Undifferentiated	506
X014	SWSWS18T09NR10E	Copiah	214	90	7/22/99	Catahoula Formation	35
B018	SESES09T07NR02W	Hinds	1021	290.1	5/29/97	Cockfield Formation	**
B019	NWSES09T07NR02W	Hinds	1120	315.1	11/10/89	Cockfield Formation	**
B021	NWNWS11T07NR02W	Hinds	893	147	10/17/83	Cockfield Formation	**

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
B023	SWSESES09T07NR02W	Hinds	1050	277	4/30/01	Cockfield Formation	874
C013	NWNES36T07NR01W	Hinds	705	180	7/1/57	Cockfield Formation	**
C029	S03T07NR01W	Hinds	774	133.75	7/23/97	Cockfield Formation	**
C031	SENES34T07NR01W	Hinds	642	129.87	10/25/84	Cockfield Formation	**
C032	NENWS11T07NR01W	Hinds	756	86	4/1/71	Cockfield Formation	**
C039	NESES16T07NR01W	Hinds	580	120	2/20/76	Cockfield Formation	**
C052	SESWS11T07NR01W	Hinds	677	162.8	7/23/97	Cockfield Formation	300
C057	SENWS31T07NR01W	Hinds	1479	328	9/27/90	Sparta Sand	350
C060	S34T07NR01W	Hinds	360	180	11/17/92	Cockfield Formation	75
C061	S34T07NR01W	Hinds	380	180	11/20/92	Cockfield Formation	75
C070	NWS34T07NR01W	Hinds	355	180	2/1/01	Cockfield Formation	60
D002	SWWSWS27T06NR04W	Hinds	1106	104	10/1/59	Cockfield Formation	**
D006	SENWS27T06NR04W	Hinds	1177	165	4/1/68	Cockfield Formation	**
D020	SWNWS29T06NR04W	Hinds	1360	102.25	5/14/97	Cockfield Formation	**
D021	NESES14T06NR04W	Hinds	1077	201.13	10/25/84	Cockfield Formation	**
D042	SWWSWS27T06NR04W	Hinds	1095	160	1/10/87	Cockfield Formation	284
E003	NESWS24T06NR03W	Hinds	1034	76	3/1/55	Cockfield Formation	**
E022	NESWS24T06NR03W	Hinds	950	136.1	5/29/97	Cockfield Formation	**
E030	SWNWS35T06NR03W	Hinds	1198	253.75	10/25/84	Cockfield Formation	**
E036	NESWS24T06NR03W	Hinds	963	112.8	5/1/86	Cockfield Formation	400
F022	NESWS27T06NR02W	Hinds	992	186	10/2/95	Cockfield Formation	**
F024	SWNWS24T06NR02W	Hinds	946	259.4	5/19/97	Cockfield Formation	**
F054	NESWS34T06NR02W	Hinds	1089	204.65	6/12/97	Cockfield Formation	200
F057	SENES08T06NR02W	Hinds	1125	182	10/19/92	Cockfield Formation	350
F061	NESES14T06NR02W	Hinds	1000	216	6/17/98	Cockfield Formation	807
G038	NENWS29T06NR01W	Hinds	773	275	1/1/55	Cockfield Formation	**
G059	NWNWS19T06NR01W	Hinds	893	245.73	10/9/01	Cockfield Formation	260
G062	NENES30T06NR01W	Hinds	718	228	8/5/61	Cockfield Formation	**
G064	NESWS21T06NR01W	Hinds	903	275	9/29/76	Sparta Sand	**
G067	SWNWS21T06NR01W	Hinds	926	277	9/29/76	Sparta Sand	**
G070	SWSESES21T06NR01W	Hinds	903	324	9/29/76	Sparta Sand	600
G084	SWSESES34T06NR01W	Hinds	1020	334	11/28/87	Sparta Sand	15

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
G088	NENES20T06NR01W	Hinds	1155	208	9/29/76	Sparta Sand	**
G090	SWSES11T06NR01W	Hinds	987	73	5/1/73	Sparta Sand	**
G092	NWNES21T06NR01W	Hinds	935	226.96	10/29/84	Sparta Sand	**
G094	SWSES16T06NR01W	Hinds	930	204	4/12/79	Sparta Sand	**
G101	SESES16T06NR01W	Hinds	842	274.24	10/9/01	Sparta Sand	**
H035	NWSES11T06NR01E	Hinds	680	158	11/1/56	Sparta Sand	**
H075	NESWS08T06NR01E	Hinds	900	289.6	12/2/83	Sparta Sand	**
H114	NESWS11T06NR01E	Hinds	823	160	5/1/58	Sparta Sand	**
H146	SWSES07T06NR01E	Hinds	746	286.46	10/20/80	Sparta Sand	608
H181	NESWS27T06NR01E	Hinds	791	242	11/30/82	Sparta Sand	159
H192	SWWS19T06NR01E	Hinds	828	265.4	8/10/89	Sparta Sand	503
H198	NWNES08T06NR01E	Hinds	1700	158.95	11/15/01	Meridian-Upper Wilcox	750
H201	NWSES08T06NR01E	Hinds	1680	120.43	7/7/00	Sparta Sand	700
H203	S08T06NR01E	Hinds	1670	153.53	11/15/01	Sparta Sand	300
J029	NWSES11T05NR04W	Hinds	1050	130.24	11/14/89	Cockfield Formation	**
J032	SES01T05NR04W	Hinds	1062	93	6/1/64	Cockfield Formation	**
J049	NESWS08T05NR04W	Hinds	1260	157.82	5/14/97	Cockfield Formation	**
J050	NESES08T05NR04W	Hinds	880	133.42	11/14/89	Cockfield Formation	**
J062	NESWS11T05NR04W	Hinds	1077	105	5/4/86	Cockfield Formation	300
J066	NESWS11T05NR04W	Hinds	1087	86	4/5/88	Cockfield Formation	500
J070	SWNES13T15NR05E	Hinds	--	30	12/29/97	Forest Hill Sand	42
J071	SWNES13T15NR05E	Hinds	162	30	12/29/97	Forest Hill Sand	38
K021	NWWS19T05NR03W	Hinds	1088	95	1/1/64	Cockfield Formation	**
K063	NWSES26T05NR03W	Hinds	1195	164.3	6/13/97	Cockfield Formation	**
K070	NENWS35T05NR03W	Hinds	1164	140	4/12/93	Cockfield Formation	261
K072	NWNWS02T05NR03W	Hinds	1341	267.5	8/30/94	Cockfield Formation	361
L006	NENWS20T05NR02W	Hinds	1175	193	10/1/59	Cockfield Formation	**
L030	SWWS21T05NR02W	Hinds	1168	218.7	5/29/97	Cockfield Formation	**
L037	SENWS30T05NR02W	Hinds	1259	186.4	6/13/97	Cockfield Formation	**
L049	NESWS24T05NR02W	Hinds	1052	215	8/1/72	--	**
L072	NESES28T05NR02W	Hinds	1245	230	2/21/94	Cockfield Formation	164
L074	NWWS21T05NR02W	Hinds	1757	--	--	Sparta Sand	610

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
M099	NWNE15T05NR01W	Hinds	1120	296	7/8/87	Sparta Sand	22
M099	NWNE15T05NR01W	Hinds	1120	296	7/8/87	Sparta Sand	608
M104	NENWS28T05NR01W	Hinds	1411	269.7	8/23/89	Sparta Sand	21
M105	NWNE22T05NR01W	Hinds	1246	318	7/24/87	Sparta Sand	15
M112	SWSES28T05NR01W	Hinds	1398	297.13	11/14/01	Sparta Sand	1260
M117	SWSWS16T05NR01W	Hinds	1426	292	1/13/84	Sparta Sand	**
M118	NWSES07T05NR01W	Hinds	890	244	11/7/84	Cockfield Formation	125
M124	NENWS30T05NR01W	Hinds	960	255	3/21/94	Cockfield Formation	50
N018	SWSWS16T05NR01E	Hinds	850	199	8/1/59	Sparta Sand	**
N020	SWSWS16T05NR01E	Hinds	795	144	2/1/52	Sparta Sand	**
N026	SWSES09T05NR01E	Hinds	749	140	10/1/56	Sparta Sand	**
N040	NENWS03T05NR01E	Hinds	746	145	3/1/52	Sparta Sand	**
N072	NWNWS03T05NR01E	Hinds	714	188	7/1/65	Sparta Sand	**
N077	SESES08T05NR01E	Hinds	786	185	11/1/71	Sparta Sand	**
N093	NWNWS16T05NR01E	Hinds	752	204	4/1/89	Sparta Sand	572
O031	NWSES01T14NR05E	Hinds	1280	101.43	11/17/89	Cockfield Formation	**
O061	SENWS01T14NR05E	Hinds	324	94	9/1/67	Forest Hill Sand	**
P059	SESWS07T04NR03W	Hinds	1141	109.25	6/13/97	Cockfield Formation	**
P072	SESWS07T04NR03W	Hinds	990	111.2	6/13/97	Cockfield Formation	**
R002	SWSES25T04NR01W	Hinds	1275	88	6/1/59	Sparta Sand	**
R173	NESWS05T04NR01E	Hinds	960	195	1/4/89	Sparta Sand	60
R174	SWSWS26T04NR01W	Hinds	220	68	6/22/89	Mint Springs	**
S002	SWSWS15T03NR04W	Hinds	307	57.94	10/22/81	Catahoula Formation	**
S038	S01T14NR05E	Hinds	1198	119	1/16/81	Cockfield Formation	**
S040	SESWS15T03NR04W	Hinds	288	56	7/14/86	Catahoula Formation	335
S046	NENES31T03NR04W	Hinds	190	49	10/28/87	Catahoula Formation	134
S047	NWNWS32T03NR04W	Hinds	193	43	8/28/87	Catahoula Formation	127
S051	NENWS22T03NR04W	Hinds	300	60	11/1/94	Catahoula Formation	261
T014	NES01T03NR03W	Hinds	530	130	1/1/68	Catahoula Formation	**
U027	NWNE23T03NR02W	Hinds	721	298	11/19/84	Forest Hill Sand	**
V033	NWSWS15T03NR01W	Hinds	473	189.2	10/9/01	Forest Hill Sand	205
V057	SES21T03NR01W	Hinds	510	181	7/1/98	Forest Hill Sand	190

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
V058	NENES10T03NR01W	Hinds	525	126	8/1/68	Forest Hill Sand	**
V059	SWSES09T03NR01W	Hinds	433	136.8	3/20/87	Forest Hill Sand	**
V064	NWNWS28T03NR01W	Hinds	590	120	12/1/61	Forest Hill Sand	**
V069	SESES28T03NR01W	Hinds	550	103	2/1/76	Forest Hill Sand	**
V071	NESES16T03NR01W	Hinds	510	135	12/18/76	Forest Hill Sand	**
V076	NWSES09T03NR01W	Hinds	421	131.18	10/19/81	Forest Hill Sand	**
V081	SESES03T03NR01W	Hinds	445	190	6/27/80	Forest Hill Sand	**
V082	SWNES28T03NR01W	Hinds	1846	188.65	9/11/95	Sparta Sand	**
V095	SWSES09T03NR01W	Hinds	417	145	11/1/87	Forest Hill Sand	927
V110	SENWSES21T03NR01W	Hinds	510	198	12/6/00	Forest Hill Sand	145
D010	NWSES29T10NR02E	Jefferson	375	168.49	11/4/81	Catahoula Formation	**
D016	NENWS29T10NR02E	Jefferson	279	170	10/1/64	Catahoula Formation	**
D022	S62T10NR02E	Jefferson	596	227	1/14/99	Catahoula Formation	252
H001	S49T09NR01E	Jefferson	262	160.75	4/24/96	Catahoula Formation	**
H010	NWS71T09NR01E	Jefferson	265	158	1/15/79	Catahoula Formation	**
H011	NWS71T09NR01E	Jefferson	263	138	1/15/76	Catahoula Formation	**
H024	S72T09NR01E	Jefferson	266	128	6/17/84	Catahoula Formation	**
J009	NWS03T09NR02E	Jefferson	676	211	6/24/82	Catahoula Formation	172
J013	S47T09NR02E	Jefferson	336	155	5/11/84	Catahoula Formation	**
J014	S47T09NR02E	Jefferson	260	130	8/17/84	Catahoula Formation	406
M033	S40T08NR012W	Jefferson	790	380.4	4/24/96	Catahoula Formation	172
N017	SENWS36T08NR01E	Jefferson	810	241	9/1/97	Catahoula Formation	400
O010	--	Jefferson	970	387	9/1/97	Catahoula Formation	431
Q011	SESES25T08NR04E	Jefferson	555	214	12/10/81	Catahoula Formation	**
Q013	SESW03T08NR04E	Jefferson	555	359.7	6/25/98	Miocene Series, Undifferentiated	**
Q016	--	Jefferson	564	352	3/25/98	Catahoula Formation	250
A011	NENES27T18NR02E	Warren	154	16	9/1/68	MS River Alluvial	**
A020	NWSES26T18NR02E	Warren	149	28	11/17/81	MS River Alluvial	230
B006	SESES13T18NR04E	Warren	848	37	12/16/80	Cockfield Formation	**

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
B009	NWNWS24T18NR04E	Warren	806	20	11/1/67	Cockfield Formation	**
B043	NWNES26T18NR04E	Warren	845	26	8/6/85	Cockfield Formation	80
B053	S13T18NR04E	Warren	80	6	5/21/93	MS River Alluvial	75
B054	S13T18NR04E	Warren	85	6	5/19/93	MS River Alluvial	75
E023	NWNES22T17NR03E	Warren	122	17	8/1/86	MS River Alluvial	1000
E025	NWNES22T17NR03E	Warren	120	19.5	10/15/90	MS River Alluvial	1402
E027	SWSENE22T17NR03E	Warren	141	36	10/22/99	MS River Alluvial	1110
E028	NWNES22T17NR03E	Warren	140	42	10/22/99	MS River Alluvial	1110
F035	S18T07NR04E	Warren	140	25	12/4/80	MS River Alluvial	**
G030	SWWS35T17NR05E	Warren	1390	234.15	12/9/94	Cockfield Formation	700
G031	SESES35T17NR05E	Warren	1340	140	8/16/94	Cockfield Formation	708
J021	SWWS02T16NR03E	Warren	181	51	9/1/66	MS River Alluvial	**
J022	SENWS03T16NR03E	Warren	140	28	9/1/66	MS River Alluvial	**
J023	NENWS03T16NR03E	Warren	140	26	9/1/66	MS River Alluvial	**
J026	SWNWS02T16NR03E	Warren	132	25	9/1/68	MS River Alluvial	**
J027	SWNWS03T16NR03E	Warren	119	25	10/1/68	MS River Alluvial	**
J028	SENWS03T16NR03E	Warren	163	26	10/1/68	MS River Alluvial	**
J029	SENE30T16NR03E	Warren	141	25	1/1/68	MS River Alluvial	**
J030	NWSWS02T16NR03E	Warren	161	28	10/1/68	MS River Alluvial	**
J032	NWNES03T16NR03E	Warren	142	22	9/1/68	MS River Alluvial	**
J033	NWNES03T16NR03E	Warren	143	22	9/1/68	MS River Alluvial	**
J047	--	Warren	155	50	10/22/99	MS River Alluvial	1001
J048	NWNES03T16NR03E	Warren	154	52	10/22/99	MS River Alluvial	1062
J049	SWSWNWS03T16NR03E	Warren	160	53	10/22/99	MS River Alluvial	1067
K027	SENWS36T16NR04E	Warren	365	140	9/23/80	Forest Hill Sand	**
K029	SWNE25T16NR04E	Warren	1220	151	6/16/80	Cockfield Formation	**
K032	NENWS04T16NR04E	Warren	310	90	8/30/83	Forest Hill Sand	**
K033	NWSWS36T16NR04E	Warren	351	152	3/1/80	Forest Hill Sand	300
M017	SESW42T15NR03E	Warren	425	125	3/1/75	Forest Hill Sand	**
N011	NENES10T15NR04E	Warren	434	172	8/1/66	Forest Hill Sand	**
N016	SWSES03T15NR04E	Warren	460	176	8/1/66	Forest Hill Sand	**
N022	SWNWS11T15NR04E	Warren	380	107	9/1/74	Forest Hill Sand	**

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TABLE 2.3-24 (Continued)

Local USGS Grid No.	LANDNET Location	County	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
N027	NENES26T15NR04E	Warren	320	40	7/28/78	Forest Hill Sand	**
N032	NESWS35T15NR04E	Warren	1190	147	1/27/83	Cockfield Formation	**
R001	SWNES49T14NR03E	Warren	130	80	2/1/61	MS River Alluvial	**
R004	S16T14NR03E	Warren	124	40	10/1/75	Catahoula Formation	**
R013	S49T14NR03E	Warren	93	25	9/1/65	MS River Alluvial	**
R014	NENWS01T14NR03E	Warren	363	70	12/1/68	Forest Hill Sand	**
R019	S49T14NR03E	Warren	98	23	3/1/69	MS River Alluvial	**
R023	NENWS01T14NR03E	Warren	380	93	8/30/77	Forest Hill Sand	**
R026	NENWS01T14NR03E	Warren	410	192	12/26/79	Forest Hill Sand	**
S008	NESWS25T14NR04E	Warren	82	14	1/1/70	Catahoula Formation	**
S016	SESWS03T14NR04E	Warren	1360	90	12/1/79	Cockfield Formation	**

NOTES:

** - No discharge information available.

SOURCE:

USGS, Jackson, Mississippi, 2002, Data File for Public Supply and Industrial Wells (Reference 33).

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TABLE 2.3-25
DETAILS OF PUBLIC SUPPLY AND INDUSTRIAL WELLS IN PORT GIBSON, MS

Owner	Latitude	Longitude	Use	County	Amount Withdrawn (mgd)	Maximum Rate (gpm)	Aquifer
City of Port Gibson	315714	905911	Municipal	Claiborne	0.17	335	Catahoula
City of Port Gibson	315735	905927	Municipal	Claiborne	0.17	200	Catahoula
City of Port Gibson	315650	905902	Municipal	Claiborne	0.17	300	Catahoula
City of Port Gibson	315730	905904	Abandoned	Claiborne	0	0	Catahoula
City of Port Gibson	315720	905855	Municipal	Claiborne	0.17	306	Catahoula
Southern Cotton Oil Co. ¹	315755	905925	Industrial	Claiborne	0	0	Miocene
City of Port Gibson	315730	905904	Municipal	Claiborne	0.17	350	Catahoula

SOURCE: Reference 33

NOTES:

1. Southern Cotton Oil Co. no longer operating.

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TABLE 2.3-26

WATER WELLS WITHIN A 4-MILE RADIUS OF GGNS

Local USGS Grid No.	LANDNET Location	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
B002	SESES36T13NR02E	--	--	--	--	**
B003	S37T13NR02E	--	--	--	--	**
B004	SWSWS31T13NR02E	225	12	8/10/90	Catahoula Formation	20
E001	SESES04T12NR01E	--	--	--	--	**
E002	NWSWS04T12NR01E	110	--	--	Mississippi River Alluvial	**
E003	SWNWS04T12NR01E	110	--	--	Mississippi River Alluvial	**
E004	S02T12NR01E	110	--	--	Mississippi River Alluvial	**
E005	NENWS31T12NR01E	401	90	3/14/79	Catahoula Formation	**
E006	S02T12NR01E	118	--	--	Mississippi River Alluvial	5000
F007	S12T12NR02E	240	118	4/6/66	Miocene Series, Undifferentiated	**
F010	SWS28T12NR02E	116	88	7/7/68	Miocene Series, Undifferentiated	**
F011	NWNWS12T12NR02E	215	60	9/1/68	Catahoula Formation	**
F012	SWSWS06T12NR02E	208	10	1/1/68	--	**
F013	SWNWS08T12NR02E	172	--	--	Catahoula Formation	**
F014	SWNES12T12NR02E	200	--	--	Catahoula Formation	**
F016	S01T02NR02E	240	146.3	10/20/81	Catahoula Formation	**
F019	NESWS12T12NR02E	80	26	11/29/71	--	**
F020	NWS29T12NR02E	--	--	--	--	**
F021	S12T12NR02E	--	--	--	--	**
F022	NWNWS12T12NR02E	--	--	--	--	**
F023	NWNWS12T12NR02E	--	--	--	--	**
F024	NWNWS12T12NR02E	--	--	--	--	**
F025	S12T12NR02E	--	--	--	--	**
F026	NENES09T12NR02E	256	152	8/1/72	Catahoula Formation	**
F027	S12T12NR02E	147	91	7/1/72	Catahoula Formation	**
F030	S12T12NR02E	--	--	--	--	**
F031	S12T12NR02E	--	--	--	--	**
F032	S12T12NR02E	--	--	--	--	**
F033	S12T12NR02E	--	--	--	--	**
F034	S12T12NR02E	--	--	--	--	**
F036	S12T12NR02E	--	--	--	--	**

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TABLE 2.3-26 (Continued)

Local USGS Grid No.	LANDNET Location	Depth Of Well (ft)	Water Level - Last (ft)	Water Level Date - Last	Aquifer	Discharge (gpm)
F037	S12T12NR02E	--	--	--	--	**
F038	S12T12NR02E	--	--	--	--	**
F039	S12T12NR02E	--	--	--	--	--
F040	S12T12NR02E	--	--	--	--	--
F042	S09T12NR02E	152	110	2/1/73	Miocene Series, Undifferentiated	--
F043	NWSES12T12NR02E	284	160	5/1/73	Miocene Series, Undifferentiated	--
F044	S12T12NR02E	630	126	9/1/74	Forest Hill Sand	--
F045	NWSWS12T12NR02E	70	40	9/1/74	Miocene Series, Undifferentiated	--
F046	NWSES12T12NR02E	110	60	10/1/74	Miocene Series, Undifferentiated	--
F047	NWSWS12T12NR02E	75	40	10/1/74	Miocene Series, Undifferentiated	--
F048	NWSWS12T12NR02E	70	40	10/1/74	Miocene Series, Undifferentiated	--
F049	SWSES12T12NR02E	105	77.77	10/1/81	Catahoula Formation	--
F050	SWNES06T12NR02E	399	185	7/1/75	Catahoula Formation	--
F051	NWSES12T12NR02E	150	79	6/1/75	Catahoula Formation	--
F052	NWSES12T12NR02E	140	63	8/14/76	Catahoula Formation	--
F053	NWS12T12NR02E	152	92	9/1/76	Catahoula Formation	--
F055	S12T12NR02E	298	105	5/29/81	Catahoula Formation	--
F056	S08T12NR02E	240	52	10/21/81	Catahoula Formation	--
F057	NWNWS01T12NR02E	505	142	8/1/82	Catahoula Formation	250
F058	S12T12NR02E	40	27	9/10/86	Mississippi River Alluvial	2
F059	S12T12NR02E	41	27	9/12/86	Mississippi River Alluvial	--
F060	S12T12NR02E	23	19	9/13/86	Mississippi River Alluvial	--
F061	S12T12NR02E	26	--	--	Mississippi River Alluvial	--
F062	S12T12NR02E	52	29	9/16/86	Mississippi River Alluvial	--
F063	S12T12NR02E	45	25	9/17/86	Mississippi River Alluvial	--
F064	S06T12NR02E	150	90	12/14/95	Catahoula Formation	564
F066	S12T12NR02E	163	--	--	Catahoula Formation	506
K039	SWSES01T11NR01E	270	180	5/1/74	Catahoula Formation	--
L051	SESWS12T11NR02E	346	165	4/1/75	Catahoula Formation	--

NOTES:

** No discharge information available.

SOURCE:

USGS, Jackson, Mississippi, 2002, data file for radius search (Reference 33)

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TABLE 2.3-27

USGS WATER QUALITY SAMPLING DATA FOR THE MISSISSIPPI RIVER AT VICKSBURG, MS

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μ S/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MG/L)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MG/L)
10/18/61	311000		396		6.9	160	
11/17/61	535000		335		7.4	140	
3/30/73	1600000		300		7.5	130	
4/5/73	1730000						401
4/12/73	1760000						
4/12/73	1760000						
4/12/73	1760000						
4/12/73	1760000						
5/3/73	1900000		181		9.1	81	
5/3/73	1900000						
5/17/73	1930000						374
6/7/73	1360000		277		8.1	140	
6/7/73							322
7/13/73	634000		377		7.9	170	276
8/9/73	512000		340		7.7	140	252
9/6/73	338000		410	7.6	7.8	170	
10/4/73	361000		479	7.4	7.7	180	129
11/1/73	540000		387	6.8	7.9	160	429
12/4/73	1050000		315	9.5	7.8	120	164
12/17/73	1260000		260	11.5	6.7		
1/15/74	1230000		274	10	7.5	110	
1/30/74	1430000		243	10.4	7.6		
3/12/74	956000		334	8.4	7.8	140	

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μS/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MG/L)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MG/L)
4/10/74	1020000		333	9.1	7.9	140	223
5/7/74	822000		300	7.4		140	403
6/5/74	1050000		280	6.8	7.7	140	485
7/9/74	899000		280	7	7.6	130	400
8/15/74	339000		400	7.8	8.3	180	
9/6/74	480000		350	7.4	7.4	160	
10/8/74	355000		325	9.2	7.8	160	275
11/8/74	419000		500	8.2	7.5	160	120
12/3/74	664000		270	10.6	7.6	130	590
1/14/75	928000		260	10.5	6	130	439
2/10/75	1100000		325	11	7.1	130	526
3/7/75	1200000		280	9.3	6.3	100	606
4/3/75	1680000		275	10	7	110	
5/14/75	1270000		380	7.3	6.7	130	633
6/5/75	774000		400	7.3	7.3	140	288
7/15/75	511000		375	6.5	7.2	160	206
7/31/75	408000		424	6.9	7.8		337
8/5/75	388000		400	6.7	7.4	160	
9/9/75	400000		450	6.6	7.6	170	225
10/15/75	341000		440	8.3	7.5	180	124
11/6/75	441000		340	7	7.7	130	88
12/12/75	633000		349	8.4	7.9	140	134
1/15/76	921000		280	10.5	7.5	120	317
2/10/76	719000		350	9.5	7.9	120	561
3/2/76	961000		310	10.4	7.3	110	365
4/6/76	831000		325	9	7.3	120	255

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μS/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MG/L)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MG/L)
5/5/76	637000		425	8.1	7.4	150	457
6/2/76	429000		425	7.1	7.2	170	240
7/7/76	474000		400	6	7.3	140	280
7/28/76	342000		420		7.6	160	152
8/11/76	299000		434	7.8	8	170	
9/8/76	233000		400	6.7	7.5	150	134
10/12/76	242000		450	8.3	7.4	160	149
11/1/76	305000		400	10	7.6	140	181
12/7/76	240000		410	12.2	8	160	142
1/4/77	234000		342	13.6	7.9	150	137
2/8/77	210000		320	12.6	7.9	150	118
3/8/77	738000		350	9.1	7.8	130	619
4/5/77	812000		254	7.8	7.6	110	503
5/3/77	499000		340	7	7.8	140	229
6/1/77	308000		360	6.9	7.7	150	275
6/28/77	259000		501	6.8	7.8	150	249
8/2/77	281000		417	6.3	8	150	208
9/7/77	301000		420	7	7.7	140	220
10/4/77	489000		300	6.2	7.7	120	272
11/1/77	403000		330	7.8	7.8	150	172
12/5/77	770000		250	8.9	7.8	100	313
1/4/78	719000		270	11.1	7.3	140	254
2/3/78	753000		278	11.4	7.1	120	301
3/7/78	468000		330	10.9	6.8	130	277
3/28/78	1210000		293	11.2	5.6	120	524
5/5/78	830000		370	8.2	7.7	150	349

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μ S/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MG/L)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MG/L)
6/13/78	610000		383	6	7.9	150	330
7/11/78	498000		410	5.7	7.8	170	186
8/1/78	431000		404	5.5	7.9	170	223
9/6/78	340000		417	6.5	8	160	165
10/3/78	378000		360	6.4	7.6	170	399
11/7/78	280000		412	8.3	8.1	180	150
12/4/78	490000		419	9.5	7.9	170	281
1/3/79	839000		300	11.4	7.5	110	480
2/7/79	919000		260	13.2	7.7	98	302
3/6/79	1170000		257	12	7.3	93	558
4/3/79	1400000		340	9.2	7.3	120	374
5/1/79	1660000		310	8	7.3	120	254
6/5/79	930000		350	6.6	7.6	140	223
7/3/79	621000		400	6.5	7.8	160	190
8/7/79	747000		370	6	7.7	130	359
9/25/79	701000		370	7.5	7.8		261
10/2/79	721000		310	7.4	7.8	130	244
11/6/79	382000		420	8.2	8.2	170	163
12/11/79	905000		340	11	8	140	338
1/8/80	780000		350	11.6	8	140	281
2/5/80	578000		343	12.9	8	140	170
4/4/80	1270000		300	9.5	7.4	120	415
4/28/80	1190000		350	7.7	7.5	130	280
6/3/80	620000		340	8.4	8	120	172
6/27/80	580000		430	8.1	7.8	160	407
7/29/80	325000		410	6.7	7.6	160	346

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μS/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MGL)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MGL)
8/26/80	422000		380	7.7	7.6	160	193
10/8/80	302000		417	7.9	8	160	163
11/3/80	243000		450	10.2	7.8	170	230
12/1/80	318000		439	12.5	8	160	235
1/13/81	176000		502	13.5	7.8	200	146
2/3/81	192000		473	12	8.2	170	484
2/25/81	393000		390	10.2	7.3	130	310
3/25/81	334000		380	9.5	7.5	140	247
4/28/81	621000		404	7.3	7.7	170	461
5/28/81	850000		310	6.8	7.8	140	690
6/24/81	876000		290	6.2	7.6	130	249
7/29/81	520000		395	6.4	7.5	160	490
9/22/81	322000		420	8	7.5	170	232
10/29/81	332000		502	7.4	7.8	200	170
1/6/82	482000		386	10.3	7.7	150	486
3/10/82	1090000		286	9.5	7.5	110	234
5/24/82	545000		473	7.3	7.5	170	
7/15/82	679000		440	7.2		150	726
12/6/82	911000		405	9.7	7.4	140	765
1/11/83	1380000	41.75	278	11	7.6	110	381
4/26/83	1470000	42.5	347	10.2	7.4		105
7/6/83	594000	22.8	411	7.2	7.8		204
11/17/83	365000	12	420		7.7		688
1/17/84	490000	17	320	12.3	7.5		100
5/23/84	1580000	45.5	284	7	7.1		231
7/18/84	720000	26	387	6.9	7.5		262

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μS/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MGL)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MGL)
11/9/84	773000	26.75	327	8.1	7.8		300
1/23/85	740000		370	9.8	7.9		69
3/28/85	1290000		339	8.7	7.6		56
7/23/85	365000	12.25	397	6.7	7.9		
11/5/85	568000	20.5	431	8.3	7.8	150	168
1/15/86	450000	14	425	9.7	8.1	180	
4/10/86	624000	22.5	417	8.1	8	160	241
7/16/86	550000	17.4	530	7.2	8.1	210	
11/19/86	886000	29.5	414	9.3	8.2		291
1/28/87	591000	20.1	439	12	8.4		
4/22/87	948000	30.7	430	8.1	8		
8/13/87	274000	7.6	460	6.9	8.2		250
12/15/87	379000	11	443	7.8	7.7		166
2/10/88	918000	29.25	340	9.5	7.6		389
4/20/88	882000	30.75	396	9.2	7.8		183
6/2/88	281000	8	469		8		91
11/16/88	222000	3.5	484	7.5	7.7		
2/15/89	790000	25.25	300	9.2	7.5		
3/27/89	938000	35.5	317		7.7		202
6/23/89	876000	31.75	340	7.3	7.6		210
11/14/89	182000	10.5	405	9.3	7.8		
6/23/90	1050000	36.75	316		7.4		303
11/30/90	316000	9.3	415	9.3	7.9		15
2/15/91	847000	29.8	340	11.3	7.6		66
5/31/91	876000	32.8	330		7.6		9
7/26/91	373000	13.3	370	7.6	7.5		9

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TABLE 2.3-27 (Continued)

SAMPLE DATE	INSTANTANEOUS DISCHARGE, CFS	GAGE HEIGHT IN FEET	SPECIFIC CONDUCTANCE (μS/CM AT 25 °C)	DISSOLVED OXYGEN (DO) (MGL)	pH, WATER, WHOLE, FIELD, STANDARD UNITS	HARDNESS TOTAL (MG/L AS CaCO3)	SEDIMENT, SUSPENDED CONCENTRATION (MGL)
11/15/91	374000	11.7		10.5	8.1		12
1/10/92	744000	25.48	355	11.4	8.1		66
4/3/92	872000	30.2	323	10.4	7.9		117
7/24/92	570000	20.38	392	6.5	8		179
10/23/92	300000	7.29	408	9.7	8		143
1/22/93	1100000	35.96	320	11.5	7.9		284
4/30/93	1280000	42.6	349	9.5	7.9		194
7/23/93	938000	35.4	371	5.7	7.8		259
10/15/93	853000	31.83	348	8.4	7.8		171
2/4/94	1030000	33.04	298	12.1	7.9		338
5/20/94	1260000	42.3	343	8.1	7.5		159
8/26/94	356000	13.28	429	7.6	7.9		53
6/16/97	951000	37.05	375		7.3		
6/16/97			375	7.2	7.3		
8/2/99	410000	15.7	480	5.9	7.6		
Minimum	176000		181	5.5	5.6	81	9
Maximum	1930000		530	13.6	9.1	210	765

SOURCE:
USGS <http://waterdata.usgs.gov/nwis/qw> (Reference 42).

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Table 2.3-28

USGS WATER QUALITY SAMPLING DATA FOR THE MISSISSIPPI RIVER NEAR ST.
JOSEPH, LOUISIANA, APPROXIMATELY AT RIVER MILE 390
STATION NO. 315218091150000

Sample Date	Parameter Value	Full Parameter Name and Units
8/12/1976	27.0	TEMPERATURE, WATER (DEG. C)
8/12/1976	20	TURBIDITY (JACKSON CANDLE UNITS)
8/12/1976	10	COLOR (PLATINUM-COBALT)
8/12/1976	430	SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C)
8/12/1976	8.0	OXYGEN DISSOLVED (MG/L)
8/12/1976	99	OXYGEN DISSOLVED (% OF SATURATION)
8/12/1976	18	CHEMICAL OXYGEN DEMAND, HIGH LEVEL, (MG/L)
8/12/1976	8.0	pH, WATER, WHOLE, FIELD, STANDARD UNITS
8/12/1976	2.2	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)
8/12/1976	113	ACID NEUTRALIZING CAPACITY (ANC), WATER, UNFILTERED, FIXED ENDPOINT TITRATION, FIELD, MG/L AS CaCO3
8/12/1976	140	ACID NEUTRALIZING CAPACITY (ANC), WATER, UNFILTERED, BICARBONATE, FIXED ENDPOINT TITRATION, FIELD, MILLIGRAMS PER LITER AS HCO3
8/12/1976	0.0	ACID NEUTRALIZING CAPACITY (ANC), WATER, UNFILTERED, CARBONATE, FIXED ENDPOINT TITRATION, FIELD, MILLIGRAMS PER LITER AS
8/12/1976	0.0	OIL AND GREASE TOTAL RECOVERABLE, GRAVIMETRIC FREON EXTRACTABLE (MG/L)
8/12/1976	1.3	NITROGEN TOTAL (MG/L AS N)
8/12/1976	0.65	NITROGEN ORGANIC TOTAL (MG/L AS N)
8/12/1976	0.01	NITROGEN AMMONIA TOTAL (MG/L AS N)
8/12/1976	0.66	NITROGEN AMMONIA PLUS ORGANIC TOTAL (MG/L AS N)
8/12/1976	0.7	NITROGEN NITRITE PLUS NITRATE TOTAL (MG/L AS N)
8/12/1976	0.100	PHOSPHORUS TOTAL (MG/L AS P)
8/12/1976	4.2	CARBON ORGANIC TOTAL (MG/L AS C)
8/12/1976	0.000	CYANIDE TOTAL (MG/L AS CN)
8/12/1976	170	HARDNESS TOTAL (MG/L AS CaCO3)
8/12/1976	52	NONCARBONATE HARDNESS WATER WHOLE TOTAL, FIELD, (MG/L AS CaCO3)
8/12/1976	43.0	CALCIUM DISSOLVED (MG/L AS Ca)
8/12/1976	14.0	MAGNESIUM DISSOLVED (MG/L AS Mg)
8/12/1976	23.0	SODIUM DISSOLVED (MG/L AS Na)
8/12/1976	0.8	SODIUM ADSORPTION RATIO
8/12/1976	3.10	POTASSIUM DISSOLVED (MG/L AS K)
8/12/1976	19.0	CHLORIDE DISSOLVED (MG/L AS Cl)
8/12/1976	66.0	SULFATE DISSOLVED (MG/L AS SO4)

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Table 2.3-28 (Continued)

Sample Date	Parameter Value	Full Parameter Name and Units
8/12/1976	35	STREPTOCOCCI, FECAL, MEMBRANE FILTER, M-ENTEROCOCCUS AGAR (COLONIES/100 ML)
8/12/1976	6	PHENOLS, TOTAL (UG/L)
8/12/1976	0.00	PCB, TOTAL (UG/L)
8/12/1976	0.0	PCB IN BOTTOM MATERIAL (UG/KG DRY SOLIDS)
8/12/1976	0.030	PHOSPHORUS ORTHOPHOSPHATE, TOTAL (MG/L AS P)
8/12/1976	5.9	NITROGEN, TOTAL (MG/L AS NO3)

SOURCE:

USGS, <http://waterdata.usgs.gov/nwis/qw> (Reference 42)

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TABLE 2.3-29

USGS WATER QUALITY DATA FOR THE MISSISSIPPI RIVER AT MILE 405
STATION NO. 315956091050000

Sample Date	Parameter Value	Full Parameter Name and Units
12/1/1980	316000	DISCHARGE, INSTANTANEOUS, CUBIC FEET PER SECOND
12/1/1980	15	CHEMICAL OXYGEN DEMAND, HIGH LEVEL, (MG/L)
12/1/1980	7.7	pH, WATER, WHOLE, LABORATORY, STANDARD UNITS
12/1/1980	65	RESIDUE, TOTAL NON FILTERABLE (MG/L)
12/1/1980	5	RESIDUE, VOLATILE NONFILTRABLE (MG/L)
12/1/1980	60	RESIDUE, FIXED NON FILTERABLE (MG/L)
12/1/1980	0	OIL AND GREASE TOTAL RECOVERABLE, GRAVIMETRIC FREON EXTRACTABLE (MG/L)
12/1/1980	1.1	NITROGEN TOTAL (MG/L AS N)
12/1/1980	0.91	NITROGEN DISSOLVED (MG/L AS N)
12/1/1980	0.19	NITROGEN ORGANIC TOTAL (MG/L AS N)
12/1/1980	0.08	NITROGEN ORGANIC DISSOLVED (MG/L AS N)
12/1/1980	0.04	NITROGEN AMMONIA DISSOLVED (MG/L AS N)
12/1/1980	0.11	NITROGEN AMMONIA TOTAL (MG/L AS N)
12/1/1980	0.02	NITROGEN, NITRITE, TOTAL, MG/L AS N
12/1/1980	0.78	NITROGEN NITRATE TOTAL (MG/L AS N)
12/1/1980	0.12	NITROGEN AMMONIA PLUS ORGANIC DISSOLVED (MG/L AS N)
12/1/1980	0.18	NITROGEN AMMONIA PLUS ORGANIC SUSPENDED TOTAL (MG/L AS N)
12/1/1980	0.30	NITROGEN AMMONIA PLUS ORGANIC TOTAL (MG/L AS N)
12/1/1980	0.8	NITROGEN NITRITE PLUS NITRATE TOTAL (MG/L AS N)
12/1/1980	0.790	NITROGEN NITRITE PLUS NITRATE DISSOLVED (MG/L AS N)
12/1/1980	0.170	PHOSPHORUS TOTAL (MG/L AS P)
12/1/1980	0.060	PHOSPHORUS DISSOLVED (MG/L AS P)
12/1/1980	7.9	CARBON ORGANIC TOTAL (MG/L AS C)
12/1/1980	0	CYANIDE TOTAL (MG/L AS CN)
12/1/1980	150	HARDNESS TOTAL (MG/L AS CAC03)
12/1/1980	39.0	CALCIUM DISSOLVED (MG/L AS CA)
12/1/1980	12.0	MAGNESIUM DISSOLVED (MG/L AS MG)
12/1/1980	20.0	SODIUM DISSOLVED (MG/L AS NA)
12/1/1980	0.7	SODIUM ADSORPTION RATIO
12/1/1980	3.20	POTASSIUM DISSOLVED (MG/L AS K)
12/1/1980	21.0	CHLORIDE DISSOLVED (MG/L AS CL)
12/1/1980	59.0	SULFATE DISSOLVED (MG/L AS SO4)
12/1/1980	1.0	ARSENIC DISSOLVED (UG/L AS AS)
12/1/1980	1	ARSENIC SUSPENDED TOTAL (UG/L AS AS)
12/1/1980	2	ARSENIC TOTAL (UG/L AS AS)
12/1/1980	0	BERYLLIUM DISSOLVED (UG/L AS BE)

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TABLE 2.3-29 (Continued)

Sample Date	Parameter Value	Full Parameter Name and Units
12/1/1980	10	BERYLLIUM SUSPENDED RECOVERABLE (UG/L AS BE)
12/1/1980	0	BERYLLIUM TOTAL (UG/L AS BE)
12/1/1980	0	CADMIUM DISSOLVED (UG/L AS CD)
12/1/1980	0	CADMIUM SUSPENDED (UG/L AS CD)
12/1/1980	0	CADMIUM TOTAL (UG/L AS CD)
12/1/1980	10.0	CHROMIUM DISSOLVED (UG/L AS CR)
12/1/1980	0	CHROMIUM SUSPENDED (UG/L AS CR)
12/1/1980	0	CHROMIUM HEXAVALENT DISSOLVED (UG/L AS CR)
12/1/1980	10	CHROMIUM TRIVALENT (UG/L AS CR)
12/1/1980	10	CHROMIUM TOTAL (UG/L AS CR)
12/1/1980	2.0	COPPER DISSOLVED (UG/L AS CU)
12/1/1980	4	COPPER SUSPENDED (UG/L AS CU)
12/1/1980	6.0	COPPER TOTAL (UG/L AS CU)
12/1/1980	50	IRON DISSOLVED (UG/L AS FE)
12/1/1980	0	LEAD DISSOLVED (UG/L AS PB)
12/1/1980	6	LEAD SUSPENDED (UG/L AS PB)
12/1/1980	6	LEAD TOTAL (UG/L AS PB)
12/1/1980	110	MANGANESE SUSPENDED (UG/L AS MN)
12/1/1980	120	MANGANESE TOTAL (UG/L AS MN)
12/1/1980	8.0	MANGANESE DISSOLVED (UG/L AS MN)
12/1/1980	2.00	NICKEL DISSOLVED (UG/L AS NI)
12/1/1980	5	NICKEL SUSPENDED (UG/L AS NI)
12/1/1980	7	NICKEL TOTAL (UG/L AS NI)
12/1/1980	0	VANADIUM DISSOLVED (UG/L AS V)
12/1/1980	0	ZINC DISSOLVED (UG/L AS ZN)
12/1/1980	20	ZINC SUSPENDED (UG/L AS ZN)
12/1/1980	20	ZINC TOTAL (UG/L AS ZN)
12/1/1980	0	SELENIUM DISSOLVED (UG/L AS SE)
12/1/1980	0	SELENIUM SUSPENDED (UG/L AS SE)
12/1/1980	0	SELENIUM TOTAL (UG/L AS SE)
12/1/1980	0	PHENOLS, TOTAL (UG/L)
12/1/1980	≤0.1	PCB, TOTAL (UG/L)
12/1/1980	8.1	CHLOROPHYLL-A, PHYTOPLANKTON, CHROMOTOGRAPHIC-FLUOROMETRIC (UG/L)
12/1/1980	1.4	CHLOROPHYLL-B, PHYTOPLANKTON, CHROMOTOGRAPHIC-FLUOROMETRIC (UG/L)
12/1/1980	0.13	NITROGEN, AMMONIA, TOTAL (MG/L AS NH4)
12/1/1980	0.05	NITROGEN, AMMONIA, DISSOLVED (MG/L AS NH4)
12/1/1980	0.52	PHOSPHORUS TOTAL (MG/L AS PO4)
12/1/1980	4.9	NITROGEN, TOTAL (MG/L AS NO3)

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TABLE 2.3-29 (Continued)

Sample Date	Parameter Value	Full Parameter Name and Units
12/1/1980	≤0.1	MERCURY, DISSOLVED (UG/L AS HG)
12/1/1980	≤0.1	MERCURY, TOTAL RECOVERABLE (UG/L AS HG)
12/1/1980	2.4	POTASSIUM 40 DISSOLVED (PCI /L AS K40)
12/1/1980	403	SPECIFIC CONDUCTANCE MICROSIEMENS/CM AT 25 DEG C
12/1/1980	100	ACID NEUTRALIZING CAPACITY (ANC), WATER, UNFILTERED, TITRATION TO pH 4.5, LABORATORY, MILLIGRAMS PER LITER AS CaCO ₃
12/1/1980	47	HARDNESS, NONCARBONATE, AS CaCO ₃ , MG/L

SOURCE:

USGS <http://waterdata.usgs.gov/nwis/gw> (Reference 42)

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TABLE 2.3-30

USGS WATER QUALITY SAMPLING DATA FOR THE MISSISSIPPI RIVER
AT MILE 402, STATION NO. 315847091072700

Sample Date	Parameter Value	Full Parameter Name and Units
11/21/96	11.5	TEMPERATURE, WATER (DEG. C)
11/21/96	750	BAROMETRIC PRESSURE (MM OF HG)
11/21/96	359	SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C)
11/21/96	9.9	OXYGEN DISSOLVED (MG/L)
11/21/96	7.7	pH, WATER, WHOLE, FIELD, STANDARD UNITS
11/21/96	74	ALPHA-BHC, D6-, SURROGATE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, PERCENT
11/21/96	76	BIPHENYL, 3,5-DICHLORO- SURROGATE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, PERCENT
11/21/96	18	LIPIDS, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, PERCENT
11/21/96	≤5	ALDRIN, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	160	PCB, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤200	TOXAPHENE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	PENTACHLOROANISOLE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	OXYCHLORDANE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	TRANS-NONACHLOR, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	CIS-NONACHLOR, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	MIREX, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	METHOXYCHLOR, P,P'-, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	METHOXYCHLOR, O,P'-, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	LINDANE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	DELTA-BHC, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	BETA-BHC BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM

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TABLE 2.3-30 (Continued)

Sample Date	Parameter Value	Full Parameter Name and Units
11/21/96	≤5	ALPHA-BHC, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	BENZENE, HEXACHLORO-, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	HEPTACHLOR EPOXIDE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	HEPTACHLOR, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	ENDRIN, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	18	DIELDRIN, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	O,P'-DDE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	O,P'-DDD, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	36	P,P'-DDD, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	P,P'-DDT, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	O,P'-DDT, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤5	DCPA, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	TRANS-CHLORDANE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM
11/21/96	≤10	CIS-CHLORDANE, BIOTA, WHOLE ORGANISM, WET WEIGHT, RECOVERABLE, MICROGRAMS PER KILOGRAM

SOURCE:

USGS <http://waterdata.usgs.gov/nwis/qw> (Reference 42)

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TABLE 2.3-31
(FER TABLE 2.4.15)

RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES, 1972

A ¹	B	C	D	E	F	G	H	J	K	L
pH	7.9	7.2	7.6	8.0	7.3	7.4	7.1	7.8	7.6	7.2
Dissolved carbon dioxide, ppm	8.2	5.5	4.6	4.4	37.0	22.0	58.0	7.0	23.0	10.0
Conductivity, mhos/cm	640.0	250.0	75.0	375.0	490.0	450.0	460.0	325.0	430.0	210.0
Color, Co-Pt units	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total solids, ppm	664.0	514.0	184.0	408.0	626.0	548.0	448.0	508.0	434.0	902.0
Suspended solids, ppm	60.0	88.0	106.0	50.0	154.0	98.0	6.0	192.0	22.0	625.0
Dissolved solids, ppm	604.0	426.0	78.0	358.0	472.0	450.0	442.0	316.0	412.0	277.0
Total hardness as CaCo ₃ , ppm	285.1	275.3	20.2	290.4	443.3	405.7	350.8	141.9	326.8	208.0
Calcium, ppm	66.2	64.3	3.3	70.7	99.2	92.4	68.5	30.8	62.8	-
Magnesium, ppm	29.0	27.8	2.9	28.5	47.4	42.4	43.6	15.8	41.2	-
Alkalinity as CaCo ₃ , ppm PP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(MO)	596.0	372.0	30.0	326.0	445.0	401.0	371.0	114.0	337.0	210.0
Silica, ppm	17.5	16.5	17.1	17.5	22.5	22.5	22.5	7.0	22.5	17.5
Chlorides, ppm	9.8	6.8	5.5	4.8	3.5	5.5	5.5	18.0	5.5	9.0
Sulfates, ppm	2.1	5.3	8.2	2.5	<0.1	<0.1	<0.1	45.7	<0.1	22.6
Nitrates, ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.3
Iron, ppm	<0.3	<0.3	3.6	<0.3	<0.3	<0.3	<0.02		<0.02	<0.020
Manganese, ppm	0.44	0.22	0.013	0.019	3.4	<0.05	<0.009		<0.009	<0.009
Potassium, ppm	5.9	5.9	1.5	3.6	1.6	2.0	1.46	3.69	1.79	1.8
Sodium, ppm	94.2	44.2	7.1	11.9	6.6	7.2	12.3	19.5	8.2	15.5
Lead, ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.009		<0.009	<0.009
Zinc, ppm	0.19	0.32	0.6	0.23	1.0	0.5	<0.020		<0.020	<0.020
Copper, ppm	<0.01	<0.01	<0.01	<0.01	-	0.0	<0.020		<0.020	<0.020

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TABLE 2.3-31 (Continued)

<u>A¹</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>J</u>	<u>K</u>	<u>L</u>
Aluminum, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.009		<0.009	<0.009
Coliform	-	-	-	-	Negative	Negative	-	-	-	-
Arsenic, ppm	0.009	0.009	0.003	0.001	-	-	0.005		0.009	0.004
Chromium, ppm	-	-	-	-	<0.005	-	<0.009		<0.009	<0.009
Fluoride, ppm	-	0.10	0.10	0.10	-	-	0.10	0.10	0.10	0.10

Sample Identification and Date of Sample Collection:

A - Well 6²; Mississippi River Alluvium, 2/9/72
B - Well 31; Pleistocene Terrace Deposits, 2/10/72
C - Well 4; Catahoula Formation 2/10/72
D - Bayou Pierre (surface water), 2/9/72
E - Well 1; Mississippi River Alluvium 2/9/72
F - P11; Mississippi River Alluvium 5/3/72
G - OW4; Mississippi River Alluvium 5/3/72
H - Test Water Well 1; Pleistocene Terrace Deposits, 6/30/72
J - Mississippi River (surface water), 6/29/72
K - Piezometer P34 (El. +55); Pleistocene Terrace Deposits, 5/24/72
L - OW118; Pleistocene Terrace Deposits, 10/10/72

NOTES:

1. Sample locations shown on Figure 2.3-6
2. Well data contained in Tables 2.3-17 and 2.3-18

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TABLE 2.3-32
USGS GROUND WATER QUALITY SAMPLING DATA

Catahoula Formation																			
USGS WELL ID	APPROX. DISTANCE AND DIRECTION FROM GGNS	DEPTH OF WELL (FT BELOW LAND SURFACE)	SAMPLE DATE	TEMP. ° C	COLOR (PLATINUM-COBALT UNITS)	SPECIFIC CONDUCTANCE (µS/CM)	pH	DISSOLVED CARBON DIOXIDE (MG/L AS CO ₂)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO ₄)	HARDNESS TOTAL (MG/L AS CaCO ₃)	DISSOLVED CALCIUM (MG/L AS Ca)	DISSOLVED MAGNESIUM (MG/L AS Mg)	DISSOLVED SODIUM, (MG/L AS Na)	DISSOLVED CHLORIDE (MG/L AS Cl)	DISSOLVED SULFATE (MG/L AS SO ₄)	DISSOLVED FLUORIDE (MG/L AS F)	DISSOLVED SILICA (MG/L AS SiO ₂)	IRON (MG/L AS Fe)	
L004 Port Gibson	6 mi. southeast	177	2/13/61				7.3	3.9			3.00	1.10	125	8.0	9.7	0.3	17.0	100	
L079 Port Gibson	6 mi. southeast	170	4/20/89	20		498	6.8												
L003 Port Gibson	6 mi. southeast	153	3/22/61	20	20	523	7.4		0.200	52	12.0	5.40	101	8.3	0.6	0.2	56.0	160	
F003 Port Gibson	6 mi. southeast	206	11/3/61	20		557	8.0			15	4.7	0.8	136	17.0	3.0	0.8	49.0	50	
L062 Port Gibson	6 mi. southeast	300	6/29/79	20.5	3	265	6.2	141		98	23.0	9.8	13	5.3	12.0	0.1	56.0	560	

Mississippi River Alluvial Aquifer													
USGS WELL ID	APPROX. DISTANCE AND DIRECTION FROM GGNS	DEPTH OF WELL, TOTAL (FEET)	COLOR (PLATINUM-COBALT UNITS)	SPECIFIC CONDUCTANCE (µS /CM)	pH	DISSOLVED CARBON DIOXIDE (MG/L AS CO ₂)	TOTAL HARDNESS (MG/L AS CaCO ₃)	DISSOLVED CALCIUM (MG/L AS Ca)	DISSOLVED MAGNESIUM (MG/L AS Mg)	DISSOLVED SODIUM, (MG/L AS Na)	DISSOLVED CHLORIDE (MG/L AS Cl)	DISSOLVED SULFATE (MG/L AS SO ₄)	DISSOLVED FLUORIDE (MG/L AS F)
E002 MP&L	On-site	11/17/77	20	673	7.2	36	270	71.0	23.0	39.0	29.0	21.0	0.4
E019 Vicksburg No. 11	25 mi. north	2/5/86	15	520	7.4			64.0	20.0	18.0	10.0	5.8	0.3
E023 Warren	25 mi. north	4/20/89		525	7.1								

SOURCE:
USGS <http://waterdata.usgs.gov/ms/nwis> (Reference 42).

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TABLE 2.3-33
MISSISSIPPI RIVER AND RADIAL WELL WATER QUALITY AT GGNS

Sample Date	Sample Location	Temperature (°F)	pH	Specific Conductance μ mhos/cm	Total Dissolved Solids	Total Alkalinity (as CaCO ₃) mg/l	Sulfate (SO ₄) mg/l	Chloride (as Cl) mg/l	Total Hardness mg/l	Total Iron (as Fe) mg/l	Sand Content mg/l
1/19/88	River	45.5	7.58	348.3	348.0	96	36	15	132	3.3	NA
4/9/88		60.8	7.30	394.7	394.7	106	52	25	123	3.1	NA
7/12/88		84.6	8.04	547.0	547.0	146	128	83	164	1.21	NA
1/19/88	Radial Well No. 1	59.9	7.20	505.6	506.0	140	46	22	175	2.5	<5
4/9/88		54.5	7.22	461.9	461.9	136	56	44	140	2.5	<0.5
7/12/88		70.8	7.24	512.3	512.3	148	90	189	146	1.97	<10
1/19/88	Radial Well No. 3	64.4	7.18	541.5	542.0	142	61	24	185	1.8	<5
4/9/88		54.5	7.11	478.1	478.1	146	49	58	147	2.6	<0.5
7/12/88		70.2	7.15	556.5	556.5	162	56	49	158	2.96	<10
1/19/88	Radial Well No. 4	59.9	7.04	550.6	551.0	174	50	18	223	3.0	<5
4/9/88		52.7	7.16	468.9	468.9	148	51	35	144	2.4	<0.5
7/12/88		72.8	7.19	547.7	547.7	160	74	132	164	2.78	<10
1/19/88	Radial Well No. 5	61.7	7.18	520.2	520.0	150	62	24	190	1.8	<5
4/9/88		56.3	7.05	538.0	538.0	142	46	43	155	0.76	<0.5
7/12/88		70.0	7.16	557.9	557.9	158	72	59	166	2.52	<10

SOURCE: Hydro Group, Ranney Division, "Annual Report, Collector Well Performance, PSW Wells 1, 3, 4, and 5," February, 1989. (Reference 46)

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TABLE 2.3-34

CHEMICAL ANALYSIS OF WATER SAMPLES, THREE POTABLE WELLS LOCATED AT THE
GGNS SITE PROPOSED POWER BLOCK LOCATION

Well Number Date Sampled	110011-01, MS-GW-02967 2/9/99	110011-03, MS-GW-14989 3/13/00	110011-04, MS-GW-15026 2/21/02
pH (lab)	8.2	7.1	7.1
Alkalinity (P) as CaCO ₃	0 mg/l	0 mg/l	0 mg/l
Alkalinity (T) as CaCO ₃	451.0 mg/l	400.0 mg/l	380.0 mg/l
Aluminum as AL			0.003 mg/l
Chloride	49.9 mg/l	19.8 mg/l	13.4 mg/l
Sulfate		8.1 mg/l	48.0 mg/l
Fluoride		0.3 mg/l	0.4 mg/l
Free Carbon Dioxide	6.0 mg/l	110.0 mg/l	66.0 mg/l
Iron (lab)	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l
Magnesium	5.4 mg/l	39.4 mg/l	40.8 mg/l
Manganese	0.003 mg/l	0.001 mg/l	0.002 mg/l
Calcium	12.4 mg/l	96.9 mg/l	87.0 mg/l
Sodium		13.5 mg/l	16.3 mg/l
Potassium		1.6 mg/l	1.2 mg/l
Total Dissolved Residue		420.0 mg/l	435.0 mg/l
Ca + Mg Hardness as CaCO ₃	53.0 mg/l	404.0 mg/l	385.0 mg/l
Zinc			0.021 mg/l

NOTES:

1. pH value has no units, other values reported in milligrams per liter (mg/l)

SOURCE:

GGNS data, 2002

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TABLE 2.4-1

COMMON FOREST OVERSTORY AND UNDERSTORY VEGETATION ON THE GGNS SITE, 1972-1973

	Forest Overstory		Understory Vegetation	
	Total Number of Taxa Recorded: 27	Common Species Sugarberry (<i>Celtis laevigata</i>) Pecans (<i>Carya</i> spp.) Green ash (<i>Fraxinus pennsylvanica</i>) Black willow (<i>Salix nigra</i>) Swamp privet (<i>Forestiera acuminata</i>) Box elder (<i>Acer negundo</i>)	Total Number of Taxa Recorded: 97	Common Species Asters (<i>Aster</i> spp.) Buckvine (<i>Ampelopsis arborea</i>) Dewberries (<i>Rubus</i> spp.) Grasses (<i>Poaceae</i>) Sugarberry (<i>Celtis laevigata</i>) Poison ivy (<i>Rhus radicans</i>) False nettle (<i>Boehmeria cylindrica</i>) Johnson grass (<i>Sorghum halepense</i>) Trumpet creeper (<i>Campsis radicans</i>) Ladies eardrops (<i>Brunnichia cirrhosa</i>)
Bluff	Total Number of Taxa Recorded: 46	Common Species Sweetgum (<i>Liquidambar styraciflua</i>) Water oak (<i>Quercus nigra</i>) Southern red oak (<i>Quercus falcata</i>) American elm (<i>Ulmus americana</i>) Hickories (<i>Carya</i> spp.)	Total Number of Taxa Recorded: 114	Common Species Switchcane (<i>Arundinaria tecta</i>) Grasses (<i>Poaceae</i>) Poison ivy (<i>Rhus radicans</i>) Japanese honeysuckle (<i>Lonicera japonica</i>) Winged elm (<i>Ulmus alata</i>) Sedges (<i>Carex</i> spp., <i>Cyperus</i> spp.) Oaks (<i>Quercus</i> spp.) Asters (<i>Aster</i> spp.) Rattan (<i>Berchemia scandens</i>) Green briars (<i>Smilax</i> spp.)
	Forest Overstory		Understory Vegetation	
	Total Number of Taxa Recorded: 27	Common Species Sugarberry (<i>Celtis laevigata</i>) Pecans (<i>Carya</i> spp.) Green ash (<i>Fraxinus pennsylvanica</i>) Black willow (<i>Salix nigra</i>) Swamp privet (<i>Forestiera acuminata</i>) Box elder (<i>Acer negundo</i>)	Total Number of Taxa Recorded: 48	Common Species Asters (<i>Aster</i> spp.) Dewberries (<i>Rubus</i> spp.) Grasses (<i>Poaceae</i>) Nemophila (<i>Nemophila microcalyx</i>) Sedges (<i>Carex</i> spp., <i>Cyperus</i> spp.) Daisy fleabane (<i>Erigeron</i> spp.) Vetches (<i>Vicia</i> spp.) Violets (<i>Viola</i> spp.) Chickweed (<i>Stellaria</i> spp.) Bedstraw (<i>Galium</i> spp.)
Winter 1973	Forest Overstory		Understory Vegetation	
Bottomland	Total Number of Taxa Recorded: 27	Common Species Sugarberry (<i>Celtis laevigata</i>) Pecans (<i>Carya</i> spp.) Green ash (<i>Fraxinus pennsylvanica</i>) Black willow (<i>Salix nigra</i>) Swamp privet (<i>Forestiera acuminata</i>) Box elder (<i>Acer negundo</i>)	Total Number of Taxa Recorded: 48	Common Species Asters (<i>Aster</i> spp.) Dewberries (<i>Rubus</i> spp.) Grasses (<i>Poaceae</i>) Nemophila (<i>Nemophila microcalyx</i>) Sedges (<i>Carex</i> spp., <i>Cyperus</i> spp.) Daisy fleabane (<i>Erigeron</i> spp.) Vetches (<i>Vicia</i> spp.) Violets (<i>Viola</i> spp.) Chickweed (<i>Stellaria</i> spp.) Bedstraw (<i>Galium</i> spp.)

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TABLE 2.4-1 (Continued)

Bluff	Total Number of Taxa Recorded: 46	Common Species	Total Number of Taxa Recorded: 60	Common Species	
		Sweetgum (<i>Liquidambar styraciflua</i>) Water oak (<i>Quercus nigra</i>) Southern red oak (<i>Quercus falcata</i>) American elm (<i>Ulmus americana</i>) Hickories (<i>Carya</i> spp.)		Switchcane (<i>Arundinaria tecta</i>) Japanese honeysuckle (<i>Lonicera japonica</i>) Grasses (<i>Poaceae</i>) Sedges (<i>Carex</i> spp., <i>Cyperus</i> spp.) Asters (<i>Aster</i> spp.)	Nemophila (<i>Nemophila microcalyx</i>) Oaks (<i>Quercus</i> spp.) Haircap moss (<i>Family Musci</i>) Crossvine (<i>Bignonia capreolata</i>) Violet (<i>Viola</i> spp.)
Spring 1973	Forest Overstory		Understory Vegetation		
Bottomland	Total Number of Taxa Recorded: 27	Common Species	No sampling could be conducted in the bottomlands due to flooding.	Common Species	
		Sugarberry (<i>Celtis laevigata</i>) Pecans (<i>Carya</i> spp.) Green ash (<i>Fraxinus pennsylvanica</i>) Black willow (<i>Salix nigra</i>) Swamp privet (<i>Forestiera acuminata</i>) Box elder (<i>Acer negundo</i>)			
Bluff	Total Number of Taxa Recorded: 46	Common Species	Total Number of Taxa Recorded: 148	Common Species	
		Sweetgum (<i>Liquidambar styraciflua</i>) Water oak (<i>Quercus nigra</i>) Southern red oak (<i>Quercus falcata</i>) American elm (<i>Ulmus americana</i>) Hickories (<i>Carya</i> spp.)		Poison ivy (<i>Rhus radicans</i>) Switchcane (<i>Arundinaria tecta</i>) Japanese honeysuckle (<i>Lonicera japonica</i>) Grasses (<i>Poaceae</i>) Spreading bladder fern (<i>Cystopteris fragilis</i>)	Sedges (<i>Carex</i> spp., <i>Cyperus</i> spp.) Winged elm (<i>Ulmus alata</i>) Virginia creeper (<i>Parthenocissus quinquefolia</i>) Rattan (<i>Berchemia scandens</i>) Oaks (<i>Quercus</i> spp.)

SOURCE: Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8

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TABLE 2.4-2

MAMMALS COLLECTED OR OBSERVED AT THE GGNS SITE, 1972 - 1973

Small Mammals		Larger Mammals	
Common Name	Scientific Name	Common Name	Scientific Name
White-footed mouse	<i>Peromyscus leucopus</i>	Eastern chipmunk	<i>Tamias striatus</i>
Cotton mouse	<i>Peromyscus gossypinus</i>	Gray squirrel	<i>Sciurus carolinensis</i>
House mouse	<i>Mus musculus</i>	Fox squirrel	<i>Sciurus niger</i>
Fulvous harvest mouse	<i>Reithrodontomys fulvescens</i>	Cottontail rabbit	<i>Sylvilagus floridanus</i>
Golden mouse	<i>Ochrotomys noutalli</i>	Swamp rabbit	<i>Sylvilagus aquaticus</i>
Pine vole	<i>Pityms pinetorium</i>	Beaver	<i>Castor canadensis</i>
Shorttail shrew	<i>Blarina brevicauda</i>	Raccoon	<i>Procyon lotor</i>
Least shrew	<i>Cryptotis parva</i>	Opposum	<i>Didelphis marsupialis</i>
Hispid cotton rat	<i>Sigmodon hispidus</i>	Armadillo	<i>Dasypus novemcinctus</i>
Rice rat	<i>Oryzomys palustris</i>	Striped skunk	<i>Mephitis mephitis</i>
		Gray fox	<i>Urocyon cinereoargenteus</i>
		Red fox	<i>Vulpes fulva</i>
		Bobcat	<i>Lynx rufus</i>
		Whitetail deer	<i>Odocoileus virginianus</i>

SOURCE:

Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8

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TABLE 2.4-3

COMMON BIRDS OF THE FOREST AND FIELD-FOREST COMMUNITIES OBSERVED SEASONALLY AT THE GGNS SITE, 1972-1973

Forest Community					
Year Round Residents		Summer Residents		Winter Residents	
Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Cardinal	<i>Cardinalis cardinalis</i>	White-eyed vireo	<i>Vireo olivaceus</i>	White-throated Sparrow	<i>Zonotrichia albicollis</i>
Carolina wren	<i>Thryothorus ludovicianus</i>	Red-eyed vireo	<i>Vireo griseus</i>	Robin	<i>Turdus migratorius</i>
Carolina Chickadee	<i>Parus carolinensis</i>	Parula Warbler	<i>Parula americana</i>	Yellow-shafted Flicker	<i>Colaptes auratus</i>
Blue Jay	<i>Cyanocitta cristata</i>	Hooded Warble	<i>Wilsonia citrina</i>	Ruby-crowned Kinglet	<i>Regulus calendula</i>
Rufous-sided Towhee	<i>Pipilio erythrophthalmus</i>	Prothonotary Warbler	<i>Protonotaria citrea</i>	Myrtle warbler	<i>Dendroica coronata</i>
Red-bellied Woodpecker	<i>Centurus carolinus</i>	Worm-eating Warbler	<i>Helmitheros vermivorus</i>	Yellow-bellied Sapsucker	<i>Sphvrapicus varius</i>
Tufted Titmouse	<i>(Parus bicolor</i>	Acadian Flycatcher	<i>Empidonax virescens</i>		
Brown Thrasher	<i>Taxostoma rufum</i>	Indigo Bunting	<i>Passerina cyanea</i>		
		Yellow-billed Cuckoo	<i>Coccyzus americanus</i>		
Field-Forest Community					
Year Round Residents		Summer Residents		Winter Residents	
Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Mourning Dove	<i>Zenaidura macroura</i>	Indigo Bunting	<i>Passerina cyanea</i>	White-throated Sparrow	<i>Zonotrichia albicollis</i>
Bobwhite	<i>Colinus virginianus</i>	Painted Bunting	<i>Passerine ciris</i>	Fox Sparrow	<i>Passerella iliaca</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Yellow-breasted Chat	<i>Icteria virens</i>	Lark Sparrow	<i>Chondestes grammacus</i>
Mocking Bird	<i>Mimus polyglottos</i>	Yellowthroat	<i>Geothlypis thrichas</i>	Field Sparrow	<i>Spizella pusilla</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Rough-winged Swallow	<i>Stelgidopteryx ruficollis</i>		
		Orchard Oriole	<i>Icterus spurius</i>		

SOURCE:

Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8.

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TABLE 2.4-4

BIRDS OBSERVED ON HAMILTON AND/OR GIN LAKES, 1972 - 1973

Water Birds		Water Fowl	
Common Name	Scientific Name	Common Name	Scientific Name
Anhinga	<i>Anhinga anhinga</i>	Wood duck	<i>Aix sponsa</i>
Great blue heron	<i>Ardea herodias</i>	Mallard	<i>Anas platyrhynchos</i>
Little blue heron	<i>Florida caerulea</i>	Canvasback	<i>Aythya valisineria</i>
Green heron	<i>Butorides virescens</i>	Gadwall	<i>Anas strepera</i>
Louisiana heron	<i>Hydranassa tricolor</i>	Pintail	<i>Anas acuta</i>
Cattle egret	<i>Bubulcus ibis</i>	Blue-winged teal	<i>Anas discors</i>
Common egret	<i>Casmerodius albus</i>	Green-winged teal	<i>Anas carolinensis</i>
White ibis	<i>Eudocimus albus)</i>		
Wood ibis	<i>Mvcteria amxana</i>		
American coot	<i>Fulica americana</i>		
Pied-billed grebe	<i>Podilymbus podiceps</i>		
Belted kingfisher	<i>Megaceryle alcyon</i>		

SOURCE:

Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8

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TABLE 2.4-5

BIRDS OF SPECIAL INTEREST OBSERVED ON
OR NEAR THE GGNS SITE, 1972 - 1973

Vultures, Hawks, and Falcons

Common Name	Scientific Name
Black vulture	<i>Coragyps atratus</i>
Turkey vulture	<i>Carthartes aura</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Broad-winged hawk	<i>Buteo platypterus</i>
American kestrel	<i>Falco sparverius</i>
Marsh hawk	<i>Circus cyaneus</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Mississippi kite	<i>Ictinia mississippiensis</i>

Owls

Common Name	Scientific Name
Great horned	<i>Bubo Virginianus</i>
Screech owl	<i>Otus asio</i>
Barn owl	<i>Tyto alba</i>
Barred owl	<i>Strix varia</i>

Upland Game Birds

Common Name	Scientific Name
Woodcock	<i>Philohela minor</i>
Mourning dove	<i>Zenaidura macroura</i>
Bobwhite	<i>Colinus virginianus</i>
Wild turkey	<i>Meleagris gallopavo</i>

SOURCE: Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8

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TABLE 2.4-6

TERRESTRIAL SPECIES OF SPECIAL INTEREST POTENTIALLY OCCURRING AT GGNS

Common Name	Scientific Name	Federal Status	State Listing	State Status
Louisiana black bear	<i>Ursus americanus luteolus</i>	Threatened	MS	Critically imperiled
Florida panther	<i>Puma concolor coryi</i>	Endangered	MS	Historically occurred
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	LA	Endangered
Interior least tern	<i>Sterna antillarum</i>	Endangered	LA	Endangered
White ibis	<i>Eudocimus albus</i>		MS	Rare or uncommon
Wood stork	<i>Mycteria americana</i>		MS	Endangered
Mississippi map turtle	<i>Graptemys pseudogeographica kohni</i>		MS	Secure
Webster's salamander	<i>Plethodon websteri</i>		MS	Rare or uncommon
Monkeyflower	<i>Mimulus ringens</i>		LA	

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TABLE 2.4-7

COMMON FISH OBSERVED AT OR NEAR GGNS, 1972 - 1973

Common Name	Scientific Name	Water Body Reported In				
		Mississippi River	Big Black River	Hamilton & Gin Lakes	Streams A and B	Stock Ponds
Paddlefish	<i>Polyodon spathula</i>			X		
Gizzard shad	<i>Dorosoma cepedianum</i>	X	X	X		
Blue catfish	<i>Ictalurus furcatus</i>	X	X			
River carpsucker	<i>Carpionodes carpio</i>	X	X			
Freshwater drum	<i>Aplodinotus grunniens</i>	X	X			
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	X				
White crappie	<i>Pomoxis annularis</i>		X			
Black crappie	<i>Pomoxis nigromaculatus</i>		X			
Silver chub	<i>Hybopsis storeriana</i>					
Flathead catfish	<i>Pylodictis olivaris</i>		X			
Shortnose gar	<i>Lepisosteus platostomus</i>		X			
Smallmouth buffalo	<i>Ictiobus bubalus</i>		X			
Channel Catfish	<i>Ictalurus punctatus</i>					X
Threadfin shad	<i>Dorosoma petenense</i>	X				
Emerald shiner	<i>Notropis atherinoides</i>	X				
River Shiner	<i>Notropis blennioides</i>	X				
Silvery minnow	<i>Hybognathus nuchalis</i>	X				
Mosquitofish	<i>Gambusia affinis</i>	X				X

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TABLE 2.4-7 (Continued)

Common Name	Scientific Name	Water Body Reported In					Stock Ponds
		Mississippi River	Big Black River	Hamilton & Gin Lakes	Streams A and B		
Mississippi silverside	<i>Medidia audens</i>	X					
Skipjack herring	<i>Alosa chrysochloris</i>	X		X			
White bass	<i>Morone chrysops</i>	X		X			
Largemouth Bass	<i>Micropterus salmoides</i>	X		X			
Bluegill sunfish	<i>Lepomis macrochirus</i>			X		X	
Bluntnose minnow	<i>Pimephales notatus</i>			X	X		
Green sunfish	<i>Lepomis cyanellus</i>				X		
Longear sunfish	<i>Lepomis megalotis</i>				X		
Warmouth	<i>Lepomis gulosus</i>				X		

SOURCE:

Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8

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TABLE 2.4-8

AQUATIC SPECIES OF SPECIAL INTEREST POTENTIALLY OCCURRING AT GGNS

Common Name	Scientific Name	Federal Status	State Listing	State Status
Paddlefish	<i>Polyodon spathula</i>		MS LA	Rare or uncommon Same
Pallid sturgeon	<i>Scaphirhynchus albus</i>	Endangered	MS LA	Critically imperiled Endangered
Chestnut lamprey	<i>Ichthyomyzon castaneus</i>		MS	Rare or uncommon
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Threatened		
Bayou darter	<i>Etheostoma rubrum</i>		MS	Rare or uncommon
Blue sucker	<i>Cycleptus elongates</i>		MS	Rare or uncommon
Black buffalo	<i>Ictiobus niger</i>		MS	Rare or uncommon
Crystal darter	<i>Crystallaria asprella</i>		MS	Critically imperiled

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TABLE 2.5-1
PROJECTED POPULATION DISTRIBUTION, 0-10 MILES

Sector/Year	0-1	1-2	2-3	3-4	4-5	5-10	Total
NORTH							
2002	0	3	0	0	0	10	13
2030	0	3	0	0	0	10	13
2040	0	3	0	0	0	10	13
2050	0	3	0	0	0	10	13
2060	0	3	0	0	0	10	13
2070	0	3	0	0	0	10	13
N-NE							
2002	0	11	0	0	0	3	14
2030	0	11	0	0	0	3	14
2040	0	11	0	0	0	3	14
2050	0	11	0	0	0	3	14
2060	0	11	0	0	0	3	14
2070	0	11	0	0	0	3	14
NE							
2002	0	0	0	0	29	3	32
2030	0	0	0	0	31	3	34
2040	0	0	0	0	32	3	35
2050	0	0	0	0	33	3	36
2060	0	0	0	0	34	3	37
2070	0	0	0	0	34	4	38
E-NE							
2002	0	14	0	45	27	102	188
2030	0	15	0	48	29	110	202
2040	0	15	0	50	30	112	207
2050	0	16	0	51	30	115	212
2060	0	16	0	52	31	118	218
2070	0	17	0	53	32	121	223
EAST							
2002	0	17	0	84	68	173	342
2030	0	18	0	90	73	186	368
2040	0	19	0	93	75	191	377
2050	0	19	0	95	77	195	386
2060	0	20	0	97	79	200	396
2070	0	20	0	100	81	205	406
E-SE							
2002	0	0	0	0	0	851	851
2030	0	0	0	0	0	915	915
2040	0	0	0	0	0	938	938
2050	0	0	0	0	0	961	961
2060	0	0	0	0	0	985	985
2070	0	0	0	0	0	1,010	1,010

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TABLE 2.5-1 (Continued)

Sector/Year	0-1	1-2	2-3	3-4	4-5	5-10	Total
SE							
2002	0	0	10	0	212	3,312	3,534
2030	0	0	11	0	228	3,560	3,799
2040	0	0	11	0	234	3,649	3,894
2050	0	0	11	0	239	3,741	3,991
2060	0	0	12	0	245	3,834	4,091
2070	0	0	12	0	252	3,930	4,193
S-SE							
2002	0	6	8	0	42	513	569
2030	0	6	9	0	45	551	612
2040	0	7	9	0	46	565	627
2050	0	7	9	0	47	579	643
2060	0	7	9	0	49	594	659
2070	0	7	9	0	50	609	675
SOUTH							
2002	0	0	4	0	0	96	100
2030	0	0	4	0	0	99	103
2040	0	0	4	0	0	100	104
2050	0	0	4	0	0	101	105
2060	0	0	4	0	0	102	106
2070	0	0	4	0	0	103	107
S-SW							
2002	0	0	0	0	0	1,362	1,362
2030	0	0	0	0	0	1,464	1,464
2040	0	0	0	0	0	1,501	1,501
2050	0	0	0	0	0	1,538	1,538
2060	0	0	0	0	0	1,577	1,577
2070	0	0	0	0	0	1,616	1,616
SW							
2002	0	0	0	0	0	6	6
2030	0	0	0	0	0	6	6
2040	0	0	0	0	0	7	7
2050	0	0	0	0	0	7	7
2060	0	0	0	0	0	7	7
2070	0	0	0	0	0	7	7
W-SW							
2002	0	0	0	0	0	98	98
2030	0	0	0	0	0	101	101
2040	0	0	0	0	0	102	102
2050	0	0	0	0	0	103	103
2060	0	0	0	0	0	104	104
2070	0	0	0	0	0	105	105

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TABLE 2.5-1 (Continued)

Sector/Year	0-1	1-2	2-3	3-4	4-5	5-10	Total
WEST							
2002	0	0	0	0	0	101	101
2030	0	0	0	0	0	104	104
2040	0	0	0	0	0	105	105
2050	0	0	0	0	0	106	106
2060	0	0	0	0	0	107	107
2070	0	0	0	0	0	108	108
W-NW							
2002	0	0	0	0	0	6	6
2030	0	0	0	0	0	6	6
2040	0	0	0	0	0	6	6
2050	0	0	0	0	0	6	6
2060	0	0	0	0	0	6	6
2070	0	0	0	0	0	6	6
NW							
2002	0	0	0	0	0	35	35
2030	0	0	0	0	0	35	35
2040	0	0	0	0	0	35	35
2050	0	0	0	0	0	35	35
2060	0	0	0	0	0	35	35
2070	0	0	0	0	0	35	35
N-NW							
2002	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0
2040	0	0	0	0	0	0	0
2050	0	0	0	0	0	0	0
2060	0	0	0	0	0	0	0
2070	0	0	0	0	0	0	0
Grand Totals							
2002	0	51	22	129	378	6,671	7,251
2030	0	54	23	139	406	7,154	7,776
2040	0	55	24	142	417	7,327	7,964
2050	0	56	25	146	427	7,504	8,157
2060	0	57	25	149	438	7,686	8,355
2070	0	58	26	153	449	7,872	8,557

SOURCE: References 1, 3 and 4

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TABLE 2.5-2

AGE AND SEX DISTRIBUTION IN REGION SURROUNDING GGNS

Population Parameter	Low Population Zone*	Emergency Planning Zone*	Region*
Male	46.1%	48.1%	48%
Female	53.9%	51.9%	52%
Age			
Less than 5 years	8.2%	6.9%	7%
5-9 years	9.0%	7.6%	7.6%
10-14 years	9.3%	7.6%	7.9%
15-19 years	9.3%	7.6%	7.9%
20-24 years	6.8%	12.5%	7.1%
25-34 years	10.9%	10.9%	12.3%
35-44 years	15.2%	13.8%	15.3%
45-54 years	13.5%	11.8%	13.2%
55-59 years	4.1%	4.8%	4.7%
60-64 years	3.6%	4.3%	4.1%
65 years and over	10.1%	12.2%	12.9%
Total	100%	100%	100%

SOURCE: Reference 1

NOTES:

* Units: Census block group.

1. Low population zone (LPZ) is defined as the area located within a two-mile radius of the GGNS Unit 1 reactor containment.
2. Plume exposure emergency planning zone (EPZ) is a modified 10-mile radius area surrounding the GGNS site. Consistent with the GGNS Unit 1 Emergency Plan, the 10-mile radius is extended to an approximate 14-mile radius to the northwest, west, and southwest of the GGNS site to include the towns of Newellton and St. Joseph, LA. Figure 2.5-10 illustrates the boundary of the GGNS Unit 1 EPZ.
3. Region is defined as the area located within a 50-mile radius of the GGNS site.

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TABLE 2.5-3

RACIAL AND ETHNIC DISTRIBUTION WITHIN THE LPZ, EPZ, AND REGION
SURROUNDING THE GGNS SITE

Ethnicity	Low Population Zone*	Emergency Planning Zone*	Region*
African American	77.5%	63.3%	45.1%
Asian	0	0	0.4%
Hawaiian	0	0	0
Hispanic	0.8%	1.3%	1.0%
Native American	0	0	0
Caucasian	21.7%	35.8%	54%

SOURCE: Reference 1

NOTES:

* Units: Census block group.

1. Low population zone (LPZ) is defined as the area located within a two-mile radius of the GGNS Unit 1 reactor containment.
2. Plume exposure emergency planning zone (EPZ) is a modified 10-mile radius area surrounding the GGNS site. Consistent with the GGNS Unit 1 Emergency Plan, the 10-mile radius is extended to an approximate 14-mile radius to the northwest, west, and southwest of the GGNS site to include the towns of Newellton and St. Joseph, LA. Figure 2.5-10 illustrates the boundary of the GGNS Unit 1 EPZ.
3. Region is defined as the area located within a 50-mile radius of the GGNS site.

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TABLE 2.5-4
INCOME DISTRIBUTION IN REGION SURROUNDING GGNS

Income	Low Population Zone*	Emergency Planning Zone*	Region*
Less than \$10,000	26.6%	16.6%	15.8%
\$10,000 to \$14,999	10.6%	9.8%	8.7%
\$15,000 to \$19,999	8.4%	8.2%	7.7%
\$20,000 to \$24,999	7.8%	7.3%	7.6%
\$25,000 to \$29,999	5.8%	6.6%	6.9%
\$30,000 to \$34,999	8.2%	6.4%	6.7%
\$35,000 to \$39,999	5.1%	6.0%	5.8%
\$40,000 to \$49,000	4.4%	5.0%	5.5%
\$45,000 to \$49,999	3.3%	7.7%	4.5%
\$50,000 to \$59,999	4.8%	6.9%	7.7%
\$60,000 to \$74,999	5.0%	6.4%	8.4%
\$75,000 to \$99,999	4.8%	6.8%	7.4%
\$100,000 to \$124,999	2.7%	3.3%	3.2%
\$125,000 to \$149,999	1.4%	1.2%	1.4%
\$150,000 to \$199,999	0.1%	0.8%	1.2%
\$200,000 >	1.0%	1.0%	1.5%

SOURCE: Reference 1

NOTES:

* Units: County Data

1. Low population zone (LPZ) is defined as the area located within a two-mile radius of the GGNS Unit 1 reactor containment.
2. Plume exposure emergency planning zone (EPZ) is a modified 10-mile radius area surrounding the GGNS site. Consistent with the GGNS Unit 1 Emergency Plan, the 10-mile radius is extended to an approximate 14-mile radius to the northwest, west, and southwest of the GGNS site to include the towns of Newellton and St. Joseph, LA. Figure 2.5-10 illustrates the boundary of the GGNS Unit 1 EPZ.
3. Region is defined as the area located within a 50-mile radius of the GGNS site.

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TABLE 2.5-5
MEDIAN HOUSEHOLD INCOME¹
WITHIN 50-MILE RADIUS OF GGNS (BY MS COUNTY / LA PARISH)

MS County / LA Parish	Median Household Income
Adams, MS	\$25,234
Amite, MS	\$26,033
Claiborne, MS	\$22,615
Copiah, MS	\$26,358
Franklin, MS	\$24,885
Hinds, MS	\$33,991
Issaquena, MS	\$19,936
Jefferson, MS	\$18,447
Lincoln, MS	\$27,279
Madison, MS	\$46,970
Rankin, MS	\$46,946
Sharkey, MS	\$22,285
Simpson, MS	\$28,343
Warren, MS	\$35,056
Wilkinson, MS	\$18,929
Yazoo, MS	\$24,795
Caldwell, LA	\$26,972
Catahoula, LA	\$22,528
Concordia, LA	\$22,742
East Carroll, LA	\$20,723
Franklin, LA	\$22,964
Madison, LA	\$20,509
Richland, LA	\$23,668
Tensas, LA	\$19,799
West Carroll, LA	\$24,636

SOURCE: Reference 7

NOTES:

1. Median income data for 2000 U.S. Census reported in 1999 dollars.

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TABLE 2.5-6

PROJECTED POPULATION DISTRIBUTION
10 TO 50 MILES FROM THE GGNS SITE

Sector/Year	10-20	20-30	30-40	40-50	Total
NORTH					
2002	726	470	653	392	2,241
2030	770	498	692	416	2,375
2040	785	508	706	424	2,423
2050	801	518	720	432	2,471
2060	817	529	735	441	2,521
2070	833	539	749	450	2,571
N-NE					
2002	20,890	17,721	6,377	200	45,188
2030	22,770	19,316	6,951	218	49,255
2040	23,453	19,895	7,159	225	50,733
2050	24,157	20,492	7,374	231	52,255
2060	24,882	21,107	7,595	238	53,822
2070	25,628	21,740	7,823	245	55,437
NE					
2002	6,000	6,132	2,005	680	14,817
2030	6,450	6,592	2,155	731	15,928
2040	6,611	6,757	2,209	749	16,326
2050	6,777	6,926	2,264	768	16,735
2060	6,946	7,099	2,321	787	17,153
2070	7,120	7,276	2,379	807	17,582
E-NE					
2002	836	2,213	27,800	48,984	79,833
2030	901	2,386	29,968	52,805	86,060
2040	925	2,448	30,748	54,178	88,298
2050	949	2,511	31,547	55,586	90,593
2060	973	2,577	32,367	57,032	92,949
2070	999	2,644	33,209	58,514	95,365
EAST					
2002	1,238	1,456	10,900	8,039	21,633
2030	1,355	1,594	11,930	8,799	23,677
2040	1,398	1,644	12,306	9,076	24,423
2050	1,442	1,696	12,693	9,362	25,192
2060	1,487	1,749	13,093	9,657	25,986
2070	1,534	1,804	13,506	9,961	26,805
E-SE					
2002	995	1,160	7,000	8,020	17,175
2030	1,085	1,264	7,630	8,742	18,721
2040	1,117	1,302	7,859	9,004	19,282
2050	1,151	1,341	8,095	9,274	19,861
2060	1,185	1,382	8,338	9,552	20,457
2070	1,221	1,423	8,588	9,839	21,070

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TABLE 2.5-6 (Continued)

Sector/Year	10-20	20-30	30-40	40-50	Total
SE					
2002	1,200	1,613	4,151	18,987	25,951
2030	1,308	1,758	4,525	20,696	28,287
2040	1,347	1,811	4,660	21,317	29,135
2050	1,388	1,865	4,800	21,956	30,009
2060	1,429	1,921	4,944	22,615	30,910
2070	1,472	1,979	5,092	23,293	31,837
S-SE					
2002	700	483	1,764	4,226	7,173
2030	753	519	1,896	4,543	7,711
2040	771	532	1,944	4,657	7,904
2050	791	546	1,992	4,773	8,101
2060	810	559	2,042	4,892	8,304
2070	831	573	2,093	5,015	8,511
SOUTH					
2002	3,900	2,222	1,242	1,087	8,451
2030	4,017	2,289	1,279	1,120	8,705
2040	4,057	2,312	1,292	1,131	8,792
2050	4,098	2,335	1,305	1,142	8,879
2060	4,139	2,358	1,318	1,154	8,968
2070	4,180	2,382	1,331	1,165	9,058
S-SW					
2002	1,069	8,026	16,095	10,600	35,790
2030	1,101	8,267	16,578	10,918	36,864
2040	1,112	8,349	16,744	11,027	37,232
2050	1,123	8,433	16,911	11,137	37,605
2060	1,134	8,517	17,080	11,249	37,981
2070	1,146	8,602	17,251	11,361	38,361
SW					
2002	500	1,712	5,700	8,034	15,946
2030	530	1,815	6,042	8,516	16,903
2040	541	1,851	6,163	8,686	17,241
2050	551	1,888	6,286	8,860	17,586
2060	562	1,926	6,412	9,037	17,937
2070	574	1,964	6,540	9,218	18,296
W-SW					
2002	1,230	1,400	2,122	1,196	5,948
2030	1,333	1,518	2,300	1,296	6,448
2040	1,371	1,560	2,365	1,333	6,628
2050	1,409	1,604	2,431	1,370	6,814
2060	1,448	1,649	2,499	1,408	7,005
2070	1,489	1,695	2,569	1,448	7,201

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TABLE 2.5-6 (Continued)

Sector/Year	10-20	20-30	30-40	40-50	Total
WEST					
2002	300	698	3,463	3,098	7,559
2030	323	752	3,733	3,340	8,149
2040	332	772	3,830	3,426	8,360
2050	340	792	3,930	3,516	8,578
2060	349	813	4,032	3,607	8,801
2070	358	834	4,137	3,701	9,030
W-NW					
2002	2,012	1,700	4,586	5,946	14,244
2030	2,169	1,833	4,944	6,410	15,355
2040	2,225	1,880	5,072	6,576	15,754
2050	2,283	1,929	5,204	6,747	16,164
2060	2,343	1,979	5,339	6,923	16,584
2070	2,403	2,031	5,478	7,103	17,015
NW					
2002	104	240	1,418	7,000	8,762
2030	113	262	1,546	7,630	9,551
2040	117	269	1,592	7,859	9,837
2050	120	278	1,640	8,095	10,132
2060	124	286	1,689	8,338	10,436
2070	128	294	1,740	8,588	10,749
N-NW					
2002	700	3,338	8,300	2,069	14,407
2030	768	3,663	9,109	2,271	15,812
2040	793	3,783	9,405	2,345	16,326
2050	819	3,905	9,711	2,421	16,856
2060	846	4,032	10,027	2,499	17,404
2070	873	4,163	10,352	2,581	17,970
Grand Totals					
2002	42,400	50,584	103,576	128,558	325,118
2030	45,746	54,325	111,279	138,449	349,799
2040	46,955	55,673	114,054	142,012	358,694
2050	48,197	57,059	116,904	145,671	367,831
2060	49,475	58,482	119,831	149,429	377,217
2070	50,788	59,944	122,838	153,288	386,858

SOURCE: References 1, 3 and 4

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TABLE 2.5-7

CLAIBORNE COUNTY INCOME¹ AND POVERTY MEASURES COMPARISON

	Claiborne County	State of Mississippi
Median Household Income	\$22,615	\$31, 330
Median Family Income	\$29,867	\$37,406
Per Capita Income	\$11,244	\$15,853
Percent of Families below Poverty Level	27.9%	16%
Percent of Individuals Below Poverty Level	32.4%	19.9%

SOURCE: Reference 7

NOTES:

1. Median income and Poverty data for 2000 U.S. Census reported in 1999 dollars.

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TABLE 2.5-8

ANNUAL AVERAGE WAGES FOR CLAIBORNE COUNTY
AND CONTIGUOUS MISSISSIPPI COUNTIES

Location	2000 Annual Average Wage	
	Manufacturing	Services
Claiborne County	\$443/week - \$11.08/hour	\$524/week - \$13.10/hour
Copiah County	\$459/week - \$11.48/hour	\$399/week - \$9.98/hour
Hinds County	\$671/week - \$16.78/hour	\$556/week - \$13.90/hour
Jefferson County	\$384/week - \$9.60/hour	\$335/week - \$8.38/hour
Warren County	\$583/week - \$14.58/hour	\$441/week - \$11.03/hour
State of Mississippi	\$548/week - \$13.70/hour	\$464/week - \$11.60/hour

SOURCE: Reference 9

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TABLE 2.5-9
AREA EMPLOYMENT BY INDUSTRY

Industry	2000		1990		Percentage Change in Jobs 1990-2000
	Number of Jobs	Percent Of Total	Number Of Jobs	Percent Of Total	
Agriculture, Forestry, Fishing	2,600	2.0%	4,204	3.0%	-38.5%
Construction	9,376	7.5%	9,528	6.9%	-1.6%
Manufacturing	15,787	12.6%	18,650	13.5%	-15.3%
Retail Trade	17,304	13.8%	24,681	17.9%	-29.8%
Transportation, Warehousing	8,198	6.5%	6,553	4.7%	+20%
Professional, Scientific, Management,	10,345	8.2%	15,797	11.4%	-34.5%
Educational & Health Services	35,353	28.2%	31,565	22.9%	+10.7%
Wholesale trade	5,220	4.1%	6,049	4.4%	-13.7%
Finance, Insurance, Real Estate	9,567	7.6%	10,691	7.7%	-10.5%
Public Administration	11,221	8.9%	9,648	7.0%	+14.0%
TOTAL	124,971		137,366		-9.0%

SOURCE: Reference 1

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TABLE 2.5-10

MANUFACTURERS WITHIN A 50-MILE RADIUS OF THE GGNS SITE

MS County LA Parish	Company	No. Of Employees	Product/Service
Adams, MS	International Paper Co.	600	Paper & allied products
	Dynasteel Corp	120	Fabricated metal products
	Mississippi River Corp	100	Paper & allied products
	Kelly's Kids	100	Apparel products
Claiborne, MS	Bruce Hardwood Floors	200	Lumber & wood products
	Prolon, LLC	90	Rubber & misc. plastic products
	Southern Lumber Co.	80	Lumber & wood products
	American Paper Tube Co.	20	Paper & allied products
Copiah, MS	Sanderson Farms, Inc.	499	Food & kindred products
	Kulhman Electric Corp.	400	Electronics & electrical components
	L C Industries, Inc.	386	Apparel products
Franklin, MS	American Railcar Industries	110	Transportation Equipment
	Franklin Timber Co.	63	Lumber & Wood Products
	Alford Lumber Co.	30	Lumber & Wood Products
Hinds, MS	Tyson Foods, Inc.	1,400	Food & kindred products
	Delphi	1,223	Electronics & electrical components

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TABLE 2.5-10 (Continued)

MS County LA Parish	Company	No. Of Employees	Product/Service
Hinds, MS (Cont.)	Eaton Aerospace	714	Industrial & commercial equipment
Lincoln, MS	Delphi	617	Electronic & electrical equipment components
	Columbus Lumber Co., LLC	150	Lumber & Wood Products
	Keystone-Seneca Wire Cloth Co.	120	Fabricated Metal Products
	Gatlin Corporation, Inc.	72	Industrial and commercial machinery and computer equipment
Warren, MS	Cooper Lighting HID	1,005	Electronic components
	LeTourneau Inc.	652	Industrial & commercial equipment
	Tyson foods, Inc	650	Food & kindred products
	Anderson-Tully Co.	550	Lumber & Wood Products
	International Paper Co.	370	Paper & allied products
Franklin, LA	La Sevilla Fashions, Inc.	250	Apparel products
	Mastercrafters Corp.	170	Fiberglass boat/trailer manufacturing
Madison, LA	API Outdoors Inc.	100	Hunting equipment
Tensas, LA	Panola Company	42	Hot Sauce
	Texas Road Gin	40	Cotton gin

SOURCE: References 9 and 10

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TABLE 2.5-11

AREA LABOR FORCE DATA
FOR DECEMBER 2002

Labor Data	Claiborne County	Surrounding Area **	State Of Mississippi
Labor force	3,220	170,770	1,320,500
Total Employment	2,820	161,380	1,239,300
Total Unemployed	400	9,390	81,200
Unemployment Rate	12.4%	8.3%	6.1%

** Surrounding area includes contiguous counties of Copiah County, MS, Franklin County, MS, Hinds County, MS, Jefferson County, MS, Lincoln County, MS, and Warren County, MS, and Tensas Parish, LA.

SOURCE: References 9 and 10

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TABLE 2.5-12

EMPLOYMENT TRENDS FOR CLAIBORNE COUNTY,
CONTIGUOUS MS COUNTIES AND TENSAS PARISH, LA - 1990-2000

MS County LA Parish	Workers Employed 1990	Workers Employed 2000	Percentage Change in Workers Employed 1990-2000	Unemployment Rate 1990	Unemployment Rate 2000
Claiborne, MS	3,490	2,990	-14.3%	15.3%	11.8%
Copiah, MS	10,540	10,420	-1.1%	9.4%	7.7%
Hinds, MS	121,360	125,340	+3.1%	5.6%	4.7%
Jefferson, MS	2,300	2,230	-3.0%	22.8%	19.5%
Warren, MS	20,780	25,630	+18.9%	7.5%	5.0%
Tensas, LA	2,390	3,100	+22.9%	8.1%	8.3%

SOURCE: References 1 and 2

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TABLE 2.5-13

REGIONAL OCCUPIED HOUSING STABILITY CHARACTERISTICS¹

Year Moved In	Units	Percentage
1999 to 3/2000	54,822	18.2%
1995 to 1998	83,311	27.6%
1990 to 1994	48,558	16.1%
1980 to 1989	47,135	15.6%
1970 to 1979	34,465	11.4%
1969 or earlier	33,456	11.1%
Occupied Housing units ²	301,747	

SOURCE: Reference 1

NOTES:

1. Regional data includes housing data reported for counties within 50-mile radius of the site.
2. Housing units include owner occupied and renter occupied housing.

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TABLE 2.5-14
REGIONAL HOUSING INFORMATION BY COUNTY / PARISH
FOR THE YEAR 2000

County	Total Housing Unit	Occupied	Owner Occupied	Renter Occupied	Vacant Housing	Seasonal /Recreational
Caldwell, LA	5,035	3,941	3,122	819	1,094	513
Catahoula, LA	5,351	4,082	3,393	689	1,269	822
Concordia, LA	9,148	7,521	5,723	1,798	1,627	963
East Carroll, LA	3,303	2,969	1,845	1,124	334	55
Franklin, LA	8,623	7,754	5,919	1,835	869	226
Madison, LA	4,979	4,469	2,766	1,703	510	167
Richland, LA	8,335	7,490	5,411	2,079	845	246
Tensas, LA	3,359	2,416	1,669	747	943	502
West Carroll, LA	4,980	4,458	3,518	940	522	57
Adams, MS	15,175	13,677	9,615	4,062	1,498	176
Amite, MS	6,446	5,271	4,535	736	1,175	490
Claiborne, MS	4,252	3,685	2,956	729	567	149
Copiah, MS	11,101	10,142	8,107	2,035	959	176
Franklin, MS	4,119	3,211	2,764	447	908	434
Hinds, MS	100,287	91,030	58,131	32,899	9,257	421
Issaquena, MS	877	726	486	240	151	40
Jefferson, MS	3,819	3,308	2,658	650	511	169
Lincoln, MS	14,052	12,538	9,788	2,750	1,514	205
Madison, MS	28,781	27,219	19,288	7,931	1,532	203
Rankin, MS	45,070	42,089	32,471	9,618	2,981	393
Sharkey, MS	2,416	2,163	1,417	746	253	48
Simpson, MS	11,307	10,076	8,176	1,900	1,231	202
Warren, MS	20,789	18,756	12,785	5,971	2,033	199
Wilkinson, MS	5,106	3,578	2,979	599	1,528	941
Yazoo, MS	10,015	9,178	6,311	2,867	837	72

SOURCE: Reference 1

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TABLE 2.5-15
SCHOOLS WITHIN THE EPZ FOR GGNS SITE¹

School Name	Institution Population	
	Students	Faculty / Staff
Port Gibson High School	565	33
Port Gibson Middle School	453	31
Arthur W. Watson Elementary	993	52
Chamberlain-Hunt Academy	111	16
Claiborne Educational Foundation	77	7
Alcorn State University	3,100	~194
Davidson High School	210	20
Newellton High School	320	24
Tensas Charter School	43	3
Tensas Elementary School	199	14
Tensas Academy	206	14

SOURCE: References 13 and 40

NOTES:

1. Student and faculty/staff populations based on 2001/2002 school year.

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TABLE 2.5-16

NUMBER OF PRIMARY AND SECONDARY SCHOOLS AND STUDENTS
WITHIN SURROUNDING COUNTIES / PARISHES

MS County LA Parish	Number of schools	Institution Population
Copiah, MS	6	4,911
Hinds, MS	85	43,281
Jefferson, MS	5	1,714
Warren, MS	14	9,180
Tensas Parish, LA	6	1,195

SOURCE: Reference 13

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TABLE 2.5-17

NATIONAL REGISTER OF HISTORIC PLACES, CLAIBORNE COUNTY, MISSISSIPPI

	Resource Name*	Address	City	Date Listed
1.	Alcorn State University Historic District	Alcorn State University	Lorman	05-20-82
2.	Bayou Pierre Site	Address Restricted	Port Gibson	06-23-78
3.	Bethel Presbyterian Church	North of Alcorn on MS 552	Alcorn	11-28-78
4.	Buena Vista Cotton Gin	NE of Port Gibson	Port Gibson	12-27-74
5.	Building at 801 Chinquepin Street	801 Chinquepin Street	Port Gibson	07-22-79
6.	Canemount	N. of Alcorn off MS 552	Alcorn	12-02-82
7.	Catholic Cemetery	700 Coffee	Port Gibson	07-22-79
8.	Catledge Archeological Site	Address Restricted	Alcorn	07-15-74
9.	Centers Creek Mound	Address Restricted	Russum	08-14-73
10.	Chamberlain-Hunt Academy Historic District	Bounded by US 61, City limits, Woodstock St., SR 547	Port Gibson	07-22-79
11.	Claremont	366 Claremont Dr.	Port Gibson	07-22-79
12.	Collina	Greenwood St. Extension	Port Gibson	07-22-79
13.	Drake Hill Historic District	Drake Hill Rd.	Port Gibson	07-22-79

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TABLE 2.5-17 (Continued)

	Resource Name*	Address	City	Date Listed
14.	Golden West Cemetery	Rodney Road	Port Gibson	07-22-79
15.	Grand Gulf Military State Park	6 mi. W of Port Gibson	Port Gibson	04-11-72
16.	Hollywood	Old Hwy 61	Port Gibson	1992
17.	Idlewild	310 Idlewild Dr.	Port Gibson	07-22-79
18.	Jewish Cemetery	900 Marginal St.	Port Gibson	07-22-79
19.	Market Street Suburb St. Mary Historic District	Bounded by Orange, Marginal, Greenwood, & Market Sts.	Port Gibson	07-22-79
20.	McGregor	SR 547	Port Gibson	07-22-79
21.	Nelson, John, Site	Address Restricted	Willows	06-13-74
22.	Oakland Chapel	Alcorn State University Campus	Alcorn	12-27-74
23.	Old Brickyard Place	Anthony St.	Port Gibson	07-22-79
24.	Old Depot Restaurant And Lounge	1202 Market St.	Port Gibson	07-22-79
25.	Old Natchez Trace (132-3T)	NE of Port Gibson	Port Gibson	11-07-76
26.	Owens Creek Bridge	Spans Owen Creek on Old CR	Utica	11-16-88
27.	Port Gibson Battlefield	4 mi. W of Port Gibson	Port Gibson	11-03-72

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TABLE 2.5-17 (Continued)

	Resource Name*	Address	City	Date Listed
28.	Port Gibson Oil Works Mill Bldg.	Anthony St.	Port Gibson	
29.	Sacred Heart Roman Catholic Church	Grand Gulf Military Monument Park	Port Gibson	11-23-87
30.	Smithfield	Address Restricted	Bruinsburg	06-09-78
31.	Van Dorn House	Van Dorn Dr	Port Gibson	06-21-71
32.	Widow's Creek Bridge	Spans Widow's Creek on CR	Port Gibson	11-16-88
33.	Windsor Ruins	12 mi. SW of Port Gibson on MS 552	Port Gibson	11-23-71
34.	Windsor Site	Address Restricted	Port Gibson	02-07-79
35.	Wintergreen Cemetery	E. Greenwood St.	Port Gibson	07-22-79

SOURCE: Reference 28

NOTES:

* Refer to Figure 2.5-5 for the location of historic places.

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TABLE 2.7-1

WIND DIRECTION AND SPEED - GRAND GULF SITE
1996 – 2003

Year	Most Common Wind Direction at 33 ft (Degrees Clockwise from North)	Average Wind Speed (mph)	Resultant Wind Direction at 33 ft (Degrees Clockwise from North)	Resultant Wind Speed at 33 ft (mph)
1996	-	4.34	-	-
1997	-	3.68	-	-
1998	-	4.18	-	-
1999	-	4.24	-	-
2000	-	4.27	-	-
2001	146	4.05	116	0.49
2002	38	4.44	88	0.60
2003	53	4.21	120	0.35

NOTES:

1. Data from GGNS Site Meteorological Tower (Reference 2)

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TABLE 2.7-2

WIND DIRECTION AND SPEED, VICKSBURG, MS
1997-2003

Year	Most Common Wind Angle (Degrees Clockwise from North)	Average Wind Speed (mph)	Resultant Wind Angle (Degrees Clockwise from North)	Resultant Wind Speed (mph)
1997	30	7.4	94	0.63
1998	160	7.5	157	1.51
1999	160	7.3	140	0.77
2000	170	7.2	110	0.60
2001	160	7.0	115	0.99
2002	160	7.6	104	0.98
2003	160	7.2	131	0.53

NOTES:

1. Data from NCDC (Reference 3)

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TABLE 2.7-3

DESIGN WET AND DRY BULB TEMPERATURES (DEGREES FAHRENHEIT)

	ASHRAE Design Value ²	Grand Gulf Site Data ³
Number of Data ¹	-	34,149
Average of Annual Extreme Low Dry Bulb	14	-
Minimum Annual Dry Bulb 99.6% Exceedance	21	25.5
Minimum Annual Dry Bulb 99% Exceedance	25	28.7
Number of data ¹	-	34,159
Maximum Annual Dry Bulb 99.6% Exceedance	95	94.6
Maximum Annual Dry Bulb 98% Exceedance	92	91.4
Average of Annual Extreme High Dry Bulb	98	-
Number of data ¹	-	25,830
Maximum Annual Wet Bulb 99.6% Exceedance	80	80.4
Maximum Annual Wet Bulb 98% Exceedance	78	78.5

NOTES:

1. "Number of data" is the number of hourly temperature measurements in the database.
2. "ASHRAE Design Value" is from the 2001 ASHRAE Fundamentals Handbook for Jackson, Mississippi (Reference 51).
3. "Grand Gulf Site" data is from meteorological tower measurements. Dry bulb temperatures are available for 2000-2003, and wet bulb for 2001-2003 (Reference 2).

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TABLE 2.7-4

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TABLE 2.7-5

RELATIVE HUMIDITY AT VICKSBURG, MS FOR FOUR TIME PERIODS PER DAY
1997 - 2001

	00:00 - 06:00	06:00- 12:00	12:00- 18:00	18:00- 24:00
Jan	85.9	78.1	66.0	81.3
Feb	86.8	76.1	60.2	79.6
Mar	84.4	72.1	58.1	76.5
Apr	87.2	69.9	54.9	76.9
May	89.1	68.5	54.5	78.3
Jun	91.5	71.9	60.1	82.9
Jul	93.3	71.6	58.2	85.1
Aug	92.5	70.4	55.1	83.5
Sep	90.1	69.8	54.7	82.5
Oct	88.8	66.5	49.9	80.1
Nov	89.2	73.9	58.6	82.3
Dec	86.2	77.1	65.0	81.6
Annual	88.8	72.2	58.0	80.9

NOTES:

1. Data from NCDC, 1997-2001 (Reference 3)
2. Hourly readings are averaged over the six hour period over all the days in the given months for these five years.

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TABLE 2.7-6

PRECIPITATION DATA (INCHES OF RAIN) AT GRAND GULF SITE

Month	Monthly Mean	Max Monthly Precipitation	Min Monthly Precipitation	Max 24 hour	Mean No. days >0.01 in
Jan	3.805	5.62	1.99	2.09	11.5
Feb	3.36	4.94	1.78	4.30	5.5
Mar	8.58	10.02	7.14	4.40	13.5
Apr	4.665	7.43	1.9	4.70	5.5
May	2.805	3.66	1.95	1.70	5.5
Jun	4.185	5.57	2.8	1.70	11.5
Jul	2.505	3.01	2	1.46	8
Aug	2.88	4.26	1.5	1.71	8.5
Sep	1.87	3.7	0.04	1.57	5.5
Oct	1.65	2.14	1.16	2.12	2.5
Nov	4.47	8.92	0.02	3.00	8
Dec	4.07	4.35	3.79	3.38	9.5
Annual	44.845	46.85	42.84	4.7	95

NOTES:

1. Data from Site Meteorological Tower, 2000 – 2001

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TABLE 2.7-7

PRECIPITATION DATA (INCHES OF RAIN) AT VICKSBURG, MS

Month	Monthly Mean	Max Monthly Mean	Min Monthly Mean	Max 24 hour	Mean No. days >0.01 in
Jan	6.376	9.68	2.79	4.52	12.2
Feb	4.428	8.72	0.74	2.79	10
Mar	6.892	8.64	5.26	3.28	11
Apr	4.208	6.33	2.14	3.77	9.8
May	2.206	4.93	0.38	2.94	9.2
Jun	3.678	5.73	1.88	4.01	9.8
Jul	2.648	5.91	0.49	3.17	9
Aug	1.98	3.8	0.61	2.73	6.8
Sep	3.738	6.62	1.69	2.73	9.6
Oct	3.024	6.46	1.32	2.67	7.8
Nov	4.894	8.26	1.41	3.37	10.6
Dec	5.492	9.94	1.98	3.96	11.6
Annual	49.564	59.76	35.69	4.52	117.4

NOTES:

1. Data from NCDC, 1997-2001

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TABLE 2.7-8

FREQUENCY OF HURRICANES (BY MONTH) FOR THE STATES OF FLORIDA,
ALABAMA, MISSISSIPPI, LOUISIANA, AND TEXAS

	<u>Category of Storm</u>					Monthly Total (No.)	Annual Frequency (yr ⁻¹)	% of Total
	1 (No.)	2 (No.)	3 (No.)	4 (No.)	5 (No.)			
May	0	0	0	0	0	0	0	0%
Jun	6	2	1	1	0	10	0.10	9%
Jul	3	3	3	0	0	9	0.09	8%
Aug	8	7	10	2	1	28	0.28	24%
Sep	11	9	15	7	1	43	0.43	37%
Oct	9	7	7	0	0	23	0.23	20%
Nov	2	2	0	0	0	4	0.04	3%
Total	39	30	36	10	2	117	1.2	100%

Where the definition of Storm Category is as follows:

Storm Category	Wind Speed (mph)	Storm Surge (ft. Above Normal)
1	74 to 95	4 to 5
2	96 to 110	6 to 8
3	111 to 130	9 to 12
4	131 to 155	13 to 18
5	Greater than 155	Greater than 18

NOTES:

1. Data is from "Atlantic Tropical Storms And Hurricanes Affecting The United States:1899-2000," NOAA Technical Memorandum NWS SR-206 (Reference 6)

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TABLE 2.7-9

TORNADOES IN CLAIBORNE, WARREN AND HINDS COUNTIES, MISSISSIPPI, AND
TENSAS PARISH, LOUISIANA

Month	Hinds County (#)	Claiborne County (#)	Warren County (#)	Tensas Parish (#)	All Four Areas (#)	Average per Year (#/yr)
Jan	5	2	4	2	13	0.25
Feb	8	1	2	0	11	0.21
Mar	8	1	0	5	14	0.27
Apr	5	2	3	3	13	0.25
May	3	0	2	2	7	0.13
Jun	1	0	2	1	4	0.08
Jul	2	0	1	0	3	0.06
Aug	2	1	1	0	4	0.08
Sep	2	0	0	0	2	0.04
Oct	1	1	3	0	5	0.10
Nov	8	3	4	4	19	0.37
Dec	4	1	4	4	13	0.25
Annual	49	12	26	21	108	2.08
Length of Record	52 yrs	52 yrs	52 yrs	52 yrs	52 yrs	52 yrs
Years	1950-2002	1950-2002	1950-2002	1950-2002	1950-2002	1950-2002
Area	869 mi ²	487 mi ²	587 mi ²	602 mi ²	2,454 mi ²	

NOTES:

1. Tornadoes listed at different sites on the same day were counted as different events. Similarly, multiple tornadoes on the same day were counted as different events.
2. Tornado frequency did not change significantly over the time range, so all data from years were used to calculate the annual frequencies.
3. Grand Gulf is in Claiborne County. Warren County, directly to the north, is included because Vicksburg is in that county, while Hinds, to the East, is included because Jackson is in that county. Vicksburg and Jackson have NCDC meteorological stations and their inclusion helps to assure all weather events are captured. Tensas parish, Louisiana is directly across the Mississippi River from the Grand Gulf site.
4. Recorded in the NOAA Storm Events Database, 1950-4/30/2002 (Reference 5)

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TABLE 2.7-10

THUNDERSTORMS AND HIGH WIND EVENTS IN CLAIBORNE, WARREN AND
HINDS COUNTIES, MISSISSIPPI, AND TENSAS PARISH, LOUISIANA

Month	Hinds County (#)	Claiborne County (#)	Warren County (#)	Tensas Parish (#)	All Four Areas (#)	Average per Year (#/yr)
Jan	9	1	8	5	16	0.62
Feb	14	5	10	7	17	.071
Mar	20	8	15	9	37	1.10
Apr	21	10	20	8	42	1.38
May	24	7	14	9	36	1.14
Jun	26	10	12	8	39	1.33
Jul	24	4	16	7	40	1.38
Aug	6	3	9	1	16	0.57
Sep	7	0	1	0	8	0.24
Oct	2	0	5	4	9	0.33
Nov	10	3	13	6	22	0.86
Dec	7	1	10	2	16	0.52
Annual	170	52	133	66	298	10.2
Length of Record	47 yrs	47 yrs	47 yrs	47 yrs	47 yrs	21 yrs
Years	1955-2002	1955-2002	1955-2002	1955-2002	1955-2002	1981-2001

NOTES:

1. Storms listed at different sites in the same county on the same day were counted as 1 event.
2. The "All Four Areas" total is equal to or less than the sum of the count for all four areas because some individual storms extended into more than 1 area (county or parish).
3. Average/yr were based on the period 7/31/1981 through 7/31/2002 (last storm in database). Prior to 1981, the yearly storm averages were markedly less frequent, suggesting less thorough storm data collection.
4. Grand Gulf is in Claiborne County. Warren County, directly to the north, is included because Vicksburg is in that county, while Hinds, to the East, is included because Jackson is in that county. Vicksburg and Jackson have NCDC meteorological stations and their inclusion helps to assure all weather events are captured. Tensas parish, Louisiana is directly across the Mississippi River from the Grand Gulf site.
5. Recorded in the NOAA Storm Events Database, 1955 – 4/30/2002 (Reference 5)

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TABLE 2.7-11

HAILSTORMS IN CLAIBORNE, WARREN AND HINDS COUNTIES MISSISSIPPI, AND
TENSAS PARISH, LOUISIANA

Month	Hinds County (#)	Claiborne County (#)	Warren County (#)	Tensas Parish (#)	All Four Areas (#)	Average per Year (#/yr)
Jan	6	0	3	1	10	0.43
Feb	5	2	2	7	16	0.67
Mar	31	4	16	9	60	2.52
Apr	51	9	13	11	84	2.95
May	24	2	9	13	48	1.90
Jun	11	0	3	3	17	0.71
Jul	9	1	0	0	10	0.43
Aug	2	0	0	1	3	0.10
Sep	0	0	0	0	0	0.00
Oct	0	0	2	1	3	0.14
Nov	18	0	2	1	21	0.95
Dec	2	0	2	3	7	0.29
Annual	159	18	52	50	279	11.10
Length of Record	47 yrs	47 yrs	47 yrs	47 yrs	47 yrs	21 yrs
(Years)	1955-2002	1955-2002	1955-2002	1955-2002	1955-2002	1981-2001

NOTES:

1. Hail events listed at different sites on the same day were counted as different events. Similarly, hail events separated by periods of no hail on the same day were counted as different events.
2. Average/yr were based on 5/26/1981 through 5/26/2002 (last hailstorm in database). Prior to this period, the yearly storm averages were markedly less frequent, suggesting less thorough storm data collection.
3. Grand Gulf is in Claiborne County. Warren County, directly to the north, is included because Vicksburg is in that county, while Hinds, to the East, is included because Jackson is in that county. Vicksburg and Jackson have NCDC meteorological stations and their inclusion helps to assure all weather events are captured. Tensas parish, Louisiana is directly across the Mississippi River from the Grand Gulf site.
4. Recorded in the NOAA Storm Events Database, 1955 – 4/30/2002 (Reference 5)

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TABLE 2.7-12

ICE STORMS IN CLAIBORNE, WARREN AND HINDS COUNTIES MISSISSIPPI, AND
TENSAS PARISH, LOUISIANA

Location or County	Date	Time	Type	Duration (hrs)	Death	Injuries	Property Damage	Crop Damage
Claiborne, Hinds, Warren & Tensas	2/1/96	6:00 PM	Ice Storm	24	0	0	\$3.0M	0
Claiborne, Hinds & Warren	12/14/97	12:30 AM	Heavy Snow	13.5	0	0	\$50K	0
Claiborne, Hinds, Warren & Tensas	12/22/98	8:00 PM	Ice Storm	57	0	0	\$16.6M	0
Warren	1/27/00	6:00 AM	Ice Storm	24	0	0	\$285K	0

NOTES:

1. Grand Gulf is in Claiborne County. Warren County, directly to the north, is included because Vicksburg is in that county, while Hinds, to the East, is included because Jackson is in that county. Vicksburg and Jackson have NCDC meteorological stations and their inclusion helps to assure all weather events are captured. Tensas parish, Louisiana is directly across the Mississippi River from the Grand Gulf site.
2. The annual frequency based on these 4 events in 8 years is 0.5/yr, and the average duration is 30 hours.
3. Recorded In The NOAA Storm Event Database, 1993 – 2001, (Reference 5).

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TABLE 2.7-13

ESTIMATED MAXIMUM POINT PRECIPITATION AMOUNTS (INCHES) FOR
SELECTED DURATIONS AND RECURRENCE INTERVALS
GRAND GULF, MISSISSIPPI
COMPARED TO RECENT EXPERIENCE AT VICKSBURG, MISSISSIPPI

Duration	<u>Recurrence Intervals (Yr.)</u>							
	1	2	5*	5	10	25	50	100
30 minutes	1.4	1.6		1.9	2.2	2.5	2.8	3.1
1 hour	1.8	2.2	1.63	2.6	3.0	3.5	3.9	4.3
2 hours	2.2	2.6	2.66	3.2	3.5	4.0	4.5	4.9
3 hours	2.4	2.8	2.71	3.5	4.0	4.5	5.1	5.5
6 hours	2.8	3.3	2.82	4.3	4.9	5.7	6.3	6.9
12 hours	3.4	4.0	3.70	5.1	5.8	6.8	7.7	8.5
24 hours	3.9	4.6	4.52	6.0	6.9	8.0	8.8	9.9
2 days		5.4		6.8	7.9	9.2	11.0	11.8
4 days		6.4		8.1	9.3	11.2	13.1	14.2
7 days		7.5		9.6	11.2	13.1	14.7	15.9
10 days		8.3		10.5	12.5	14.3	16.0	17.6

NOTES:

* Recent 5 year experience, 1997-2001, Vicksburg Meteorology Station, data from the NCDC added to the table for comparison purposes.

SOURCES:

Data for 2 hours to 10 days duration (from UFSAR Table 2.3-74):
Hershfield, D.M., Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years, US Weather Bureau Technical Paper 40, Washington, D.C., 1961 (Reference 20)

Miller, J/F., Two to Ten Day Precipitation for Return Periods of 2 to 100 years in the Contiguous United States, US Weather Bureau Technical Paper 49, Washington, D.C., 1964 (Reference 21)

For data for 30 minutes and 1 hour duration:
NOAA Technical Memorandum NWS HYDRO-35, Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States (Reference 35)

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TABLE 2.7-14
(UFSAR TABLE 2.3-17)

TOTAL MAXIMUM WINTER PRECIPITATION JACKSON, MISSISSIPPI

Season	Maximum 48 Hour Precipitation (Inches)
1960-61	3.13
1961-62	3.65
1962-63	1.67
1963-64	4.03
1964-65	5.31
1965-66	2.54
1966-67	1.69
1967-68	3.15
1968-69	1.84
1969-70	2.32
1970-71	2.27
1971-72	4.77
1972-73	2.91
1973-74	4.47
1974-75	3.41

NOTES:

Data source is Reference 17.

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PASQUILL STABILITY CLASS ANNUAL FREQUENCY

GRAND GULF²NOTES:

- Rev. 1

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TABLE 2.7-16

PASQUILL STABILITY CLASS WINTER FREQUENCY

STABILITY CLASS BY WIND DIRECTION ^{1,2}

GRAND GULF
SEASON = WINTER

STABILITY CLASS	WIND FROM															
	N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	S	S-SW	SW	W-SW	W	W-NW	NW	N-NW
A	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
B	.02	.02	.02	.03	.01	.03	.03	.04	.03	.05	.02	.07	.06	.08	.10	.05
C	.12	.10	.12	.04	.05	.07	.14	.11	.10	.11	.19	.23	.23	.19	.19	.09
D	.41	.15	.14	.13	.16	.16	.25	.42	.46	.35	.43	.33	.40	.35	.23	.47
E	.22	.19	.19	.18	.11	.12	.22	.25	.20	.26	.21	.18	.14	.19	.24	.24
F	.15	.34	.24	.22	.16	.28	.20	.14	.14	.17	.06	.10	.10	.09	.16	.14
G	.08	.20	.29	.41	.50	.33	.16	.05	.05	.06	.08	.10	.07	.10	.09	.06

NOTES:

1. Data from Calculation ENTO002-CALC-003, Plume Characteristics Of Proposed New Cooling Towers At Grand Gulf, Rev. 2 (Reference 24)
2. Values are fraction of times with described stability class when the wind is in the indicated direction.

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TABLE 2.7-17

PASQUILL STABILITY CLASS SPRING FREQUENCY

STABILITY CLASS BY WIND DIRECTION ^{1,2}

GRAND GULF
SEASON = SPRING

		WIND FROM																
		N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	S	S-SW	SW	W-SW	W	E-SE	SE	N-NW	N-NW
STABILITY CLASS	WIND HEADED																	
	S	S-SW	SW	W-SW	W	W-NW	NW	N-NW	N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	STAG.	
	A	.00	.01	.01	.02	.01	.00	.02	.02	.02	.05	.05	.14	.09	.07	.03	.00	
	B	.09	.09	.09	.05	.05	.06	.10	.09	.08	.12	.25	.30	.28	.15	.19	.09	
	C	.21	.09	.10	.04	.05	.09	.13	.16	.16	.26	.23	.28	.17	.11	.26	.10	
	D	.40	.25	.19	.15	.14	.12	.23	.29	.29	.27	.30	.30	.23	.29	.30	.35	
	E	.17	.22	.15	.14	.12	.13	.16	.19	.21	.15	.07	.08	.09	.13	.10	.18	
	F	.10	.27	.23	.25	.21	.22	.22	.18	.21	.14	.08	.03	.05	.17	.10	.20	
	G	.03	.08	.23	.35	.41	.38	.15	.06	.04	.04	.02	.03	.03	.07	.03	.08	

NOTES:

1. Data from Calculation ENTO002-CALC-003, Plume Characteristics Of Proposed New Cooling Towers At Grand Gulf, Rev. 2 (Reference 24)
2. Values are fraction of times with described stability class when the wind is in the indicated direction.

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TABLE 2.7-18

PASQUILL STABILITY CLASS SUMMER FREQUENCY

STABILITY CLASS BY WIND DIRECTION ^{1,2}

GRAND GULF
SEASON = SUMMER

		WIND FROM																
		N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	S	S-SW	SW	W-SW	W	E-SE	SE	NW	N-NW
		WIND HEADED																
STABILITY CLASS	S	S-SW	SW	W-SW	W	W-NW	NW	N-NW	N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	STAG.	
A	.11	.05	.04	.05	.04	.04	.04	.05	.05	.07	.12	.19	.32	.34	.24	.21	.08	
B	.24	.14	.10	.06	.05	.05	.08	.11	.10	.14	.29	.25	.33	.27	.36	.31	.16	
C	.26	.15	.14	.08	.05	.09	.13	.13	.10	.19	.24	.25	.14	.18	.18	.21	.14	
D	.23	.24	.17	.13	.10	.13	.19	.14	.18	.21	.24	.22	.17	.15	.16	.17	.15	
E	.05	.13	.13	.11	.10	.11	.09	.14	.12	.10	.03	.03	.02	.01	.02	.03	.08	
F	.07	.17	.18	.19	.23	.20	.19	.21	.23	.14	.05	.02	.01	.03	.03	.04	.18	
G	.04	.12	.23	.38	.43	.37	.28	.23	.22	.15	.03	.04	.02	.02	.01	.03	.21	

NOTES:

1. Data from Calculation ENTO002-CALC-003, Plume Characteristics Of Proposed New Cooling Towers At Grand Gulf, Rev. 2 (Reference 24)
2. Values are fraction of times with described stability class when the wind is in the indicated direction.

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TABLE 2.7-19

PASQUILL STABILITY CLASS FALL FREQUENCY

STABILITY CLASS BY WIND DIRECTION ^{1,2}

GRAND GULF SEASON = FALL		WIND FROM																	
	N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	S	S-SW	SW	W-SW	W	W-NW	NW	N-NW	SE	S-SE	STAG.
WIND HEADED																			
STABILITY CLASS	S	S-SW	SW	W-SW	W	W-NW	NW	N-NW	N	N-NE	NE	E-NE	E	E-SE	SE	S-SE	STAG.		
A	.00	.00	.00	.01	.00	.01	.00	.00	.00	.01	.01	.02	.02	.04	.01	.01	.01		
B	.12	.07	.07	.08	.05	.07	.13	.16	.11	.12	.25	.16	.28	.33	.32	.20	.06		
C	.19	.13	.12	.06	.04	.07	.13	.16	.15	.23	.15	.27	.24	.22	.33	.28	.14		
D	.33	.24	.18	.11	.09	.15	.22	.27	.36	.36	.30	.32	.24	.22	.15	.28	.31		
E	.19	.16	.11	.12	.09	.12	.14	.18	.14	.14	.15	.11	.11	.08	.08	.11	.25		
F	.11	.28	.23	.20	.19	.21	.23	.15	.16	.09	.09	.06	.06	.07	.08	.08	.17		
G	.05	.12	.28	.43	.55	.38	.15	.08	.08	.05	.05	.06	.04	.03	.03	.04	.07		

NOTES:

1. Data from Calculation ENTO002-CALC-003, Plume Characteristics Of Proposed New Cooling Towers At Grand Gulf, Rev. 2 (Reference 24)
2. Values are fraction of times with described stability class when the wind is in the indicated direction.

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TABLE 2.7-20

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, JANUARY 1992 – 2000 (NCDC DATA)

January	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with Inversions	Average Height	Average Strength
1992	74.2%	846.5	0.0702	45.2%	1577.0	0.0259
1993	66.7%	705.7	0.0627	38.9%	1227.0	0.0430
1994	78.9%	783.6	0.0861	55.6%	1282.0	0.0366
1995	63.6%	1061.7	0.0539	42.9%	1370.5	0.0311
1996	80.0%	818.9	0.0608	23.5%	1531.5	0.0275
1997	63.2%	865.0	0.0589	55.6%	1378.2	0.0455
1998	73.7%	774.7	0.0511	30.4%	1847.2	0.0313
1999	41.2%	921.1	0.0696	30.0%	1446.0	0.0354
2000	70.0%	1313.4	0.0413	33.3%	1821.5	0.0318
Total	68.2%	870.0	0.0633	39.5%	1492.1	0.0341

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-21

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, FEBRUARY 1992 – 2000 (NCDC DATA)

February	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	79.3%	622.2	0.0704	21.4%	1558.8	0.0277
1993	55.6%	761.3	0.0793	21.4%	1822.6	0.0386
1994	76.5%	634.0	0.0894	36.8%	1995.4	0.0530
1995	68.8%	896.6	0.0565	8.3%	1987.0	0.0400
1996	64.7%	854.0	0.0589	33.3%	1689.4	0.0476
1997	78.6%	1166.2	0.0598	38.5%	1505.2	0.0318
1998	57.1%	725.6	0.0726	0.0%	--	--
1999	50.0%	658.5	0.0550	25.0%	2549.1	0.0324
2000	78.6%	894.8	0.0679	41.2%	1857.3	0.0436
Total	68.6%	785.8	0.0687	26.0%	1840.7	0.0401

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-22

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, MARCH 1992 – 2000 (NCDC DATA)

March	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	58.6%	943.3	0.0446	31.0%	1614.6	0.0384
1993	65.2%	863.3	0.0588	23.5%	2139.9	0.0273
1994	73.7%	526.1	0.0725	25.0%	1679.0	0.0324
1995	50.0%	843.2	0.0755	5.9%	2576.0	0.0205
1996	62.5%	565.5	0.0717	20.0%	1447.7	0.0835
1997	60.0%	883.8	0.0694	12.5%	2514.2	0.0320
1998	38.5%	498.1	0.0547	28.6%	2453.1	0.0382
1999	55.6%	500.9	0.0654	25.0%	1644.3	0.0149
2000	58.8%	936.5	0.0549	18.8%	1901.8	0.0213
Total	59.2%	753.8	0.0621	21.4%	1848.3	0.0356

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-23

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, APRIL 1992 – 2000 (NCDC DATA)

April	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	76.7%	783.9	0.0488	26.7%	2086.4	0.0376
1993	75.0%	731.5	0.0511	37.5%	2034.0	0.0390
1994	72.2%	667.8	0.0788	7.1%	556.0	0.0236
1995	63.6%	951.4	0.0603	13.0%	1439.0	0.0249
1996	80.0%	841.4	0.0528	33.3%	1874.2	0.0207
1997	57.9%	794.4	0.0720	9.1%	982.0	0.0167
1998	58.8%	565.0	0.0620	27.3%	2261.3	0.0292
1999	40.0%	1751.8	0.0264	0.0%	--	--
2000	68.8%	905.8	0.0642	14.3%	1948.0	0.0343
Total	66.7%	837.2	0.0582	19.0%	1869.9	0.0307

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-24

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, MAY 1992 – 2000 (NCDC DATA)

May	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	61.5%	713.5	0.0518	26.9%	2167.9	0.0452
1993	50.0%	449.8	0.0495	0.0%	--	--
1994	65.2%	696.7	0.0600	14.3%	1311.0	0.0280
1995	36.8%	786.6	0.0528	9.1%	438.0	0.0500
1996	58.8%	1129.4	0.0450	30.0%	2190.0	0.0302
1997	44.4%	522.4	0.0646	20.0%	1824.8	0.0179
1998	60.0%	798.2	0.0767	25.0%	1303.4	0.0291
1999	50.0%	411.9	0.0613	0.0%	--	--
2000	61.1%	603.3	0.0409	20.0%	2278.4	0.0087
Total	54.9%	694.3	0.0560	18.1%	1910.8	0.0340

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-25

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, JUNE 1992 – 2000 (NCDC DATA)

June	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	50.0%	550.4	0.0470	7.4%	1240.7	0.0283
1993	78.6%	745.6	0.0330	0.0%	--	--
1994	38.9%	503.0	0.0403	20.0%	324.0	0.0304
1995	80.0%	524.6	0.0622	18.2%	2402.0	0.0312
1996	42.1%	415.2	0.0368	0.0%	--	--
1997	23.8%	1036.5	0.0263	8.3%	502.9	0.0024
1998	30.0%	688.7	0.0368	14.3%	1941.0	0.0438
1999	25.0%	387.9	0.0278	7.7%	691.0	0.0080
2000	38.9%	668.9	0.0446	20.0%	373.0	0.0119
Total	44.4%	595.4	0.0431	9.3%	1235.3	0.0239

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-26

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, JULY 1992 – 2000 (NCDC DATA)

July	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	51.6%	462.1	0.0409	6.5%	453.8	0.0819
1993	21.4%	388.2	0.0208	0.0%	--	--
1994	34.6%	402.2	0.0390	0.0%	--	--
1995	52.2%	406.7	0.0411	0.0%	--	--
1996	47.6%	418.3	0.0311	5.9%	1045.8	0.0345
1997	56.7%	454.3	0.0257	6.3%	452.0	0.0281
1998	33.3%	449.6	0.0411	0.0%	--	--
1999	37.5%	459.3	0.0265	0.0%	--	--
2000	57.9%	446.5	0.0497	0.0%	--	--
Total	45.1%	437.7	0.0359	3.0%	601.3	0.0566

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-27

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, AUGUST 1992 – 2000 (NCDC DATA)

August	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	48.4%	774.7	0.0434	19.4%	2282.3	0.0263
1993	57.1%	406.7	0.0322	6.3%	1936.0	0.0269
1994	53.8%	662.2	0.0433	5.6%	288.8	0.0529
1995	75.0%	386.2	0.0337	7.7%	573.0	0.0345
1996	46.4%	385.1	0.0397	5.9%	2179.7	0.0250
1997	64.0%	430.6	0.0399	25.0%	1379.4	0.0296
1998	64.3%	402.4	0.0372	6.7%	404.0	0.0611
1999	52.2%	423.4	0.0458	0.0%	--	--
2000	42.1%	419.6	0.0436	0.0%	--	--
Total	56.0%	478.6	0.0395	10.6%	1658.1	0.0319

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-28

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, SEPTEMBER 1992 – 2000 (NCDC DATA)

September	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	50.0%	800.4	0.0350	13.3%	1552.7	0.0235
1993	68.2%	664.3	0.0484	0.0%	--	--
1994	57.9%	673.4	0.0573	15.4%	2378.3	0.0408
1995	67.9%	598.2	0.0589	30.8%	1976.1	0.0428
1996	59.1%	619.2	0.0454	0.0%	--	--
1997	66.7%	533.5	0.0484	17.6%	2712.0	0.0270
1998	56.3%	540.2	0.0429	0.0%	--	--
1999	68.8%	450.4	0.0545	7.1%	3044.0	0.0292
2000	42.1%	481.4	0.0496	26.7%	2025.0	0.0399
Total	59.6%	608.1	0.0491	12.2%	2119.6	0.0343

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-29

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, OCTOBER 1992 – 2000 (NCDC DATA)

October	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	83.9%	660.8	0.0731	35.5%	1694.4	0.0408
1993	82.4%	754.7	0.0734	31.3%	1901.6	0.0398
1994	54.5%	612.0	0.0654	14.3%	2186.8	0.0563
1995	57.1%	767.1	0.0647	34.8%	1506.6	0.0455
1996	59.1%	594.2	0.0975	12.5%	2428.5	0.0526
1997	78.9%	751.4	0.0597	24.0%	1635.7	0.0345
1998	76.2%	499.0	0.0827	29.2%	1741.9	0.0352
1999	68.4%	423.7	0.0683	20.0%	1658.8	0.0250
2000	75.0%	412.7	0.0870	23.8%	2053.3	0.0298
Total	70.8%	610.1	0.0748	26.0%	1777.3	0.0393

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-30

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, NOVEMBER 1992 – 2000 (NCDC DATA)

November	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	75.0%	1183.0	0.0572	42.9%	1547.5	0.0472
1993	81.0%	585.2	0.0926	38.1%	1353.0	0.0707
1994	47.1%	814.2	0.0599	56.5%	1639.3	0.0396
1995	77.8%	519.8	0.0589	28.6%	1492.7	0.0440
1996	66.7%	698.6	0.0609	40.0%	1625.1	0.0396
1997	77.3%	555.8	0.0332	52.4%	1433.9	0.0325
1998	73.7%	712.5	0.0611	72.7%	1694.5	0.0442
1999	80.0%	462.5	0.0737	21.7%	1398.6	0.0368
2000	47.4%	439.2	0.0673	42.3%	1485.8	0.0293
Total	70.3%	685.5	0.0626	43.9%	1543.2	0.0422

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-31

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, DECEMBER 1992 – 2000 (NCDC DATA)

December	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	77.4%	1066.4	0.0556	66.7%	1515.1	0.0277
1993	64.7%	874.1	0.0662	40.9%	1398.2	0.0755
1994	77.3%	817.8	0.0672	51.9%	1337.9	0.0594
1995	64.7%	913.9	0.0671	54.5%	1596.9	0.0464
1996	64.3%	424.2	0.0767	26.3%	1625.1	0.0372
1997	68.8%	865.0	0.0703	37.5%	1531.1	0.0475
1998	56.3%	879.7	0.0527	42.1%	1736.8	0.0452
1999	85.7%	691.0	0.0642	36.4%	1774.9	0.0437
2000	77.8%	745.5	0.0316	52.9%	1226.6	0.0549
Total	72.1%	833.0	0.0603	46.5%	1508.7	0.0472

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-32

INVERSION HEIGHTS AND STRENGTHS, JACKSON, MISSISSIPPI INTERNATIONAL
AIRPORT, ANNUAL 1992 – 2000 (NCDC DATA)

Annual	% Mornings with Inversions	Average Height	Average Strength	% Afternoons with inversions	Average Height	Average Strength
1992	63.9%	795.5	0.0552	28.0%	1669.6	0.0350
1993	64.3%	684.2	0.0594	22.6%	1589.3	0.0528
1994	60.2%	662.7	0.0653	29.2%	1532.3	0.0456
1995	63.3%	694.1	0.0559	24.0%	1564.7	0.0399
1996	58.3%	652.3	0.0570	19.3%	1727.5	0.0400
1997	60.3%	699.5	0.0512	27.5%	1542.3	0.0359
1998	57.2%	623.5	0.0574	26.9%	1761.1	0.0396
1999	54.0%	584.7	0.0568	17.6%	1732.5	0.0333
2000	58.4%	675.3	0.0549	29.8%	1684.4	0.0355
Total	60.3%	685.3	0.0569	25.3%	1640.0	0.0393

NOTES:

1. Inversion is defined as three NOAA weather balloon elevation readings showing consecutive increases in temperature with height (below 3000m).
2. Balloons were released each day at 6:00 AM and 6:00 PM. Height is defined as elevation in meters where temperature first decreases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in degrees Centigrade per meter within the inversion layer.

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TABLE 2.7-33
(UFSAR TABLE 2.3-134)

NUMBER OF INVERSION¹ OCCURRENCES DURING JANUARY AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	7	10	7	9	9	6	11	10	15	12	10
2	2	8	5	6	5	4	2	3		5	4
3	3	2	4	1	2	2	3	2	1	3	2
4	2	2			4	1	4	1	2	2	2
5	3	1	2	3	2	3	1	1	1	3	2
6	1	4	1	3	3		1			1	1
7	2	1	1	1			1	2	2	1	1
8			1	1			2			1	1
9	2			2	1	4		1			1
10		3	1								1
11			1	1			1	1			*
12	1			1	1	2				1	1
13	1			1		1		3	2		1
14		2	1	3			1	1	2	4	1
15	8			3	5	4	4	3	3	1	3
16	2	7	2	8	6	5	9	5	5	4	5
17											
≥18											
Total ³	34	40	26	43	38	32	40	33	33	38	36

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

* = Less than 1

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TABLE 2.7-34
(UFSAR TABLE 2.3-135)

NUMBER OF INVERSION¹ OCCURRENCES DURING FEBRUARY AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	10	10	10	5	11	4	6	9	6	12	8
2	6	3	4	4	3	6	3	4	3		4
3	3	1	3	3	4	5		4	1	4	3
4	3	2	1	2	2	1	1	3			2
5		1	4	1	1	1		2	1	3	1
6	2	1	4	2	1	1	1	3	4	4	2
7		1	2		1	2	1	2	3		1
8	1	1				1		2			1
9	2	1	1	1			1				1
10			1			1	1	1		3	1
11	1	1	1	1	1		1		1		1
12			1	2				1	1	2	1
13		1	1	3	1		2	2	2	2	1
14	3	1		3	3	1	5	2	4	3	2
15	3	4	5	5	5	8	6	4	5	3	5
16											
17											
≥18											
Total ³	34	28	38	32	33	31	28	39	31	36	34

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-35
(UFSAR TABLE 2.3-136)

NUMBER OF INVERSION¹ OCCURRENCES DURING MARCH AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	11	14	13	7	9	10	15	8	7	5	10
2	6	2	5	6	6	8	8	1	4	2	5
3	6	3	3	4	1	4	1	5		1	3
4	7	1	4	2	4	1		3	4	1	3
5	2	1	1		3	1	1	1	1	1	1
6	3	3	1	1		3	3		2	1	2
7	2	1	1	3	1	1	3		2		1
8	1		3			2		1	1	1	1
9		2	1	2		3			3	1	1
10		1	2	3	1			1			1
11	1		2	1	3	3	1		1	2	1
12		1	1		1		1	1	1	3	1
13	4	5	2	3	3	3	2	6	4	2	3
14	3	4	4	3	5	4	7	5	6	4	4
15			1	1	2		1				1
16											
17											
≥18											
Total ³	46	38	44	36	39	43	43	33	36	24	38

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-36
(UFSAR TABLE 2.3-137)

NUMBER OF INVERSION¹ OCCURRENCES DURING APRIL AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	11	12	8	12	11	8	9	12	20	10	11
2	5	6	3	2	8	7	6	5	5	8	6
3	1	1	7	7	1	10	2	2	4	2	4
4		1	1	1	2	3	2	2	5	2	2
5		2	2	5		2	1	1	3	3	2
6	4			3	3	1	2	1	3	1	2
7				2	1	1	1	1	1		1
8		1	1	1		1	1	2	2	2	1
9	1	1	2					4		1	1
10		2	1		1		2	2	1		1
11	2		1	1	1			1			1
12	1	2	6	2	2	1	2		1		1
13	11	10	5	8	10	13	12	9	5	5	9
14											
15											
16											
17											
≥18											
Total ³	36	38	37	44	40	47	40	42	50	34	43

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-37
(UFSAR TABLE 2.3-138)

NUMBER OF INVERSION¹ OCCURRENCES DURING MAY AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	7	8	11	8	11	2	7	3	3	6	7
2	3	5	5	3	5	2	3	2	4	4	4
3	5	6	2	1	4		4	2	5	1	3
4	1	2	6	2		1	3	1	2	3	2
5	4	6	3	2	4	2	3	2	2	1	3
6	1	3	1	1		2	3		2		1
7	3		1	1	1	4	4		2	3	2
8	1		1	2		2	2	1	1	1	1
9	1	4	1	2		1			3	1	1
10				1	4			2	3	1	1
11	6	3	2	2	1	2	4	2	3	1	3
12	3	6	6	6	5	10	5	8	3	11	6
13	8	5	6	7	10	7	7	14	9	4	8
14											
15											
16											
17											
≥18											
Total ³	43	48	45	38	45	35	45	37	42	37	42

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-38
(UFSAR TABLE 2.3-139)

NUMBER OF INVERSION OCCURRENCES DURING JUNE AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	1	3	6	7	7	2	6	8	8	9	6
2	2	4	6	1	5	2	2	4	3	4	4
3	2	1	4	3	3	1	2	2	3	3	2
4	2	2		3		3			3	1	1
5	1	1	3	5	2	1	3	4		3	2
6	1	1	2	1	1	1			2	2	1
7		2	2	1	2			1	1	3	1
8			3	2	2	1		3	1	2	1
9	2	2	1			1	2	1	1		1
10		1	1	3				6	2		1
11	23	18	15	15	20	23	18	14	16	18	18
12											
13											
14											
15											
16											
17											
≥18											
Total ³	34	35	43	41	42	35	33	43	40	45	38

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-39
(UFSAR TABLE 2.3-140)

NUMBER OF INVERSION¹ OCCURRENCES DURING JULY AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	4	3	3	12	6	5	3	3	7	5	5
2	2	4	5	5	4		1	3	2	7	3
3	3	5	1	4	1	1	2		4	3	2
4	3	2		2		2	1	1	4	1	2
5	2	2	2	1	3	4	2	5	3	4	3
6		2	1	3	1	1				1	1
7	1	1	1	3	3		3	1	5	3	2
8	2	3	3	3	2	2		2	2	3	2
9	3	1	2		2		2		2	2	1
10	2	2	2	2	2	8	1		1		2
11	7	5	7	6	6	7	6	9	6	6	6
12	10	13	13	8	12	10	15	15	9	8	11
13											
14											
15											
16											
17											
≥18											
Total ³	39	43	40	49	42	40	36	39	45	43	40

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-40
(UFSAR TABLE 2.3-141)

NUMBER OF INVERSION¹ OCCURRENCES DURING AUGUST AT JACKSON, MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	5	6	6	5	8	9	9	4	4	7	6
2	1	3	2	2	2	3	4	2	2	11	3
3	2	2	3	3		2	2		3	2	2
4	3		1	1	1	2	1	3		2	1
5	1	3	2	3		4	3	3	2	5	3
6	1		1	1	1	2	3	2	1	2	1
7	1	1			2	1		2	2	2	1
8	3	2	3		1	1	1				1
9	2	1	1	3	3	1	2		2		2
10	2		3		5	2	1	1	2	1	2
11	1	2	2	2	1	4	3	5	3	4	3
12		2	2	1	2	3	1	2	2	4	2
13	18	19	17	20	16	12	17	17	18	9	16
14											
15											
16											
17											
≥18											
Total ³	40	41	43	41	42	46	47	41	41	49	43

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-41
(UFSAR TABLE 2.3-142)

NUMBER OF INVERSION¹ OCCURRENCES DURING SEPTEMBER AT JACKSON,
MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	3	5	4	9	6	2	9	6	4	8	6
2	5	3	2	5	3	2	5	2	6	2	4
3	2	2	5	1	4		4	3	3	1	2
4	1		1	2	1	4	1		1	1	1
5	1		1	2	3	2	2	3	2	2	2
6			5	3	4	1		2		2	2
7		1	2	1	1	3	3	4	4	1	2
8	1		3	1	1	2	1	1	1		1
9		2	2		2		2	1			1
10	1	2	1	3		1	1	1	1	2	1
11	2	2	2		1			2	2		1
12		1			1	2	1	4	2		1
13	20	18	4	8	11	13	10	12	14	13	12
14	3	2	2	4	2	2	5	2	1	1	2
15											
16											
17											
≥18											
Total ³	39	38	34	39	40	34	44	43	41	33	38

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-42
(UFSAR TABLE 2.3-143)

NUMBER OF INVERSION¹ OCCURRENCES DURING OCTOBER AT JACKSON,
MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	4	4	7	7	6	3	6	10	3	10	6
2	2	5	5	1	3	3	3	5	1	3	3
3	2	2	3	2	3	4	1	5		4	3
4	2		2	1	4	1	1	2	1	4	2
5	2	2		1	3			1	2	3	1
6	1	1		1	1				1		1
7	1	1	2	1	1	2	2	3		2	2
8	2			2	2		1				1
9	3	1	2	2		1		2	1		1
10			2	2	2		2	5	1		1
11	2		1	3			1		2		1
12	2	2			3		1		2		1
13		2	2	1	1	1	1	1		1	1
14	4	6	8	2	3	8	5	6	8	5	6
15	14	13	5	14	4	14	14	6	16	13	11
16											
17											
≥18											
Total ³	41	39	39	40	36	37	38	50	36	45	41

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

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TABLE 2.7-43
(UFSAR TABLE 2.3-144)

NUMBER OF INVERSION¹ OCCURRENCES DURING NOVEMBER AT JACKSON,
MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	14	9	10	4	10	8	7	7	20	5	9
2	6	1	12	1	3	1	2	1	2	10	4
3	4	5	1	2	2	3	2	4	2	4	3
4	2	3	1		1	2	1	4	5	1	2
5	2	3	5	1	2	2	3	4	1	3	3
6	4	1	2		1	3	3	2	1		2
7	1	2	1		2	2	1	2	3	2	2
8	1	2	2	1	3		2	1	1	1	1
9	1	1					1	1		1	1
10	1	1	2	1		2	1		2	3	1
11		1			2					1	*
12		1		1	1	1	1			1	1
13		1			1	3	1	1		1	1
14		2	2	2	1		1		1	1	1
15	5	8	1	9	5	8	4	6	9	8	6
16	5	3	3	6	5	5	3	3	2	1	4
17											
≥18											
Total ³	46	44	42	28	39	40	33	36	49	43	41

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

* Less than one-half but greater than zero.

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TABLE 2.7-44
(UFSAR TABLE 2.3-145)

NUMBER OF INVERSION¹ OCCURRENCES DURING DECEMBER AT JACKSON,
MISSISSIPPI

Duration ²	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Mean
1	7	12	10	8	6	14	11	8	5	7	10
2	3	1	3	6	4	3	6	8	3	2	4
3	3	3	5	1	1	3	1	2	4	3	3
4	1	2	4	2	1	3	3	3	5	4	3
5	1	2	1	1	3			2	1	1	1
6		3	1	1	2	1	2	2	1	3	2
7	3	2		3	5	1	1	2	3		2
8	1	2		1	2	2		2	2		1
9			3			2	1	4		2	1
10	2	2		1	1		2	1	1	2	1
11		1		1	1		1			1	1
12	2		1		1	1		1			1
13	3		2		3		1		2		1
14				1				1	1	1	*
15	2	3	5	2	1	2	2	2	6	1	3
16	4	7	6	7	9	7	6	4	2	2	5
17											
≥18											
Total ³	42	40	41	35	40	39	37	42	36	29	39

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means “zero”).

* Less than one-half but greater than zero.

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TABLE 2.7-45
(UFSAR TABLE 2.3-146)

MEAN NUMBER OF INVERSION¹ OCCURRENCES DURING 1955-1964
AT JACKSON, MISSISSIPPI

Duration ²	Months												Annual
	J	F	M	A	M	J	J	A	S	O	N	D	
1	10	8	10	11	7	6	5	6	6	6	9	10	94
2	4	4	5	6	4	4	3	3	4	3	4	4	48
3	2	3	3	4	3	2	2	2	2	3	3	3	32
4	2	2	3	2	2	1	2	1	1	2	2	3	23
5	2	1	1	2	3	2	3	3	2	1	3	1	24
6	1	2	2	2	1	1	1	1	2	1	2	2	18
7	1	1	1	1	2	1	2	1	2	2	2	2	18
8	1	1	1	1	1	1	2	1	1	1	1	1	13
9	1	1	1	1	1	1	1	2	1	1	1	1	13
10	1	1	1	1	1	1	2	2	1	1	1	1	14
11	*	1	1	1	3	18	6	3	1	1	*	1	36
12	1	1	1	2	6		11	2	1	1	1	1	28
13	1	1	3	9	8			16	12	1	1	1	53
14	1	2	4						2		1	*	16
15	3	5	1							11	6	3	29
16	5										4	5	14
17													
≥18													
Total ³	36	34	38	43	42	38	40	43	38	41	41	39	473

NOTES:

1. Based on Pasquill-Turner calculation of E, F or G from hourly surface observations.
2. Consecutive hours of E, F or G stability for each discrete occurrence.
3. Number of discrete occurrences. (No entry in tables means "zero").

* Less than one but greater than zero.

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TABLE 2.7-46
(UFSAR TABLE 2.3-147)

PERCENT OF HOURS WITH INVERSION*
AT JACKSON, MISSISSIPPI

YEAR	J	F	M	A	M	J	J	A	S	O	N	D	ANNUAL
1955	34.7	26.6	30.1	32.5	40.6	41.8	41.1	47.0	51.4	53.8	37.4	33.2	39.3
1956	33.1	23.8	29.8	32.2	40.0	37.9	44.0	48.1	49.7	51.2	47.2	37.2	39.6
1957	17.1	32.6	33.6	32.4	36.0	38.8	44.9	49.6	31.9	41.7	29.4	39.5	35.7
1958	45.8	36.8	29.7	34.0	37.2	38.8	39.2	48.9	36.5	50.4	42.5	33.3	39.5
1959	35.1	29.2	34.4	33.1	40.5	40.6	43.4	48.9	40.8	33.9	41.1	44.4	38.8
1960	33.9	31.6	32.7	38.3	42.7	41.9	45.0	45.8	42.5	51.5	47.2	32.5	40.5
1961	40.7	36.5	32.3	37.1	41.5	34.3	43.0	48.7	43.6	50.7	33.8	31.7	39.5
1962	32.7	35.0	30.8	35.3	47.7	41.1	45.7	49.9	49.3	49.5	34.9	35.0	40.6
1963	30.1	36.5	34.4	28.5	43.2	37.1	41.3	50.5	45.4	56.4	40.4	35.5	40.0
1964	29.8	34.2	24.7	21.0	37.2	40.6	38.0	42.1	34.9	47.2	42.1	22.7	34.5
MEAN	33.3	32.3	31.2	32.4	40.7	39.3	42.6	48.0	42.6	48.6	36.6	34.5	38.8

* Based on Pasquill-Turner calculations of E, F or G stability from hourly surface observations.

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TABLE 2.7-47
(UFSAR TABLE 2.3-148)

NUMBER OF INVERSION OCCURRENCES
DURING JANUARY AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	4	11	9	24
2	5	8	7	20
3	1	11	4	16
4	3	6	4	13
5	2	2	1	5
6	6	2	3	11
7	11	8	9	28
8	1	3	7	11
9	11	6	2	19
10	1	0	0	1
11	0	0	0	0
12	0	2	0	2
13	0	0	0	0
14	0	1	0	1
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	45	61	46	152

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TABLE 2.7-48
(UFSAR TABLE 2.3-149)

NUMBER OF INVERSION OCCURRENCES
DURING FEBRUARY AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	4	3	6	13
2	2	1	5	8
3	3	2	4	9
4	3	1	4	8
5	2	4	2	8
6	13	8	1	32
7	9	6	4	19
8	9	5	9	23
9	3	14	5	22
10	1	1	0	2
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	49	47	50	146

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TABLE 2.7-49
(UFSAR TABLE 2.3-150)

NUMBER OF INVERSION OCCURRENCES
DURING MARCH AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	11	7	14	32
2	4	8	6	18
3	6	5	2	13
4	3	5	3	13
5	3	2	2	11
6	14	16	11	41
7	10	8	3	21
8	6	10	4	20
9	2	1	1	4
10	1	0	0	1
11	0	0	0	0
12	0	2	0	2
13	0	0	0	0
14	0	1	0	1
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	60	62	46	168

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TABLE 2.7-50
(UFSAR TABLE 2.3-151)

NUMBER OF INVERSION OCCURRENCES
DURING APRIL AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	9	8	8	25
2	5	5	2	12
3	6	5	4	15
4	1	8	4	13
5	4	3	8	15
6	17	16	13	46
7	7	14	11	32
8	6	7	10	23
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	55	66	60	181

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TABLE 2.7-51
(UFSAR TABLE 2.3-152)

NUMBER OF INVERSION OCCURRENCES
DURING MAY AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	11	8	6	25
2	3	3	6	12
3	5	3	1	9
4	7	3	4	14
5	3	3	1	7
6	22	21	22	65
7	16	15	13	44
8	4	8	2	14
9	0	3	1	4
10	0	0	0	0
11	0	0	0	0
12	0	1	0	1
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	71	68	56	195

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TABLE 2.7-52
(UFSAR TABLE 2.3-153)

NUMBER OF INVERSION OCCURRENCES
DURING JUNE AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	3	8	12	23
2	3	2	5	10
3	2	1	4	7
4	3	2	2	7
5	7	6	3	16
6	22	22	19	63
7	25	15	14	54
8	0	6	4	10
9	0	3	0	3
10	1	2	0	3
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	66	67	43	196

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TABLE 2.7-53
(UFSAR TABLE 2.3-154)

NUMBER OF INVERSION OCCURRENCES
DURING JULY AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	4	4	9	17
2	1	3	3	7
3	1	1	3	5
4	3	4	7	14
5	7	6	5	18
6	27	17	20	64
7	20	24	20	64
8	3	5	3	11
9	1	0	0	1
10	0	1	0	1
11	0	1	0	1
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	67	67	70	204

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TABLE 2.7-54
(UFSAR TABLE 2.3-155)

NUMBER OF INVERSION OCCURRENCES
DURING AUGUST AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	1	5	6	12
2	1	0	2	3
3	1	0	3	4
4	1	2	6	9
5	2	3	3	8
6	7	15	21	43
7	30	28	21	79
8	11	11	8	30
9	5	2	0	7
10	2	1	1	4
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	1	0	0	1
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	62	67	71	200

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TABLE 2.7-55
(UFSAR TABLE 2.3-156)

NUMBER OF INVERSION OCCURRENCES
DURING SEPTEMBER AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	4	6	7	17
2	0	3	4	7
3	1	4	3	8
4	4	1	0	5
5	2	6	3	11
6	3	5	8	16
7	34	10	25	69
8	12	1	13	26
9	3	2	0	5
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	63	53	63	179

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TABLE 2.7-56
(UFSAR TABLE 2.3-157)

NUMBER OF INVERSION OCCURRENCES
DURING OCTOBER AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	5	2	7	14
2	7	2	3	12
3	6	3	5	14
4	4	5	1	10
5	3	0	4	7
6	3	0	4	7
7	22	12	15	49
8	19	22	18	59
9	0	12	1	13
10	0	3	0	3
11	0	0	0	0
12	0	0	0	0
13	0	1	0	1
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	69	63	58	190

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TABLE 2.7-57
(UFSAR TABLE 2.3-158)

NUMBER OF INVERSION OCCURRENCES
DURING NOVEMBER AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	16	6	6	28
2	8	1	2	11
3	3	5	0	8
4	5	3	1	9
5	3	0	0	3
6	3	2	1	6
7	11	8	17	36
8	12	23	13	48
9	2	5	5	12
10	0	4	1	5
11	0	0	0	0
12	0	1	0	1
13	0	3	0	3
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	63	65	46	174

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TABLE 2.7-58
(UFSAR TABLE 2.3-159)

NUMBER OF INVERSION OCCURRENCES
DURING DECEMBER AT GRAND GULF SITE

Duration (hrs.)	1973	1974	1976	Total
1	9	4	4	17
2	2	10	4	16
3	4	6	2	12
4	2	2	4	8
5	2	3	2	7
6	7	2	1	10
7	11	14	13	38
8	10	14	7	31
9	14	9	9	32
10	2	0	2	4
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	1	0	1
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	53	65	48	166

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TABLE 2.7-59
(UFSAR TABLE 2.3-160)

NUMBER OF INVERSION OCCURRENCES AT GRAND GULF SITE

Duration (hrs.)	1972-1973	1973-1974	1976	Total
1	81	72	94	247
2	41	46	49	136
3	39	46	35	120
4	39	42	40	121
5	40	38	34	113
6	144	126	134	404
7	206	167	165	538
8	93	124	98	315
9	31	56	24	111
10	8	14	4	26
11	0	1	0	1
12	0	4	0	4
13	0	4	0	4
14	1	2	0	3
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
≥18	0	0	0	0
Total Number of Discrete Events	723	751	677	2151

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TABLE 2.7-60
(UFSAR TABLE 2.3-161)

PERCENT OF HOURS WITH INVERSION AT GRAND GULF SITE

Month	1972-1973	1973-1974	1976	Annual
Jan	37.1	39.3	28.4	34.8
Feb	43.1	51.8	28.1	44.2
Mar	39.5	41.8	24.5	35.3
Apr	36.1	46.4	43.8	42.1
May	47.2	51.6	39.0	45.9
Jun	52.6	53.6	41.3	49.3
Jul	52.6	55.7	48.5	52.2
Aug	62.5	57.8	54.3	58.2
Sep	57.2	45.2	50.8	51.3
Oct	53.3	65.6	44.9	54.5
Nov	39.6	71.9	41.7	51.2
Dec	40.1	51.3	40.1	46.8
Mean	46.6	52.7	41.2	46.8

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TABLE 2.7-61

MIXING HEIGHTS AT JACKSON INTERNATIONAL AIRPORT

Month	Avg. Morning (m)	Avg. Afternoon (m)
Jan	481.0	765.8
Feb	464.5	1065.2
Mar	514.0	1193.7
Apr	479.9	1418.1
May	462.7	1534.2
Jun	474.5	1684.1
July	401.6	1495.1
Aug	327.9	1818.1
Sep	381.6	1593.1
Oct	316.3	1255.0
Nov	379.6	898.1
Dec	471.8	745.9

NOTES:

1. Data is from the NCDC for the 10 year period of 1992 through 2001

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TABLE 2.7-62

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JANUARY, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.3	5.0	4.9	2.1	0.6	0.0	0.0	13.9
N-NE	0.3	1.9	4.3	1.5	0.2	0.0	0.0	8.2
NE	0.3	2.4	2.5	0.4	0.0	0.0	0.0	5.6
E-NE	0.3	1.5	1.1	0.1	0.0	0.0	0.0	3.0
E	0.6	2.9	0.9	0.1	0.0	0.0	0.0	4.6
E-SE	0.7	3.0	1.3	0.2	0.0	0.0	0.0	5.1
SE	0.6	3.8	2.2	0.4	0.0	0.0	0.0	7.1
S-SE	0.7	4.1	5.4	0.8	0.1	0.0	0.0	11.1
S	0.9	4.2	4.5	1.6	0.2	0.0	0.0	11.4
S-SW	0.4	1.9	3.6	1.2	0.3	0.1	0.0	7.4
SW	0.2	1.4	2.1	0.7	0.2	0.0	0.0	4.7
W-SW	0.1	0.8	0.9	0.1	0.1	0.0	0.0	2.1
W	0.3	1.1	1.1	0.4	0.0	0.0	0.0	2.9
W-NW	0.2	1.3	1.2	0.2	0.0	0.0	0.0	2.9
NW	0.3	1.9	2.1	0.5	0.1	0.0	0.0	4.8
N-NW	0.4	2.3	1.7	0.7	0.1	0.0	0.0	5.2
Total	7.6	39.5	39.9	10.9	1.9	0.2	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-63

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING FEBRUARY, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.0	5.0	4.3	2.1	0.2	0.1	0.0	12.7
N-NE	0.3	2.4	3.0	0.8	0.1	0.0	0.0	6.5
NE	0.4	2.8	2.2	0.3	0.0	0.0	0.0	5.7
E-NE	0.3	2.1	0.5	0.0	0.0	0.0	0.0	3.0
E	0.5	3.4	1.8	0.3	0.0	0.0	0.0	6.0
E-SE	0.8	2.7	1.3	0.2	0.1	0.0	0.0	5.1
SE	0.9	3.3	1.9	0.4	0.0	0.0	0.0	6.5
S-SE	0.5	5.2	4.1	1.2	0.3	0.0	0.0	11.4
S	0.8	5.6	4.2	2.2	0.7	0.1	0.0	13.7
S-SW	0.3	1.5	3.2	1.3	0.5	0.0	0.0	6.7
SW	0.2	1.1	1.8	1.3	0.1	0.0	0.0	4.4
W-SW	0.1	1.3	1.0	0.5	0.2	0.0	0.0	3.0
W	0.2	1.1	0.6	0.4	0.1	0.0	0.0	2.4
W-NW	0.1	1.7	1.1	0.3	0.0	0.0	0.0	3.3
NW	0.4	1.6	2.4	0.7	0.1	0.0	0.0	5.2
N-NW	0.2	1.8	1.6	0.7	0.1	0.0	0.0	4.4
Total	7.0	42.5	34.9	12.8	2.6	0.2	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-64

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING MARCH, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	0.8	5.8	5.3	1.2	0.1	0.0	0.0	13.3
N-NE	0.1	2.5	4.1	1.2	0.0	0.0	0.0	7.9
NE	0.5	3.0	2.7	0.7	0.0	0.0	0.0	7.1
E-NE	0.4	1.9	1.1	0.1	0.0	0.0	0.0	3.6
E	0.4	3.3	1.8	0.3	0.0	0.0	0.0	5.7
E-SE	0.6	3.2	1.6	0.4	0.1	0.0	0.0	5.9
SE	0.8	3.3	1.4	0.3	0.2	0.1	0.0	6.0
S-SE	0.5	4.2	3.3	0.9	0.2	0.0	0.0	9.0
S	0.9	5.6	3.9	1.8	0.3	0.0	0.0	12.5
S-SW	0.3	2.0	2.6	1.2	0.2	0.0	0.0	6.3
SW	0.3	1.0	1.0	0.2	0.1	0.0	0.0	2.5
W-SW	0.2	1.0	0.8	0.3	0.2	0.0	0.0	2.5
W	0.1	1.2	1.2	0.8	0.4	0.0	0.0	3.7
W-NW	0.2	1.2	1.4	1.6	0.2	0.0	0.0	4.5
NW	0.1	1.5	2.5	0.8	0.1	0.0	0.0	5.0
N-NW	0.3	1.7	1.6	0.7	0.1	0.0	0.0	4.5
Total	6.5	42.4	36.2	12.4	2.3	0.2	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-65

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING APRIL, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.4	3.8	3.1	1.3	0.1	0.0	0.0	9.7
N-NE	0.2	1.6	2.0	0.9	0.0	0.0	0.0	4.7
NE	0.3	2.0	1.6	0.6	0.0	0.0	0.0	4.5
E-NE	0.1	1.8	1.3	0.1	0.0	0.0	0.0	3.4
E	0.5	2.7	1.9	0.2	0.0	0.0	0.0	5.4
E-SE	0.5	3.2	1.6	0.1	0.0	0.1	0.0	5.4
SE	0.9	3.1	1.7	0.5	0.1	0.0	0.0	6.3
S-SE	0.7	4.8	5.3	1.5	0.2	0.0	0.0	12.5
S	0.7	5.1	7.6	4.3	0.5	0.0	0.0	18.2
S-SW	0.3	1.5	3.7	2.5	0.3	0.0	0.0	8.4
SW	0.1	0.9	2.1	0.8	0.2	0.0	0.0	4.1
W-SW	0.1	0.9	0.7	0.5	0.1	0.0	0.0	2.3
W	0.3	1.4	1.3	0.5	0.1	0.0	0.0	3.8
W-NW	0.3	1.0	1.3	0.7	0.3	0.0	0.0	3.6
NW	0.1	1.8	2.1	0.6	0.2	0.0	0.0	4.8
N-NW	0.2	1.4	1.0	0.5	0.0	0.0	0.0	3.1
Total	6.7	37.0	38.3	15.6	2.1	0.2	0.1	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-66

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING MAY, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.7	4.5	1.7	0.2	0.0	0.0	0.0	8.1
N-NE	0.2	1.7	1.2	0.2	0.0	0.0	0.0	3.4
NE	0.3	2.2	1.0	0.0	0.0	0.0	0.0	3.5
E-NE	0.3	2.4	0.7	0.1	0.0	0.0	0.0	3.6
E	0.4	3.4	0.8	0.1	0.0	0.0	0.0	4.8
E-SE	1.1	4.1	0.7	0.1	0.0	0.0	0.0	6.0
SE	1.4	5.8	1.6	0.2	0.0	0.0	0.0	9.0
S-SE	1.1	5.9	4.4	0.7	0.1	0.0	0.0	12.3
S	1.4	9.0	9.7	2.4	0.2	0.0	0.0	22.7
S-SW	0.5	3.8	4.2	1.4	0.0	0.0	0.0	10.0
SW	0.2	1.9	2.0	0.5	0.0	0.0	0.0	4.5
W-SW	0.2	0.9	1.2	0.2	0.0	0.0	0.0	2.5
W	0.2	1.0	1.0	0.2	0.0	0.0	0.0	2.4
W-NW	0.2	1.0	0.7	0.1	0.0	0.0	0.0	2.1
NW	0.3	1.2	0.9	0.2	0.0	0.0	0.0	2.6
N-NW	0.2	1.2	1.1	0.2	0.0	0.0	0.0	2.7
Total	9.6	50.2	33.0	6.7	0.3	0.1	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-67

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JUNE, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.8	4.2	1.4	0.2	0.0	0.0	0.0	7.7
N-NE	0.2	2.6	1.6	0.1	0.0	0.0	0.0	4.5
NE	0.3	2.9	0.8	0.0	0.0	0.0	0.0	4.1
E-NE	0.5	2.6	0.5	0.0	0.0	0.0	0.0	3.6
E	1.0	3.7	1.0	0.0	0.0	0.0	0.0	5.7
E-SE	1.3	4.7	0.9	0.0	0.0	0.0	0.0	6.9
SE	1.4	5.2	1.4	0.2	0.1	0.0	0.0	8.2
S-SE	1.0	7.1	2.3	0.1	0.0	0.0	0.0	10.6
S	1.8	9.5	7.1	0.6	0.1	0.0	0.0	19.0
S-SW	0.6	5.0	6.5	0.8	0.0	0.0	0.0	13.0
SW	0.3	2.7	3.1	0.3	0.0	0.0	0.0	6.3
W-SW	0.3	1.6	1.3	0.0	0.0	0.0	0.0	3.1
W	0.4	1.4	0.8	0.0	0.0	0.0	0.0	2.6
W-NW	0.1	0.8	0.5	0.1	0.0	0.0	0.0	1.6
NW	0.1	1.2	0.4	0.1	0.0	0.0	0.0	1.8
N-NW	0.2	0.7	0.4	0.0	0.0	0.0	0.0	1.3
Total	11.3	55.8	29.9	2.7	0.2	0.0	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-68

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JULY, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	4.1	9.2	0.9	0.0	0.0	0.0	0.0	14.2
N-NE	0.3	2.3	1.1	0.1	0.0	0.0	0.0	3.9
NE	0.3	2.1	0.9	0.0	0.0	0.0	0.0	3.3
E-NE	0.4	2.9	0.7	0.0	0.0	0.0	0.0	4.0
E	1.4	3.9	0.7	0.1	0.0	0.0	0.0	6.2
E-SE	1.2	4.3	0.5	0.0	0.0	0.0	0.0	6.0
SE	1.8	3.6	0.6	0.1	0.0	0.0	0.0	6.1
S-SE	1.8	5.5	0.9	0.1	0.0	0.0	0.0	8.2
S	2.6	9.7	2.2	0.1	0.0	0.0	0.0	14.6
S-SW	1.6	5.0	0.9	0.1	0.0	0.0	0.0	7.5
SW	0.8	5.6	1.0	0.0	0.0	0.0	0.0	7.4
W-SW	0.5	3.8	1.1	0.0	0.0	0.0	0.0	5.4
W	0.8	3.6	1.3	0.0	0.0	0.0	0.0	5.8
W-NW	0.3	1.5	0.7	0.0	0.0	0.0	0.0	2.5
NW	0.5	1.4	0.3	0.0	0.0	0.0	0.0	2.2
N-NW	0.5	1.9	0.3	0.0	0.0	0.0	0.0	2.7
Total	18.7	66.4	13.9	0.7	0.1	0.1	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-69

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING AUGUST, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	4.3	9.2	1.5	0.0	0.0	0.0	0.0	14.9
N-NE	0.5	4.1	2.5	0.0	0.0	0.0	0.0	7.3
NE	0.6	4.8	1.7	0.0	0.0	0.0	0.0	7.1
E-NE	0.4	5.1	1.4	0.1	0.0	0.0	0.0	7.0
E	1.2	5.0	0.9	0.0	0.0	0.0	0.0	7.2
E-SE	1.3	2.6	0.3	0.1	0.0	0.0	0.0	4.3
SE	1.8	3.7	0.2	0.1	0.0	0.0	0.0	5.8
S-SE	1.4	2.9	0.3	0.0	0.0	0.0	0.0	4.7
S	3.1	8.5	1.5	0.3	0.0	0.0	0.0	13.4
S-SW	1.1	4.0	1.6	0.1	0.0	0.0	0.0	6.8
SW	0.8	3.6	1.8	0.1	0.0	0.0	0.0	6.3
W-SW	0.6	3.1	1.1	0.1	0.0	0.0	0.0	4.9
W	0.7	2.0	1.2	0.0	0.0	0.0	0.0	3.9
W-NW	0.7	1.3	0.4	0.0	0.0	0.0	0.0	2.3
NW	0.3	1.2	0.2	0.0	0.0	0.0	0.0	1.7
N-NW	0.6	1.3	0.4	0.0	0.2	0.0	0.0	2.5
Total	19.3	62.3	17.0	1.2	0.3	0.0	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-70

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING SEPTEMBER, VICKSBURG, MS

Direction From	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	Total (%)	Avg. Speed
	Frequency of Occurrence (%)								
N	3.3	9.0	4.3	1.7	0.1	0.0	0.0	18.4	6.8
N-NE	0.6	5.2	6.0	0.9	0.1	0.0	0.0	12.7	8.2
NE	0.5	3.8	3.1	0.3	0.1	0.0	0.0	7.9	7.5
E-NE	0.8	4.1	2.4	0.2	0.0	0.0	0.0	7.6	6.8
E	0.7	5.1	2.9	0.2	0.0	0.0	0.0	8.9	6.7
E-SE	1.2	4.6	1.6	0.6	0.1	0.0	0.0	8.2	6.6
SE	1.5	4.6	1.8	0.2	0.0	0.0	0.0	8.1	6.0
S-SE	1.1	3.5	1.4	0.3	0.0	0.0	0.0	6.2	6.2
S	1.0	4.1	1.6	0.3	0.0	0.0	0.0	7.0	6.1
S-SW	0.5	1.7	0.9	0.0	0.0	0.0	0.0	3.1	6.1
SW	0.3	1.0	0.2	0.0	0.0	0.0	0.0	1.6	5.2
W-SW	0.2	0.8	0.2	0.0	0.0	0.0	0.0	1.4	5.7
W	0.5	1.0	0.2	0.0	0.0	0.0	0.0	1.6	4.9
W-NW	0.2	0.7	0.2	0.1	0.0	0.0	0.0	1.2	6.5
NW	0.5	0.9	0.8	0.2	0.0	0.0	0.0	2.4	7.1
N-NW	0.7	2.1	0.8	0.0	0.0	0.0	0.0	3.7	6.0
Total	13.7	52.2	28.5	5.1	0.5	0.0	0.0	100.0	6.4

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-71

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING OCTOBER, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	3.0	8.6	5.0	2.1	0.4	0.0	0.0	19.2
N-NE	0.3	2.8	4.9	1.3	0.2	0.0	0.0	9.5
NE	0.3	2.8	2.2	0.1	0.0	0.0	0.0	5.5
E-NE	0.3	2.5	1.0	0.0	0.0	0.0	0.0	3.8
E	0.9	4.4	1.0	0.0	0.0	0.0	0.0	6.2
E-SE	2.3	6.3	1.7	0.3	0.1	0.0	0.0	10.7
SE	2.7	6.6	3.0	0.8	0.0	0.0	0.0	13.2
S-SE	1.0	5.3	3.4	0.9	0.1	0.0	0.0	10.6
S	1.1	4.5	2.4	0.9	0.0	0.0	0.0	8.8
S-SW	0.2	1.4	1.1	0.3	0.0	0.0	0.0	3.1
SW	0.0	1.2	0.2	0.0	0.0	0.0	0.0	1.5
W-SW	0.2	0.5	0.2	0.1	0.0	0.0	0.0	1.0
W	0.2	0.7	0.9	0.1	0.0	0.0	0.0	1.9
W-NW	0.2	0.4	0.3	0.0	0.0	0.0	0.0	1.0
NW	0.2	0.5	0.5	0.0	0.0	0.0	0.0	1.3
N-NW	0.3	1.6	0.9	0.0	0.0	0.0	0.0	2.8
Total	13.3	50.1	28.6	7.2	0.9	0.0	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-72

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING NOVEMBER, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	2.9	7.4	6.0	0.8	0.1	0.0	0.0	17.3
N-NE	0.4	3.3	2.8	0.2	0.0	0.0	0.0	6.7
NE	0.4	2.2	1.4	0.0	0.0	0.0	0.0	4.1
E-NE	0.6	3.3	1.2	0.0	0.0	0.0	0.0	5.0
E	1.1	3.8	0.8	0.1	0.1	0.0	0.0	5.9
E-SE	1.1	5.0	0.9	0.1	0.0	0.0	0.0	7.2
SE	2.1	4.5	1.3	0.2	0.0	0.0	0.0	8.1
S-SE	0.7	4.4	3.3	0.3	0.1	0.0	0.0	8.8
S	0.9	4.3	3.0	1.2	0.1	0.0	0.0	9.4
S-SW	0.3	1.3	0.9	0.2	0.0	0.0	0.0	2.7
SW	0.4	1.5	0.9	0.1	0.0	0.0	0.0	3.0
W-SW	0.3	1.2	1.3	0.2	0.0	0.0	0.0	3.0
W	0.5	1.7	1.2	0.3	0.1	0.0	0.0	4.0
W-NW	0.6	2.0	1.2	0.3	0.1	0.0	0.0	4.3
NW	0.4	2.3	1.7	0.3	0.0	0.0	0.0	4.7
N-NW	0.6	2.7	2.1	0.3	0.0	0.0	0.0	5.8
Total	13.4	50.9	30.1	4.9	0.6	0.1	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-73

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING DECEMBER, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.8	7.8	5.6	2.2	0.6	0.1	0.0	18.1
N-NE	0.2	2.0	3.0	0.7	0.2	0.0	0.0	6.2
NE	0.3	1.3	1.2	0.1	0.0	0.0	0.0	2.9
E-NE	0.3	1.3	0.7	0.1	0.0	0.0	0.0	2.4
E	0.7	1.8	0.9	0.1	0.0	0.0	0.0	3.4
E-SE	0.6	2.9	1.3	0.2	0.0	0.0	0.0	5.0
SE	1.2	4.2	2.5	0.2	0.0	0.0	0.0	8.2
S-SE	0.7	3.2	3.3	1.6	0.1	0.0	0.0	8.8
S	1.1	4.5	2.7	1.1	0.2	0.1	0.0	9.6
S-SW	0.4	2.0	1.3	0.4	0.0	0.0	0.0	4.1
SW	0.2	1.7	0.7	0.4	0.1	0.0	0.0	3.1
W-SW	0.3	1.6	1.0	0.2	0.1	0.0	0.0	3.2
W	0.6	2.1	2.0	0.6	0.2	0.1	0.0	5.5
W-NW	0.2	2.1	2.0	0.6	0.1	0.0	0.0	5.0
NW	0.6	3.2	3.2	0.8	0.0	0.0	0.0	7.9
N-NW	0.3	2.8	2.9	0.5	0.0	0.0	0.0	6.5
Total	9.4	44.5	34.4	9.9	1.6	0.3	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-74

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING ALL YEARS, VICKSBURG, MS

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	2.2	6.5	3.7	1.2	0.2	0.0	0.0	13.8
N-NE	0.3	2.7	3.0	0.7	0.1	0.0	0.0	6.8
NE	0.4	2.7	1.8	0.2	0.0	0.0	0.0	5.1
E-NE	0.4	2.6	1.0	0.1	0.0	0.0	0.0	4.1
E	0.8	3.6	1.3	0.1	0.0	0.0	0.0	5.8
E-SE	1.0	3.9	1.2	0.2	0.0	0.0	0.0	6.3
SE	1.4	4.3	1.7	0.3	0.0	0.0	0.0	7.7
S-SE	0.9	4.7	3.2	0.7	0.1	0.0	0.0	9.6
S	1.3	6.2	4.3	1.4	0.2	0.0	0.0	13.5
S-SW	0.5	2.6	2.6	0.8	0.1	0.0	0.0	6.7
SW	0.3	1.9	1.4	0.4	0.1	0.0	0.0	4.1
W-SW	0.3	1.4	0.9	0.2	0.0	0.0	0.0	2.8
W	0.4	1.5	1.1	0.3	0.1	0.0	0.0	3.4
W-NW	0.3	1.3	0.9	0.4	0.1	0.0	0.0	2.9
NW	0.3	1.6	1.5	0.4	0.0	0.0	0.0	3.8
N-NW	0.4	1.8	1.3	0.3	0.0	0.0	0.0	3.8
Total	11.1	49.0	30.8	7.8	1.2	0.1	0.0	100.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-75

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JANUARY, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	2.7	6.6	3.9	0.2	0.0	0.0	0.0	13.5
N-NE	3.4	5.6	0.6	0.0	0.0	0.0	0.0	9.6
NE	3.7	3.2	0.2	0.0	0.0	0.0	0.0	7.1
E-NE	3.3	0.9	0.0	0.0	0.0	0.0	0.0	4.2
E	3.2	1.3	0.0	0.0	0.0	0.0	0.0	4.5
E-SE	2.7	2.2	0.0	0.0	0.0	0.0	0.0	4.9
SE	1.5	4.1	0.1	0.0	0.0	0.0	0.0	5.7
S-SE	0.9	3.9	1.3	0.0	0.0	0.0	0.0	6.1
S	0.9	4.9	2.1	0.0	0.0	0.0	0.0	7.9
S-SW	0.6	1.9	2.3	0.0	0.0	0.0	0.0	4.8
SW	1.1	2.2	1.6	0.4	0.0	0.0	0.0	5.2
W-SW	1.7	2.8	0.9	0.0	0.0	0.0	0.0	5.5
W	1.2	2.5	0.8	0.0	0.0	0.0	0.0	4.5
W-NW	1.3	2.0	0.3	0.0	0.0	0.0	0.0	3.6
NW	1.1	2.4	0.2	0.0	0.0	0.0	0.0	3.7
N-NW	1.8	5.2	2.2	0.0	0.0	0.0	0.0	9.2
Total	31.2	51.6	16.5	0.7	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-76

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING FEBRUARY, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.4	4.8	3.7	0.0	0.0	0.0	0.0	9.9
N-NE	2.9	5.1	0.9	0.0	0.0	0.0	0.0	9.0
NE	2.8	3.4	0.4	0.0	0.0	0.0	0.0	6.6
E-NE	2.6	2.9	0.1	0.0	0.0	0.0	0.0	5.5
E	3.8	1.8	0.0	0.0	0.0	0.0	0.0	5.6
E-SE	3.4	2.0	0.0	0.0	0.0	0.0	0.0	5.4
SE	1.8	2.6	0.5	0.0	0.0	0.0	0.0	4.9
S-SE	1.1	4.5	3.5	0.8	0.1	0.0	0.0	9.9
S	0.8	2.5	2.9	0.2	0.0	0.0	0.0	6.5
S-SW	1.1	1.5	1.1	0.1	0.0	0.0	0.0	3.8
SW	0.6	1.0	1.0	0.0	0.0	0.0	0.0	2.6
W-SW	1.9	1.9	0.3	0.1	0.0	0.0	0.0	4.2
W	1.5	1.6	0.5	0.0	0.0	0.0	0.0	3.6
W-NW	0.9	3.5	0.6	0.0	0.0	0.0	0.0	4.9
NW	1.5	3.5	0.5	0.0	0.0	0.0	0.0	5.5
N-NW	1.6	6.8	3.7	0.1	0.0	0.0	0.0	12.2
Total	29.9	49.4	19.5	1.2	0.1	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-77

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING MARCH, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.4	5.3	3.5	0.3	0.0	0.0	0.0	10.5
N-NE	1.8	4.3	2.6	0.1	0.0	0.0	0.0	8.8
NE	2.4	2.3	1.0	0.0	0.0	0.0	0.0	5.8
E-NE	2.9	1.4	0.0	0.0	0.0	0.0	0.0	4.3
E	4.1	2.2	0.1	0.0	0.0	0.0	0.0	6.3
E-SE	4.1	2.2	0.1	0.0	0.0	0.0	0.0	6.3
SE	2.4	4.4	1.4	0.1	0.0	0.0	0.0	8.2
S-SE	1.2	4.5	2.8	0.0	0.0	0.0	0.0	8.5
S	0.8	3.8	1.8	0.0	0.0	0.0	0.0	6.3
S-SW	0.7	1.4	1.4	0.3	0.0	0.0	0.0	3.8
SW	0.6	1.3	1.0	0.2	0.0	0.0	0.0	3.1
W-SW	0.8	3.0	1.2	0.1	0.0	0.0	0.0	5.1
W	1.1	4.3	0.9	0.0	0.0	0.0	0.0	6.3
W-NW	0.8	1.9	0.3	0.0	0.0	0.0	0.0	3.0
NW	1.4	2.6	0.3	0.0	0.0	0.0	0.0	4.2
N-NW	1.6	4.3	3.3	0.1	0.0	0.0	0.0	9.3
Total	28.1	49.4	21.6	1.0	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-78

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING APRIL, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	0.6	2.0	1.8	0.1	0.0	0.0	0.0	4.6
N-NE	1.2	3.6	0.7	0.1	0.0	0.0	0.0	5.6
NE	2.9	2.3	0.4	0.0	0.0	0.0	0.0	5.6
E-NE	5.1	1.1	0.1	0.0	0.0	0.0	0.0	6.4
E	5.4	1.6	0.0	0.0	0.0	0.0	0.0	6.9
E-SE	5.4	2.1	0.0	0.0	0.0	0.0	0.0	7.5
SE	3.4	7.5	0.2	0.0	0.0	0.0	0.0	11.1
S-SE	1.7	6.4	3.1	0.2	0.0	0.0	0.0	11.4
S	1.8	8.1	4.4	0.0	0.0	0.0	0.0	14.4
S-SW	0.7	3.8	2.8	0.0	0.0	0.0	0.0	7.4
SW	1.0	2.3	1.4	0.0	0.0	0.0	0.0	4.6
W-SW	0.7	2.5	0.3	0.0	0.0	0.0	0.0	3.5
W	0.8	1.8	0.0	0.0	0.0	0.0	0.0	2.5
W-NW	0.6	1.1	0.0	0.0	0.0	0.0	0.0	1.7
NW	0.6	0.9	0.0	0.0	0.0	0.0	0.0	1.6
N-NW	0.9	2.7	1.4	0.0	0.0	0.0	0.0	5.0
Total	33.0	49.7	16.8	0.6	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-79

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING MAY, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.3	3.0	1.4	0.0	0.0	0.0	0.0	5.7
N-NE	1.9	3.2	0.4	0.0	0.0	0.0	0.0	5.4
NE	6.5	2.1	0.3	0.0	0.0	0.0	0.0	9.0
E-NE	6.7	0.7	0.0	0.0	0.0	0.0	0.0	7.4
E	6.7	0.7	0.0	0.0	0.0	0.0	0.0	7.4
E-SE	3.7	0.6	0.0	0.0	0.0	0.0	0.0	4.3
SE	4.3	3.5	0.0	0.0	0.0	0.0	0.0	7.8
S-SE	2.5	4.9	0.4	0.0	0.0	0.0	0.0	7.8
S	2.1	9.9	3.2	0.0	0.0	0.0	0.0	15.2
S-SW	2.0	6.8	2.0	0.0	0.0	0.0	0.0	10.8
SW	1.2	5.3	0.9	0.0	0.0	0.0	0.0	7.3
W-SW	1.0	2.2	0.0	0.0	0.0	0.0	0.0	3.3
W	1.5	0.9	0.0	0.0	0.0	0.0	0.0	2.4
W-NW	1.1	0.7	0.0	0.0	0.0	0.0	0.0	1.8
NW	0.6	0.7	0.0	0.0	0.0	0.0	0.0	1.3
N-NW	0.8	2.3	0.0	0.0	0.0	0.0	0.0	3.1
Total	43.8	47.5	8.7	0.0	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
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TABLE 2.7-80

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JUNE, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.4	2.3	0.2	0.0	0.0	0.0	0.0	3.9
N-NE	2.5	3.2	0.2	0.0	0.0	0.0	0.0	5.9
NE	10.3	6.0	0.4	0.0	0.0	0.0	0.0	16.7
E-NE	9.5	1.9	0.0	0.0	0.0	0.0	0.0	11.4
E	8.0	1.2	0.0	0.0	0.0	0.0	0.0	9.2
E-SE	6.7	1.4	0.0	0.0	0.0	0.0	0.0	8.1
SE	6.2	4.2	0.1	0.0	0.0	0.0	0.0	10.5
S-SE	3.1	2.9	0.1	0.0	0.0	0.0	0.0	6.1
S	2.1	2.6	0.2	0.0	0.0	0.0	0.0	5.0
S-SW	1.7	2.8	0.3	0.0	0.0	0.0	0.0	4.8
SW	1.2	2.6	0.1	0.0	0.0	0.0	0.0	3.9
W-SW	1.3	1.6	0.0	0.0	0.0	0.0	0.0	3.0
W	1.2	1.2	0.0	0.0	0.0	0.0	0.0	2.4
W-NW	1.2	1.1	0.0	0.0	0.0	0.0	0.0	2.3
NW	1.3	1.6	0.0	0.0	0.0	0.0	0.0	3.0
N-NW	1.4	2.5	0.0	0.0	0.0	0.0	0.0	3.9
Total	59.1	39.3	1.6	0.0	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
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TABLE 2.7-81

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING JULY, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	0.9	1.3	0.0	0.0	0.0	0.0	0.0	2.2
N-NE	1.3	1.0	0.0	0.0	0.0	0.0	0.0	2.3
NE	5.7	1.6	0.0	0.0	0.0	0.0	0.0	7.3
E-NE	7.8	0.7	0.0	0.0	0.0	0.0	0.0	8.5
E	7.0	0.8	0.0	0.0	0.0	0.0	0.0	7.8
E-SE	6.5	0.5	0.0	0.0	0.0	0.0	0.0	7.1
SE	7.1	1.6	0.0	0.0	0.0	0.0	0.0	8.7
S-SE	4.3	2.6	0.0	0.0	0.0	0.0	0.0	7.0
S	6.0	2.6	0.0	0.0	0.0	0.0	0.0	8.6
S-SW	5.9	3.8	0.1	0.0	0.0	0.0	0.0	9.8
SW	3.5	5.6	0.0	0.0	0.0	0.0	0.0	9.1
W-SW	3.1	3.8	0.0	0.0	0.0	0.0	0.0	6.9
W	3.5	2.1	0.0	0.0	0.0	0.0	0.0	5.7
W-NW	2.9	1.0	0.0	0.0	0.0	0.0	0.0	3.9
NW	1.3	1.1	0.0	0.0	0.0	0.0	0.0	2.4
N-NW	1.2	1.4	0.0	0.0	0.0	0.0	0.0	2.6
Total	68.2	31.5	0.3	0.0	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
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TABLE 2.7-82

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING AUGUST, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.2	1.3	0.1	0.0	0.0	0.0	0.0	2.6
N-NE	2.8	2.3	0.0	0.0	0.0	0.0	0.0	5.1
NE	9.0	6.5	0.5	0.0	0.0	0.0	0.0	16.0
E-NE	9.7	2.3	0.0	0.0	0.0	0.0	0.0	12.0
E	9.8	0.9	0.0	0.0	0.0	0.0	0.0	10.7
E-SE	8.7	1.2	0.0	0.0	0.0	0.0	0.0	9.9
SE	5.9	3.1	0.0	0.0	0.0	0.0	0.0	8.9
S-SE	3.8	1.6	0.1	0.0	0.0	0.0	0.0	5.5
S	4.2	1.6	0.0	0.0	0.0	0.0	0.0	5.8
S-SW	1.9	2.1	0.1	0.0	0.0	0.0	0.0	4.1
SW	1.9	3.9	0.1	0.0	0.0	0.0	0.0	5.8
W-SW	1.9	1.8	0.0	0.0	0.0	0.0	0.0	3.7
W	2.4	0.9	0.0	0.0	0.0	0.0	0.0	3.3
W-NW	1.4	0.9	0.0	0.0	0.0	0.0	0.0	2.3
NW	1.2	0.9	0.0	0.0	0.0	0.0	0.0	2.0
N-NW	1.1	1.6	0.1	0.0	0.0	0.0	0.0	2.7
Total	66.5	32.6	0.9	0.0	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
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TABLE 2.7-83

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING SEPTEMBER, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.3	4.9	1.3	0.2	0.0	0.0	0.0	7.7
N-NE	3.3	8.3	2.1	0.0	0.0	0.0	0.0	13.8
NE	12.2	5.5	0.7	0.1	0.0	0.0	0.0	18.5
E-NE	10.6	2.2	0.0	0.0	0.0	0.0	0.0	12.8
E	7.5	0.8	0.0	0.0	0.0	0.0	0.0	8.3
E-SE	6.6	1.2	0.0	0.0	0.0	0.0	0.0	7.8
SE	4.6	3.1	0.0	0.0	0.0	0.0	0.0	7.7
S-SE	2.2	2.2	0.2	0.0	0.0	0.0	0.0	4.6
S	1.6	2.0	0.4	0.0	0.0	0.0	0.0	4.1
S-SW	1.0	1.6	0.1	0.0	0.0	0.0	0.0	2.7
SW	0.9	0.6	0.0	0.0	0.0	0.0	0.0	1.6
W-SW	1.4	0.5	0.0	0.0	0.0	0.0	0.0	1.9
W	1.0	0.6	0.1	0.0	0.0	0.0	0.0	1.7
W-NW	1.1	0.5	0.1	0.0	0.0	0.0	0.0	1.8
NW	0.6	0.8	0.1	0.0	0.0	0.0	0.0	1.5
N-NW	1.1	1.9	0.2	0.0	0.0	0.0	0.0	3.3
Total	57.1	37.1	5.4	0.3	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-84

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING OCTOBER, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.9	5.3	1.7	0.0	0.0	0.0	0.0	8.9
N-NE	3.5	5.9	1.0	0.0	0.0	0.0	0.0	10.4
NE	8.2	5.5	0.9	0.0	0.0	0.0	0.0	14.6
E-NE	9.5	0.9	0.0	0.0	0.0	0.0	0.0	10.4
E	8.4	0.5	0.1	0.0	0.0	0.0	0.0	9.1
E-SE	6.7	2.2	0.1	0.0	0.0	0.0	0.0	9.0
SE	4.5	5.4	0.1	0.0	0.0	0.0	0.0	10.0
S-SE	1.7	2.9	0.5	0.1	0.0	0.0	0.0	5.3
S	1.2	3.0	0.4	0.1	0.0	0.0	0.0	4.7
S-SW	1.1	1.8	0.6	0.1	0.0	0.0	0.0	3.6
SW	0.9	1.4	0.1	0.0	0.0	0.0	0.0	2.4
W-SW	1.6	1.3	0.0	0.0	0.0	0.0	0.0	3.0
W	1.5	0.6	0.0	0.0	0.0	0.0	0.0	2.1
W-NW	0.6	0.7	0.0	0.0	0.0	0.0	0.0	1.3
NW	1.2	0.6	0.0	0.0	0.0	0.0	0.0	1.8
N-NW	1.3	2.2	0.2	0.0	0.0	0.0	0.0	3.6
Total	53.7	40.1	5.8	0.4	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-85

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING NOVEMBER, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	2.2	5.6	1.9	0.0	0.0	0.0	0.0	9.7
N-NE	2.6	6.4	1.4	0.0	0.0	0.0	0.0	10.5
NE	6.2	1.9	0.1	0.0	0.0	0.0	0.0	8.1
E-NE	8.1	1.0	0.0	0.0	0.0	0.0	0.0	9.1
E	7.3	1.1	0.0	0.0	0.0	0.0	0.0	8.4
E-SE	6.7	2.5	0.0	0.0	0.0	0.0	0.0	9.2
SE	2.4	5.4	0.5	0.0	0.0	0.0	0.0	8.3
S-SE	1.6	3.2	1.6	0.0	0.0	0.0	0.0	6.5
S	1.3	3.0	2.5	0.0	0.0	0.0	0.0	6.8
S-SW	0.7	1.5	1.0	0.2	0.0	0.0	0.0	3.4
SW	0.6	1.3	0.3	0.0	0.0	0.0	0.0	2.3
W-SW	1.0	2.8	0.9	0.0	0.0	0.0	0.0	4.7
W	1.2	1.5	0.2	0.0	0.0	0.0	0.0	2.9
W-NW	0.5	1.5	0.1	0.0	0.0	0.0	0.0	2.0
NW	0.6	1.2	0.1	0.0	0.0	0.0	0.0	2.0
N-NW	1.2	3.2	1.7	0.0	0.0	0.0	0.0	6.1
Total	44.3	43.2	12.3	0.3	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-86

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING DECEMBER, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	2.5	4.3	1.5	0.0	0.0	0.0	0.0	8.4
N-NE	2.1	3.0	0.1	0.0	0.0	0.0	0.0	5.3
NE	2.8	2.6	0.2	0.0	0.0	0.0	0.0	5.5
E-NE	3.6	1.3	0.0	0.0	0.0	0.0	0.0	5.0
E	8.5	2.4	0.0	0.0	0.0	0.0	0.0	10.8
E-SE	4.8	3.6	0.0	0.0	0.0	0.0	0.0	8.4
SE	2.9	5.9	1.8	0.0	0.0	0.0	0.0	10.6
S-SE	1.3	3.3	4.8	0.2	0.0	0.0	0.0	9.5
S	1.0	2.2	2.4	0.0	0.0	0.0	0.0	5.5
S-SW	0.4	1.7	0.6	0.0	0.0	0.0	0.0	2.7
SW	0.4	1.2	0.3	0.0	0.0	0.0	0.0	1.9
W-SW	1.0	2.6	1.4	0.0	0.0	0.0	0.0	4.9
W	0.9	3.8	2.1	0.3	0.0	0.0	0.0	7.1
W-NW	1.0	2.7	0.6	0.0	0.0	0.0	0.0	4.3
NW	1.4	2.3	0.2	0.0	0.0	0.0	0.0	3.9
N-NW	1.4	4.0	0.8	0.0	0.0	0.0	0.0	6.2
Total	36.0	46.7	16.9	0.4	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-87

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
DURING ALL YEARS, GGNS SITE

Direction From	Wind Speed (mph)							Avg. Speed
	0-3	4-7	8-12	13-17	18-22	23-27	≥ 28	
	Frequency of Occurrence (%)							Total (%)
N	1.6	3.9	1.7	0.1	0.0	0.0	0.0	7.2
N-NE	2.4	4.3	0.8	0.0	0.0	0.0	0.0	7.6
NE	6.1	3.6	0.4	0.0	0.0	0.0	0.0	10.1
E-NE	6.7	1.4	0.0	0.0	0.0	0.0	0.0	8.1
E	6.7	1.3	0.0	0.0	0.0	0.0	0.0	8.0
E-SE	5.5	1.8	0.0	0.0	0.0	0.0	0.0	7.3
SE	3.9	4.3	0.4	0.0	0.0	0.0	0.0	8.6
S-SE	2.1	3.6	1.5	0.1	0.0	0.0	0.0	7.3
S	2.0	3.9	1.7	0.0	0.0	0.0	0.0	7.6
S-SW	1.5	2.6	1.0	0.1	0.0	0.0	0.0	5.2
SW	1.2	2.4	0.6	0.0	0.0	0.0	0.0	4.2
W-SW	1.5	2.3	0.4	0.0	0.0	0.0	0.0	4.2
W	1.5	1.8	0.4	0.0	0.0	0.0	0.0	3.7
W-NW	1.1	1.4	0.2	0.0	0.0	0.0	0.0	2.7
NW	1.1	1.5	0.1	0.0	0.0	0.0	0.0	2.7
N-NW	1.3	3.1	1.1	0.0	0.0	0.0	0.0	5.5
Total	46.2	43.1	10.3	0.4	0.0	0.0	0.0	100.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-88

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM A SINGLE
SECTOR, VICKSBURG, MS

Sector	1997	1998	1999	2000	2001	Max. of All Years	Avg.
N	7	28	22	9	22	28	17.6
N-NE	15	6	10	11	10	15	10.4
NE	10	17	6	4	11	17	9.6
E-NE	7	8	4	5	5	8	5.8
E	15	8	5	6	5	15	7.8
E-SE	13	16	10	6	10	16	11.0
SE	7	7	8	7	12	12	8.2
S-SE	11	13	16	15	16	16	14.2
S	18	13	13	16	27	27	17.4
S-SW	11	15	11	13	11	15	12.2
SW	8	11	10	8	7	11	8.8
W-SW	7	7	5	6	5	7	6.0
W	12	12	5	10	8	12	9.4
W-NW	6	8	7	8	8	8	7.4
NW	11	8	7	6	5	11	7.4
N-NW	9	4	7	9	11	11	8.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

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TABLE 2.7-89

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM 3 ADJACENT
SECTORS, VICKSBURG, MS

Sector	1997	1998	1999	2000	2001	All	Avg.
N	31	30	39	68	43	68	42.2
N-NE	63	30	62	74	64	74	58.6
NE	27	28	26	24	15	28	24.0
E-NE	35	35	17	21	18	35	25.2
E	28	43	28	24	24	43	29.4
E-SE	22	74	44	36	27	74	40.6
SE	23	42	45	19	51	51	36.0
S-SE	42	63	45	68	64	68	56.4
S	42	109	62	57	49	109	63.8
S-SW	61	52	57	59	32	61	52.2
SW	17	20	25	27	34	34	24.6
W-SW	20	31	15	18	21	31	21.0
W	26	29	34	18	17	34	24.8
W-NW	21	37	30	17	22	37	25.4
NW	37	20	19	23	33	37	26.4
N-NW	41	28	28	23	25	41	29.0

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-90

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM 5 ADJACENT
SECTORS, VICKSBURG, MS

Sector	1997	1998	1999	2000	2001	All	Avg.
N	71	51	70	75	76	76	57.2
N-NE	104	55	70	85	66	104	31.5
NE	77	89	62	78	65	78	25.8
E-NE	67	43	66	33	33	67	16.7
E	35	107	44	45	31	45	13.3
E-SE	56	110	45	49	67	56	17.5
SE	61	107	80	68	69	68	21.5
S-SE	49	160	91	105	98	105	25.7
S	73	120	98	101	126	101	29.0
S-SW	68	109	93	65	61	68	22.2
SW	64	86	68	59	39	64	20.5
W-SW	34	46	37	29	39	34	10.5
W	37	37	49	25	27	37	10.3
W-NW	38	42	49	28	34	38	11.0
NW	48	50	56	36	45	48	14.0
N-NW	47	42	49	68	50	68	19.2

NOTES:

1. Data From NCDC, 1997-2001 (Reference 3)

GGNS
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TABLE 2.7-91

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM A SINGLE
SECTOR, GRAND GULF SITE

Sector	2001	2002	2003	All	Avg.
N	17	18	22	22	19.0
N-NE	13	19	17	19	16.3
NE	15	32	21	32	22.7
E-NE	7	6	8	8	7.0
E	7	9	8	9	8.0
E-SE	9	8	9	9	8.7
SE	12	17	12	17	13.7
S-SE	18	12	12	18	14.0
S	23	18	15	23	18.7
S-SW	7	17	13	17	12.3
SW	9	8	10	10	9.0
W-SW	6	11	9	11	8.7
W	16	17	15	17	16.0
W-NW	6	10	6	10	7.3
NW	6	7	6	7	6.3
N-NW	16	8	11	16	11.7

NOTES:

1. Data From Site Meteorological Tower, 2001 - 2003 (Reference 2)

GGNS
EARLY SITE PERMIT APPLICATION
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TABLE 2.7-92

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM 3 ADJACENT
SECTORS, GRAND GULF SITE

Sector	2001	2002	2003	All	Avg.
N	51	57	58	58	55.3
N-NE	48	102	61	102	70.3
NE	31	55	82	82	56.0
E-NE	45	59	37	59	47.0
E	23	17	16	23	18.7
E-SE	21	27	18	27	22.0
SE	40	39	25	40	34.7
S-SE	55	64	28	64	49.0
S	53	41	55	55	49.7
S-SW	43	51	37	51	43.7
SW	18	19	37	37	24.7
W-SW	20	22	18	22	20.0
W	23	23	25	25	23.7
W-NW	19	32	23	32	24.7
NW	27	24	27	27	26.0
N-NW	41	39	46	46	42.0

NOTES:

1. Data From Site Meteorological Tower, 2001 – 2003 (Reference 2)

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TABLE 2.7-93

MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM 5 ADJACENT
SECTORS, GRAND GULF SITE

Sector	2001	2002	2003	All	Avg.
N	85	108	88	108	93.7
N-NE	68	106	111	122	113.0
NE	67	102	110	110	93.0
E-NE	74	109	92	109	91.7
E	60	81	67	81	69.3
E-SE	64	49	53	64	55.3
SE	83	78	56	83	72.3
S-SE	83	67	63	83	71.0
S	86	87	74	87	82.3
S-SW	71	75	55	75	67.0
SW	44	75	60	75	59.7
W-SW	31	28	37	37	32.0
W	23	37	27	37	29.0
W-NW	32	37	43	43	37.3
NW	53	48	50	53	50.3
N-NW	62	57	59	62	59.3

NOTES:

1. Data From Site Meteorological Tower, 2001 - 2003 (Reference 2)

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TABLE 2.7-94

COMPARISON OF MAXIMUM WIND PERSISTENCE
AT GRAND GULF SITE AND JACKSON, MS

Sector	Single Sector		Three Adjacent Sectors		Five Adjacent Sectors	
	GGNS	Jackson	GGNS	Jackson	GGNS	Jackson
N	22	19	58	88	108	158
N-NE	19	15	102	56	122	114
NE	32	26	82	84	110	84
E-NE	8	14	59	47	109	98
E	9	12	23	56	81	87
E-SE	9	14	27	50	64	114
SE	17	27	40	79	83	90
S-SE	18	29	64	75	83	171
S	23	17	55	97	87	182
S-SW	17	16	51	71	75	112
SW	10	17	37	55	75	109
W-SW	11	18	22	42	37	72
W	17	9	25	36	37	66
W-NW	10	20	32	41	43	59
NW	7	26	27	51	53	56
N-NW	16	23	46	43	62	84

NOTES:

1. Period of record at GGNS site, Sept. 2001 - 2003 (Reference 2)
2. Period of record at Jackson, 1955 – 1964 (UFSAR, Reference 4)

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TABLE 2.7-95

COMPARISON OF MAXIMUM WIND PERSISTENCE AT THE GRAND GULF SITE AND
VICKSBURG, MS

	Single Sector		Three Adjacent Sectors		Five Adjacent Sectors	
<u>Sector</u>	GGNS	Vicksburg	GGNS	Vicksburg	GGNS	Vicksburg
N	22	28	58	68	108	76
N-NE	19	15	102	74	122	104
NE	32	17	82	28	110	78
E-NE	8	8	59	35	109	67
E	9	15	23	43	81	45
E-SE	9	16	27	74	64	56
SE	17	12	40	51	83	68
S-SE	18	16	64	68	83	105
S	23	27	55	109	87	101
S-SW	17	15	51	61	75	68
SW	10	11	37	34	75	64
W-SW	11	7	22	31	37	34
W	17	12	25	34	37	37
W-NW	10	8	32	37	43	38
NW	7	11	27	37	53	48
N-NW	16	11	46	41	62	68

NOTES:

1. Period of record at GGNS site, 2001 - 2003. Data from Site Meteorological Tower (Reference 2).
2. Period of record at Vicksburg, 1997 – 2001. Data from NCDC (Reference 3).

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TABLE 2.7-96

TEMPERATURE MEANS AND EXTREMES AT VICKSBURG, MS

	Daily Max	Daily Min	Monthly Mean	Record Max	Year Occurred	Record Min	Year Occurred
Jan	57.2	39.0	48.0	79	2000	16	2001
Feb	63.7	43.2	53.3	84	2001	23	2000
Mar	67.5	48.2	57.7	86	1998	25	1998
Apr	76.1	55.1	65.7	92	1999	37	1997
May	84.7	64.1	74.4	99	1998	49	1999
Jun	89.3	70.4	79.3	100	1998	56	2000
Jul	93.2	73.3	82.5	103	2000	60	2001
Aug	93.1	71.5	81.5	107	2000	59	1997
Sep	87.5	65.3	75.7	107	2000	43	2001
Oct	78.9	53.0	65.2	96	1998	33	1999
Nov	67.5	44.7	55.7	86	1998	24	1997
Dec	56.7	38.3	47.2	81	1998	21	2000
Annual	76.3	55.5	65.6	107	2000	16	2001

NOTES:

1. Data from NCDC, 1997-2001

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TABLE 2.7-97

TEMPERATURE MEANS AND EXTREMES AT GRAND GULF SITE

	Daily Max	Daily Min	Monthly Mean	Record Max	Year Occurred	Record Min	Year Occurred
Jan	55.2	38.6	46.7	79.1	2000	17.3	2001
Feb	65.5	44.8	54.9	81.4	2000	25.5	2000
Mar	66.6	48.6	57.4	83.1	2000	34.4	2001
Apr	75.5	56.3	66.1	86.7	2000	34.9	2000
May	82.5	65.3	73.9	91.3	2000	54.0	2001
Jun	85.2	69.2	76.5	90.6	2001	58.7	2000
Jul	90.7	73.5	81.4	100.6	2000	63.5	2001
Aug	90.1	73.8	80.9	104.2	2000	68.4	2001
Sep	84.4	66.6	74.6	103.3	2000	47.1	2001
Oct	76.2	53.9	64.6	88.2	2000	36.5	2001
Nov	68.6	47.9	57.4	87.7	2000	29.1	2000
Dec	54.7	37.8	46.2	78.1	2001	19.1	2000

NOTES:

1. Data from Site Meteorological Tower, 2000 – 2001

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TABLE 2.7-98

RAINFALL FREQUENCY DISTRIBUTION AT GRAND GULF, 2000-2001
NUMBER OF HOURS PER MONTH, AVERAGE YEAR

inch/hr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.01 - 0.019	13.5	1	21	3.5	1	7.5	10.5	8	1	1	1	5.5
0.02 - 0.099	63.5	9	57	3.5	4.5	11	20.5	0	4.5	2.5	20.5	20
0.10 - 0.249	6	8	20	15	6	14	5.5	7.5	5	1	7.5	7.5
0.25 - 0.499	1.5	4.5	5	3	1.5	2.5	0.5	2	1.5	0.5	3.5	3
0.50 - 0.99	0	0.5	1.5	0.5	2	1	1	1	0.5	1	2	0.5
1.00 - 1.99	0	0	0.5	1	0	0	0	0.5	0	0.5	0	0.5
2.0 & over	0	0	0	0	0	0	0	0	0	0	0	0
Total	84.5	23	105	26.5	15	36	38	19	12.5	6.5	34.5	37

NOTES:

1. Data from Site Meteorological Tower, 2000 – 2001

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TABLE 2.7-99

RAINFALL FREQUENCY DISTRIBUTION AT VICKSBURG, MS
NUMBER OF HOURS PER MONTH, AVERAGE YEAR

inch/hr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.01-0.019	19.4	13.2	15.4	11	9	7.8	5.8	6.6	8.8	11.2	15.4	14
0.02-0.099	29.4	15.4	26.2	18.8	9.4	16	7	7.4	14.2	10	25.2	28.6
0.10-0.249	14.8	11	16	10	3.6	3.6	2.6	1.8	5.6	4	10.4	13.6
0.25-0.499	6	4.2	6	1.8	2	2.8	1	1	2.4	1.8	4	3.8
0.50-0.99	0.6	0.6	1.4	1.6	0.6	1.2	1.2	0.6	0.8	0.8	0.8	0.8
1.00-1.99	0.2	0.2	0	0	0	0.4	0.4	0.4	0.6	0.6	0	0
2.0 & over	0	0	0	0	0	0	0	0	0	0	0	0
Total	70.4	44.6	65	43.2	24.6	31.8	18	17.8	32.4	28.4	55.8	60.8

NOTES:

1. Data from NCDC, 1997-2001

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TABLE 2.7-100
(UFSAR TABLE 2.3-75)

MAXIMUM OBSERVED SHORT PERIOD PRECIPITATION (IN.)
VICKSBURG, MISSISSIPPI

Period	Minutes				Hours					
	5	10	15	30	1	2	3	6	12	24
Amount*	0.83	1.20	1.41	2.44	3.44	4.17	5.78	7.10	8.73	9.97
Date*	4/12	5/12	8/19	8/22	8/22	2/17	2/17	7/13	4/29	3/27
Year*	1909	1923	1918	1960	1960	1927	1927	1907	1953	1951
Amount**					1.63	2.66	2.71	3.04	3.70	4.52
Date**					8/31	8/31	8/31	6/9	6/9	1/28
Year**					1998	1998	1998	1997	1997	1998

NOTES:

* Length of record for 5 to 30 minutes was 66 years; length of record for remaining data is 69 years. (Data taken from UFSAR Table 2.3-75)

SOURCE:

Jennings, A.H., Maximum Recorded United States Point Rainfall for 5 minutes to 24 hours at 296 First Order Stations, US Weather Bureau Technical Paper 2, Washington, D.C., 1963.

** Length of record 5 years (1997 to 2001), Vicksburg Meteorology Station, NCDC

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TABLE 2.7-101

TOTAL HOURS OF SNOWFALL, VICKSBURG, MISSISSIPPI

	1997	1998	1999	2000	2001
January	19	0	0	3	5
February	2	0	0	0	0
March	0.5	0	0	0	0
November	0	0	0	0.5	0
December	8	16	2.5	5	0

NOTES:

1. Data from NCDC (Reference 3)

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TABLE 2.7-102

AVERAGE HOURS OF FOG AND HAZE AT VICKSBURG

	Fog (Average hours/month)	Haze (Average hours/month)
Jan	11.466	2.694
Feb	6.316	8.194
Mar	1.28	6.446
Apr	5.602	5.188
May	2.612	27.462
Jun	2.078	7.626
Jul	2.13	35.108
Aug	3.798	34.876
Sep	3.61	21.316
Oct	14.866	15.78
Nov	28.026	20.282
Dec	10.558	8.94
Annual (hours/yr)	92.342	193.912

NOTES:

1. Vicksburg did not report any hours of heavy fog, smoke, dust storms, or sand storms in this period.
2. Data from NCDC, 1997-2001

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TABLE 2.7-103

METEOROLOGICAL EQUIPMENT SPECIFICATION
AND PERFORMANCE CHARACTERISTICS

<u>Primary Tower</u>		
Wind Direction	Start threshold: Distance constant: Dampening ratio: Range:	0.7 mph 1.1 meter 0.4 at 10 degrees 0 to 540 degrees
Wind Speed	Start threshold: Accuracy: Distance constant: Range:	0.63 mph ±1% 5 ft 0 to 90 mph
Temperature	Accuracy: Range:	±0.2 °F -30 °F to 122 °F
ΔT	Accuracy:	±0.1 °F or 1% of ΔT
Precipitation	Accuracy: Resolution:	±1% up to 3 in./hr 0.01 to 15 in.
Dew Point	Accuracy:	±0.72 °F

<u>Backup Tower</u>		
Wind Direction	Start threshold: Dampening ratio: Distance constant:	0.7 mph 0.4 at 10 degrees 1.1 meters
Wind Speed	Start threshold: Distance constant: Range:	0.63 mph 5 ft 0 to 90 mph

NOTES:

1. This equipment was installed in March 1983

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TABLE 2.7-104
(UFSAR TABLE 2.3-170)

METEOROLOGICAL EQUIPMENT SPECIFICATION
AND PERFORMANCE CHARACTERISTICS – EXISTING EQUIPMENT

New Equipment

Wind Direction	Start threshold:	0.5 mph
	Distance constant:	1.0 meters
	Dampening ratio:	>0.4 at 10 degrees
	Range:	0 to 360 degrees
Wind Speed	Start threshold:	0.5 mph
	Accuracy:	±1%
	Distance constant:	4.9 ft
	Range:	0 to 125 mph
Temperature	Accuracy:	±0.27 F
	Range:	-22 F to 122 F
ΔT	Accuracy:	±0.1%
Precipitation	Accuracy:	±5% up to 6 in./hr
	Resolution:	0.01 in.
Relative Humidity	Accuracy:	±5% RH

Backup Tower

Wind Direction	Start threshold:	0.5 mph
	Dampening ratio:	>0.4 at 10 degrees
	Distance constant:	1.0 meters
Wind Speed	Start threshold:	0.5 mph
	Distance constant:	4.9 Ft
	Range:	0 to 125 mph
Temperature	Accuracy:	±0.27 °F
	Range:	-22 F to 122 F

NOTES:

1. This equipment was installed in December 2000 and January 2001.

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TABLE 2.7-105

MONTHLY DATA RECOVERY RATE – DATA FROM 1996 TO 2003

	1996	1997	1998	1999	2000	2001	2002	2003
Jan	96%	100%	94%	97%	96%	100%	100%	100%
Feb	84%	97%	100%	99%	89%	93%	95%	76%
Mar	100%	98%	96%	100%	98%	99%	100%	90%
Apr	100%	100%	87%	99%	94%	100%	100%	100%
May	100%	99%	100%	100%	99%	100%	99%	95%
Jun	68%	100%	73%	99%	99%	100%	97%	100%
Jul	96%	81%	94%	99%	100%	100%	100%	100%
Aug	96%	100%	95%	100%	72%	100%	100%	92%
Sep	100%	99%	99%	99%	99%	86%	92%	100%
Oct	94%	100%	81%	94%	99%	98%	100%	100%
Nov	94%	99%	98%	99%	95%	98%	100%	100%
Dec	88%	100%	83%	82%	99%	100%	100%	100%
Avg.	93%	98%	92%	97%	95%	98%	99%	96%

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TABLE 2.7-106

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
EXTREMELY UNSTABLE, STABILITY CLASS A

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	0	0	0	1	2	3	2	10	10	21	15	2	0	67
N-NE	0	0	0	0	1	2	2	5	6	5	5	0	0	26
NE	0	0	1	2	3	6	7	16	14	13	3	4	0	69
E-NE	0	0	0	2	3	6	5	9	3	2	0	0	0	31
E	0	0	0	2	2	3	4	5	3	0	0	0	0	17
E-SE	0	1	0	1	2	4	4	3	1	1	0	0	0	16
SE	0	0	1	1	2	8	7	17	9	4	1	0	0	48
S-SE	0	0	1	3	3	4	4	8	7	9	8	3	0	50
S	0	1	1	1	1	3	3	5	6	11	9	2	0	42
S-SW	0	0	1	2	3	5	4	10	8	16	8	2	0	58
SW	0	0	1	1	8	7	12	14	7	13	1	2	0	65
W-SW	0	0	1	6	5	13	14	11	7	9	2	0	0	68
W	0	0	2	4	9	15	12	12	6	6	2	0	0	68
W-NW	0	0	1	6	7	8	5	8	3	6	0	0	0	45
NW	0	0	0	2	2	8	5	9	5	4	0	0	0	35
N-NW	0	0	0	3	4	7	5	19	18	28	8	2	0	95
TOTAL	0	1	7	33	56	103	95	163	115	149	62	16	0	801

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TABLE 2.7-107

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
MODERATELY UNSTABLE, STABILITY CLASS B

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	0	0	0	1	1	1	3	4	4	16	5	4	0	37
N-NE	0	0	0	1	1	1	0	3	5	3	3	0	0	15
NE	0	0	0	1	4	3	3	2	5	3	1	0	0	20
E-NE	0	0	1	1	4	2	1	4	0	1	0	0	0	12
E	0	0	1	0	1	1	1	2	1	0	0	0	0	6
E-SE	0	0	1	3	2	2	1	1	1	0	0	0	0	8
SE	0	0	1	2	2	5	6	6	5	2	0	0	0	28
S-SE	0	0	0	2	1	2	2	3	2	4	4	1	0	19
S	0	0	1	1	1	2	2	2	6	8	4	0	0	25
S-SW	0	0	1	0	1	2	1	3	3	5	5	0	0	21
SW	0	0	0	1	2	4	1	7	6	5	3	0	0	28
W-SW	0	0	1	2	2	4	4	5	6	4	1	0	0	27
W	0	0	0	2	3	4	2	5	2	2	0	1	0	20
W-NW	0	0	0	2	1	3	4	4	0	3	1	0	0	17
NW	0	0	1	1	1	3	3	5	2	1	0	0	0	17
N-NW	0	0	1	1	0	3	4	4	11	16	3	0	0	43
TOTAL	0	0	7	18	23	38	35	58	58	72	28	5	0	343

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TABLE 2.7-108

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
SLIGHTLY UNSTABLE, STABILITY CLASS C

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	0	1	0	0	3	3	4	8	9	14	7	2	0	50
N-NE	0	0	0	1	1	2	1	8	9	11	3	1	0	36
NE	0	1	1	1	1	2	3	6	5	8	3	0	0	31
E-NE	0	0	1	1	1	2	3	5	1	0	0	0	0	13
E	0	1	2	1	3	2	1	2	2	0	0	0	0	13
E-SE	0	1	2	3	1	2	3	1	1	0	0	0	0	12
SE	0	0	1	1	3	3	4	7	4	4	0	0	0	27
S-SE	0	0	1	1	2	3	3	5	3	4	3	1	0	25
S	0	0	1	2	1	3	3	3	6	11	4	0	0	33
S-SW	0	0	0	2	0	1	1	2	3	7	4	1	0	21
SW	0	0	0	2	1	1	0	11	4	8	3	1	0	30
W-SW	0	0	1	1	3	3	3	4	7	4	1	1	0	27
W	0	0	1	1	6	5	2	4	4	5	1	2	0	30
W-NW	0	1	1	1	3	8	6	9	2	4	0	0	0	33
NW	0	0	1	1	1	4	5	7	3	1	0	0	0	23
N-NW	0	0	0	2	3	4	5	12	20	15	4	1	0	65
TOTAL	0	3	9	17	31	47	46	93	85	96	33	8	0	468

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TABLE 2.7-109

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
NEUTRAL, STABILITY CLASS D

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	0	1	9	14	19	32	29	73	61	78	33	11	0	360
N-NE	1	1	11	11	18	27	28	58	49	44	24	6	0	276
NE	0	3	12	21	24	33	32	52	34	26	4	2	0	241
E-NE	1	3	11	26	18	17	19	17	9	4	0	0	0	126
E	1	4	13	22	16	18	14	20	10	1	0	0	0	117
E-SE	1	3	11	28	21	24	14	16	4	2	1	0	0	125
SE	0	1	9	27	33	34	34	29	21	31	9	3	0	231
S-SE	0	1	8	16	21	19	19	35	27	50	27	9	2	233
S	0	4	7	12	17	11	16	35	41	68	29	4	1	246
S-SW	0	1	7	11	13	13	18	29	27	42	18	11	0	190
SW	0	3	1	14	16	16	16	24	22	20	10	6	1	147
W-SW	0	2	11	14	21	22	19	23	14	19	6	2	1	153
W	0	2	5	15	22	17	11	17	12	16	9	7	0	134
W-NW	0	4	6	7	19	17	7	21	12	13	1	0	0	107
NW	0	4	8	13	14	21	12	18	13	13	1	1	0	117
N-NW	1	3	6	13	17	26	25	53	31	53	13	1	0	242
TOTAL	3	38	133	264	309	347	314	520	387	480	186	62	4	3047

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TABLE 2.7-110

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
SLIGHTLY STABLE, STABILITY CLASS E

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	0	6	12	16	15	9	9	17	13	6	3	1	0	107
N-NE	1	15	19	24	30	29	34	38	18	10	1	0	0	219
NE	3	20	48	47	45	28	18	24	7	2	1	0	0	242
E-NE	4	22	42	45	29	10	8	5	1	0	0	0	0	166
E	3	28	40	40	24	14	8	6	2	1	0	0	0	166
E-SE	2	18	28	34	25	17	9	21	6	1	0	0	0	161
SE	1	14	20	34	33	29	25	44	31	24	2	0	0	255
S-SE	2	10	22	24	18	16	12	37	34	42	16	4	0	238
S	3	11	22	26	20	26	26	42	41	57	13	2	0	289
S-SW	2	12	12	14	17	9	15	17	19	18	16	4	0	156
SW	1	6	5	8	9	10	6	7	5	5	6	0	0	67
W-SW	2	6	5	7	5	4	4	9	6	9	4	0	0	62
W	1	4	3	5	6	4	4	4	6	3	3	0	0	40
W-NW	0	4	4	6	2	2	4	6	3	4	0	0	0	35
NW	1	2	3	4	4	5	5	7	3	2	0	0	0	35
N-NW	0	5	11	11	10	4	5	6	4	6	0	1	0	64
TOTAL	25	182	297	344	292	216	192	290	199	190	64	12	0	2303

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TABLE 2.7-111

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
MODERATELY STABLE, STABILITY CLASS F

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	2	4	4	3	2	1	0	0	0	0	0	0	0	16
N-NE	2	15	16	9	12	6	5	6	1	1	0	0	0	72
NE	3	19	36	39	28	7	3	3	1	1	0	0	0	142
E-NE	8	39	33	34	11	4	1	0	0	0	0	0	0	130
E	11	43	41	19	12	3	1	0	0	0	0	0	0	129
E-SE	6	23	23	17	22	5	4	4	2	1	0	0	0	106
SE	3	15	18	17	14	12	7	8	2	1	0	0	0	97
S-SE	4	12	7	8	5	7	2	7	1	1	0	0	0	54
S	2	4	5	3	3	1	2	3	0	0	0	0	0	22
S-SW	3	5	1	2	2	2	2	1	0	0	1	0	0	16
SW	2	1	2	2	0	0	1	1	1	0	0	0	0	8
W-SW	2	4	6	2	1	0	0	0	0	1	0	0	0	15
W	1	3	0	1	0	0	0	0	0	0	0	0	0	5
W-NW	1	3	1	0	1	0	0	0	0	0	0	0	0	5
NW	1	2	1	0	0	0	0	0	0	0	0	0	0	4
N-NW	1	2	2	3	1	0	0	0	0	0	0	0	0	7
TOTAL	52	193	195	159	113	49	27	32	6	5	1	0	0	830

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TABLE 2.7-112

2002 TO 2003 GRAND GULF DATA (AVERAGED IN HOURS)
EXTREMELY STABLE, STABILITY CLASS G

	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	4	5	7	>13	TOTAL
N	2	4	1	0	0	0	0	0	0	0	0	0	0	6
N-NE	3	6	9	2	2	4	0	1	0	0	0	0	0	26
NE	9	52	61	42	15	5	2	1	0	0	0	0	0	187
E-NE	31	126	69	23	2	1	0	0	0	0	0	0	0	251
E	29	98	72	27	9	1	1	4	0	0	0	0	0	240
E-SE	9	35	38	37	24	21	9	11	0	0	0	0	0	184
SE	4	5	9	8	11	4	2	1	0	0	0	0	0	44
S-SE	2	2	2	1	1	2	0	1	0	0	0	0	0	9
S	3	1	1	0	0	0	0	0	0	0	0	0	0	4
S-SW	0	1	0	0	0	0	0	0	0	0	0	0	0	1
SW	0	1	0	0	0	0	0	0	0	0	0	0	0	1
W-SW	1	1	1	0	0	0	0	0	0	1	0	0	0	3
W	0	1	1	0	0	0	0	0	0	0	0	0	0	2
W-NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	1	2	0	0	0	0	0	0	0	0	0	0	0	3
N-NW	0	1	1	0	0	0	0	0	0	0	0	0	0	2
TOTAL	98	334	263	140	64	36	14	17	0	1	0	0	0	968

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TABLE 2.7-113

EXCLUSION AREA BOUNDARY CUMULATIVE FREQUENCY OF RELATIVE
CONCENTRATION (X/Q) OF EFFLUENT AT THE MINIMUM SITE BOUNDARY DISTANCE
(841 M), 0-2 HOURS

Cumulative Frequency	X/Q
1 %	6.83E-04
3 %	5.39E-04
5 %	4.29E-04
10 %	2.97E-04
15 %	2.14E-04
20 %	1.68E-04
25 %	1.26E-04
30 %	1.02E-04
35 %	8.48E-05
40 %	7.24E-05
45 %	6.27E-05
50 %	6.37E-05
55 %	6.07E-05
60 %	5.16E-05
65 %	4.38E-05
70 %	4.16E-05
75 %	3.77E-05
80 %	3.43E-05
85 %	2.27E-05
90 %	7.84E-06
95 %	2.85E-06

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TABLE 2.7-114

CUMULATIVE FREQUENCY OF RELATIVE CONCENTRATION (X/Q) OF EFFLUENT AT THE
LOW POPULATION ZONE (3219 M), 0-2 HOURS

Cumulative Frequency	X/Q
1 %	2.04E-04
3 %	1.65E-04
5 %	1.30E-04
10 %	8.02E-05
15 %	5.70E-05
20 %	3.98E-05
25 %	2.97E-05
30 %	2.35E-05
35 %	1.78E-05
40 %	1.48E-05
45 %	1.33E-05
50 %	1.16E-05
55 %	9.97E-06
60 %	8.60E-06
65 %	7.52E-06
70 %	6.45E-06
75 %	5.55E-06
80 %	4.40E-06
85 %	1.96E-06
90 %	5.69E-07
95 %	2.68E-07

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TABLE 2.7-115

EXCLUSION AREA BOUNDARY
DIRECTION DEPENDENT SECTOR RELATIVE CONCENTRATION (X/Q)
OF EFFLUENT AT THE MINIMUM SITE BOUNDARY (841 m)

Downwind Sector	0-2 Hours
S	1.21E-04
S-SW	2.50E-04
SW	4.73E-04
W-SW	5.95E-04
W	5.90E-04
W-NW	4.41E-04
NW	2.72E-04
N-NW	1.90E-04
N	1.46E-04
N-NE	1.25E-04
NE	8.75E-05
E-NE	1.12E-04
E	7.94E-05
E-SE	7.39E-05
SE	7.83E-05
S-SE	9.97E-05

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TABLE 2.7-116

LOW POPULATION ZONE
DIRECTION DEPENDENT SECTOR RELATIVE CONCENTRATION (X/Q)
OF EFFLUENT AT THE LPZ (3219 m)

Sector	0-2 Hours	0-8 Hours	8-24 Hours	1-4 Days	4-30 Days
S	2.84E-05	1.41E-05	9.90E-06	4.62E-06	1.55E-06
S-SW	6.79E-05	3.20E-05	2.19E-05	9.70E-06	3.00E-06
SW	1.44E-04	6.94E-05	4.83E-05	2.19E-05	7.07E-06
W-SW	1.82E-04	8.83E-05	6.16E-05	2.82E-05	9.15E-06
W	1.80E-04	8.68E-05	6.04E-05	2.75E-05	8.85E-06
W-NW	1.31E-04	6.20E-05	4.26E-05	1.89E-05	5.88E-06
NW	7.61E-05	3.62E-05	2.50E-05	1.12E-05	3.53E-06
N-NW	4.81E-05	2.30E-05	1.59E-05	7.12E-06	2.25E-06
N	3.40E-05	1.70E-05	1.20E-05	5.63E-06	1.90E-06
N-NE	2.88E-05	1.38E-05	9.50E-06	4.25E-06	1.34E-06
NE	1.93E-05	9.09E-06	6.24E-06	2.76E-06	8.58E-07
E-NE	2.36E-05	1.11E-05	7.66E-06	3.40E-06	1.06E-06
E	1.56E-05	7.49E-06	5.18E-06	2.33E-06	7.41E-07
E-SE	1.54E-05	7.14E-06	4.85E-06	2.10E-06	6.32E-07
SE	1.56E-05	7.38E-06	5.07E-06	2.25E-06	7.02E-07
S-SE	2.18E-05	1.05E-05	7.27E-06	3.29E-06	1.05E-06

GGNS
EARLY SITE PERMIT APPLICATION
PART 3 – ENVIRONMENTAL REPORT

TABLE 2.7-117

ANNUAL AVERAGE X/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Location	Direction	Distance (miles) ²	Distance (meters)	X/Q (sec/m ³) No Decay Undepleted	X/Q (sec/m ³) No Decay Depleted	D/Q (per m ²)
SITE BOUNDARY	S	0.72	1155.	2.2E-06	1.9E-06	7.9E-09
SITE BOUNDARY	S-SW	0.73	1169.	3.7E-06	3.3E-06	8.1E-09
SITE BOUNDARY	SW	0.85	1364.	6.8E-06	6.0E-06	8.7E-09
SITE BOUNDARY	W-SW	0.85	1364.	8.8E-06	7.8E-06	6.8E-09
SITE BOUNDARY	W	0.98	1575.	6.7E-06	5.8E-06	5.1E-09
SITE BOUNDARY	W-NW	0.98	1575.	4.2E-06	3.7E-06	4.5E-09
SITE BOUNDARY	NW	0.98	1575.	2.6E-06	2.3E-06	5.3E-09
SITE BOUNDARY	N-NW	0.67	1076.	3.3E-06	2.9E-06	8.7E-09
SITE BOUNDARY	N	0.58	934.	3.9E-06	3.5E-06	1.2E-08
SITE BOUNDARY	N-NE	0.52	841.	3.0E-06	2.8E-06	9.6E-09
SITE BOUNDARY	NE	0.52	841.	1.9E-06	1.8E-06	7.3E-09
SITE BOUNDARY	E-NE	0.52	841.	2.4E-06	2.2E-06	7.4E-09
SITE BOUNDARY	E	0.56	904.	1.5E-06	1.4E-06	5.6E-09
SITE BOUNDARY	E-SE	0.67	1086.	8.8E-07	7.9E-07	3.3E-09
SITE BOUNDARY	SE	0.60	963.	1.2E-06	1.1E-06	3.9E-09
SITE BOUNDARY	S-SE	0.60	963.	2.0E-06	1.8E-06	8.6E-09
NEAREST HOME	S	3.45	5548.	1.8E-07	1.4E-07	5.2E-10
NEAREST HOME	S-SW	1.05	1686.	2.0E-06	1.7E-06	4.4E-09
NEAREST HOME	N	0.81	1310.	2.2E-06	1.9E-06	6.6E-09
NEAREST HOME	N-NE	0.64	1029.	2.1E-06	1.9E-06	7.0E-09
NEAREST HOME	E-NE	0.63	1021.	1.7E-06	1.5E-06	5.4E-09

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TABLE 2.7-117 (Continued)

Location	Direction	Distance (miles) ²	Distance (meters)	X/Q (sec/m ³) No Decay Undepleted	X/Q (sec/m ³) No Decay Depleted	D/Q (per m ²)
NEAREST HOME	E-SE	1.06	1708.	4.1E-07	3.5E-07	1.5E-09
NEAREST HOME	SE	2.39	3843.	1.3E-07	1.0E-07	3.7E-10
NEAREST HOME	S-SE	1.42	2283.	4.5E-07	3.9E-07	2.0E-09
NEAREST GARDEN	S	3.45	5548.	1.8E-07	1.4E-07	5.2E-10
NEAREST GARDEN	S-SW	1.05	1686.	2.0E-06	1.7E-06	4.4E-09
NEAREST GARDEN	N	1.49	2404.	8.0E-07	6.8E-07	2.3E-09
NEAREST GARDEN	E-NE	0.63	1021.	1.7E-06	1.5E-06	5.4E-09
NEAREST GARDEN	E-SE	1.06	1701.	4.1E-07	3.6E-07	1.6E-09
NEAREST GARDEN	SE	4.17	6704.	5.5E-08	4.2E-08	1.4E-10
NEAREST GARDEN	S-SE	4.70	7561.	7.0E-08	5.3E-08	2.4E-10
RV AREA	E-NE	0.39	620.	4.1E-06	3.8E-06	1.2E-08
ESC	N-NW	0.20	314.	2.9E-05	2.7E-05	6.0E-08
GIN LAKE	W-NW	0.46	747.	1.6E-05	1.4E-05	1.5E-08
HAMILTON LAKE	W	0.55	884.	1.8E-05	1.6E-05	1.3E-08
SITE GARDEN	S-SE	0.69	1107.	1.5E-06	1.4E-06	6.8E-09
NEAREST MILK COW	S-SW	10	16093	7.0E-08	4.7E-08	8.7E-11
NEAREST MEAT COW	S	4	6437	1.4E-07	1.1E-07	4.0E-10

NOTES:

1. Combined vent – Ground Level Releases Only.
2. Distances are corrected for the approximate difference between GGNS Unit 1 location and the ESP facility location. For example, dose analyses were done using a distance of 0.63 miles for the nearest garden, based on the distance of 0.67 miles given in ER Section 2.7 Reference 29 for this receptor location.

GGNS
EARLY SITE PERMIT APPLICATION
PART 3 – ENVIRONMENTAL REPORT

TABLE 2.7-118

ANNUAL AVERAGE RELATIVE CONCENTRATION, X/Q, UNDEPLETED

COMBINED VENT												
NO DECAY, UNDEPLETED												
ANNUAL AVERAGE CHI/Q		DISTANCE IN MILES FROM THE SITE										
SECTOR		0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S		1.417E-05	4.102E-06	2.007E-06	1.234E-06	6.388E-07	4.061E-07	2.877E-07	2.179E-07	1.726E-07	1.414E-07	1.186E-07
S-SW		2.419E-05	7.076E-06	3.465E-06	2.136E-06	1.116E-06	7.160E-07	5.113E-07	3.900E-07	3.110E-07	2.561E-07	2.161E-07
SW		5.922E-05	1.720E-05	8.323E-06	5.147E-06	2.719E-06	1.764E-06	1.272E-06	9.786E-07	7.864E-07	6.521E-07	5.536E-07
W-SW		7.748E-05	2.245E-05	1.081E-05	6.698E-06	3.554E-06	2.316E-06	1.677E-06	1.294E-06	1.043E-06	8.674E-07	7.381E-07
W		7.427E-05	2.154E-05	1.038E-05	6.431E-06	3.411E-06	2.221E-06	1.608E-06	1.241E-06	9.997E-07	8.309E-07	7.069E-07
W-NW		4.713E-05	1.369E-05	6.617E-06	4.094E-06	2.165E-06	1.406E-06	1.015E-06	7.816E-07	6.287E-07	5.216E-07	4.431E-07
NW		2.900E-05	8.460E-06	4.131E-06	2.547E-06	1.333E-06	8.575E-07	6.136E-07	4.689E-07	3.746E-07	3.089E-07	2.610E-07
N-NW		1.874E-05	5.479E-06	2.688E-06	1.655E-06	8.627E-07	5.522E-07	3.935E-07	2.996E-07	2.385E-07	1.961E-07	1.652E-07
N		1.719E-05	5.037E-06	2.479E-06	1.525E-06	7.921E-07	5.054E-07	3.592E-07	2.728E-07	2.167E-07	1.778E-07	1.495E-07
N-NE		1.125E-05	3.282E-06	1.615E-06	9.927E-07	5.150E-07	3.281E-07	2.328E-07	1.766E-07	1.401E-07	1.148E-07	9.645E-08
NE		7.284E-06	2.091E-06	1.021E-06	6.259E-07	3.233E-07	2.051E-07	1.450E-07	1.097E-07	8.678E-08	7.097E-08	5.951E-08
E-NE		8.972E-06	2.573E-06	1.254E-06	7.693E-07	3.985E-07	2.536E-07	1.798E-07	1.363E-07	1.081E-07	8.859E-08	7.442E-08
E		6.577E-06	1.868E-06	9.070E-07	5.554E-07	2.870E-07	1.822E-07	1.289E-07	9.753E-08	7.723E-08	6.320E-08	5.302E-08
E-SE		5.282E-06	1.504E-06	7.320E-07	4.473E-07	2.296E-07	1.449E-07	1.020E-07	7.683E-08	6.059E-08	4.940E-08	4.131E-08
SE		5.999E-06	1.721E-06	8.386E-07	5.144E-07	2.657E-07	1.686E-07	1.192E-07	9.015E-08	7.135E-08	5.836E-08	4.894E-08
S-SE		9.471E-06	2.707E-06	1.320E-06	8.080E-07	4.154E-07	2.624E-07	1.849E-07	1.394E-07	1.100E-07	8.970E-08	7.503E-08
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)		DISTANCE IN MILES FROM THE SITE										
SECTOR		5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S		1.015E-07	5.623E-08	3.720E-08	2.096E-08	1.405E-08	1.033E-08	8.046E-09	6.521E-09	5.441E-09	4.640E-09	4.027E-09
S-SW		1.858E-07	1.047E-07	7.014E-08	4.023E-08	2.727E-08	2.022E-08	1.587E-08	1.294E-08	1.085E-08	9.295E-09	8.097E-09
SW		4.787E-07	2.760E-07	1.881E-07	1.106E-07	7.626E-08	5.733E-08	4.549E-08	3.745E-08	3.166E-08	2.733E-08	2.396E-08
W-SW		6.396E-07	3.719E-07	2.550E-07	1.512E-07	1.049E-07	7.922E-08	6.309E-08	5.209E-08	4.417E-08	3.820E-08	3.357E-08
W		6.125E-07	3.558E-07	2.438E-07	1.444E-07	1.001E-07	7.555E-08	6.013E-08	4.964E-08	4.207E-08	3.638E-08	3.196E-08
W-NW		3.834E-07	2.215E-07	1.512E-07	8.909E-08	6.155E-08	4.633E-08	3.679E-08	3.031E-08	2.565E-08	2.215E-08	1.943E-08
NW		2.247E-07	1.273E-07	8.565E-08	4.942E-08	3.364E-08	2.503E-08	1.969E-08	1.610E-08	1.352E-08	1.161E-08	1.013E-08
N-NW		1.418E-07	7.952E-08	5.308E-08	3.027E-08	2.043E-08	1.510E-08	1.182E-08	9.611E-09	8.043E-09	6.876E-09	5.980E-09
N		1.282E-07	7.142E-08	4.745E-08	2.688E-08	1.806E-08	1.330E-08	1.037E-08	8.411E-09	7.021E-09	5.991E-09	5.200E-09
N-NE		8.261E-08	4.585E-08	3.037E-08	1.712E-08	1.146E-08	8.416E-09	6.548E-09	5.301E-09	4.417E-09	3.763E-09	3.261E-09
NE		5.089E-08	2.812E-08	1.857E-08	1.044E-08	6.982E-09	5.126E-09	3.988E-09	3.229E-09	2.692E-09	2.294E-09	1.989E-09
E-NE		6.375E-08	3.546E-08	2.354E-08	1.333E-08	8.968E-09	6.612E-09	5.164E-09	4.194E-09	3.506E-09	2.995E-09	2.603E-09
E		4.538E-08	2.514E-08	1.665E-08	9.404E-09	6.323E-09	4.661E-09	3.640E-09	2.957E-09	2.472E-09	2.112E-09	1.836E-09
E-SE		3.524E-08	1.929E-08	1.266E-08	7.060E-09	4.712E-09	3.452E-09	2.682E-09	2.169E-09	1.807E-09	1.538E-09	1.333E-09
SE		4.186E-08	2.314E-08	1.530E-08	8.616E-09	5.778E-09	4.251E-09	3.313E-09	2.687E-09	2.244E-09	1.915E-09	1.662E-09
S-SE		6.404E-08	3.510E-08	2.304E-08	1.286E-08	8.573E-09	6.277E-09	4.874E-09	3.940E-09	3.279E-09	2.791E-09	2.417E-09

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TABLE 2.7-118 (Continued)

COMBINED VENT NO DECAY, UNDEPLETED										
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT SEGMENT BOUNDARIES IN MILES FROM THE SITE										
DIRECTION	5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
FROM SITE										
S	2.129E-06	6.676E-07	2.913E-07	1.736E-07	1.190E-07	5.784E-08	2.150E-08	1.041E-08	6.545E-09	4.650E-09
S-SW	3.677E-06	1.165E-06	5.174E-07	3.127E-07	2.167E-07	1.073E-07	4.112E-08	2.036E-08	1.298E-08	9.312E-09
SW	8.883E-06	2.834E-06	1.286E-06	7.902E-07	5.551E-07	2.820E-07	1.125E-07	5.764E-08	3.754E-08	2.736E-08
W-SW	1.157E-05	3.702E-06	1.694E-06	1.048E-06	7.400E-07	3.795E-07	1.537E-07	7.961E-08	5.221E-08	3.825E-08
W	1.111E-05	3.553E-06	1.624E-06	1.004E-06	7.087E-07	3.630E-07	1.468E-07	7.593E-08	4.975E-08	3.643E-08
W-NW	7.067E-06	2.256E-06	1.026E-06	6.316E-07	4.443E-07	2.263E-07	9.066E-08	4.657E-08	3.039E-08	2.218E-08
NW	4.389E-06	1.392E-06	6.208E-07	3.765E-07	2.617E-07	1.304E-07	5.046E-08	2.519E-08	1.614E-08	1.163E-08
N-NW	2.849E-06	9.009E-07	3.982E-07	2.398E-07	1.657E-07	8.162E-08	3.097E-08	1.521E-08	9.644E-09	6.890E-09
N	2.623E-06	8.275E-07	3.636E-07	2.179E-07	1.500E-07	7.338E-08	2.753E-08	1.339E-08	8.441E-09	6.003E-09
N-NE	1.709E-06	5.381E-07	2.357E-07	1.409E-07	9.677E-08	4.714E-08	1.755E-08	8.481E-09	5.320E-09	3.771E-09
NE	1.083E-06	3.380E-07	1.469E-07	8.730E-08	5.971E-08	2.893E-08	1.071E-08	5.166E-09	3.241E-09	2.299E-09
E-NE	1.332E-06	4.165E-07	1.821E-07	1.087E-07	7.467E-08	3.645E-08	1.366E-08	6.661E-09	4.209E-09	3.001E-09
E	9.644E-07	3.001E-07	1.306E-07	7.769E-08	5.321E-08	2.586E-08	9.644E-09	4.696E-09	2.968E-09	2.117E-09
E-SE	7.770E-07	2.404E-07	1.034E-07	6.097E-08	4.146E-08	1.989E-08	7.260E-09	3.480E-09	2.178E-09	1.542E-09
SE	8.906E-07	2.778E-07	1.207E-07	7.177E-08	4.911E-08	2.382E-08	8.839E-09	4.283E-09	2.697E-09	1.919E-09
S-SE	1.401E-06	4.347E-07	1.874E-07	1.106E-07	7.531E-08	3.617E-08	1.322E-08	6.328E-09	3.955E-09	2.797E-09

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TABLE 2.7-119

ANNUAL AVERAGE RELATIVE CONCENTRATION, X/Q, DEPLETED

COMBINED VENT		DISTANCE IN MILES FROM THE SITE											
NO DECAY, DEPLETED													
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)													
SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500		
S	1.318E-05	3.731E-06	1.789E-06	1.080E-06	5.425E-07	3.363E-07	2.330E-07	1.731E-07	1.347E-07	1.085E-07	8.970E-08		
S-SW	2.251E-05	6.436E-06	3.087E-06	1.870E-06	9.477E-07	5.929E-07	4.142E-07	3.098E-07	2.427E-07	1.966E-07	1.634E-07		
SW	5.511E-05	1.564E-05	7.417E-06	4.505E-06	2.309E-06	1.460E-06	1.030E-06	7.773E-07	6.137E-07	5.006E-07	4.186E-07		
W-SW	7.211E-05	2.042E-05	9.637E-06	5.863E-06	3.018E-06	1.917E-06	1.358E-06	1.028E-06	8.141E-07	6.658E-07	5.581E-07		
W	6.912E-05	1.959E-05	9.254E-06	5.629E-06	2.897E-06	1.839E-06	1.302E-06	9.855E-07	7.801E-07	6.379E-07	5.345E-07		
W-NW	4.386E-05	1.245E-05	5.897E-06	3.584E-06	1.839E-06	1.164E-06	8.222E-07	6.209E-07	4.905E-07	4.004E-07	3.350E-07		
NW	2.699E-05	7.695E-06	3.681E-06	2.230E-06	1.132E-06	7.100E-07	4.971E-07	3.725E-07	2.923E-07	2.371E-07	1.973E-07		
N-NW	1.744E-05	4.983E-06	2.396E-06	1.449E-06	7.327E-07	4.572E-07	3.187E-07	2.380E-07	1.861E-07	1.505E-07	1.249E-07		
N	1.600E-05	4.581E-06	2.209E-06	1.335E-06	6.727E-07	4.185E-07	2.909E-07	2.167E-07	1.691E-07	1.365E-07	1.130E-07		
N-NE	1.047E-05	2.985E-06	1.439E-06	8.690E-07	4.374E-07	2.717E-07	1.886E-07	1.403E-07	1.093E-07	8.814E-08	7.292E-08		
NE	6.779E-06	1.902E-06	9.102E-07	5.479E-07	2.745E-07	1.698E-07	1.175E-07	8.711E-08	6.772E-08	5.448E-08	4.499E-08		
E-NE	8.350E-06	2.341E-06	1.117E-06	6.734E-07	3.384E-07	2.100E-07	1.457E-07	1.083E-07	8.436E-08	6.801E-08	5.626E-08		
E	6.121E-06	1.699E-06	8.083E-07	4.862E-07	2.437E-07	1.508E-07	1.044E-07	7.747E-08	6.026E-08	4.852E-08	4.009E-08		
E-SE	4.916E-06	1.368E-06	6.523E-07	3.916E-07	1.950E-07	1.200E-07	8.263E-08	6.102E-08	4.728E-08	3.792E-08	3.123E-08		
SE	5.583E-06	1.565E-06	7.473E-07	4.503E-07	2.256E-07	1.396E-07	9.656E-08	7.161E-08	5.568E-08	4.480E-08	3.700E-08		
S-SE	8.814E-06	2.463E-06	1.177E-06	7.073E-07	3.528E-07	2.173E-07	1.498E-07	1.107E-07	8.580E-08	6.886E-08	5.673E-08		
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)		DISTANCE IN MILES FROM THE SITE											
SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000		
S	7.569E-08	3.964E-08	2.499E-08	1.304E-08	8.205E-09	5.715E-09	4.243E-09	3.293E-09	2.639E-09	2.167E-09	1.815E-09		
S-SW	1.385E-07	7.379E-08	4.712E-08	2.502E-08	1.593E-08	1.119E-08	8.369E-09	6.533E-09	5.262E-09	4.341E-09	3.649E-09		
SW	3.568E-07	1.946E-07	1.264E-07	6.875E-08	4.454E-08	3.173E-08	2.399E-08	1.891E-08	1.536E-08	1.276E-08	1.080E-08		
W-SW	4.768E-07	2.622E-07	1.713E-07	9.400E-08	6.126E-08	4.384E-08	3.327E-08	2.630E-08	2.142E-08	1.784E-08	1.513E-08		
W	4.565E-07	2.508E-07	1.638E-07	8.976E-08	5.845E-08	4.180E-08	3.172E-08	2.506E-08	2.040E-08	1.699E-08	1.440E-08		
W-NW	2.858E-07	1.562E-07	1.016E-07	5.540E-08	3.595E-08	2.564E-08	1.941E-08	1.531E-08	1.244E-08	1.034E-08	8.757E-09		
NW	1.675E-07	8.974E-08	5.754E-08	3.073E-08	1.965E-08	1.385E-08	1.039E-08	8.127E-09	6.559E-09	5.420E-09	4.564E-09		
N-NW	1.057E-07	5.606E-08	3.566E-08	1.882E-08	1.193E-08	8.358E-09	6.232E-09	4.853E-09	3.900E-09	3.211E-09	2.695E-09		
N	9.555E-08	5.035E-08	3.188E-08	1.671E-08	1.055E-08	7.357E-09	5.469E-09	4.247E-09	3.405E-09	2.798E-09	2.343E-09		
N-NE	6.158E-08	3.232E-08	2.040E-08	1.065E-08	6.694E-09	4.657E-09	3.453E-09	2.676E-09	2.142E-09	1.757E-09	1.470E-09		
NE	3.794E-08	1.982E-08	1.247E-08	6.489E-09	4.078E-09	2.836E-09	2.104E-09	1.631E-09	1.305E-09	1.071E-09	8.963E-10		
E-NE	4.752E-08	2.500E-08	1.581E-08	8.289E-09	5.237E-09	3.659E-09	2.723E-09	2.118E-09	1.700E-09	1.399E-09	1.173E-09		
E	3.383E-08	1.772E-08	1.118E-08	5.847E-09	3.693E-09	2.579E-09	1.920E-09	1.493E-09	1.199E-09	9.865E-10	8.274E-10		
E-SE	2.627E-08	1.360E-08	8.503E-09	4.390E-09	2.752E-09	1.910E-09	1.415E-09	1.095E-09	8.761E-10	7.184E-10	6.007E-10		
SE	3.121E-08	1.632E-08	1.028E-08	5.358E-09	3.375E-09	2.352E-09	1.748E-09	1.357E-09	1.088E-09	8.942E-10	7.492E-10		
S-SE	4.774E-08	2.474E-08	1.548E-08	7.996E-09	5.007E-09	3.473E-09	2.571E-09	1.989E-09	1.590E-09	1.303E-09	1.089E-09		

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EARLY SITE PERMIT APPLICATION
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TABLE 2.7-119 (Continued)

COMBINED VENT NO DECAY, DEPLETED		SEGMENT BOUNDARIES IN MILES FROM THE SITE									
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT											
DIRECTION	5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	
FROM SITE											
S	1.906E-06	5.703E-07	2.366E-07	1.357E-07	9.008E-08	4.114E-08	1.355E-08	5.791E-09	3.315E-09	2.176E-09	
S-SW	3.290E-06	9.949E-07	4.201E-07	2.443E-07	1.640E-07	7.631E-08	2.589E-08	1.133E-08	6.573E-09	4.357E-09	
SW	7.950E-06	2.420E-06	1.044E-06	6.173E-07	4.200E-07	2.003E-07	7.080E-08	3.205E-08	1.901E-08	1.280E-08	
W-SW	1.036E-05	3.161E-06	1.375E-06	8.188E-07	5.599E-07	2.695E-07	9.664E-08	4.426E-08	2.643E-08	1.790E-08	
W	9.940E-06	3.034E-06	1.319E-06	7.846E-07	5.363E-07	2.578E-07	9.229E-08	4.221E-08	2.519E-08	1.704E-08	
W-NW	6.325E-06	1.927E-06	8.329E-07	4.935E-07	3.362E-07	1.607E-07	5.702E-08	2.589E-08	1.539E-08	1.038E-08	
NW	3.928E-06	1.189E-06	5.040E-07	2.942E-07	1.981E-07	9.271E-08	3.176E-08	1.401E-08	8.175E-09	5.441E-09	
N-NW	2.550E-06	7.695E-07	3.234E-07	1.874E-07	1.254E-07	5.803E-08	1.950E-08	8.461E-09	4.884E-09	3.224E-09	
N	2.348E-06	7.069E-07	2.952E-07	1.703E-07	1.135E-07	5.219E-08	1.734E-08	7.452E-09	4.275E-09	2.809E-09	
N-NE	1.529E-06	4.597E-07	1.914E-07	1.101E-07	7.323E-08	3.353E-08	1.106E-08	4.719E-09	2.695E-09	1.765E-09	
NE	9.695E-07	2.887E-07	1.193E-07	6.822E-08	4.519E-08	2.058E-08	6.747E-09	2.874E-09	1.642E-09	1.076E-09	
E-NE	1.192E-06	3.558E-07	1.479E-07	8.496E-08	5.651E-08	2.592E-08	8.605E-09	3.706E-09	2.132E-09	1.404E-09	
E	8.631E-07	2.563E-07	1.060E-07	6.071E-08	4.027E-08	1.840E-08	6.076E-09	2.613E-09	1.503E-09	9.905E-10	
E-SE	6.954E-07	2.054E-07	8.395E-08	4.764E-08	3.138E-08	1.415E-08	4.576E-09	1.936E-09	1.103E-09	7.215E-10	
SE	7.971E-07	2.373E-07	9.805E-08	5.609E-08	3.717E-08	1.694E-08	5.569E-09	2.383E-09	1.366E-09	8.979E-10	
S-SE	1.254E-06	3.714E-07	1.521E-07	8.646E-08	5.699E-08	2.574E-08	8.331E-09	3.521E-09	2.003E-09	1.309E-09	

GENS

ANNUAL AVERAGE RELATIVE DEPOSITION, D/Q

COMBINED VENT

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TABLE 2.7-120 (Continued)

COMBINED VENT *****		RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS *****									
		SEGMENT BOUNDARIES IN MILES *****									
DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	
S	7.654E-09	2.365E-09	9.409E-10	5.142E-10	3.268E-10	1.404E-10	4.353E-11	1.725E-11	9.213E-12	5.702E-12	
S-SW	8.011E-09	2.475E-09	9.849E-10	5.382E-10	3.421E-10	1.469E-10	4.556E-11	1.805E-11	9.643E-12	5.969E-12	
SW	1.107E-08	3.421E-09	1.361E-09	7.439E-10	4.728E-10	2.031E-10	6.298E-11	2.490E-11	1.333E-11	8.250E-12	
W-SW	8.654E-09	2.674E-09	1.064E-09	5.814E-10	3.695E-10	1.587E-10	4.922E-11	1.951E-11	1.042E-11	6.448E-12	
W	8.265E-09	2.553E-09	1.016E-09	5.552E-10	3.529E-10	1.516E-10	4.701E-11	1.863E-11	9.949E-12	6.158E-12	
W-NW	7.327E-09	2.264E-09	9.007E-10	4.922E-10	3.128E-10	1.344E-10	4.167E-11	1.652E-11	8.819E-12	5.459E-12	
NW	8.707E-09	2.690E-09	1.070E-09	5.849E-10	3.718E-10	1.597E-10	4.952E-11	1.963E-11	1.048E-11	6.487E-12	
N-NW	7.488E-09	2.314E-09	9.206E-10	5.031E-10	3.197E-10	1.373E-10	4.259E-11	1.688E-11	9.014E-12	5.579E-12	
N	7.878E-09	2.434E-09	9.686E-10	5.293E-10	3.364E-10	1.445E-10	4.481E-11	1.776E-11	9.484E-12	5.870E-12	
N-NE	5.525E-09	1.707E-09	6.792E-10	3.711E-10	2.359E-10	1.013E-10	3.142E-11	1.245E-11	6.650E-12	4.116E-12	
NE	4.188E-09	1.294E-09	5.148E-10	2.813E-10	1.788E-10	7.681E-11	2.382E-11	9.440E-12	5.041E-12	3.120E-12	
E-NE	4.259E-09	1.316E-09	5.236E-10	2.861E-10	1.818E-10	7.811E-11	2.422E-11	9.600E-12	5.126E-12	3.173E-12	
E	3.596E-09	1.111E-09	4.421E-10	2.416E-10	1.536E-10	6.596E-11	2.045E-11	8.106E-12	4.329E-12	2.679E-12	
E-SE	2.898E-09	8.954E-10	3.563E-10	1.947E-10	1.237E-10	5.315E-11	1.648E-11	6.533E-12	3.489E-12	2.159E-12	
SE	2.792E-09	8.625E-10	3.432E-10	1.876E-10	1.192E-10	5.120E-11	1.588E-11	6.293E-12	3.361E-12	2.080E-12	
S-SE	6.142E-09	1.897E-09	7.550E-10	4.126E-10	2.622E-10	1.126E-10	3.493E-11	1.384E-11	7.393E-12	4.576E-12	