4.0 ENVIRONMENTAL EFFECTS OF CONSTRUCTION[1]

4.1 Land-Use Impacts

4.1.1 The Site and Vicinity

The GGNS site property boundary encompasses approximately 2100 acres. Due to the presence of an operating nuclear power plant, current land use is limited (Figure 2.2-1). Figure 2.2-1 indicates the areas proposed for new construction. Land use in the adjacent areas is largely devoted to forest with some agricultural pastureland.

Construction of the new facility will result in some alterations. Some of these alterations are unavoidable and irreversible; others are unavoidable but subject to improvement. As noted below, some of the areas designated for a new facility have already been prepared or altered from the construction and for the operation of GGNS Unit 1.

An estimated 400 acres of the 2100-acre GGNS site would be affected by construction of a new facility (Figure 2.4-3). The various areas potentially affected by construction of a new facility and the acreage within each area are provided in Table 2.2-1 and depicted in Figure 2.2-1. The major impact producing actions during site preparation and construction would be: clearing, grading, excavation, spoil deposition and dewatering. During construction, noise would increase with the operation of vehicles, earthmoving equipment, materials handling equipment, impact equipment, and other stationary equipment (pumps, compressors, etc.), and the increase of human activity. The major types of impact that could result from these activities are alteration of existing vegetation, alteration of topography, and alteration of water quality of site drainage.

Some areas of the site proposed for the new construction have been previously developed or altered for use by the existing GGNS facility. New construction would have little impact in these areas. Of the approximately 400 acres estimated for the construction of a new facility, approximately 120 acres overlap currently developed or previously altered areas. It is estimated that approximately 125 acres would contain permanent structures (primarily a power block area, cooling tower area, and bottom land pipeline and intake areas, as shown in Figure 2.3-1). Acreage not containing permanent structures would be reclaimed to the maximum extent possible.

Construction activities associated with a new facility would require a construction stormwater discharge permit and stormwater pollution prevention plan (SWPPP) under federal and state National Pollutant Discharge Elimination System (NPDES) regulations. These measures would minimize construction impacts to surface water thus resulting in no change to the potential uses of these waters.

No adverse impacts to the land use in the surrounding communities are anticipated. Transportation routes are described in Section 2.2 (Figures 2.2-2 and 2.2-6). The influx of construction workers may result in minor traffic congestion on local roadways, however this would be temporary. No change to the local transportation infrastructure is anticipated.

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

No adverse impacts to barge traffic on the Mississippi River are anticipated. The barge slip constructed for GGNS Unit 1 would be used to offload large equipment and materials for the construction of a new facility transported by river.

There would be no adverse impact to existing railway service in the area from new facility construction activities at the GGNS site. The nearest railroad is operated by Kansas City Southern, which has freight train service that passes within 28 miles northeast of the site (Figure 2.2-6). New rail service may be required to support materials deliveries and new facility construction activities.

There are a number of recreational land use areas within the vicinity of the GGNS site on both the Mississippi and Louisiana side of the Mississippi River. A detailed discussion of these areas is provided in Section 2.2.

The recreational area likely to be the most affected by construction on the GGNS site would be the Grand Gulf Military Park. There would be an increase in traffic, noise and dust from construction activities that may affect the park. However, peak park use is on the weekend, when construction activity would likely be reduced.

Because the GGNS site is already aesthetically altered by the presence of an existing nuclear power plant with a natural draft cooling tower, and construction impacts would be temporary, adverse impacts to visual aesthetics of the site and vicinity are not expected from the construction of a new facility.

The gas-transmission pipeline that line runs 4.75 miles east of the site (Figure 2.2-4) and parallel with U.S. Highway 61 in a north-south direction would not be affected by the construction due to its distance from the proposed site.

There are no mineral resources being exploited within the site boundary. Mineral resources within the county are mainly construction sand and gravel (Reference 3). These resources would not be affected by construction of a new facility.

Construction activities to be conducted within a floodplain on the site would be the water intake structure and embayment along with other items that are a part of that water intake facility. This water intake will be located at or near the existing barge slip area (Figures 2.2-1 and 5.3-1). There would be some impact from excavation and construction of the intake structure along the river bank in the flood plain areas, but the impact is expected to be small and temporary. Additionally, trenching from the intake to the proposed power block location on the bluffs east of the river would be required to lay supply and discharge piping from the new facility. Most of the floodplain areas are also classified as wetlands. For a detailed discussion of land use impacts to wetlands, refer to Sections 4.3 and 5.3.

Review of the Claiborne County Soil Survey issued in 1963 and inquiry with the Claiborne County Natural Resources Conservation Service (NRCS) indicates the presence of soil types, which may be considered “Prime Farmland” at the GGNS site (Reference 4). However, some exclusions apply. If land is frequently flooded during the growing season or is already in or committed to urban development or water storage, it is not considered “prime farmland” (References 4, 5, 6, and 7). No coastal zones, wild and scenic rivers were identified in or around the proposed construction area. (Reference 8)

4.1.2 Transmission Corridors And Offsite Areas

Presently there are two types of transmission lines connected to the GGNS switchyard: 500 kV and 115 kV. No new transmission corridors are planned for a new facility at this time (ESP application). Once the facility design is finalized, appropriate analyses of transmission and distribution system adequacy will be made. For additional discussion, see Section 3.7.

4.1.3 Historical Properties

A discussion of historical properties is provided in Section 2.5.3. There are 35 sites in Claiborne County that are listed on the National Register of Historic Places, some of which are located within 10 mile radius of the site. (Table 2.5-16 and Figure 2.5-5). Project related construction would occur wholly within the GGNS site boundary. Based upon evaluations conducted prior to site development for GGNS and consultation with state and federal agencies, it is considered unlikely that any historical resources will be adversely impacted by new construction at the GGNS ESP Site. However, the Mississippi Department of Archives and History (MDAH) has recommended a pre-construction survey be conducted in portions of proposed construction area D and in construction area F (Figure2.2-1) for any unknown archeological resources (Reference 9). If previously unknown archeological resources are discovered, data recovery efforts would be initiated in conjunction with consultation with the MDAH.

4.1.4 Construction Noise Impact Assessment

A detailed analysis of construction noise requires specific information concerning construction equipment and activities that have not yet been established. Such information includes the type, size and number of equipment, usage factors, location, schedule, etc. Noise levels at 50 ft for various categories of construction equipment are listed in Table 4.1-1. Table 3.0-1 also provides general information regarding bounding construction noise levels to be expected. Not all construction equipment will operate simultaneously, and equipment will not always produce maximum noise when in use (e.g., full load operation vs. idling).

4.1.4.1 Previous GGNS Construction Noise Surveys

A series of five bimonthly noise surveys were conducted during various phases of the existing GGNS facility construction. The dates of the five surveys and primary activities occurring during each of them are presented in Table 4.1-2. (These should be typical of those expected during any construction activities associated with a new nuclear facility at the GGNS ESP Site.) To facilitate the comparison of results from the previous ambient survey results above, similar procedures with respect to sampling technique, sampling schedule, monitoring locations, and equipment were employed. One major consideration, time of year, could not be duplicated and still permit noise surveys to coincide with selected phases of construction. Therefore, in addition to studying the effects of construction on the noise environment, natural seasonal variations, primarily due to insects, were also studied.

Sound levels were measured and recorded on an analog strip chart recorder for 5 minutes on the dB(A) scale and for 30 seconds on each of the 10 octave bands at each point. The dB(A) record is a true random sample in that no attempt will be made to eliminate unusual or intrusive sound since they are taken into account in the analysis of data. However, every attempt was made to eliminate all sounds except background noises during the octave band measurements to prevent biasing any particular octave. This was accomplished by waiting until all such sounds have died away before making the recording. The short sample time and desire to obtain a continuous spectrum of background noise required that such a procedure be followed. To ensure proper operation of the equipment, a calibration check was performed prior to beginning each new round of monitoring points.

Three noise levels were determined from each 5-minute record of dB(A) levels. They were the L_{10}, L_{50}, and L_{90} decibel levels, or the decibel level exceeded 10, 50, and 90 percent of the time *respectively during the 5-minute sample. The* L_{90} *level is defined as the ambient or background noise level, the* L_{50} *is the median noise level, and the* L_{10} *is the intrusive noise level. This method of analysis provided a more realistic description of the noise environment by taking the exposure time to certain noise levels into account. Simple means and maximums cannot yield such an analysis.*

Only one level was determined from each 30-second octave band record. Since an attempt was made during the recording to eliminate all but background sounds, this level should correspond closely to an L_{90} *decibel level.*

To facilitate a direct comparison of the results of the two surveys, original data from both surveys were operated on separately by the logarithmic averaging program. Only data from points 1 through 6 (points on the site boundary monitored during both surveys) were used in the program.

Survey No. 1

Each of the monitoring points shown in Figure 2.8-1*, except point 7, which was inaccessible due to flooding, were monitored five times a day for 2 consecutive days between the hours of 7:00 A.M. one day and 1:00 A.M. of the next day.*

Survey No. 2

Monitoring points 1, 3, 4, 5, 6, and 8, shown in Figure 2.8-1*, were monitored six times a day, or once every 4 hours, for 2 consecutive days. Modifications made included an additional survey time at 4:00 A.M. to cover adequately the lengthened work schedule and the elimination of monitoring points 2 and 7 as redundant or unnecessary.*

Survey No. 3

Monitoring points 1, 3, 4, 5, and 6, shown in Figure 2.8-1*, were monitored 6 times a day, or once every 4 hours, for 2 consecutive days. Monitoring point number 8 in Port Gibson was eliminated from this survey because a good baseline for this point had already been established by earlier surveys; and because differences in the type of construction activity at the site had little or no effect at this point.*

Survey No. 4

Monitoring points 1, 3, 4, 5, and 6, shown in Figure 2.8-1*, were monitored 6 times a day, or once every 4 hours for 2 consecutive days.*

Survey No. 5

Monitoring points 1, 3, 4, 5, and 6, shown in Figure 2.8-1 *were monitored 6 times a day, or once every 4 hours, for 2 consecutive days.*

4.1.4.2 Previous GGNS Construction Noise Survey Results

Survey No. 1 (June 1974)

A comparison of the median dB(A) noise levels (level exceeding 50 percent of the time and denoted by L_{50}*) at each monitoring point, between the ambient background noise survey and construction noise survey No. 1, is presented in* Figure 4.1-1*. The anticipated result of higher noise levels during construction hours is not as apparent as expected. The only directly observable increase attributed to construction by the survey team occurred at points 4 and 5, the nearest construction activity. At times when no construction was in progress, noise levels* *were significantly lower than those obtained during the previous survey. A lower insect population, whether from natural causes or from land clearing operations, is the most probable cause of this. However, since the same phenomenon was observed at point 8, 7 miles from the construction site (a distance great enough so that construction activities could have no effect), it must be assumed that the noise level reduction is widespread and independent of construction.*

The variation of the dB(A) levels, L_{10}, L_{50} and L_{90}, with time for the entire site is shown in Figure 4.1-2 *for the June 1974 survey and in* Figure 4.1-3 *for the July 1973 survey. Construction appears to have raised the overall daytime levels a few decibels, whereas the reduced number of crickets and cicadas has lowered the nighttime levels by about 5 decibels. The combined effect is a reduction in the diurnal variation giving a more constant noise level throughout the day and night at the L_{90} and L_{50} decibel levels. The higher L_{10} level during the day shows the influence of increased traffic volume. All levels fall within the "normally acceptable" range for community acceptance as defined by HUD in the HUD Noise Assessment Guidelines, Technical Background.*

The overall averages of these three levels for both surveys are presented in Table 4.1-3*. The limits of HUD's four categories are also shown for comparison. These limits do not constitute a set of standards, but serve as a guide in selecting sites for housing projects.*

The overall effect for the entire site (monitoring points 1 through 6) for all monitoring times of both survey days is illustrated in Figure 4.1-4*.*

Survey No. 2 (August 1974)

Median noise levels from this survey were compared with levels from the preconstruction survey in Figure 4.1-5*. Point 5, immediately adjacent to construction activities, had clearly experienced the greatest increase in noise levels. Points 3, 4, and 6 were about equidistant from noise producing activities, but vegetation and terrain combined to attenuate levels reaching points 4 and 6 at or below those measured during the preconstruction survey. Point 3 did not share these attenuating factors to the same degree and hence had a higher noise level. The shape and magnitude of the curves from points 1, 4, 6, and 8 are similar for both surveys, indicating virtually no noise impact at these points caused by construction activities.*

Even though construction activities continued around the clock, the pace, and hence noise level, is not constant. Breaks for meals and machinery maintenance caused drastic reductions in the noise level. At these times the noise level was even quieter than it was before the land was cleared, because the number of insects and frogs, had been reduced by the clearing.

Survey No. 3 (October 1974)

Median noise levels from this survey were compared with levels from the preconstruction survey in Figure 4.1-6*. As before, Point 5 experienced the greatest increase in noise levels because it was immediately adjacent to construction activity. Point 4 had levels about the same as before construction began, but the other points experienced levels significantly lower than preconstruction levels most of the time. The natural seasonal variation in insect and frog populations accounts for this decrease in level. Because of the lower background level, construction noise could be heard most distinctly at these points even though the noise produced was not louder than before.*

Survey No. 4 (December 1974)

Median noise levels from this survey were compared with levels from the preconstruction survey in Figure 4.1-7*. All points except Point 5 experienced significant decreases in noise levels (up to*

20 dB(A)) since the July 1973 survey, thus indicating a strong seasonal influence. Point 5 was subjected to noise from construction traffic on Waterloo Road and construction machinery on the site proper. The noise level at this point fluctuated above or below levels previously measured, thereby displaying the combined effects of construction and natural seasonal variations.

Survey No. 5 (February 1975)

Median noise levels from this survey were compared with levels from the pre-construction survey in Figure 4.1-8*. As a result of the seasonal reduction in insect numbers and activities, the background noise levels measured during this survey were below those measured during the preconstruction survey.*

The highest L_{50} levels were measured at Point 5, nearest the construction site; however, the dominant source of noise at this point and also at Point 4 was truck and auto traffic associated with construction, rather than actual construction equipment. Points 1, 3, and 6, which experience little construction traffic, had correspondingly lower noise levels.

4.1.4.3 Previous GGNS Construction Noise Survey Conclusions

Survey No. 1 (June 1974)

Even though construction was in progress and noise was being produced, the reduction in noise levels from the insects more than offset this to yield an overall reduction in dB(A) noise levels. The reduction however was very small. The range between the overall L90 and L10 levels increased from 3 dB to 9 dB, indicating a slightly less than acceptable noise environment. However, offsetting this factor was a reduction in the diurnal variation yielding a more constant level throughout the day and night.

Survey No. 2 (August 1974)

Noise levels at Point 5, and to a lesser degree at Point 3, increased because of construction activities. At monitoring Points 1, 4, 6, and 8, near single residences or communities, noise levels were virtually unchanged.

Survey No. 3 (October 1974)

Construction activity produced noise levels similar to those measured during the previous construction noise survey. A natural reduction in the number of insects reduced the level of background noise, thereby permitting construction noise to be more evident at greater distances. However, overall noise levels were slightly lower than those of the previous survey.

Survey No. 4 (December 1974)

A temporary reduction in construction activity and the continued reduction of insect noise resulted in a significant decrease in noise levels at the Grand Gulf site.

Survey No. 5 (February 1975)

Resumption of normal construction activity slightly increased noise levels around the site. Because of the opening of the new site access road, Point 4 experienced a definite increase in noise level. Insect activity remained at a low level as it had during the previous winter surveys.

4.1.4.4 Evaluation of Previous GGNS Construction Noise-Level Effects

The periodic noise surveys made at the site boundary under a range of representative conditions showed that construction appeared to have raised the overall daytime levels only a *few decibels. This slight increase in noise levels and lack of complaints from nearby residents substantiates conclusions that noise levels at the site do not exceed acceptable levels.*

4.1.4.5 New Construction Noise

The expected noise levels at point 5, which historically had the highest noise levels during construction, can be calculated as follows:

$$SPL_2 = SPL_1 - 20 \log_{10} (r_2/ r_1) - A_e$$ (Reference 13)

where,

SPL_2	=	Sound pressure level at distance r_2 from the source
SPL_1	=	Sound pressure level at distance r_1 from the source
A_e	=	Excess attenuation

The excess attenuation factor was not considered to be applicable.

PPE (Table 3.0-1) lists typical construction noises ranging from 76 to 101 dB(A) at 50 feet from the source. Using the above equation, the acceptable noise level of 65 dB(A) would be reached at a distance between 177 feet to 3,155 feet from the source, considering the noise range above. Assuming a construction noise level of 101dB(A) at 50 feet from the source, then the expected worse-case noise level at point 5 (approximately 4,500 feet from the proposed area of the power block for a new facility would be approximately 62 dB(A), which is below the acceptable noise level of 65 dB(A) stated in NUREG-1555. The 62 dB(A) level calculated from the above equation is consistent with the noise levels measured during construction of GGNS Units 1 and 2.

The proposed cooling tower location (Figure 2.3-1) is approximately 1,000 feet from the northern property line. Assuming a construction noise level of 101dB(A) at 50 ft from the proposed cooling tower location, then the expected worse case noise level at the nearest property line would be approximately 75 dB(A). The nearest residence is about 1,600 feet east-northeast from the source, resulting in an unattenuated noise level of about 71 dB(A). Taking into account the noise attenuation properties of the surrounding vegetation, the noise level would likely be less than 65 dB(A) at the residence. Thus the noise levels during the construction of the cooling towers will have minimal impact on the surroundings. Based on the previous survey and the above calculations, construction noise levels during construction of a new facility at the GGNS ESP site will have minimal impacts on the surrounding populace.

From Table 4.1-1, continuous noise levels from construction activities at 50 ft would typically range from approximately 69 to 98 dB(A). Using the above equation, a separation distance of about 2,400 ft would be required to reduce the maximum noise level to 65 dB(A).

GGNS Units 1 and 2 were constructed in accordance with the Environmental Protection Program Respecting Construction of Grand Gulf Nuclear station Units 1 and 2, as set out in Staff Exhibit 2-A in the evidentiary hearing on environmental matters conducted by the Atomic Safety and Licensing Board, February 19-21, 1974. The objective of the program was to assure that construction was accomplished with practices that caused minimum impact. (Reference 11)

There was only one amendment to the program during the construction of Units 1 and 2. In January 1976, the NRC agreed that it was appropriate to discontinue the bimonthly noise level surveys since survey results indicated that noise levels did not exceed acceptable levels. Efforts had continued to reduce excessive and objectionable vehicular noise, and continued observations by environmental inspectors showed that construction activities had not resulted in noise levels sufficient to warrant resumption of the noise level surveys. (Reference 11) Therefore, noise level measurements should not be required during the construction of a new facility at the GGNS ESP Site. Noise level measurements would commence only if the neighboring residents or the nearby community of Grand Gulf complained of the noise.

4.1.4.6 Land Use Construction Noise Conclusions

Complying with applicable OSHA noise regulations will ensure that the impact on construction workers is considered to be small. There is no reason to believe that the noise level would significantly deviate from this level with the addition of reactor plants at the site. Therefore, the noise level at the site is expected to be well below the 65 dB(A) upper limit for noise stated in NUREG-1555.

4.1.5 References

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9. Waggener, Thomas, Review and Compliance Officer, Mississippi Department of Archives and History, Historic Preservation Division. Letter to Mr. John Anderson, Enercon Services. December 12, 2002.
10. The Noise Guidebook, U. S. Department of Housing and Urban Development, 1991.
11. Mississippi Power and Light Company, Grand Gulf Nuclear Station Units 1 and 2, Final Environmental Report (FER), as amended through Amendment No. 8.
12. Magrab (1975) by Wilson, Ihrig & Associates, Inc. (WIA, 1986).
13. Beranek, L., Noise Reduction, McGraw-Hill, 1960.

4.2 Water-Related Impacts

4.2.1 Hydrologic Alterations

This section of the report will address identification and description of hydrologic alterations that could result from proposed construction activities.

4.2.1.1 Site Preparation and Station Construction

Construction of Grand Gulf Nuclear Station (GGNS) Unit 1 (and partial completion of Unit 2) resulted in alterations to the plant site. Approximately 465 acres of the 2,100-acre site were affected by construction (Reference 1); however, permanent structures and facilities occupy only about 169 acres (Table 2.2-1), not including the heavy haul road and plant service water supply and return pipeline right of way. Since GGNS Unit 1 is located in the loessial bluff portion of the site, most site preparation and construction activities were concentrated in this area.

Construction of a new facility on the site would result in additional alterations of the site; however, much of the new construction would be conducted in areas that were previously disturbed during construction of the existing facilities (Figures 2.1-1 and 2.4-3). Construction of a new facility is estimated to require approximately 400 acres in the areas indicated on Figure 2.2-1 and listed in Table 2.2-1.

Construction impacts would be reduced and effectively managed by development and implementation of a site-specific construction Stormwater Pollution Prevention Plan (SWPPP). SWPPPs typically address employee training; installation of silt fences, straw bales, slope breakers, and other erosion prevention measures; preventive maintenance of equipment to prevent leaks and spills; procedures for storage of chemicals and waste materials; spill control practices; revegetation; regular inspections of control measures; and visual inspections for discharges that may be detrimental to water quality.

<u>Intake Structure, Intake Pipelines, Pipelines and Discharge Pipelines</u>

Makeup water (cooling tower makeup and other raw water needs) for a new facility would be supplied primarily from the Mississippi River via an embayment, and associated intake structure, located on the east bank of the river and on the north side of the existing barge slip. Dredging would be required to form the embayment on the Mississippi River. A temporary increase in turbidity would occur in the Mississippi River near the site during construction and dredging activities. The additional turbidity from these construction activities would likely be quickly dissipated due to the relatively high flow velocity and the large volume of water in the river. Riprap, or other appropriate means, would be used to stabilize the banks of the embayment and the river shoreline around the embayment during and following construction. These construction activities would be done in compliance with Corps of Engineer requirements, and would not affect long-term water quality.

Effluent (e.g., cooling tower(s) blowdown, waste water from plant processes, etc., as shown on Figure 2.3-29) from a new facility would be combined with that from GGNS Unit 1 facility, and the combined effluent would be discharged into the river downstream of the intake embayment.

The intake and discharge pipelines would be constructed in a trench extending across the bottomlands from the river to the proposed location of the power block for a new facility along the heavy haul road route (Figure 2.2-1). During construction of the trench for the existing GGNS plant service water system supply and plant discharge pipelines along the same route, dewatering was required. Water was pumped from the trench to the river or onto the floodplain. Localized increases in turbidity resulted, along with some siltation in the immediate area. Since the water from the trench was comprised essentially of recharge water from the river itself, little impact on the river occurred. (Reference 1) Dewatering impacts for construction of a new trench would likely be similar in nature.

The proposed outfall, located above normal river water level, would include a concrete drainage course to the river similar to that for the GGNS Unit 1 discharge structure. Therefore, hydrologic impacts of the discharge outfall structure construction would be less than that for the embayment construction.

The intake and embayment, and the proposed discharge design, are described in brief in Sections 3.3 and 3.4, including the estimated uptake of river water required for the new facility and the maximum expected discharge flow rate and temperature. Section 4.3 provides a detailed discussion of the ecological construction impacts of the embayment and intake structure, intake pipelines, and discharge pipelines.

Power Block

The proposed power block area for the new facility was previously cleared and graded, and remains so today. New construction in this area would tend to increase erosion, siltation of streams, and leaching of nutrients to Stream A and Stream B; however, the effects would be less than those for areas with vegetative cover. Drainage patterns from the area may be altered to accommodate the new facility structures in this area. Impacts would be reduced by use of SWPPP procedures. Discharge of runoff through the two existing sedimentation basins would minimize increased sedimentation downstream of the new facility's proposed power block location.

During excavation of the existing GGNS Unit 1 power block, the use of tie-back walls effectively restricted dewatering to a localized area. Perched water levels declined about 10 feet within the confines of the dewatering zone for the power block excavation. Since the localized perched water did not constitute a water source for the site area, existing ground water use was not affected by dewatering of the power block excavation. It is anticipated that dewatering would be required for construction of the new facility. The bounding depth for the foundation of the power block for a new facility is 140 ft below grade (Table 3.0-1). The effects on ground water should be similar to those encountered during construction of the existing GGNS Unit 1 plant and are expected to be localized (Section 4.2.2.2).

Dewatering of the power block excavation would add to the volume of Stream A and/or Stream B, but this addition would be temporary in nature.

Cooling Tower and Construction Support Areas

The proposed cooling tower(s) location (Figure 2.3-1), north of Stream A, is primarily in an area that was previously disturbed (used primarily as a spoils fill area). New construction would result in increased runoff and silt loads to Stream A due to heavy earth moving activity and loss of vegetative cover. Construction of a pipeline extending across Stream A from the proposed cooling tower(s) area to the power block area would involve disturbance of the stream channel; however, the effect would be temporary in nature.

The proposed construction areas south of Stream B are primarily forested. Due to the rugged topography of this area, extensive grading and leveling may be required, and intermittent streams (Figure 2.4-3) may be filled. Deforestation would tend to increase erosion, siltation of streams, and leaching of nutrients, and may also increase flood flow (Reference 3). The greatest impacts tend to occur during logging and clearing activities. Drainage patterns from these areas may be altered to accommodate the new facility structures in this area.

Impacts would be reduced by use of SWPPP procedures. Discharge of runoff through the two existing sedimentation basins would minimize sedimentation downstream of the construction area.

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 5). It is anticipated that construction of a new facility would require a similar quantity of water. Therefore, installation of an additional well may be required for construction purposes.

4.2.1.2 Transmission Facilities

No new transmission line rights-of-way are planned for a new facility on the GGNS ESP Site (Section 3.7). A new facility would be connected to the existing transmission system through the existing GGNS switchyard, which was designed and constructed to accommodate two identical units. Construction of the second GGNS unit was never completed. Since new transmission facilities are not planned in support of this ESP Application, hydrologic alterations are not a consideration for this ESP Application.

4.2.1.3 Offsite Construction

Improvements were made to local roads and bridges leading to GGNS during construction of the existing plant, and road and bridge construction resulted in some alterations to surface water. It is anticipated that the existing road system would be adequate for construction of a new facility, and new road construction would not be necessary. Therefore, no offsite hydrologic alterations are anticipated.

4.2.2 Water-Use Impacts

The discussion of water use impacts is divided into surface water and ground water environments.

4.2.2.1 Surface Water

<u>Mississippi River</u>

Dredging would be required to form the embayment for construction of the intake structure on the Mississippi River, and periodic maintenance dredging may also be required. A temporary increase in turbidity would occur in the Mississippi River near the site during dredging activities, but dredging operations would be in compliance with Corps of Engineer and MDEQ requirements, and would not affect long-term water quality. This temporary effect would not have a significant impact on water use or water quality.

The makeup water intake structure and the embayment are located away from the main channel of the Mississippi River. Construction of the embayment and intake structure would not impair normal river traffic, so the embayment and intake structure would not have a significant impact on navigational uses of the river.

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 million gallons/day (mgd), and the water is primarily used in high pressure sprayers used to strip bark from logs.

Short-term increases in turbidity from new construction on the river at the GGNS ESP Site would not impact this operation.

Local Streams

Construction impacts would be reduced by development and implementation of a Stormwater Pollution Prevention Plan. SWPPP control measures typically include installation of silt fences and other erosion prevention measures, and periodic inspections for signs of any visible discharges that may be detrimental to water quality. Water discharges would be monitored in accordance with applicable National Pollutant Discharge Elimination System (NPDES) requirements and state water quality standards at the time of construction; therefore, impacts to local streams should be minor.

Local Lakes

Water quality of Gin Lake would be largely unaffected by proposed new facility construction due to the lake's location to the north and west of the proposed construction areas. None of the construction for the proposed Mississippi River intake structure would occur upstream of Gin Lake. Stream A and Stream B have no active connection to Gin Lake (Reference 1) so any changes in water quality of these streams should not adversely impact Gin Lake.

Hamilton Lake receives the discharges from Stream A and Stream B. Runoff that discharges to Hamilton Lake would first pass through sedimentation basins A and B, which would retain most of the sediments transported from the new construction areas. The sedimentation basins and other control measures, such as the use of silt fences or straw bales, would minimize the increase in silt reaching Hamilton Lake. The effects of any increased sedimentation on water quality in Hamilton Lake would be negligible compared to the sediment load that is contributed by the Mississippi River during flood events.

Use of Hamilton and Gin Lakes for recreational fishing may be temporarily restricted during construction as a safety measure to protect members of the public from hazards related to the use of heavy construction equipment. Therefore, the impact to recreational users of these lakes would be minimal.

Dewatering to support construction would result in disposal of the pumped water to either to the two sedimentation basins, A and B, the local floodplain, or directly to the Mississippi river. Localized increases in turbidity are to be expected from this activity; however, little impact is expected on surface water quality at the dewatering discharge locale.

4.2.2.2 Ground Water

Dewatering at the power block excavation and the radial wells has been necessary for plant construction. At the power block excavation, the use of tie-back walls effectively restricted dewatering to a localized area. Perched water levels declined about 10 feet within the confines of the dewatering zone for the power block excavation. Since the localized perched water table in this zone does not constitute a water source for the site area, existing ground water use was not affected by dewatering of the power block excavation.

Dewatering at the power block excavation for a new facility in a location would likely be necessary. Specific dewatering requirements, dewatering well locations, and well design details would be done when the new facility design and layout are finalized. Construction standards for temporary construction dewatering wells and for permanent dewatering wells would be in accordance with applicable standards published in the MDEQ ground water use and protection regulations, and necessary permits would be obtained from the MDEQ.

The bounding depth for the foundation of the power block for a new facility is 140 ft below grade (Table 3.0-1). Excavation to this depth would require dewatering of the localized area. There are three existing wells, located just west of the proposed location of the power block, that provide potable and fire protection makeup water to GGNS Unit 1. These wells may be impacted by dewatering for the deep excavation and may need to be relocated. Since the exact location of the excavation is not known, it is not now possible to predict what impacts this dewatering may have on the production of these three GGNS Unit 1 wells. However, there are mitigation technologies, such as freeze-walls, tie-back walls, etc., that may be implemented to minimize this localized impact to the Catahoula formation.

The effects of construction dewatering would be localized and would not impact offsite ground water users. Current regulations state that the MDEQ permit board may deny a permit or reduce the allowable withdrawal rate if such use would interfere with existing permitted uses or is in conflict with the public interest (Reference 4). The MDEQ would conduct a review prior to issuance of permits for new dewatering wells.

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 5). It is anticipated that construction of a new facility would require a similar quantity of water. The amount of water usage for construction of a new facility may be reduced if portable toilet facilities are utilized for sanitary needs. The recommended planning number for potable water consumption for workers in hot climates is 3 gpd for each worker (Reference 6). Based on the maximum construction worker population of 3,150 people indicated in the PPE (Table 3.0-1), the potable water consumption is estimated at 9,450 gpd.

Three wells completed within the Catahoula formation are currently used to supply water for general site purposes. Two of these wells are in routine use, and the third well is a backup. 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 continuous construction water needs for a new facility, and the installation of an additional well would likely be required for construction purposes. The addition of a new well, with the capacity to supply the above construction needs, is not expected to have a significant impact on the local aquifer, nor on offsite water users. (See Section 5.2.2.2 for additional discussion regarding the potential impact of this well.)

Federal financially assisted projects that have the potential to contaminate a 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 8). 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.

The U. S. Department of Agriculture Rural Development Office (Mississippi Office) would initially screen the project and then would refer the matter to the EPA Sole Source Aquifer Program (Reference 8). During construction of a new facility, appropriate measures would be taken to prevent introduction of contaminants into the Sole Source Aquifer.

4.2.2.3 Aquatic Biota and Wetlands

Construction of the proposed embayment and intake structure on the east shore of the river would entail temporary loss of the edge habitat of the Mississippi River in the affected areas. Permanent alteration and habitat losses would occur in the area occupied by the embayment. Construction activities directly affecting the river would center on intake embayment construction. These activities would be expected to take place during low river levels, so river biota would be exposed to minimal direct impacts.

Construction of the trenches for the intake and discharge pipelines would directly affect the wetlands in the floodplain. However, the construction would be primarily along the existing haul road for GGNS Unit 1 so incremental impacts to the wetland would be minimal. The pipes would be buried, so there would be no permanent alteration of water flow patterns in the floodplain.

Section 4.3 provides additional detail on the ecological impacts of facility construction.

4.2.2.4 Water Use / Water Quality Regulations

Appropriate Corps of Engineers and MDEQ permits would be obtained for construction in the floodplain and in wetland areas. The Corps of Engineers regulatory authority is based on Section 10 of the Rivers and Harbors Act of 1899 which prohibits the obstruction or alteration of navigable waters of the United States without a permit, and Section 404 of the Clean Water Act which prohibits the discharge of dredged or fill material into waters of the United States without a permit. Other laws that may affect the processing of applications for Corps of Engineers permits include the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Coastal Zone Management Act, the National Historic Preservation Act, the Deepwater Port Act, the Federal Power Act, the Marine Mammal Protection Act, the Wild and Scenic Rivers Act, and the National Fishing Enhancement Act (Reference 2).

Water discharges would be monitored in accordance with applicable National Pollutant Discharge Elimination System (NPDES) requirements and state water quality standards at the time of construction. It is anticipated that there will be no applicable Native American standards.

Construction standards for water supply wells would be in accordance with applicable standards published in the MDEQ groundwater use and protection regulations, and necessary permits would be obtained from the MDEQ. Current regulations state that the MDEQ permit board may deny a permit or reduce the allowable withdrawal rate if such use would interfere with existing permitted uses or is in conflict with the public interest.

4.2.3 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. U. S. Army Corps of Engineers, Vicksburg District, 2001, URL www.mvk.usace.army.mil/offices/od/odf/main.asp.

3. Maidment, David R., Handbook of Hydrology, McGraw-Hill Inc., New York, N.Y., 1992, pages 13.1-13.7.

4. State of Mississippi Department of Environmental Quality, Office of Land and Water Resources, Surface Water and Ground Water Use and Protection Regulations, Adopted June 1988, Amended April 1990, Amended July 1993, and Amended December 1994.

5. Grand Gulf Nuclear Station Updated Final Safety Analysis Report (UFSAR)

6. U.S. Environmental Protection Agency, Exposure Factors Handbook, Volume 1 – General Factors, Document No. EPA/600/P-95/002Fa, August 1997.

7. U.S. Environmental Protection Agency, Exposure Factors Handbook, Volume 1 – General Factors, Document No. EPA/600/P-95/002Fa, August 1997.

8. U.S. Environmental Protection Agency, Region 4, and U.S.D.A. Rural Development, Mississippi State Office, “Sole Source Aquifer Memorandum of Understanding,” 1998.

4.3 Ecological Impacts

This section describes the potential impacts that construction of a new facility at the GGNS ESP Site may have on the ecological resources of the site. In general, potential impacts associated with construction are temporary and minor, with the exception of the permanent commitment of terrestrial habitat, and a limited amount of aquatic habitat resources. As discussed in Section 4.1, an estimated 400 acres of the 2100-acre GGNS site would be affected by the construction of a new facility (Figure 2.4-3). Of this amount, it is estimated that approximately 125 acres would contain permanent structures (primarily a power block area, cooling tower area, and bottom land pipeline and intake areas, as shown in Figure 2.3-1). The impacts to the remaining 275 acres are expected to be temporary. This temporarily impacted land would be revegetated and allowed to return to a wild state following construction.

4.3.1 Terrestrial Ecosystems

4.3.1.1 Upland Vegetation

Temporary and long-term alteration and loss of vegetative cover is the primary impact on vegetation resulting from construction of a new facility at the GGNS ESP Site. Approximately 145 acres of upland forest and approximately 105 acres of upland fields would be affected by the construction of a new facility (Figure 2.4-3). This represents approximately 35% and 66% of these habitat types within the GGNS site, respectively. The remaining construction space in upland areas, about 90 acres, would be in areas previously disturbed by the construction of GGNS Unit 1.

In forested areas contractors would clear the construction area of woody vegetation and then, where necessary, fill and grade the site to create a level surface. As was the case with the construction of GGNS Units 1 and 2[1], merchantable timber would likely be sold. Debris generated during clearing would be appropriately disposed.

Removal of forests could result in increased forest fragmentation, which in turn could affect the movement of wildlife through the habitat. However, this effect would be minimal. Forested areas would not be isolated. Inspection of the aerial photograph (Figure 2.4-2) indicates that there would be sufficient forested areas surrounding the construction areas and the GGNS site in general to allow movement of wildlife through the remaining forests.

In non-forested areas where grading may be unnecessary, for example upland fields or sites previously disturbed during construction of Units 1 and 2, the degree of disturbance would be less. The land would be cleared; however, the soil stratification may be minimally disturbed.

Overall, the potential impacts to upland vegetation would be expected to be manageable. Approximately 100 acres of the upland area of the GGNS site would be permanently altered (i.e., for structures, parking lots, etc.) for a new facility. The remaining acreage disturbed by construction would be revegetated or reseeded and allowed to develop back into a stable ecological community. There are standard construction techniques that would minimize long-term impacts. When clearing upland fields that would not require extensive grading, the

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[1] The original site layout was established for two nuclear units. Construction of the second unit was halted prior to its completion; however, the majority of the Unit 2 power block buildings were completed, along with the outer cylindrical concrete wall of the reactor containment, which is partially complete. Construction of the switchyard was essentially completed for the second unit.

construction contractor could scalp vegetation off at ground level, leaving the plant rootstock intact. This may allow the area to revegetate more rapidly than if the rootstock were destroyed. Within a relatively short period after construction, some native species would begin to invade cleared areas. Typically, these colonizing species germinate either from buried or fugitive seed, although some species sprout from rootstocks. Over a period of time and in the absence of further disturbance, these colonizing species would be replaced by later successional species. Eventually, disturbed areas not otherwise revegetated, would slowly develop stable communities similar to what existed prior to construction.

Following construction, contractors could reseed temporary work spaces. In some cases, shrubs and ornamental trees could be planted according to revegetation and landscaping plans for the site. In certain areas, seedlings of trees normally found on the GGNS site, such as sycamore and sweetgum, could be planted to help stabilize soils and speed regeneration.

4.3.1.2 Wetlands

The primary impact to forested and shrub-scrub wetlands in the floodplain at the GGNS site resulting from construction of the intake and discharge water pipelines would be the long-term alteration of vegetation. Approximately 30 acres of bottomland palustrine, forested, seasonally flooded wetland would be disturbed during the construction of a new facility (Figure 2.4-3). This is approximately 3% of this habitat type within the GGNS site property. The remainder of the area required for construction would be in areas previously disturbed for the construction of GGNS Unit 1 (e.g., heavy haul road, barge slip area). In herbaceous wetlands, for example, this impact would be temporary, since herbs and grasses regenerate quickly and water movement throughout the wetland would generally not be impeded or altered. In forested and scrub-shrub wetlands, this impact would be longer term due to the longer recovery period for these wetland types.

Clearing of wetland vegetation would also result in a temporary loss or alteration of wildlife habitat. Construction would temporarily displace wildlife from the affected wetland areas and may result in the loss or injury of some wildlife individuals that could not flee from the construction area. Construction would also temporarily diminish the recreational and aesthetic values of the wetlands in which the equipment is operating. These effects would be greatest during and immediately following construction.

Increased silt loading to the bottomland wetlands, Hamilton and Gin Lakes, and the borrow pit may occur during construction; however, this sediment loading would be minimal compared to that which occurs as a result of the seasonal flooding of this area.

As with the upland areas, the impacts to the wetlands would be manageable. Using standard construction techniques, the impacts to temporarily disturbed areas could be minimized, minimizing the time for native vegetation to reinvade the areas. The areas in the wetland permanently altered due the presence of the buried pipeline could be kept to a minimum required for maintenance.

During clearing of the land, there are several techniques available to minimize disturbance and facilitate recovery of the area after construction. Wetland vegetation could be cut off at ground level, leaving the root system intact. Only stumps and roots directly over the excavation would be removed. This would promote more rapid regeneration of woody vegetation. Additionally, to further facilitate revegetation of wetlands, the construction contractor could segregate, and later replace, the top foot or so of topsoil from the area disturbed by excavation , except in areas with standing water or saturated soils. In addition, contractors could be required to limit construction equipment operating in the floodplain to the minimum area needed to do the excavations and backfill affected areas. Access to the area could be limited to the heavy haul road.

To minimize disturbance to wetlands with saturated soils or standing water, contractors may use low-ground-weight construction equipment, or operate normal equipment from timber riprap, prefabricated equipment mats, or geotextile fabric overlain with gravel fill. Following construction, materials used to stabilize the areas would be removed.

Following construction, the areas could be seeded with annual ryegrass or other species that require no lime or fertilizer. This would facilitate stabilization of the soils. Following initial seeding, the floodplain would be allowed to revegetate naturally with native herbaceous and woody plant species. Approximately 5 acres of this area would be left to return to a natural state. Approximately 25 acres would contain permanent structures (i.e., intake and embayment) or be required to be maintained as a pipeline route to the intake and outfall structures.

Regeneration of trees and large shrubs would be prevented by mechanical mowing, cutting, trimming, or herbicide application, as required. To minimize permanent alteration of floodplain vegetation, only limited vegetation maintenance would take place, namely selective cutting of trees within a specified distance from the pipelines, intake structure and embayment, and maintenance of a permanent corridor centered over the pipelines for safety, and to facilitate pipeline surveys.

The procedures outlined above would accelerate regeneration of the native wetland vegetation and would, therefore, minimize long-term effects including the risk of establishing undesirable species.

4.3.1.3 Wildlife

Direct mortality of wildlife could potentially occur throughout the construction period; however, this would be a temporary impact affecting only those organisms that could not readily flee the construction area. Clearing, grading, excavating, and/or burying habitats within the construction zone leads to mortality of small mammals, reptiles, amphibians, invertebrates, and nesting birds with eggs or young (Reference 4). For reasons discussed below, direct mortality of wildlife in the limited areas of construction would not be great enough to cause long-term effects on local populations.

Burrowing vertebrates are especially vulnerable. Burrows also provide shelter for other vertebrates. Toads, salamanders, turtles, lizards and snakes, other mammals including rabbits, ground squirrels, mice, weasels, and skunks, and birds, also use burrows created by other species. The density of burrowing species at GGNS is unknown and the magnitude of impact on species inhabiting burrows cannot be predicted. Although there may be some mortalities during the construction period, the confined disturbance is not expected to significantly affect local populations of species that inhabit burrows.

Construction machinery and personnel vehicles sometimes collide with wildlife on construction sites or while traveling to and from these sites. Wildlife that are particularly vulnerable to collisions with vehicles are species that are inconspicuous, slow-moving, and/or nocturnal. They include opossums, skunks, rabbits, deer, turtles, snakes, amphibians, and birds, particularly those such as mourning doves and meadowlarks that inhabit shrubs or fields adjacent to roads (References 5, 6, and 7).

As documented in the literature for bear and deer, increased traffic volume on local roads would probably lead to increased collisions with wildlife (Reference 8). The number of wildlife-vehicle collisions is also probably directly related to local population levels of wildlife. But vehicle-related mortality does not appear to contribute substantially to the overall mortality rate of a population (Reference 9). While increased on- and off-road traffic would be expected to result in more wildlife mortalities through the construction period, significant impacts on wildlife populations are not anticipated due to the relatively confined disturbance. Potential impacts to species of special interest are discussed below.

During construction, wildlife would be expected to avoid areas on and adjacent to construction sites. Noise, machine activity, and dust from disturbed ground would probably displace birds, mammals, and other species beyond the actual construction area (Reference 10). Although not strictly analogous to normal construction activity, studies show that off-road vehicles in desert ecosystems reduce numbers of breeding birds, small mammals, and reptiles (References 11, 12, and 13). Density of some species of nesting birds is also known to decrease in fields near well-traveled highways (Reference 14).

Noise associated with construction activities would cause birds and other wildlife to avoid construction areas. (Reference 15). Reports indicate that mammals and birds escape from noises between 75 and 85 dB(A) and animals in groups react more strongly to noise than individuals alone (Reference 16). Equipment such as scrapers and dozers typically emit noise levels within the 75 to 85 dB(A) range at distances of 200 feet (Reference 16). Avoiding construction sites partially off-sets the risk that wildlife would collide with equipment or vehicles.

Disturbance and displacement generally would be temporary. Most affected wildlife would likely return to the surrounding area soon after construction was completed. The exception to this would be in areas where the permanent disturbance created by new facilities, particularly those like cooling towers, that emit noise. Most of the wildlife on the site or in near-by habitats would not be adversely affected by temporary disturbance or displacement. Construction within or near some habitats, including those used for significant life history functions like nesting, may result in a greater impact. In general, the degree of construction impact in these habitats depends on the time or season of the disturbance. This type of impact may usually be avoided by scheduling construction outside of critical periods.

There would be a potential for the accidental release of chemicals, including petroleum products during construction. The consequences to wildlife would be most severe if toxic compounds entered surface waters. Refueling vehicles and storage of fuel, oil, and other fluids during construction could create a potential contamination hazard to aquifers and surface waters. Implementation of the site specific Storm Water Pollution Prevention Plan would minimize the potential for accidental spills.

In addition to direct impact on wildlife, the proposed project could result in indirect effects in the form of short-term, long-term, or permanent alteration and/or loss of habitat. Construction requires clearing or scalping of woody vegetation in the construction zone, including the ROW for the intake and discharge water pipelines. Most non-woody vegetation within construction zones is destroyed by equipment and/or by stockpiling or disposing of soil. In addition, rock outcrops are cut and/or filled to create a level work space. The resulting alteration and/or loss of habitat adversely affects some wildlife. Restoration and recovery of vegetation on disturbed areas depends on the type of vegetation, the degree of restoration effort, and the amount of precipitation during restoration. Generally, impacts on fields, clearings, and emergent marshes in higher precipitation zones like that at the GGNS site are short term.

The clearing of forests in areas where facilities would be constructed would have a long-term impact on the availability of forest habitat because these forests would not be replaced.

Consequently, effects of construction in woodland areas would lower the overall carrying capacity of the site for wildlife within the GGNS site. Given the relatively limited area of construction, impact to the wildlife in the site area would be expected to be minimal.

However, exceptions could occur where construction removes small, isolated woodlands that are islands of unique wildlife habitat like the mixed hardwood-loblolly pine stand located just north of the switchyard. Although borders of wooded areas support greater diversity of plants and animals than interiors of forests (References 17 through 20), construction in small woodlots and strands of riparian forest would further reduce their areas and concomitantly reduce local habitat diversity and animal species diversity (References 21 through 23). Additionally, removal of snags in such forests impact wildlife that are dependent on cavities for nesting and snags for feeding (Reference 24). Such species typically include various small owls, bluebirds, some ducks, woodpeckers, squirrels, and bats. This mixed hardwood-loblolly pine stand is located near the edge of proposed construction laydown are and could be protected, thus minimizing any impacts to this isolated woodland.

4.3.1.4 Avian Mortality

The type of cooling tower for a new facility at the GGNS ESP Site has not been selected yet. If natural-draft towers were selected, limited mortality of birds colliding with the tower would be expected. Mechanical-draft towers, typically built lower to the ground, cause negligible mortality (Reference 2).

Existing data on cooling-tower collision mortality suggest that natural draft cooling towers cause only a very small fraction of the total bird collision mortality. The relatively few nuclear plants having natural draft towers in the United States, combined with the relatively low bird mortality at individual natural draft towers, shows that (1) these nuclear plant towers are not greatly affecting bird populations and (2) their contribution to the cumulative effects of bird collision mortality is very small (Reference 2).

As noted in the FER (Reference 1), several hundred to several thousand wood ducks, mallards, gadwalls, and green-winged teal may utilize the lowland areas adjacent to and including the GGNS site from October through March. Waterfowl and other birds that are commonly present as permanent or summer residents around nuclear plants do not frequently collide with the towers (Reference 2). Summer use of the Hamilton and Gin lakes by water birds is low (Reference 1). Flight lines are generally between fields north of the site, where birds feed, to Hamilton and Gin Lakes, where they roost. This flight path would not bring them into conflict with the cooling towers (Reference 1). Birds of special interest at GGNS include the bald eagle, least tern, white ibis, and wood stork. These are potentially seasonal residents or transient non-breeders of the type not normally significantly affected by cooling tower collisions (Reference 2). Thus, considering local conditions and past experience, major waterfowl collision incidents would not be expected to occur.

In general, a high percentage of the collision mortalities occur during spring and fall migratory periods and mainly involve passerines (songbirds) migrating at night (Reference 2). Even these collisions with cooling towers involve sufficiently small numbers for any species that it is unlikely that the losses would threaten the stability of local populations or result in a noticeable impairment of the function of a species within local ecosystems. Thus, avian mortality resulting from collision with cooling towers is considered of small significance (Reference 2).

4.3.1.5 Species of Special Interest

The list of special interest species at GGNS includes one plant: the square-stemmed monkey flower. The primary impact on this species could be the direct loss of individual plants or groups of plants located within a construction zone; however, the occurrence of this plant on the site has not been confirmed. If the plant is determined to be present on the GGNS site, then steps to protect the plant could be implemented, such as avoiding the areas where the plant is located.

MP&L (Reference 1) reported the American Alligator as the only Federally-listed threatened or endangered (T/E) species inhabiting the site in the 1970s. However, the alligator population has since expanded throughout its range. Its status has been demoted from endangered to “threatened by similarity of appearance.” Alligators occur at GGNS and are routinely removed as a personnel safety precaution. This practice would be expected to continue.

Of the remaining terrestrial species of special interest identified by resource agencies consulted during preparation of this report, only the Louisiana black bear would commonly occur in upland portions of the site where most of the construction would occur. Bears are highly mobile and would be expected to avoid areas on and adjacent to construction sites. Noise, machine activity, and dust from disturbed ground would probably displace them beyond the actual construction area; although, in so doing bears might suffer greater exposure to vehicle collisions. However, death of bears associated with this activity would have no significant effect on the continued survival of the species.

In correspondence concerning special interest species, the Louisiana Department of Wildlife and Fisheries (LDWF) commented on the presence of a water bird nesting colony near Somerset, Louisiana, about 15 miles northwest of the site. This site is presumably the closest known colonial water bird nesting site to GGNS and would not be affected by construction.

None of the other resource agencies contacted commented in the occurrence of any critical terrestrial habitat on or near the GGNS site (Section 2.4.1.2). Similarly, there are no wildlife sanctuaries, refuges, or preserves in the immediate area. Accordingly, construction at GGNS has little potential to impact any such areas.

4.3.2 Aquatic Ecosystems

Increased sedimentation and turbidity from construction have the greatest potential to adversely affect fisheries resources. Other potential impacts include interruption of fish migration and spawning, fish entrainment, and fish mortality from toxic substance spills. Some fish migrate during spawning runs in the spring, summer, and fall. Direct spills into streams could be toxic to fish, depending on the type, quantity, and concentration of the spill. To reduce the potential for surface water contamination, fuel and other potentially toxic materials would be stored away from waterways, thereby minimizing the chance of direct surface water contamination. A Spill Prevention, Control and Countermeasures Plan specific to the construction period would provide a mechanism for immediate response and cleaning of accidental spills. Such a plan would be prepared before construction begins.

4.3.2.1 Impacts to the Mississippi River

Potential impacts to the Mississippi River during construction of a new facility would be similar to the impacts during the construction of GGNS Unit 1. Construction of GGNS Unit 1 did not result in any significant impact to the water quality of the Mississippi River (Reference 1). Installation of the new cooling water intake and discharge structures and construction of the embayment would require construction on the river shoreline. The river would receive dewatering effluent from trenching in the floodplain, runoff from the bluff area via onsite streams and Hamilton Lake, and minor, localized turbidity during construction and maintenance of the water intake and discharge structures. Due to the localized area and the temporary nature of construction of the intake and discharge structures, impacts to the banks of the Mississippi River would be minimal.

Site runoff reaching the Mississippi River via Hamilton Lake is apparently buffered by the lake itself. The FER also reported that there appeared to be no indications that the river bank was altered in the area of the Hamilton Lake outlet (Reference 1). Like construction of the barge slip for Unit 1, construction of the intake and discharge structures would be restricted to periods when river water level was low (i.e., not during flood season). Based on experience from the construction of GGNS Units 1 and 2 (Reference 1) the material removed during dredging operations would consist primarily of sand. Soil overburden would be removed to a spoils site or otherwise disposed. Since most of disturbed material would be sand, very little turbidity would be induced in the river during construction of the embayment. The intake and discharge pipelines would be constructed within a trench excavated across the bottomlands to the plant site on the bluff. In this area, the trench would likely require dewatering. Water would be pumped from the trench to the river or onto the floodplain. Localized increases in turbidity would result, along with some siltation in the immediate area. Since the water from the trench would consist essentially of recharge water from the river itself, little impact on the overall quality of river water would be expected (Reference 1).

Backwater habitats in the Mississippi River, described in Section 2.4.2.1.1, 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. The proposed intake and outfall structures would not be located near a backwater area and would not be on the inside of a large bend in river. Therefore, no impacts to backwater areas would be expected.

Biota in the river would not be significantly affected by construction of the embayment and intake and discharge structures with the exception of some very local displacement of fish and benthos in the immediate areas of the structures. Some siltation and increased turbidity may result in the loss of benthic biota sensitive to increased siltation or displacement of a small number of fish. As stated in Section 2.4.2.1.1 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 (Reference 1), 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. Given this fact, and the temporary nature of construction impacts, impacts to biota of the Mississippi River would be expected to be minimal. River biota would return to its normal state in the affected area soon after completion. Additionally, construction would in no way preclude or conflict with continued use of this reach of the river by recreational or commercial fishermen.

4.3.2.2 Impacts on Gin and Hamilton Lakes

According to MP&L (Reference 1), Gin Lake was largely unaffected by construction of Unit 1 due to its location to the north of the active construction area. The Gin Lake drainage basin remained in a relatively undisturbed condition and would probably remain so in the future.

Hamilton Lake receives site runoff via streams “A” and “B.” Gin Lake also flows into Hamilton Lake through a series of culverts constructed beneath the heavy haul road. Direct connection exists between the river and Hamilton Lake (when the Mississippi River rises above 56 feet msl) through the discharge stream at the south end of Hamilton Lake. (Reference 1)

During flood periods, the level of suspended solids in Mississippi River water increases due to transport of silt from upstream areas. The increase in suspended solids in the river water contributes to siltation of Hamilton and Gin Lakes. MP&L (Reference 1) reported on bathymetric surveys of the lakes. Gin Lake, which receives insignificant runoff from the plant site, silted about 3 to 4 feet from 1973 to 1977. During this period, the Mississippi River flooded the bottomland annually as it continues to do today. MP&L (Reference 1) concluded that siltation in both lakes was due to Mississippi River floods, since both experienced similar levels of siltation.

Runoff from the plant site that discharges to Hamilton Lake first passes through sedimentation basins A and B that retain most of the sediment transported from the plant site. Suspended sediment that passes from the sedimentation basins flows into Hamilton Lake. However, its contribution to the silting of Hamilton Lake is considered insignificant compared to that of the Mississippi River during floods. Additional re-routing of onsite drainages and construction of additional sediment retention basins would likely be required to support construction of a new facility. A buffer zone of native vegetation could be maintained between the construction areas and the lakes. Proper construction practices and the use of silt fences or hay bales would also help minimize sediment input to the lakes. Overall, like the original construction on the site, construction activities would be expected to cause minimal impacts on these lakes.

4.3.2.3 Impacts on 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. MP&L (Reference 1) concluded that previous owners stocked the ponds with bluegill and channel catfish. Two of the ponds were filled with excavated soil during original construction at GGNS. Loss of the remaining ponds, if necessary to complete construction of a new facility, represents no significant loss to any species of recreational or commercially important fish, no loss of significant recreational fishing opportunity, nor loss of any important fish habitat.

4.3.2.4 Impacts on Streams

As reported by MP&L (Reference 1), streams “A” and “B” were exposed to the impacts during the construction of GGNS Units 1 and 2. Stream “A” was channeled through a culvert under the plant access road. Stream “B” was stabilized with rip-rap or concrete flumes on the bluff, and passes through culverts where required by grading and filling, including a culvert under the south access road. Sediment retention basins were also placed within each stream in mid-1974 as erosion control measures (Figure 2.3-8). These basins actually represent an increase in the available aquatic habitat (Reference 1).

Both streams received increased runoff, silt, and nutrient loads during initial construction at GGNS as a result of the earth moving and the loss of vegetative cover in uplands. Dewatering of the power block excavation added to stream volume, although this input was minimized by the use of tie-back walls and was temporary in nature (Reference 1). Mortality of less tolerant species probably occurred. This situation would probably re-occur during future construction. However, since stream biota on the site constitutes a fishery of no recreational or commercial significance, the impact is temporary and insignificant. In addition, the existing sediment retention basins and the use of silt fencing or similar techniques to minimize the release of silt to the streams, would mitigate this impact.

In 1973, stream “A” was intermittent (Reference 1). It is now perennial due to runoff from the existing plant site. Unlike in 1973, it now probably supports a stable, but low density population of fish and other aquatic organisms similar to that of stream “B due to the augmented flow.

However, in addition to rip-rap and flumes, the stream bed near the main (northeast) spoils area at GGNS was also filled with excavation spoils during construction of Unit 1 (Reference 1). However, like stream “A”, aquatic biota in stream “B” was subjected to increased runoff and turbidity from earth moving activities at the site during the previous construction. This impact would also occur during construction of the new facility. Accordingly, additional mortality of less tolerant species would occur.

Site stream “A” was modified during construction of the heavy haul road to flow into Hamilton Lake through culverts under the road. Bottomland streams received increased runoff as the pipeline ROW was cleared of vegetation and the haul road constructed. Runoff decreased with establishment of low growing vegetation in the corridor. This would probably reoccur during construction of the new facility. However, these impacts would generally be temporary and limited mainly to the construction period. Since there are no populations of recreational or commercial value in the streams, nor is there any critical habitat there, the long-term effects on fishery resources would be negligible.

As discussed in Section 2.4 the Mississippi River, streams “A” and “B” as well as the ephemeral drainages at GGNS are classified as “waters of the United States.” Sediment retention basins A & B are considered modifications of Streams A & B and, therefore, are also classified as “waters of the United States” (Reference 25). Waters of the United States are under the regulatory jurisdiction of the Corps of Engineers who would issue appropriately conditioned permits for work involving these waterways.

4.3.2.5 Impacts on Species of Special Interest

Impacts to aquatic species of special interest would not be expected to occur during the construction of a new facility. There are several fish species of special interest identified in Section 2.4.2.2 that would have a potential of inhabiting the Mississippi River in the vicinity of the GGNS site, however, as stated above, fish would be expected to avoid the disturbed area during construction.

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4.4 Socioeconomic Impacts

The discussion of socioeconomic impacts is divided into three sections. First, direct physical effects of station construction on the community and existing GGNS employees are considered. Second, the social and economic impacts of station construction on the surrounding region are considered. Finally, considerations of environmental justice are presented.

4.4.1 Physical Impacts

A detailed description of the GGNS site location and surrounding community characteristics is provided in Sections 2.1 and 2.2.1. As explained in these sections, the GGNS site is located in a rural area, relatively remote from population centers and communities. Therefore, the potential for direct physical impacts to the surrounding communities from plant construction is minimal.

The staff at GGNS Unit 1 would be the largest population likely to be impacted by construction activities. The peak construction workforce for a new facility is estimated to be approximately 3,150 workers (Table 3.0-1). Construction workers would follow standard construction safety precautions and procedures; thus, potential impacts to construction workers need not be discussed further. However, during construction activities the people working the day shift at GGNS Unit 1 could be subjected to noise, dust and gaseous pollutants associated with construction events. Except for GGNS Unit 1 structures, no other industrial, commercial, or residential structures would be directly affected by the construction of a new facility. A description of the population distribution located within five miles of the site is presented in Section 2.1.

The southeastern quadrant of the proposed power block location for a new facility encompasses or borders an area which currently includes GGNS Unit 1 buildings for contractor in-processing, general employee training, site badging, welding test shop, and a number of metal storage buildings from original GGNS Unit 1 construction, etc. Structures on the southwest side of the power block location which could possibly be impacted include a paint shop, the site water supply wells and well water treatment facilities and water tower. In the proposed cooling tower location, there is a metal building used as a carpenter shop. Some of these structures may require removal and/or relocation to other areas on the site. Other buildings associated with GGNS Unit 1 are outside the proposed construction areas, and would likely not be affected by construction activities.

4.4.1.1 Noise

As discussed in Section 4.1, noise on the site property and in the vicinity of the GGNS site was monitored during construction of GGNS Unit 1, and the impacts of construction noise were considered to be small and of a temporary nature. Noise levels at the site boundaries are expected to be below the regulatory guidance of 65 dB(A) stated in NUREG-1555 for construction on the ESP Site. A construction noise abatement and protection program will provide required mitigative measures for noise which may, on a short term basis, exceed this guidance.

Traffic on Grand Gulf Road will increase substantially during the peak construction period, and will be at its peak during the morning and evening shift changes. Noise in the general area will increase from this increased traffic but the increases will be temporary, and will only occur as indicated twice per day, during the week.

The proposed location for the new power block is located in what is currently a parking lot along with the contractor in-processing and training facility and other existing structures as noted above. The area is about 100 to 150 ft from the GGNS Unit 1 administration building and the Unit 2 MP&L construction building. The potential exists for loud noises near the current work force during the construction of a new facility. However, the majority of the Unit 1 plant workers work indoors, which provides additional noise protection beyond that provided by distance considerations discussed in Section 4.1. Noise protection and training would be provided to GGNS Unit 1 personnel in accordance with existing safety procedures for the site, as needed.

It is not known at this time if blasting would be necessary during the construction of a new facility. People are more sensitive to changes in noise levels at night, so, if necessary, blasting, along with other excessively loud construction activities would be done during daytime hours.

4.4.1.2 Air

Air pollution would likely increase during construction activities due to increases in dust from unpaved construction roads and unvegetated construction areas, engine exhaust from machinery associated with construction, and possibly smoke from permitted outdoor burning activities. A number of controls would be initiated to keep air emissions within applicable government standards during construction.

4.4.1.2.1 Dust

Dust control measures, including wetting unpaved roads and construction areas with water during dry weather, would be implemented at the site to control excessive dust resulting from vehicle traffic. Areas cleared for construction would be mulched and/or seeded in order to reduce wind-blown dust. The concrete batch plant would be equipped with a dust-control system that would be checked and maintained on a routine basis.

4.4.1.2.2 Burning controls

Should there be a need for open burning, a burn pit would confine burning to a location least likely to affect operations at GGNS Unit 1 and construction activities at a new facility. Open burning would utilize technology designed to increase the efficiency of combustion while reducing smoke levels, and would be conducted in compliance with applicable air permitting requirements established by the MDEQ and in coordination with applicable fire protection jurisdictions. Procedures would also be established to prevent brush and forest fires initiated by open burning on the GGNS site.

4.4.1.2.3 Engine Emissions Controls

Construction equipment burning gasoline or diesel fuel would be routinely inspected and maintained to prevent excessive exhaust emissions. Equipment found to have excessive emissions would be repaired or replaced as required to meet applicable air regulations and permits in place at the time of construction.

Overall, air pollution emissions due to construction would be expected to be temporary and minimal. Construction activities would be conducted in accordance with the best management practices available at the time of construction. Air emissions would be controlled, as necessary, to meet the requirements of applicable air regulations and permits in place at the time of construction.

4.4.1.3 Visual Aesthetics

The most visually obtrusive structures under consideration for a new facility are natural draft cooling towers. The bounding cooling tower(s) height would be approximately 550 feet. A 522 ft tall natural draft cooling tower currently exists at the site (Reference 1); therefore, the construction of additional cooling towers would add only minimal additional aesthetic impacts to the site vicinity. The areas around the GGNS site are rural and generally heavily wooded, which would tend to help conceal construction of the new facility. Some construction activities for the new facility may be visible from the Mississippi River (e.g., the embayment and intake structure, cooling towers, etc.), and from Grand Gulf Military Park. There are bluffs on the site east of the Mississippi River that are about 65 ft above the average river level (Reference 1), and dense forest throughout the vicinity that would help conceal the construction of new structures.

Because the GGNS site is already aesthetically altered by the presence of an existing nuclear power plant with a natural draft cooling tower, and construction impacts would be temporary, adverse impacts to visual aesthetics of the site and vicinity are not expected from the construction of a new facility.

4.4.1.4 Transportation Supporting Construction

The rail line, which extended from Vicksburg to the site and beyond, and the spur constructed to the site to support GGNS Unit 1 construction, have since been abandoned. To support transport of heavy materials and equipment to the site, new rail service will likely be required. This may involve reconstruction of rail tracks along the former rights of way, or construction of new rail lines.

4.4.2 Social and Economic Impacts

Section 2.5 provides a detailed description of the social and economic characteristics of the region surrounding the ESP Site. The area within the boundaries of the GGNS Unit 1 Emergency Planning Zone (an approximate 10-mile radius around the site on the Mississippi side of the river) is a rural setting with a low population density. 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.

The peak construction work force for a new facility is estimated to be 3,150 workers. The majority of construction worker in-migrants and their families would settle into developed metropolitan areas, or the associated suburbs, such as Vicksburg (Warren County), Natchez (Adams County), and Clinton/Jackson (Hinds County). These three counties have a combined year 2000 population of over 300,000 people. Assuming that 50 percent of the construction workforce would move into the region, with an average family size of four (4), an estimated 6,300 people would move to within 50 miles of the GGNS site. This represents approximately 2 percent of the year 2000 population for Warren, Adams, and Hinds Counties. Construction of the new facility is assumed to take five years. Construction workers who move into the region for this temporary work would most likely leave the area after completion of the construction work; however, a few may stay on to become permanent staff. The remainder of the workforce would be comprised of individuals who already reside in the region.

The expected number of in-migrating construction workers and their families would not represent a significant increase in the population of the region (relative to the current population of surrounding communities. This influx of people could potentially impact the public services in these communities, however, these impacts would not be expected to be significant. Additional details are presented below.

Social or economic impacts incurred by individual communities due to the temporary influx of construction workers and their families would be offset in part by the increase in local retail sales, and increases in sales, personal property, and income tax revenues paid by facility construction workers and their families.

Issues related to socioeconomic impacts from station construction include local housing, tax payments, local public services, local land use, local employment, and historic resources. These issues are discussed in the following sections.

4.4.2.1 Local Housing

As stated above, the bounding construction workforce for a new facility is 3,150 workers, 50 percent (or 1575) of which would be assumed to in-migrate to the region with their families. The remainder of the construction workers would be made up of individuals already residing in the region.

Warren County, including Vicksburg, MS, had over 2,000 vacant housing units in the year 2000 (Table 2.5-14). In Claiborne County and surrounding counties (Warren, Copiah, and Jefferson) there were over 4,000 vacant housing units in year 2000. Including Adams County and Hinds County, the total of vacant housing units increases to about over 14,800. Due to the uncertainties in key factors, it is not possible to accurately estimate the number of housing units that would be available in the region in the year 2025, the assumed start year for construction of a new facility. However, based on the year 2000 census data, and the assumed in-migrant workforce, the number of housing units available for personnel moving into the region would be expected to be adequate. Thus no significant burden on local housing resources would be expected.

4.4.2.2 Regional Tax

Temporary construction workers and their families would increase property, income and sales taxes, benefiting the region.

4.4.2.3 Local Public Services

Local public services affected by plant operation include: education, transportation, public safety, social services, public utilities, tourism and recreation. In general, impacts to each of these services from plant construction are expected to be minimal. It is expected that construction workers and their families would concentrate in population centers with well developed public services. The workers would be expected to settle in several metropolitan communities throughout the region, minimizing the likelihood that new construction workers and their families would overburden the public services in any one community.

4.4.2.3.1 Education

It is unlikely all of the temporary construction workers traveling into the region for work, would travel with their families. Many of the short-term employees will likely travel to the area unaccompanied by family members. Some of the construction personnel would commute from existing homes in the region; and therefore, would not impact local school districts.

Table 2.5-16 shows the number of schools within the Mississippi counties surrounding Claiborne in the GGNS site region, and in Hinds County. Many of the in-migrant construction workers would likely move to metropolitan areas with access to the public services. Workers with school-aged children would be interested in community school districts, for example. The largest school district near the GGNS site is at Vicksburg, MS. The current student population at Vicksburg is 9,180 (Table 2.5-16), but the district's capacity is significantly higher. According to the district, the system has had as many as 10,000 students, and has recently added two new schools, indicating the capacity exists for additional students (Reference 2).

Private schools located in the area further increase educational options for in-migrating construction workers and their families. Based upon the likelihood that plant workers would choose to live in metropolitan communities, the anticipated number of construction workers and their families would not be expected to significantly impact the educational institutions in the area. In addition, access to the large capacity school districts available in Hinds County (near metropolitan areas such as Jackson and Clinton) further minimizes any localized stress on area school districts. Any small adverse impacts to local school districts due to the influx of plant workers into a community would be proportionally offset by increased sales, personal property and income tax revenues paid by facility construction personnel and their families.

4.4.2.3.2 Transportation

The GGNS site is accessible by both river and road. U.S. Highway 61 and State Highway 18 connect Port Gibson (5 miles southeast of the site) with Natchez, Jackson, and Vicksburg. 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, Mississippi. The Natchez Trace Parkway runs between Clinton, MS, and Port Gibson, providing access from the Clinton/Jackson area to the site. Refer to Figure 2.5-3 and Figure 2.5-4 for maps of major highways in Claiborne County and in the surrounding counties. A detailed description of the current transportation routes around the GGNS site is provided in Section 2.5.2.10.

The number of traffic accidents on Grand Gulf Road increased during the construction of GGNS Unit 1. In the four years preceding plant construction (i.e., 1971-1974) the average number of traffic accidents on Grand Gulf Road was 5 per year. During construction (e.g., 1975-1978) an average of 30 accidents per year occurred on Grand Gulf Road. Traffic counts conducted during the construction of the GGNS Units 1 and 2 (GGNS Unit 2 was not completed), indicated the roadways were not overloaded. Temporary traffic overloads were reported during morning and evening shift changes (Reference 3).

Due to the increased traffic expected during construction of a new facility, combined with the existing GGNS Unit 1 personnel traffic, traffic accidents on Grand Gulf Road may again increase. In order to mitigate the amount of traffic utilizing Grand Gulf Road, shift changes for construction workers could be arranged so they do not overlap with shift changes for the GGNS Unit 1 personnel.

A highway construction project to extend the present path of Highway 18 is in the planning stages. This proposed extension would connect Highway 18 from Port Gibson to Grand Gulf Road near the site, providing additional access to the GGNS site (Reference 4). The section of U.S. Highway 61 from Natchez Trace Parkway south through Claiborne and Jefferson Counties to the Jefferson/Adams County line is currently being widened from two to four lanes (References 5 and 6). The sections of U.S. Highway 61 to the north and to the south of this construction are already four-lanes. Therefore, Highway 61 is expected to more easily accommodate the increased traffic created by construction workers headed to the GGNS ESP Site (Reference 5).

It should be noted that during the GGNS Units 1 and 2 construction peak, Highway 61 was a 2-lane highway from Vicksburg to Port Gibson, and south to Natchez. Although traffic was heavy during the mornings and evening commute, the highway was adequate with only two lanes. Grand Gulf Road was the primary route to the site from Highway 61, with a small amount of commuter traffic bypassing a portion of Grand Gulf Road using Oil Mill Road (Oil Mill Road tees into Grand Gulf Road prior to the site access). Therefore, it is expected that the extension of Highway 18 to a location very near the site, and added lanes to Highway 61 in the vicinity of the GGNS site would improve traffic capacity, which should help to off-set the temporary additional traffic due to commuting construction personnel.

The total estimated work force for construction of a new facility is 3150 (Table 3.0-1). Of this total, it is estimated that approximately 300 workers would live in trailer parks near the site, thus not contributing to the primary roadways commuter traffic. It is also estimated that 20% of the workers would car pool and the work would be split between two shifts. This would result in approximately 1,100 additional vehicles to and from the GGNS site on the primary access roads each shift.

The primary access to the GGNS site is from Grand Gulf Road, just north of the site. There is a second access road, currently blockaded, that accesses the site from Bald Hill Road, just east of the site. This access road could be re-opened to help alleviate any traffic congestion during shift changes.

Table 4.4-1 shows current daily traffic counts and estimated hourly capacity of the primary roads in Claiborne County. The information clearly shows that the primary access routes, including Grand Gulf Road, have sufficient capacity to handle the projected increase in traffic due to the construction work force for a new facility. Therefore, impacts to transportation in the region of the GGNS site would not be expected to be significant.

4.4.2.3.3 Public Safety

The temporary increase in the construction workforce and the construction operations for a new facility can increase the burden on local fire and police departments. The impacts to any one community would be minimized by the disbursement of the construction workforce in several more populous areas in the surrounding communities. Impacts to the local police and fire departments could result in the need for local communities to hire additional police or fire staff, buy additional vehicles, and build new facilities or improve the existing facilities. The additional tax revenues from influx of construction staff would, in part, help offset the cost to expand local police and fire departments. These impacts would further be offset by the benefits provided to local residents due to improvements in public safety departments, and in increased employment in these departments.

4.4.2.3.4 Social Services

Eleven hospitals with a total capacity of about 3,000 hospital beds are located in Claiborne and the surrounding Mississippi Counties. It is expected that minor injuries to construction workers, can be treated or assessed utilizing onsite medical personnel and supplies. Other injuries would be treated at one of eleven hospitals located in the contiguous Mississippi Counties, depending on capacity and ability to treat specific injuries. Detailed information concerning the capacity of the hospitals in Claiborne County and the adjacent Mississippi Counties is provided in Section 2.5.2.9. Specific agreements were established with local medical care suppliers to support emergency planning. It is expected that the arrangements would be updated to support the new facility. And a new medical center has recently been constructed in Vicksburg (Highway 61 North) with a full range of major medical capability (approximately 35 miles from the site). It is anticipated that Port Gibson Hospital would accept construction injuries. However, more serious injuries would be routed to medical centers more capable of handling severe injuries including River Regional Medical Center and Parkview Hospital. Based on the size and availability of medical services in Claiborne and the immediate surrounding counties, the temporary construction workers would not overburden existing medical services.

4.4.2.3.5 Public Utilities

A detailed description of construction related water requirements and impacts is presented in Section 4.2.2.2. Because the new facility, like GGNS Unit 1, would utilize an independent onsite water supply and water and sewer treatment facilities, Port Gibson water and sewer services would not be burdened by construction of a new facility at the GGNS ESP Site.

The short-term influx of a construction-related population of as many as 6,300 persons (one-half the expected number of construction workers and their families) to the area would not be expected to overburden local sewer and water utilities in surrounding communities because the construction workforce would be spread over a large geographic area. The commuting construction workforce would commute from the surrounding Mississippi counties, but would likely concentrate in larger population centers such as Vicksburg, Natchez and Clinton/Jackson due to the services available in these developed, more populous areas.

Water and sewer availability and capacity information obtained from the Mississippi Development Authority (MDA) was reviewed for the communities of Vicksburg and Jackson Mississippi. The current water consumption in the community of Vicksburg is below the reported capacity. The water and sewer services in Vicksburg are currently at 70 percent of total capacity (Reference 7). Municipal water and sewer services in Jackson are reported at 85 percent of total capacity (Reference 7). Based on utility capacity information the communities of Vicksburg and Jackson, cities typical of the metropolitan cities that would be settled by construction workers, the influx of construction workers would not overburden public utilities in surrounding communities. Costs incurred by local utilities for increased water usage and sewer treatment supplies would be offset by revenues paid by the new users, and by increased commercial retail demand, and property, sales, and income tax revenues generated by the in-migration of construction workers.

4.4.2.4 Recreation and Tourism

A detailed description of local tourism and recreation is provided in Section 2.5.2.7. Due to the proximity of the Grand Gulf Military Park to the north of the GGNS site, with access only via Grand Gulf Road, increased traffic resulting from the transportation of machinery and the construction workforce would affect the traffic flow to Grand Gulf Military Park. This impact would be expected to occur during periods of heavy traffic, primarily in the morning and in the evening when shift change takes place, and generally only during the week. The majority of visitors frequent the Grand Gulf Military Park on the weekends.

The effect on Grand Gulf Military Park would be short term, since construction activities are temporary.

4.4.2.5 Effects On Offsite Land Use

A detailed description of regional land use is discussed in Section 2.2.3. Land use within the immediate vicinity is primarily comprised of forests, with some agriculture and recreational facilities. It is possible that the short-term influx of a construction-related population of as many as 6,300 persons (construction workers and their families) would increase the demand for, and stimulate the development of, some commercial businesses (e.g. gasoline and automotive service stations, restaurants, etc.). However, these services would likely be confined to existing commuter routes, and would not represent a major land use change for the region. Given the rural setting of the site and the premise that the majority of the work force will emanate from the surrounding more populated areas and communities away from the site, it is likely a large portion of these new business and jobs would be temporary; i.e., not survive in the post-construction period.

See Section 4.4.1.4 above for discussion of a possible new rail line to the site.

4.4.2.6 Local Employment

A detailed description of local and regional employment trends is provided in Section 2.5.2.1. General trends for Claiborne County and the contiguous counties indicate the total number of jobs across all industries surveyed have decreased 9 percent from years1990 to 2000. In that same time period, construction jobs within Claiborne and the surrounding counties decreased by 1.6 percent. It is expected that some local construction workers would be employed for the construction of the new facilities, temporarily increasing area employment.

The short-term influx of a construction-related population of as many as 6,300 persons (construction workers and their families) would likely increase demand for commercial and retail establishments, which would provide limited additional employment opportunities to residents of local and surrounding communities.

During the construction of GGNS Unit 1, it was estimated that 8 new non-manufacturing jobs were created in Claiborne County for every 100 construction jobs created (Reference 5). Overall, it was estimated that 30 non-manufacturing jobs were created in the region for each 100 construction jobs (Reference 5). If the same ratio were applied to the future construction of a new facility at the GGNS site, then 945 additional jobs would be created in the region. Given the rural setting of the site and the premise that the majority of the work force will emanate from the surrounding more populated areas and communities away from the site, it is likely a large portion of these new business and jobs would be temporary; i.e., not survive in the post-construction period.

4.4.2.7 Historic Resources

A detailed description of the historic features identified in Claiborne County is included in Section 2.5.3. Claiborne County has 35 sites listed on the National Register of Historic Places (Table 2.5-17). The increase in the construction workforce at the GGNS site with the addition of a new facility may result in increased visitation of these historic resources. This would result in additional revenues for locations that charge an admission fee.

4.4.3 Environmental Justice Impacts

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 health or environmental consequences of a proposed project.

This environmental justice review is an assessment of the potential disproportionate environmental (including socioeconomic) and human health impacts on low-income and/or minority populations attributable to the construction of a new facility at the GGNS ESP Site. Low-income is defined as a household living at or below the national poverty level.

4.4.3.1 Demographics

The characteristics of the population within the region, a 50 mile radius around the GGNS site, was determined by examining 2000 Census data (Reference 8). Section 2.5 provides detailed discussion regarding demographics of this region which were used in this review of environmental justice related impacts. In particular, see Section 2.5.4, which provides the criteria and screening results regarding the presence and distribution of minority and low-income population groups within a 50 miles radius of the GGNS site.

4.4.3.2 Potential Impacts

4.4.3.2.1 Potential Environmental Impacts

For the purposes of this environmental justice assessment, environmental impacts considered included potential impact to the air, surface water, ground water, and terrestrial and aquatic ecosystems. Table 4.6-1 summarizes the potential adverse impacts from construction of a new facility. None of these potential impacts are judged to be significant. Consideration specific to potential socioeconomic related impacts is addressed below.

4.4.3.2.2 Potential Socioeconomic Impacts

Potential adverse socioeconomic impacts during construction of a new facility are included in Table 4.6-1. These include potential adverse impacts on air quality, aesthetics, schools, transportation, public safety, social services, public utilities, and recreational resources. However, impacts during the construction period would be temporary, and none of the potential impacts attributable to construction of a new facility were judged to be significant.

Facility construction, including temporary construction areas, would be accomplished within the boundaries of the current GGNS site. No additional land must be procured beyond the current site, and no relocations or major alterations to local off-site roads as a result of construction of a new facility would be expected.

Several positive socioeconomic impacts, principally applicable to Mississippi areas surrounding the site, would be realized by the construction of a new facility at the GGNS ESP Site (Sections 4.4.1 and 4.4.2). These include increased employment opportunities, both directly and indirectly related to facility construction for workers within the region of the GGNS site, and increased tax revenues. See Section 2.5.2.2 for additional discussion of special provisions for tax payments made directly to Claiborne County in recognition of its role as host county to the site.

4.4.3.3 Conclusion

Based on the information gathered for this Environmental Justice review it is concluded that, while there are substantial minority populations and a few localized low income populations in the region of the GGNS site, there are no significant adverse impacts as a result of facility construction that would disproportionately affect these populations.

4.4.4 References

1. Grand Gulf Nuclear Station Updated Final Safety Analysis Report, UFSAR.

2. Telephone Contact: Susan Landrom, District Media Services Coordinator, Vicksburg Warren School District (601) 634-0403.

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

4. Conguista, Paul, of Willowford, Gerhardt, and Knight, personal communication, Port Gibson, Mississippi, October 2002 and March 2003.

5. Middleton, Carl, Mississippi Department of Transportation, Assistant District Engineer, Yazoo City, Mississippi, March 2003.

6. Valentine, Ray, Mississippi Department of Transportation, Planning Department, Jackson, Mississippi, March 2003.

7. URL, Mississippi Development Authority, Community Profile, October 29, 2002, http://www.mississippi.org/.

8. URL, U.S. Census Bureau 2000, September 2002, http://www.census.gov/.

4.5 Radiation Exposure to Construction Workers

This section evaluates the potential radiological dose impacts to construction workers at the proposed new facility locations on the Grand Gulf site resulting from the operation of the Grand Gulf Unit 1 nuclear plant.

4.5.1 Site Layout

The Universal Transverse Mercator Grid Coordinates for the proposed location of the power block area of the new facility on the GGNS ESP Site are approximately N3,543,261 meters and E684,018 meters (Figure 2.1-1). The location of the centerline coordinates between the GGNS Unit 1 and Unit 2 reactor locations is N3,542,550 and E684,360 meters (MS Grid coordinates of N549,033 ft and E278,462 ft) (Reference 1). The approximate center of the GGNS Unit 1 Turbine Building is located at MS Grid coordinates of N548,770 and E278,552 ft. Other designated construction areas for a new facility are illustrated on Figure 2.1-1.

4.5.2 Radiation Sources

Construction workers at a new facility on the ESP site could be exposed to direct radiation, and to gaseous radioactive effluents emanating from the routine operation of Grand Gulf Unit 1.

Radiation dose to construction workers is expected to be due mostly to the skyshine from the nitrogen-16 (N-16) source present in the operating Grand Gulf Unit 1 main turbine steam cycle. However, exposure from the Grand Gulf Unit 1 condensate water storage tank (CST) and from airborne effluents from Grand Gulf Unit 1 must also be considered.

The N-16 activity present in the reactor steam in the main steam lines, turbines, and moisture separators provides an air-scattered radiation dose contribution to locations outside the Grand Gulf Unit 1 structures as a result of the high energy gamma rays which it emits as it decays. A N-16 specific activity of 50 μCi/gm was used in the GGNS Unit 1 UFSAR N-16 skyshine dose analysis presented in UFSAR Sections 12.4.2.2 and 12.4.3 (Reference 1).

The radiation source term used in the GGNS Unit 1 UFSAR Section 12.4.2.1 analysis of dose from the CST is 1.8×10^{-4} μCi/cc (Reference 1, Section 12.4.2.1).

Grand Gulf Unit 1 releases airborne effluents via four gaseous effluent release points to the environment. These are the radwaste building vent, the turbine building vent, the containment vent, and the auxiliary building vent. The mechanical vacuum pump exhausts to the turbine building vent, and the offgas system exhausts to the radwaste building vent (Reference 1, Section 11.3.3.2). The expected radiation sources (nuclides and activities) in the gaseous effluents are listed the Grand Gulf Unit 1 UFSAR in Table 11.3-9.

Grand Gulf Unit 1 releases radioactive liquid effluents via the radwaste discharge pipe which are diluted by mixing with the cooling tower blowdown flow of approximately 11,000 gpm. The annual expected releases of activity to the environment in liquid effluents are presented in Reference 1 Table 11.2-10. These effluents are released directly to the Mississippi River via an underground pipe from the Unit 1 site to the river. Construction activities for a new facility, at the river, would primarily be upstream of the GGNS Unit 1 release point for liquid effluents. Therefore, it is expected that there would be minimal impact to construction workers from radioactivity contained in liquid effluents.

4.5.3 Measured Radiation Dose Rates and Airborne Concentrations

Environmental radiological monitoring data obtained from the Grand Gulf Nuclear Station (GGNS) Annual Radiological Environmental Operating Report, January 1, 2001 through

December 31, 2001 (Reference 2), and from the Grand Gulf Nuclear Station (GGNS) 2001 Annual Radioactive Effluent Release Report, January 1, 2001 through December 31, 2001 (Reference 3), were used to assess any potential radiological impact on construction workers due to the operation of Grand Gulf Unit 1. The data from these reports is considered representative and conservative for the GGNS ESP site dose evaluations.

The Annual Radioactive Effluent Release Report for 2001 (Reference 3) provides a summary of offsite doses for water-related and airborne-related exposure pathways.

4.5.3.1 Airborne-Related Dose

As stated in the Annual Radioactive Effluent Release Report for 2001 (Reference 3) the 2001 airborne effluent doses presented in Table 4.5-1 are computed for locations at the site boundary or at unrestricted areas beyond the site boundary. Locations within the site boundary were also considered when selecting locations for dose calculations. Consideration of site boundary locations as well as unrestricted areas within and beyond the site boundary provides assurance that offsite doses will not be substantially underestimated while attempting to provide an accurate dose calculation. The most limiting location for dose to a member of the public was used for these dose calculations. The doses were determined to be a small fraction (≤ 10%) of the 10 CFR 50 Appendix I limits.

4.5.3.2 Liquid-Related Dose

As stated in the Annual Radioactive Effluent Release Report for 2001 (Reference 3) the 2001 Liquid Effluent Doses presented in Table 4.5-2 are computed for the maximum exposed individual. The maximum dose contribution from liquid effluents is considered to occur in the adult age group via consumption of fish. The doses were determined to be a small fraction of the 10 CFR 50 Appendix I limits.

4.5.3.3 Direct Radiation Dose

Thermoluminescent dosimeters (TLDs) are used to measure the ambient gamma radiation levels at many locations surrounding Grand Gulf Unit 1. Of particular interest are those TLDs on the outer ring which are located approximately three to five miles from the site, the inner ring which are located within the general area of the site boundary, and those TLDs on the protected area boundary surrounding the plant. There are seven TLDs on the outer ring, nine TLDs on the inner ring and 16 on the protected area (PA) boundary (refer to Reference 3 page 17 for approximate locations of the TLDs on the outer and inner rings, and Figure 4.5-1 for PA TLD approximate locations). The data for year 2001 are shown in Tables 4.5-3 through 4.5-5.

The Annual Radiological Environmental Operating Report for 2001 (Reference 2) concluded that comparison of the outer and inner ring TLDs results to the control and to the previous indicator results indicates that ambient radiation levels are unaffected by plant operations. Radiation levels at the outer and inner ring TLDs continue to remain at or near background.

4.5.4 Construction Worker Dose Estimates

Figure 2-1 of Reference 2 shows that background radiation is approximately 10 to 12 mrem/qtr in the areas surrounding GGNS. The 16 TLDs on the protected area boundary measured dose rates in 2001 ranging from near background to a maximum of 106 mrem/qtr (annual mean), which is about 95 mrem/qtr higher than background. As shown in Table 4.5-5, each TLD is located in a certain sector. Figure 4.5-1 shows the location of the proposed construction areas closest (to GGNS Unit 1) relative to these sectors and the approximate TLD locations. It is evident that the highest radiation levels measured by these 16 TLDs are on the east side of

Grand Gulf Unit 1. The radiation levels are much lower on the west/northwest side of GGNS Unit 1 because the Unit 1 and 2 auxiliary and control buildings provide shielding from the Unit 1 Turbine Building, which is the source of the great majority of the N-16 skyshine gamma radiation.

The proposed construction site for the power block of a new facility is located on the west/northwest side of Grand Gulf Unit 1 (Sectors P, Q, and R) were the radiation levels, as measured by the TLDs on the protected area boundary in those sectors, are approximately 10 mrem/qtr, or essentially background (Table 4.5-5). Considering that the construction site for the proposed power block location of a new facility will be several hundred feet or more away from the protected area boundary, and about 1000 feet from the Unit 1 Turbine Building, the radiation levels due to N-16 skyshine are expected to be essentially background levels, similar to those readings obtained at TLDs located on the west/northwest side of the plant protected area boundary.

As shown in Figure 4.5-1, there are other proposed construction areas located to the east of the GGNS Unit 1 facility. These areas which are to the south and north of the switchyard are approximately 750 feet southeast and northeast, respectively, from the Grand Gulf Unit 1 Turbine Building at their closest point. Construction workers in these areas may be subjected to slightly higher doses than those working in other areas of a construction site for a new facility since they would be on the side of GGNS Unit 1 which has the highest N-16 skyshine (Sectors D,E,F,G,H). However, these areas are over 250 ft. from the nearest PA TLD locations, which will result in a substantial reduction in the dose rate due to distance from the source of the radiation. As evidence of this distance effect, inner ring TLD M-22 which is located on the former railroad entrance crossing on Bald Hill Road approximately 2500 feet from Unit 1 in Sector G, had an annual mean quarterly dose of 8.6 mrem/qtr. Inner ring TLD M-21 which is located near the former training center on Bald Hill Road, approximately 2000 feet from Unit 1 in Sector J, had an annual mean quarterly dose of 11.9 mrem/qtr.

Proposed construction areas also exist southwest of the GGNS Unit 1 facility outside of the site south access road leading from Bald Hill Road (Figure 4.5-1). The larger of these two areas is approximately 1270 feet from the Grand Gulf Unit 1 Turbine Building at its closest point and lies in Sectors J, K, L and M. The smaller area is approximately 1080 feet from the Grand Gulf Unit 1 Turbine Building at its closest point and lies in Sectors M and N. The highest annual mean radiation level measured by the TLDs on the protected area boundary in these sectors, was in Sector J at 20.9 mrem/qtr (Table 4.5-5). Considering that the closest points of these proposed construction areas to the nearest GGNS Unit 1 protected area boundary TLDs is over 500 ft., it is expected that the dose rates in these two constructions areas will be at or very near background levels.

The TLDs located on the inner ring and those on the protected area boundary would also measure dose from potentially radioactive water storage tanks such as the Condensate Storage Tank (CST). Therefore the TLD readings indicated would include any dose related to gamma radiation emanating from the CST.

The proposed location of the power block and normal heat sink cooling towers are shown on Figure 2.3-1 of the ER. These areas are to the west and northwest of the existing unit; the power block area is several hundred ft. from the GGNS Unit 1 Protected Area (PA) fence, and to the cooling tower location from the PA is over 1000 ft. Other proposed construction areas are indicated to the south of the proposed power block location, to the east of the existing GGNS Unit 1 facility, and at the Mississippi River east shore. Each of these proposed construction areas to the south and east are more than 250 ft. from the nearest PA TLD location (Reference Figure 4.5-1).

Given that the construction areas are spread around the existing facility, and that the majority of work is estimated to be done on the west side of GGNS Unit 1 in the lower dose areas, it is considered reasonable to use an average of all the PA TLDs listed in Table 4.5-5 (approximately 37.5 mrem/qtr.) to determine dose for all areas proposed for new construction. Considering an occupational exposure period of 2080 hours per year, and a construction work force of 3,150 (see Table 3.0-1), the estimated annual construction work force dose is approximately 112 Person-Rem. Considering the large distance from the TLD locations to the proposed construction areas, actual worker dose would be expected to be much less.

The GGNS Unit 1 Condensate Storage Tank is within the PA fence, so the TLD readings account for this source term.

The maximum quarterly total body dose rates from airborne releases is given in the 2001 GGNS Annual Radiological Effluent Release Report (Reference 3) as 1.32E-01 mrem/yr. This dose rate results in insignificant dose to a similar size construction force by comparison to the direct radiation dose estimated using the TLD readings along the PA (approximately 0.1 Person-Rem annually).

Liquid effluents are released to the Mississippi River via the discharge outfall at the existing barge slip (Figure 2.2-1). Whole body dose reported in the 2001 GGNS Annual Radiological Effluent Release Report (Reference 3) on an annual basis is 1.80E-02 mrem. Again this results in an insignificant contribution of approximately 0.06 Person-Rem on an annual basis for a work force of 3,150 people.

The annual dose to an individual construction worker from all three pathways is summarized in Table 4.5-10 and compared to the public dose criteria in 10 CFR 20.1301 (Reference 6) and 40 CFR 190 (Reference 7) in Table 4.5-7 and Table 4.5-8, respectively. Since the calculated doses meet the public dose criteria of 10 CFR 20.1301 and 40 CFR 190, the workers would not need to be classified as radiation workers. Comparison of the construction worker occupational dose to 10 CFR 20.1201 (Reference 5) criteria is provided in Table 4.5-9. Table 4.5-11 shows that the doses also meet the design objectives of 10 CFR 50, Appendix I (Reference 8), for gaseous and liquid effluents.

The maximum annual collective dose to the construction work force (3150 workers) is estimated to be 112 Person-Rem.

The calculated doses are based on available dose rate measurements and calculations from References 2 and 3. These dose rates may increase in the future as site conditions change. However, the ESP site would be continually monitored during the construction period and appropriate actions would be taken as necessary to ensure that the construction workers are protected from radiation exposure.

It is concluded that annual construction worker doses attributable to the operation of GGNS Unit 1 for the proposed construction areas for a new facility would be a small fraction of 10 CFR 20 and 10 CFR 50 Appendix I limits. Thus, monitoring of individual construction workers will not be required.

4.5.5 References

1. Grand Gulf Nuclear Station Updated Final Safety Analysis Report, UFSAR.

2. Grand Gulf Nuclear Station (GGNS) Annual Radiological Environmental Operating Report, January 1, 2001 through December 31, 2001.

3. Grand Gulf Nuclear Station (GGNS) 2001 Annual Radioactive Effluent Release Report, January 1, 2001 through December 31, 2001.

4. ICRP Publication 30, Limits for Intakes of Radionuclides by Workers, Part 1, Published for the International Commission on Radiological Protection by Pergamon Press, 1979.

5. 10 CFR 20.1201, Code of Federal Regulations, Occupational Dose Limits for Adults.

6. 10 CFR 20.1301, Code of Federal Regulations, Dose Limits for Individual Members of the Public.

7. 40 CFR 190, Code of Federal Regulations, Environmental Radiation Protection Standards for Nuclear Power Operations.

8. 10 CFR 50, Appendix I, Code of Federal Regulations, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion ‘As Low As is Reasonably Achievable’ for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents.

4.6 Measures & Controls to Limit Adverse Impacts During Construction

Potential adverse environmental impacts caused by the construction of a new facility at the GGNS ESP Site have been described in Sections 4.1 through 4.5. In this section the potential adverse environmental impacts are summarized and potential mitigation measures to reduce adverse impacts are presented. Because technology may change between the time an Early Site Permit is issued and a new facility is constructed, there are no commitments implied in this presentation of potential mitigation measures. The mitigation techniques presented herein represent best management practices or standard industrial practices at the time of ESP application submittal.

Table 4.6-1 summarizes the potential impacts identified in Sections 4.1 through 4.5 and potential measures to mitigate these impacts.

TABLE 4.1-1

TYPICAL NOISE LEVELS OF CONSTRUCTION EQUIPMENT

Equipment Type Earthmoving	Range of Noise Level dB(A) at 50 ft
Front loaders	72-84
Backhoes	72-93
Tractors, Dozers	76-96
Scrapers, Graders	80-93
Pavers	86-88
Trucks	82-94
Materials Handling	
Concrete mixers	75-88
Concrete pumps	81-83
Concrete batch plant	75-90
Cranes (movable)	75-86
Cranes (derrick)	86-88
Forklifts	76-82
Stationary	
Pumps	69-71
Generators	71-82
Compressors	74-86
Drill Rigs	70-85
Impact	
Pneumatic tools	83-88
Jack hammers and rock drills	81-98
Compactors	84-90

SOURCE:

Adapted from Magrab (1975) by Wilson, Ihrig & Associates, Inc. (WIA, 1986). (Reference 12)

TABLE 4.1-2
(FER TABLE 2.7-1)

PRIMARY ACTIVITIES OCCURRING DURING EACH OF THE CONSTRUCTION NOISE SURVEYS

Survey No.	Date	Activities
1	June 5-6, 1974	Logging and ground clearing operations onsite. Crews were working on 10-hour shift from 7 a.m. to 5 p.m. with a break for lunch.
2	August 27-30, 1974	In the two months since the first survey was conducted, construction activities progressed from one 10-hour shift to two 10-hour shifts operating around the clock preparing foundations. The shifts were separated by a 2-hour machinery maintenance period.
3	October 16-18, 1974	Excavation for foundations and other earth moving operations were in progress on a 24-hour basis.
4	December 9-10, 1974	Excavation in the power block area was in progress, but at a reduced rate due to heavy rains. Only three or four machines were working at one time.
5	February 25-27, 1975	Foundation construction was in progress and the opening of a new site access road between monitoring Points 3 and 4 affected noise levels at Point 4.

TABLE 4.1-3

OVERALL AVERAGE dB(A) LEVELS, L_{10}, L_{50}, AND L_{60}, FOR THE JULY 1973 SURVEY AND THE JUNE 1974 SURVEY vs HUD CATEGORY AND CRITERIA

	July 1973	June 1974	HUD's Categories[1, 4]			
			1	2	3	4
L_{10} (intrusive)[2, 3]	56.1	58.7	<53	53-67	67-82	>82
L_{50} (median)[2, 3]	53.7	51.7	<45	45-60	60-75	>75
L_{90} (ambient)[2, 3]	51.7	49.7	<41	41-56	56-70	>70

NOTES:

1. 1 – Clearly acceptable

   2 – Normally acceptable

   3 – Normally unacceptable

   4 – Clearly unacceptable
2. (All numbers in dB(A) units.)
3. Data taken from GGNS FER, Section 2.7.5.2.1
4. These categories were applicable at the time of the noise surveys. Currently, HUD guidelines are: acceptable <65; normally unacceptable 65-75; and unacceptable >75 (Reference 10).

TABLE 4.4-1

CLAIBORNE COUNTY ROADWAY ANALYSIS

Primary Route	Roadway Description and Improvements	Average Daily Traffic Count[2] (vehicles/day)	Estimated Roadway Capacity (vehicles/hr)
GGNS Site to U.S. 61	2-lane Grand Gulf Road - no significant changes	940 to 1100	1100/hr
U.S. 61 N to Vicksburg	U.S. 61 between Port Gibson and Vicksburg is a modern 4-lane, divided freeway	6800	1900 per lane per hr (or 3800/hr)
U.S. 61 N and MS 462 E to Vicksburg	MS 462 re-paved and re-signed - added a span in the Kennison Creek bridge	600	1300
MS 18 W to Utica	MS 18 was re-paved in 2002 and brought up to MDOT standards with 12-foot wide lanes	2500	1300
MS 547 E to Hazlehurst	MS 547 re-surfaced in 2002	2900	1300
MS 552 S to U.S. 61 S to Natchez	MS 552 is a 4-lane, divided freeway from Alcorn State University to U.S. 61 S	360, then 2800 South of Alcorn	1900 vehicles/lane/hr (or 3800/hr)
Westside to U.S. 61 S to Natchez	U.S. 61 S is two-lane improved roadway - will be 4-lane, divided freeway within 2 years like U.S. 61 N from Port Gibson	No MDOT data available for Westside Rd. - U.S. 61 S is 5500	>1400
MS 552 S to U.S. 61 S to Natchez	MS 552 S is a 4-lane divided freeway from Alcorn U. U.S. 61 S is a 2-lane road	2800 5500	3800 via 4-lane freeway 1900 (U.S. 61 S)

<u>SOURCE:</u>

Temple, J. M., 2003, Evaluation Of Existing Evacuation Time Estimates And Analysis Of Potential Impediments To Protective Actions; Grand Gulf Nuclear Station, Black Diamond Engineers, Inc.

Mississippi Dept. of Transportation Planning Division, Claiborne County Mississippi, Estimated 2000 Average Daily Traffic

TABLE 4.5-1

2001 AIRBORNE EFFLUENT DOSE (mrem)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	TOTAL
	Organ Dose				
Iodine, Tritium & Particulates	.0115	.00891	.00932	.0105	.0402
	Fission and Activation Gases				
Total Body Dose (mrem/yr)	.0151	.0371	.132	.0264	N/A
Skin Dose (mrem/yr)	.0281	.0672	.245	.0504	N/A
Gamma Air Dose (mrad)	.00124	.00184	.00392	.00191	.00890
Beta Air Dose (mrad)	.00133	.00192	.00402	.00206	.00934
	Direct Radiation				
Direct Radiation	0.0	.3	.6	.4	1.3

SOURCE:

Grand Gulf Nuclear Station (GGNS) 2001 Annual Radioactive Effluent Release Report, January 1, 2001 through December 31, 2001 (Reference 3)

TABLE 4.5-2

2001 LIQUID EFFLUENT DOSE (mrem)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	TOTAL
Bone	.000177	.00551	.00509	.00177	.0127
Liver	.000515	.0166	.00853	.00876	.0335
Thyroid	.000390	.00186	.000859	.000422	.00348
Kidney	.000390	.00984	.00376	.00386	.0174
Lung	.000458	.00232	.00169	.000744	.00518
GI-LLI	.000544	.0173	.00414	.0246	.0429
Whole Body	.000426	.00898	.00546	.00326	.0180

SOURCE:

Grand Gulf Nuclear Station (GGNS) 2001 Annual Radioactive Effluent Release Report, January 1, 2001 through December 31, 2001 (Reference 3)

TABLE 4.5-3

OUTER RING TLD DOSE (mrem/Qtr) – APPROXIMATELY THREE TO FIVE MILES FROM THE SITE (ODCM SPECIFICATIONS)

Station	1st Qtr '01	2nd Qtr '01	3rd Qtr '01	4th Qtr '01	Annual Mean '01
M-36	8.6	9.3	8.7	9.1	8.9
M-40	10.1	11.3	9.8	10.1	10.3
M-48	10.9	9.6	10.4	10.3	10.3
M-49	12.2	11.3	11.2	11.7	11.60
M-50	10.6	10.6	10.3	10.6	10.5
M-55	11.5	10.4	10.7	10.9	10.9
M-57	11.9	11.1	12.3	11.1	11.58

SOURCE:

Grand Gulf Nuclear Station (GGNS) Annual Radiological Environmental Operating Report, January 1, 2001 through December 31, 2001 (Reference 2)

TABLE 4.5-4

INNER RING TLD DOSE (mrem/Qtr) - WITHIN GENERAL AREA OF SITE BOUNDARY (ODCM SPECIFICATIONS)

Station	1st Qtr '01	2nd Qtr '01	3rd Qtr '01	4th Qtr '01	Annual Mean '01
M-16	10.8	10.3	9.0	10.7	10.2
M-17	10.0	9.5	9.2	10.4	9.8
M-19	9.4	10.2	9.1	10.6	9.8
M-21	11.7	12.1	11.3	12.5	11.9
M-22	8.4	8.8	8.0	9.4	8.6
M-23	8.0	8.3	8.2	8.7	8.3
M-25	6.8	10.0	8.5	9.4	8.7
M-28	10.2	11.0	10.9	11.0	10.8
M-94	11.1	10.3	9.8	11.0	10.6

SOURCE:

Grand Gulf Nuclear Station (GGNS) Annual Radiological Environmental Operating Report, January 1, 2001 through December 31, 2001 (Reference 2)

TABLE 4.5-5

PROTECTED AREA BOUNDARY TLD DOSE (mrem/Qtr)

Station/Sector		1st Qtr '01	2nd Qtr '01	3rd Qtr '01	4th Qtr '01	Annual Mean '01
M-61	D	65.2	44.1	50.0	59.6	54.7
M-62	E	89.4	60.6	68.2	83.9	75.5
M-63	N	19.5	14.4	14.9	16.5	16.3
M-64	M	21.9	17.5	18.8	21.2	19.8
M-65	L	18.8	15.0	16.5	19.1	17.3
M-66	K	22.9	17.1	18.6	21.6	20.1
M-67	J	23.6	19.5	18.3	22.1	20.9
M-68	H	98.3	67.6	73.8	88.9	82.2
M-69	G	125.8	80.7	92.0	126.0	106.1
M-70	F	109.9	73.1	89.0	111.0	95.8
M-71	C	29.6	18.9	22.3	29.1	25.0
M-72	B	21.6	16.3	17.0	21.9	19.2
M-74	Q	10.5	8.2	9.4	11.4	9.9
M-76	A	16.7	12.8	13.5	16.8	14.9
M-77	R	10.7	8.7	8.9	10.5	9.7
M-81	P	11.2	9.8	9.1	10.6	10.2

SOURCE:

Grand Gulf Nuclear Station (GGNS) Annual Radiological Environmental Operating Report, January 1, 2001 through December 31, 2001 (Reference 2)

TABLE 4.5-6

DELETED

TABLE 4.5-7

COMPARISON OF CONSTRUCTION WORKER PUBLIC DOSE
TO 10 CFR 20.1301 CRITERIA

Type of Dose	Annual Dose Limits	Estimated Dose
Whole body dose equivalent	100 mrem	< 1 mrem
Maximum dose rate in any hour	2 mrem/hr	<< 1 mrem

TABLE 4.5-8

COMPARISON OF CONSTRUCTION WORKER PUBLIC DOSE FROM GASEOUS EFFLUENT DISCHARGES TO 40 CFR 190 CRITERIA

Type of Dose	**Annual Dose Limits**	**Evaluated Dose**
Whole body dose	25 mrem	< 1 mrem
Thyroid doses	75 mrem	< 1 mrem
Other organ doses	25 mrem	< 1 mrem

Note: 10 CFR 20 requires that the dose to an individual from radioactive effluents also meet 40 CFR 190 limits.

TABLE 4.5-9

COMPARISON OF CONSTRUCTION WORKER OCCUPATIONAL DOSE
TO 10 CFR 20.1201 CRITERIA

Type of Dose	**Annual Dose Limit**	**Evaluated Dose**
Whole body dose	5 rem	< .037 rem
Thyroid dose	50 rem	< .037 rem
Dose to the eye	15 rem	< .037 rem
Dose to skin or extremities	50 rem	< .037 rem

NOTES:

1. Average of all PA TLDs of 37.5 mrem/qtr. for year 2001 is used to determine conservative dose.
2. Exposure period of 2080 hours per year is assumed.
3. Using the maximum TLD reading (annual average) of 106 mrem/qtr. results in a dose of approximately 0.1 rem, still much less than the limits.

TABLE 4.5-10

ANNUAL CONSTRUCTION WORKER DOSES

	Annual Dose (mrem)		
	Whole Body	**Critical Organ**	**TEDE**
Direct radiation	37	-	37
Gaseous effluents	0.132	0.245	0.206
Liquid effluents	0.018	0.043	0.031
Total	37.15	0.29	37.24

Note: A weighting factor of 0.3 is applied to the critical organ dose, which when added to the whole body dose gives the indicated TEDE dose (Reference 4).

TABLE 4.5-11

COMPARISON WITH 10 CFR 50 APPENDIX I CRITERIA FOR EFFLUENT DOSES

	Annual Dose (mrem)	
	Annual Limit	**Estimated Dose**
Whole body dose from liquid effluents	3	0.018
Organ dose from liquid effluents	10	0.043
Whole body dose from gaseous effluents	5	0.132
Skin dose from gaseous effluents	15	0.245
Organ dose from all effluents	15	0.288

TABLE 4.6-1

MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
4.1 Land Use		
4.1.1 Site & Vicinity	Clearing and grading would affect approximately 400 acres of the 2100-acre GGNS site. Soils would be disturbed, vegetation destroyed, drainage patterns altered. Impact would be minimal.	Acreage would be reclaimed following construction to the maximum extent possible.
4.1.4 Construction Noise Impact Assessment	Increase in noise level within GGNS boundary. Impact would be temporary and minimal.	Increased noise would be limited to onsite areas. Natural attenuation would decrease noise to acceptable levels in offsite areas. Standard noise protection and abatement procedures would be followed during construction.
4.1.3 Historic Properties	Possibility of unknown archaeological resources in two potential construction areas. Impact expected to be minimal based on previous construction site survey.	Survey the areas to be disturbed for archaeological resources prior to land disturbance, followed by data recovery, if necessary.
4.2 Water-Related Impacts		
4.2.1 Hydrologic Alterations	Temporary increase in turbidity in the Mississippi River associated with the construction of the intake and outfall structures. Impact expected to be temporary and minimal.	The turbidity from construction activities would likely quickly dissipate due to the relatively high flow velocity and the large volume of water in the river. The banks of the embayment and the river shoreline around the embayment would be stabilized with riprap, or other appropriate means during and following construction. Construction activities would be done in compliance with Corps of Engineer requirements, and would not affect long-term water quality.
	Dewatering of the trench for the intake and discharge pipelines would be necessary. Impact expected to be temporary and minimal.	Water from the trench would be recharge water from the river itself. Groundwater levels would return to normal following construction completion and back-filling of the trench.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Excavation and grading for construction of power block and cooling towers may cause an increased silt load to Stream A and Stream B. Impact expected to be temporary and minimal.	Impacts would be minimized by implementing a site-specific construction Stormwater Pollution Prevention Plan addressing employee training; installation of silt fences, straw bales, slope breakers, and other erosion prevention measures; preventive maintenance of equipment to prevent leaks and spills; procedures for storage of chemicals and waste materials; spill control practices; revegetation; regular inspections of control measures; and visual inspections for discharges that may be detrimental to water quality. Vegetative cover on land not in active construction would be maintained. Runoff would be routed to existing sedimentation basins, whenever possible. Water discharges would be monitored in accordance with applicable National Pollutant Discharge Elimination System (NPDES) requirements and state water quality standards during construction.
	Construction of the power block may require dewatering. Perched water level may be decreased; however, this effect would be localized and would not impact offsite ground water users. Impact expected to be temporary and minimal.	Impact would be minimized through the use of tie-back walls or similar control technology. Construction standards for temporary construction dewatering wells and for permanent dewatering wells would be in accordance with applicable standards published in MDEQ groundwater use and protection regulations.
	Dewatering for construction of the power block, if necessary may increase flow in Stream A and/or Stream B. Impact expected to be temporary and minimal.	None necessary.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Extensive grading, leveling, and filling of intermittent streams in the construction area south of Stream B may be required due to the rugged topography of this area. Deforestation would tend to increase erosion, siltation of streams, and leaching of nutrients from soil, and may also increase flood flow. Impact expected to be temporary and minimal.	Impacts would be minimized by use of Storm Water Pollution Prevention Program procedures. Runoff would be directed to a sedimentation basin to minimize sediment load downstream of the construction area.
4.2.2 Water Use Impacts	Potential for temporary increase in turbidity in the Mississippi River due to dredging that would be required for construction of the embayment. Impact expected to be temporary and minimal.	Dredging would be in compliance with Corps of Engineers and MDEQ requirements, and would not affect long-term water quality. No potable water users within 50 miles downstream. Nearest industrial user about 2 miles downstream.
	Construction of intake and outfall structures would take place on the eastern bank of the river, not in the shipping channel.	No mitigation would be necessary, as construction activities on the river bank would not affect barge traffic.
	Impacts to local streams expected to be minimal.	
	Impact to water quality of Gin Lake would be minimal. Gin Lake does not receive water from either Stream A or Stream B. The silt load to Gin Lake from overland runoff may increase. Impact expected to be temporary and minimal.	Implementation of the site specific SWPPP would include appropriate mitigation measures for protection of Gin lake.
	Small probability that Hamilton Lake would received increased sediment load from Streams A and B. Impact expected to be temporary and minimal.	Proper control of siltation, e.g. use of silt fences or straw bales, and existing sedimentation basins would minimize silt load of Streams A and B and hence, Hamilton Lake.
	Use of Hamilton and Gin lakes for recreational fishing may be temporarily restricted during construction for safety reasons. Impacts to the recreational use of these lakes would be temporary and minimal.	No mitigation necessary.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Construction of the power block may require dewatering. Perched water level may be decreased; however, this effect would be localized and would not impact offsite ground water users. Onsite wells used by GGNS Unit 1 for miscellaneous water supply (Potable, sanitary, etc.) may be impacted if local dewatering of the Catahoula formation is necessary for the construction of deep foundations. Impact expected to be temporary and minimal.	Impact to onsite wells would be minimized through the use of tie-back walls or similar control technology. New wells may be required for GGNS Unit 1 use. Construction standards for temporary construction dewatering wells and for permanent dewatering wells would be in accordance with applicable standards published in MDEQ groundwater use and protection regulations. No offsite ground water usage impact mitigation required, since no impact is expected.
	Construction activities would require approximately 350 gpm of water for concrete batch plant operation, dust suppression, and sanitary needs. This may require the construction of an additional well. Impacts on the local aquifer and water users would be minimal.	Construction of new well would be in accordance with applicable standards published in MDEQ groundwater use and protection regulations.
4.3 Ecological Impacts		
4.3.1 Terrestrial Ecosystems	Loss of a maximum of approximately 145 acres (35%) of upland forest habitat and approximately 105 acres (66%) of upland field habitat. The remaining construction areas in upland area, a maximum of 90 acres, would be in areas previously disturbed by the construction of GGNS Unit 1. A total of approximately 100 acres of upland habitat would be permanently altered. Overall impact expected to be minimal.	Actual construction area would be kept to a minimum. Careful construction techniques would help minimize impacts and facilitate recovery of the native vegetation. Land in temporary construction areas would be revegetated after construction.
	Increase in forest fragmentation due to clear cutting of construction areas. Impact would be minimal.	Sufficient forests surround proposed construction areas to allow for movement of wildlife.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Approximately 30 acres (3%) of bottomland palustrine, forested, seasonally flooded wetland would be disturbed. Approximately 25 acres would be permanently impacted by the construction of the pipeline, embayment and the intake and outfall structures for the proposed new facility. Overall impact expected to be minimal.	Disturbed area would be kept to a minimum. Much of the area required for construction in the floodplain has been previously disturbed. Minimal disturbance to land during clearing activities would help minimize impacts and facilitate recovery of native vegetation. Areas disturbed for installation of the pipeline would be restored to their preconstruction elevation and contours. Excavated top soil would be segregated and replaced in the top of the trench allowing wetland characteristics to be restored after construction Construction activities would be confined to low water periods thus minimizing physical disturbance of soils. Careful construction techniques would help minimize impacts. These techniques include, but not be limited to, use of low-weight construction equipment; operating equipment from protective surfaces, e.g., timber riprap or prefabricated equipment mat; restricting access to the construction site to the heavy haul road; and reseeding the area following construction to stabilize the soils.
	Potential for increased siltation from the construction area to the surrounding wetlands, Gin and Hamilton Lakes and the borrow pit lake. Impact expected to be temporary and minimal.	This area is routinely flooded by the Mississippi River. Implementation of the site specific SWPPP would include appropriate mitigation measures for protection of the wetlands and lakes.
	Potential for very limited mortality of wildlife during the construction period. Impact expected to be temporary and minimal.	The majority of wildlife would avoid construction areas.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Wildlife would be displaced from construction areas and would avoid construction areas during active construction. Impact expected to be temporary and minimal.	Wildlife would return to areas not permanently disturbed by construction.
	Construction within or near habitat used for significant life history functions (e.g., nesting) may result in a somewhat greater impact to wildlife. Impact expected to be minor and temporary.	If necessary, construction activities could be scheduled to avoid nesting or similar critical life history periods.
	Accidental spill of chemicals and/or petroleum products may adversely affect soils and wildlife. Impact expected to be temporary and minimal.	Implementation of the site specific SWPPP would minimize the potential for accidental spills.
	The carrying capacity of the habitat within the GGNS site would be slightly reduced because of permanent loss of habitat. Impact expected to be minimal	Loss in carrying capacity would be minimal because of the large area of similar habitat in and in the region surrounding the GGNS site.
	Removal of small, isolated mixed hardwood-loblolly pine stand north of the switch yard could result in the loss of a unique wildlife habitat within the GGNS site. Impact may be significant.	The removal of this forest stand could be avoided. There appears to be sufficient land around this area for construction without disturbing this area.
	Birds may collide with cooling towers, causing mortality. Impact expected to be minimal.	Water birds may use Hamilton and Gin Lakes for feeding, however the cooling towers would not be in the flight path. Research shows avian mortality caused by natural draft cooling towers does not greatly affect bird populations and cumulative effects of bird collisions with cooling towers on national bird populations is very small. No mitigation necessary.
	Construction activities may disturb the square-stemmed monkeyflower, a species of special interest that may be present on the GGNS site. Impacts expected to be minimal and temporary.	The occurrence of this plant has not been confirmed on the GGNS site. If the plant is shown to be present, construction activities could avoid its location.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Black bears may inhabit the GGNS site. The black bear has been identified as a threatened species by the U.S. Fish and Wildlife Service.	Black bears are highly mobile and would be expected to avoid construction areas. No critical bear habitat has been identified on the GGNS site. A survey for species of special interest would be conducted on the GGNS site prior to construction activities.
4.3.2 Aquatic Ecosystems	Temporary increase in silt load to the Mississippi River during construction of intake and outfall structures. Impact expected to be temporary and minimal.	Careful construction techniques would help minimize impacts. Increased silt load would be minimal when compared to normal silt load of river. Material removed from river bank would be predominantly sand. All dredging would be done in accordance with permit from U.S Army Corps of Engineers and MDEQ.
	There may be limited loss of benthic biota in the river due to siltation from dredging activities. Impacts to river biota would be temporary and minimal.	Benthic habitat in the Mississippi River around the GGNS site has been characterized as non-productive. Fish would avoid the construction area.
	Hamilton and Gin Lakes and the borrow pit lake may receive an increased sediment load from runoff from construction areas. Impact expected to be temporary and minimal.	Construction of Unit 1 resulted in minimal and temporary impacts to Gin Lake. Streams that drain the site do not enter Gin Lake. Hamilton Lake receives site runoff via Streams A and B. Gin Lake also flows into Hamilton Lake. A buffer zone of native vegetation would be maintained between the construction areas and the lakes. Proper construction practices and the use of silt fences and similar devices would minimize impacts during the construction period. This influx of silt would be insignificant when compared to that from the Mississippi River during floods.
	Upland stock ponds may receive increased siltation during construction. Impact expected to be temporary and minimal.	The stock ponds are man made structures of little ecological importance.

TABLE 4.6-1 (Continued)

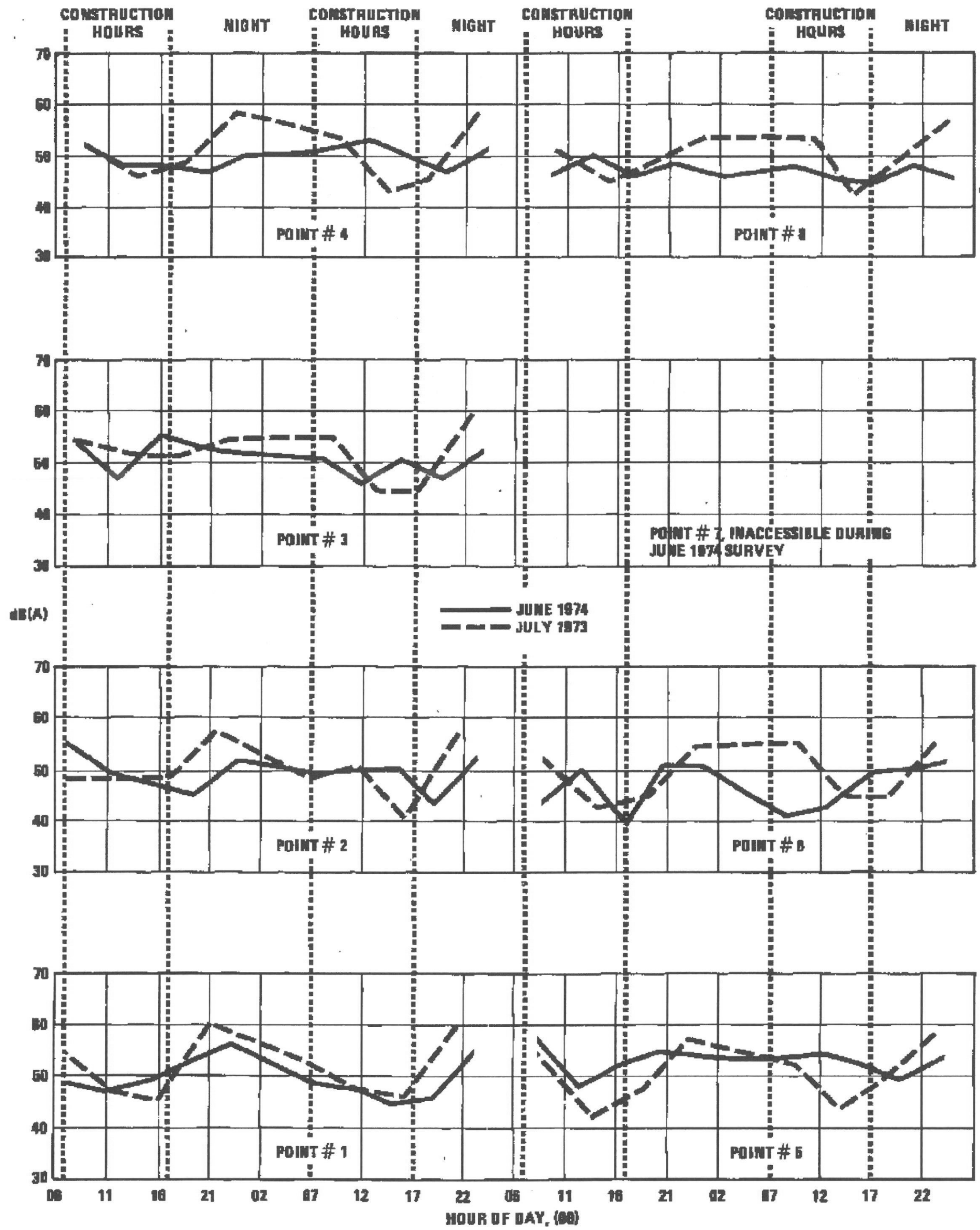
Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Stream A and Stream B may receive an increased sediment load during construction. Impact expected to be temporary and minimal.	The existing sedimentation basins would help minimize this temporary impact. Proper construction techniques and the use of silt fencing or similar techniques would further minimize impacts
	Impacts to aquatic species of special interest would not be expected to occur.	There are several fish species of special interest that potentially inhabit the Mississippi River in the vicinity of the GGNS. But, fish would be expected to avoid the area disturbed during construction.
4.4 Socioeconomic Impacts		
4.4.1 Physical Impacts	Construction noise onsite may impact GGNS Unit 1 day shift workers outside of buildings. Impact expected to be temporary and minimal.	Onsite personnel (non-construction) would be provided hearing protection if needed when outside exiting GGNS Unit 1 facilities.
	Minor increase in air pollution may occur onsite and in the vicinity caused by operation of diesel engines. Impact expected to be temporary and minimal.	Routine inspection and maintenance of diesel engines would minimize the release of pollutants. Air emissions would be controlled, if necessary, to meet the requirements of applicable air regulations and onsite permits in place at the time of construction.
	Construction activities may cause excessive dust during dry weather. Impact expected to be temporary and minimal.	Mitigation measures would include dust suppression by water spray. Cleared areas would be seeded with grasses or mulched to reduce windblown dust. The concrete batch plant would be equipped with dust suppression equipment.
	Open burning of debris may degrade local air quality with the increased release of particulates. Impact expected to be temporary and minimal.	Open burning would take place in a burn pit with means to increase the efficiency and completeness of burning. Open burning would be in compliance with MDEQ regulations.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Aesthetic characteristics in the vicinity of the site would not be significantly altered. Impact expected to be minimal.	The GGNS site is an industrial site. The aesthetic characteristics of the area were altered with the construction of GGNS Unit 1. The GGNS site is located in a rural forested area which helps to obscure the cooling tower and other facilities from view offsite.
4.4.2 Social and Economic Impacts	Minimal impacts on public and private schools in the region of the GGNS site would be expected. Impact expected to be temporary.	In-migrating work force and their families would be expected to settle throughout the region, with a preference for urban and suburban areas. This in-migration would represent approximately 2% of the total population of the region. There would be sufficient capacity in schools in the region.
	Transportation routes in the region of the GGNS site are adequate to handle the commuting construction work force. There may be an increase in traffic accidents associated with the increased traffic, particularly on Grand Gulf Road leading to the site. Impact expected to be temporary and minimal.	Transportation routes in the region were adequate for the construction work force for GGNS Unit 1. U.S. Highway 61 north from Port Gibson has been converted from a 2-lane to a 4-lane divided highway. There are several on-going and planned upgrades to highways in the region that would likely be completed prior to the start of construction of the proposed new facility. These upgrades would help reduce the number of traffic accidents. Flexible construction shifts and Unit 1 operation shifts would also help minimize potential impacts.
	Impacts to public safety in any one community in the region of the GGNS site due to the in-migration of the construction work force would be expected to be temporary and minimal.	In-migrating work force and their families would be expected to settle throughout the region, with a preference for urban and suburban areas. This in-migration would represent approximately 2% of the total population of the region. If upgrades to existing public safety services would be necessary, the cost would be offset by increased tax revenues from in-migrating population.

TABLE 4.6-1 (Continued)

Impact Category	Description of Impact	Explanation and Potential Mitigation Measures
	Impacts to social services in any one community in the region of the GGNS site due to the in-migration of the construction work force would be expected to be temporary and minimal.	In-migrating work force and their families would be expected to settle throughout the region, with a preference for urban and suburban areas. This in-migration would represent approximately 2% of the total population of the region.
	Impacts to public utilities in any one community in the region of the GGNS site due to the in-migration of the construction work force would be expected to be temporary and minimal.	In-migrating work force and their families would be expected to settle throughout the region, with a preference for urban and suburban areas. This in-migration would represent approximately 2% of the total population of the region.
	Access road to Grand Gulf Military Park via Grand Gulf Road would have increased traffic due to construction workers. Impact expected to be temporary and minimal.	Increased traffic would be primarily on the weekdays, early morning and evenings. Primary visitation to the Grand Gulf Military Park is on weekends.
4.5 Radiation Exposure to Construction Workers	The annual radiation dose to construction workers in the proposed construction areas for the new facility, attributable to the operation of GGNS Unit 1, would be a small fraction of legal limits (10CFR20 and 10CFR50 Appendix I).	No mitigation necessary.
	If a second reactor is constructed as part of the proposed new facility, the annual radiation dose to construction workers from operation of Unit 1 of the proposed new facility would be a small fraction of legal limits (10CFR20 and 10CFR50 Appendix I).	No mitigation necessary.



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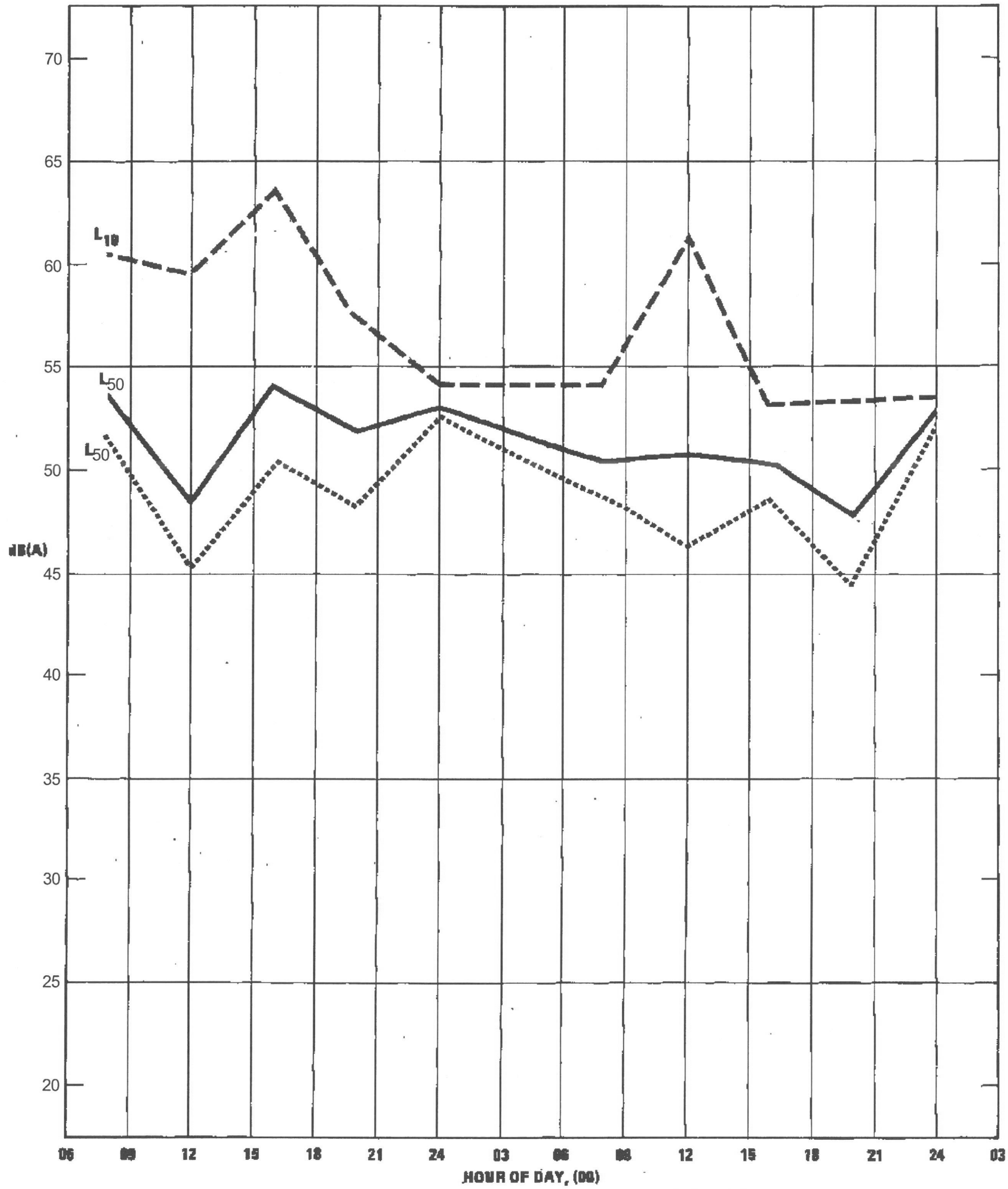
COMPARISON OF MEDIAN (L_{50})
dB(A) NOISE LEVELS BETWEEN
JULY 1973 AND JUNE 1974 SURVEYS
(FER FIGURE 2.7-3)

FIGURE 4.1-1 REV. 1



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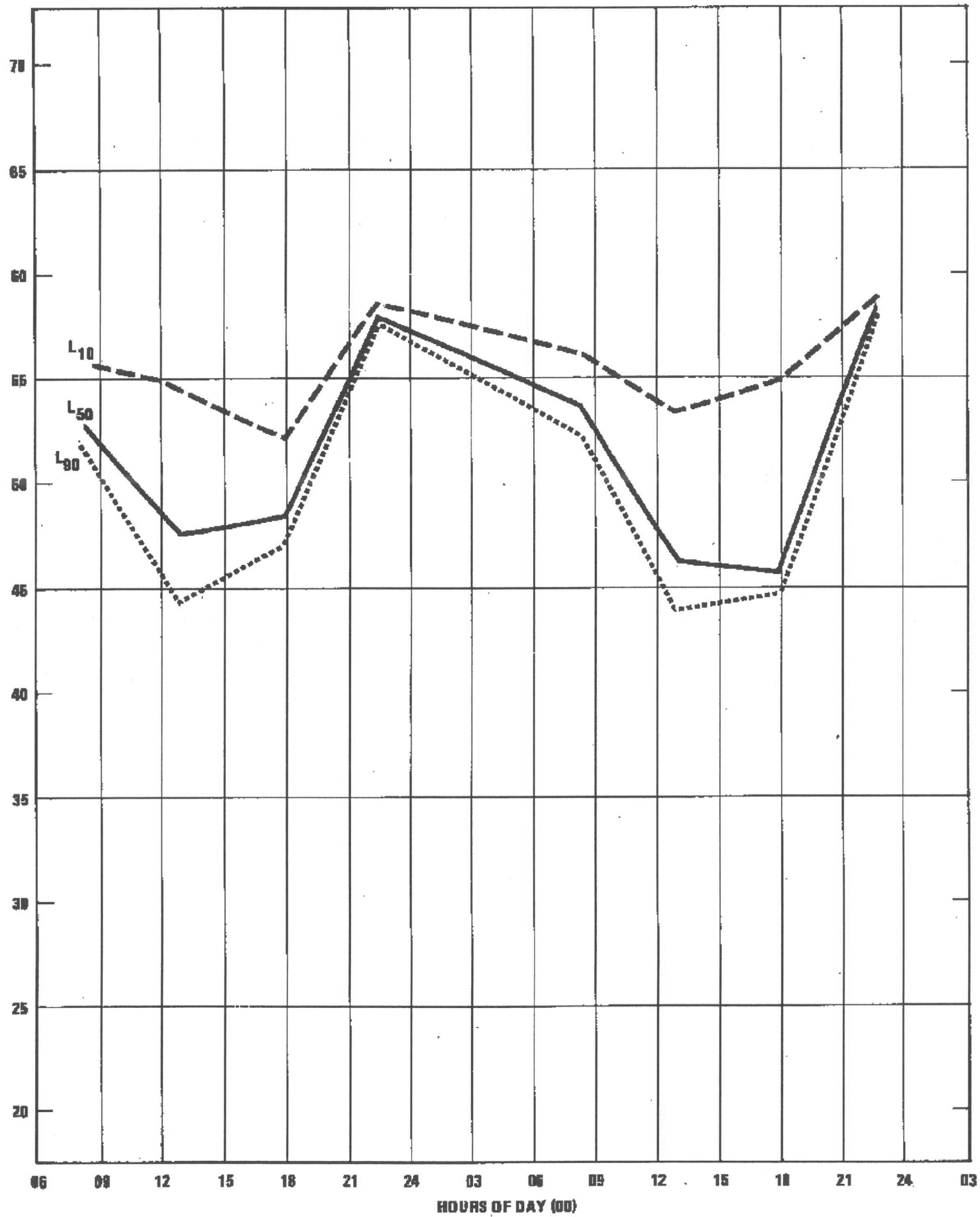
VARIATION OF dB(A) NOISE LEVELS
WITH TIME DURING THE
CONSTRUCTION NOISE SURVEY, JUNE 1974
(FER FIGURE 2.7-4)

FIGURE 4.1-2 REV. 1



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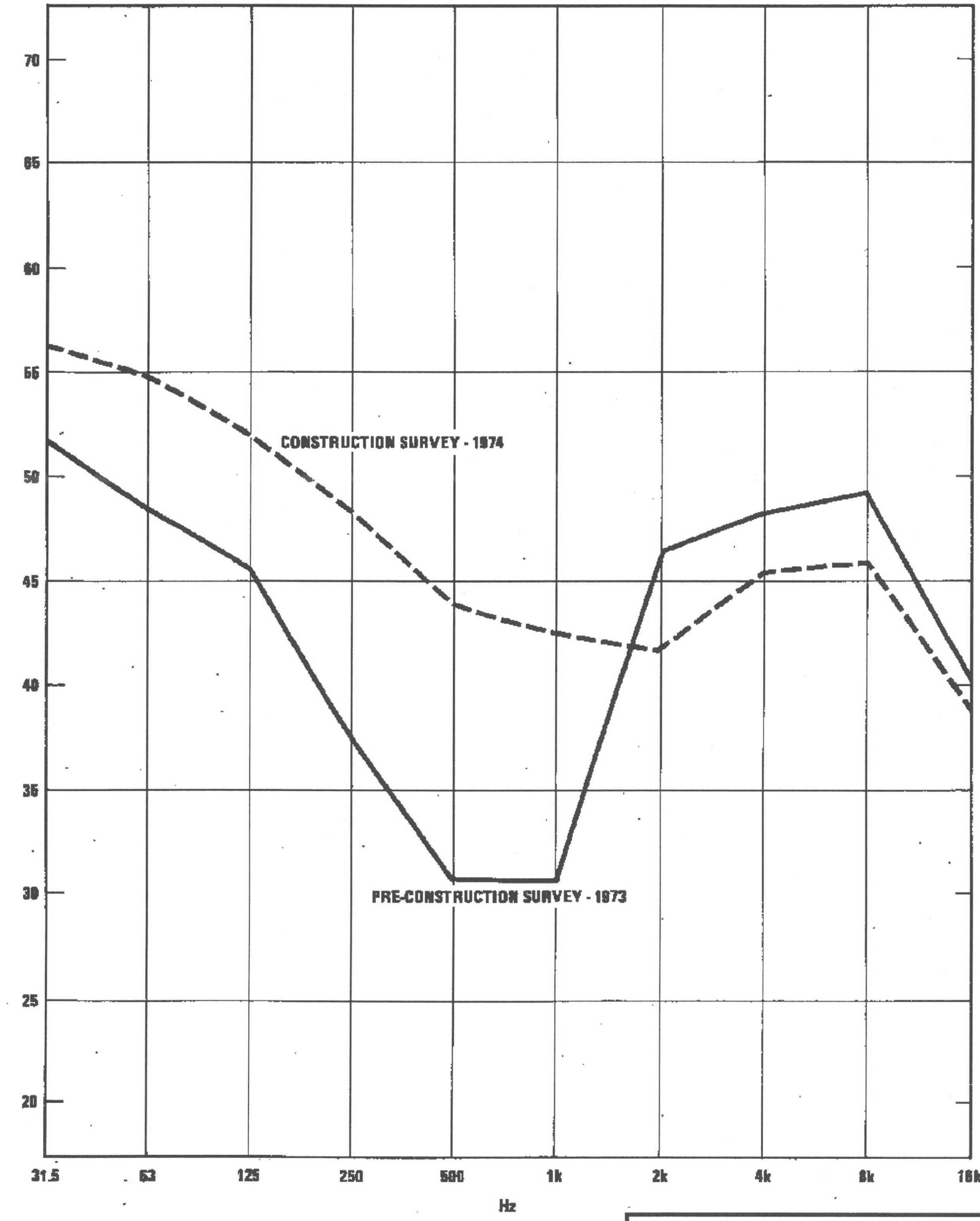
VARIATION OF dB(A) NOISE LEVELS
WITH TIME DURING THE AMBIENT
BACKGROUND NOISE SURVEY, JULY 1973
(FER FIGURE 2.7-5)

FIGURE 4.1-3 REV. 1



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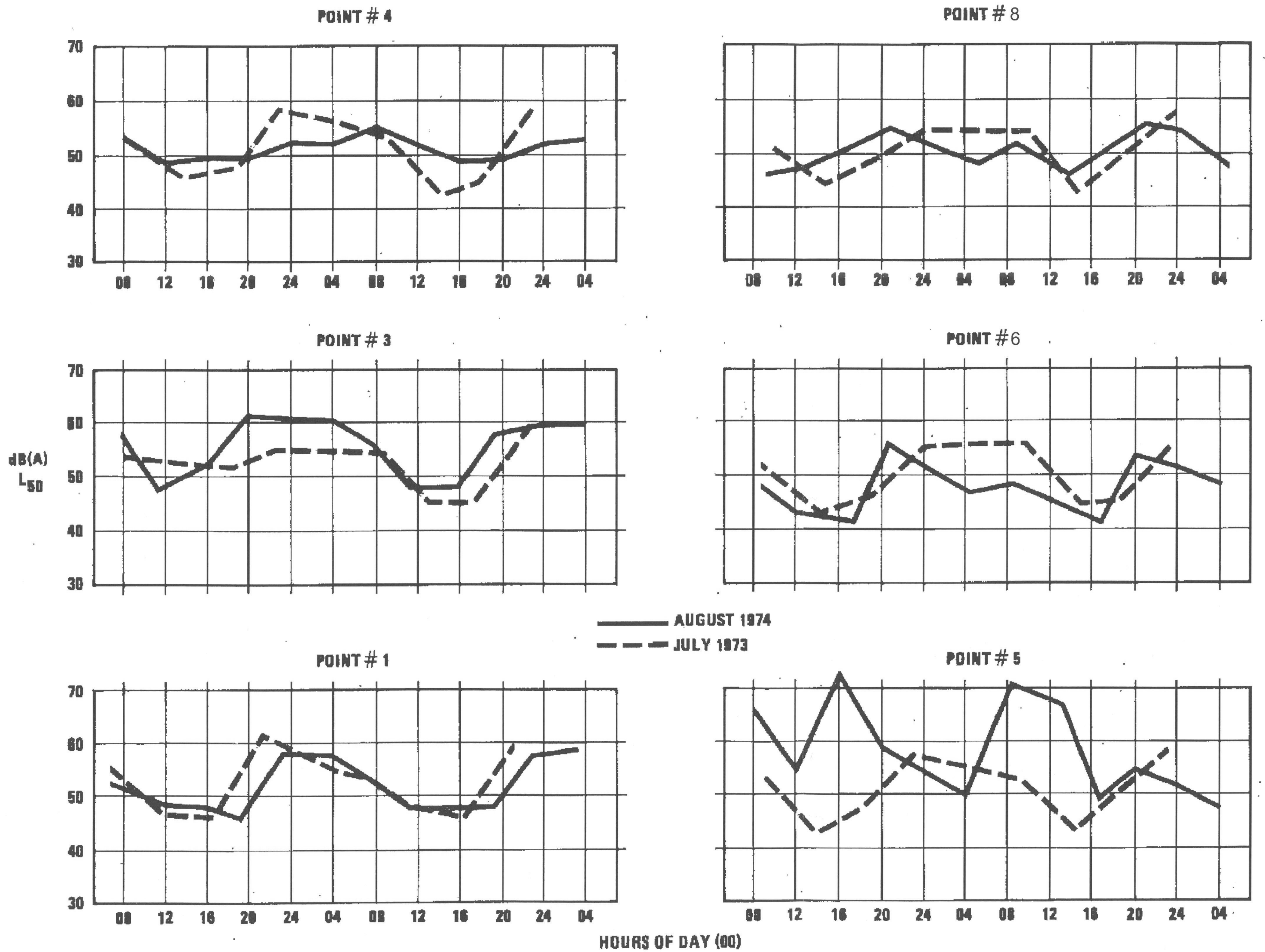
OVERALL MEAN OCTAVE BAND LEVELS
DURING THE JULY 1973
AND JUNE 1974 SURVEYS
(FER FIGURE 2.7-6)

FIGURE 4.1-4 REV. 1



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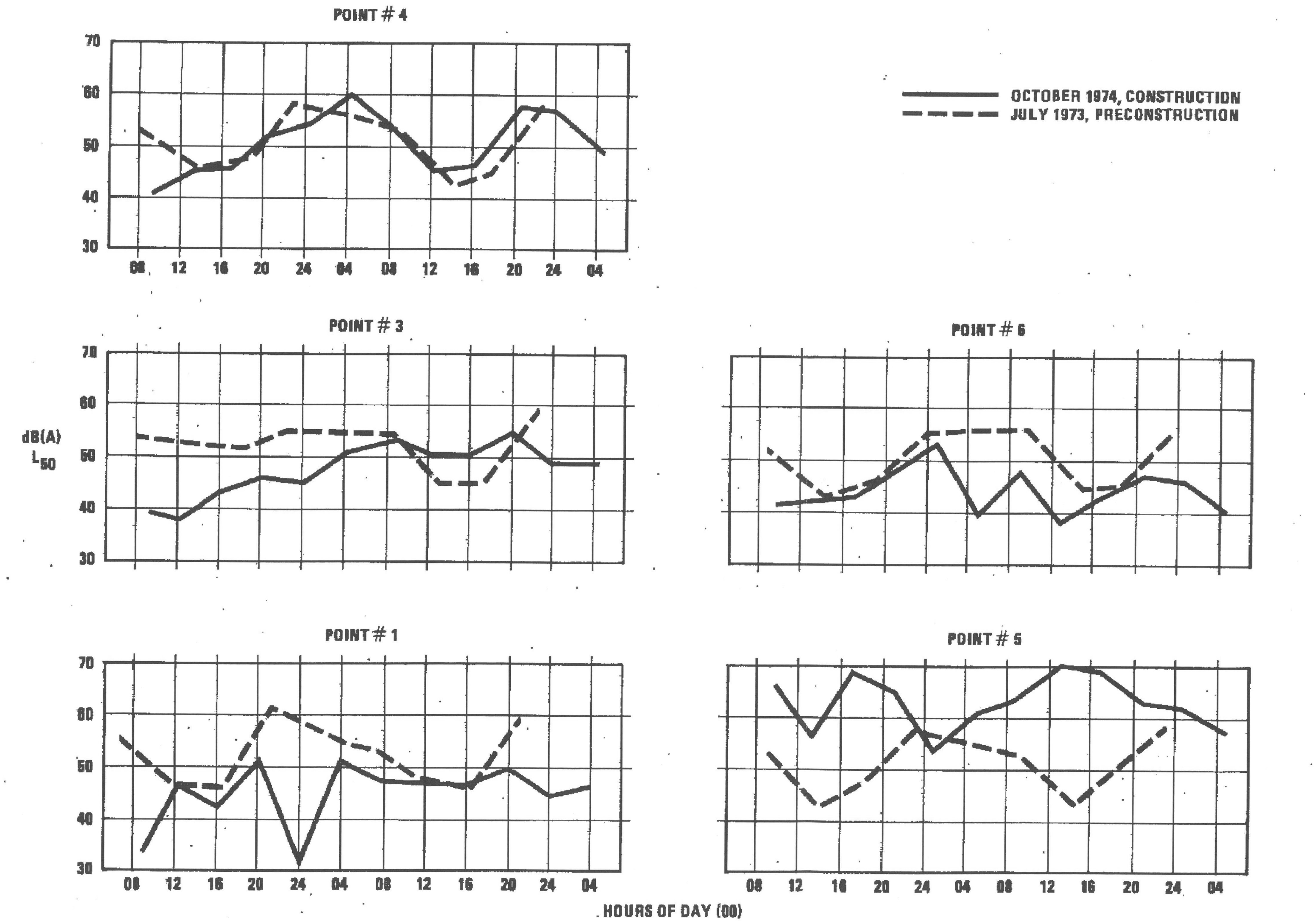
COMPARISON OF MEDIAN (L_{50}) dB(A) NOISE LEVELS BETWEEN JULY 1973 AND AUGUST 1974 SURVEYS (FER FIGURE 2.7-7)

FIGURE 4.1-5 REV. 1



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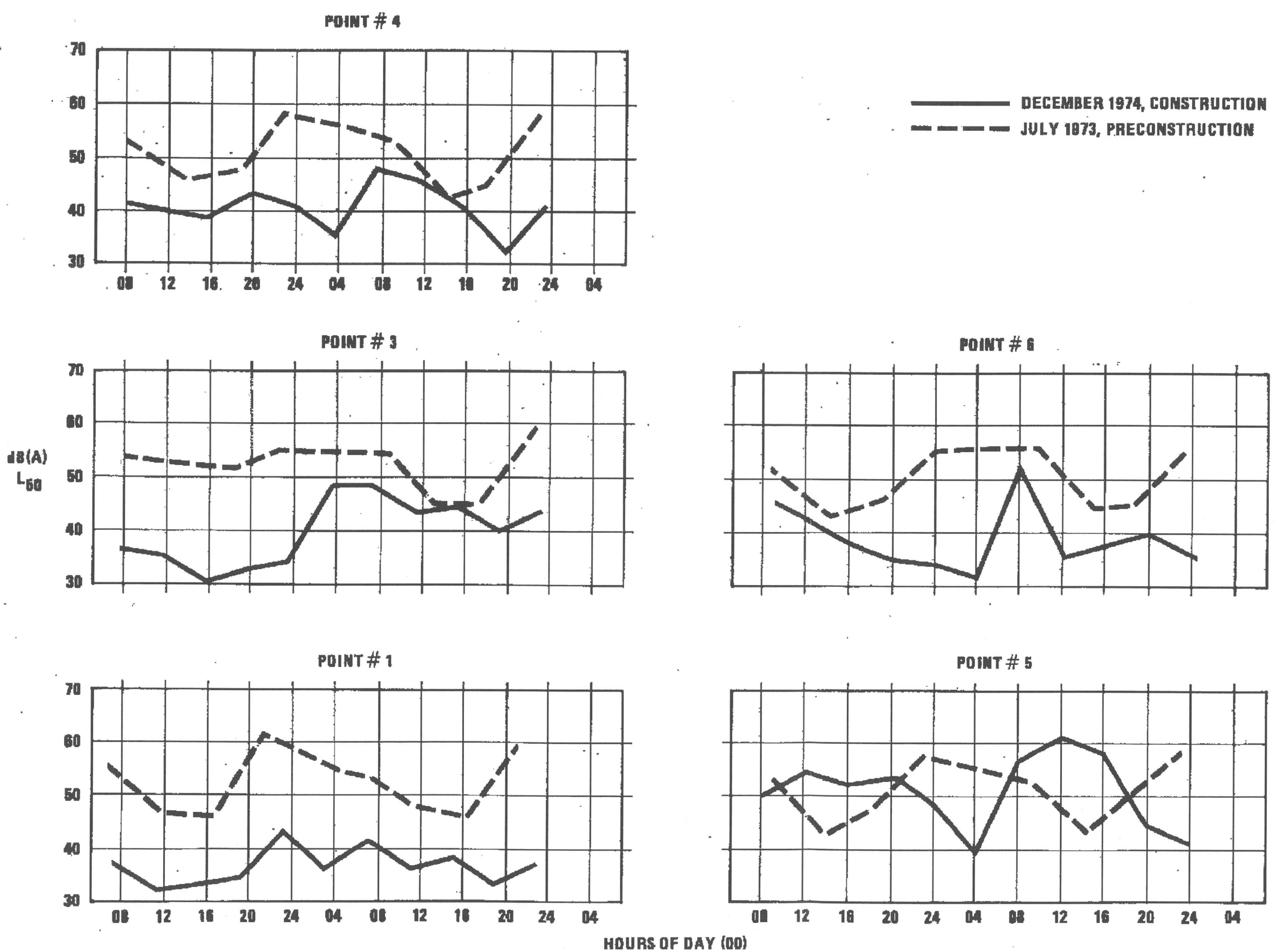
COMPARISON OF MEDIAN (L_{50}) dB(A)
NOISE LEVELS BETWEEN JULY 1973
AND OCTOBER 1974 SURVEYS
(FER FIGURE 2.7-8)

FIGURE 4.1-6 REV. 1



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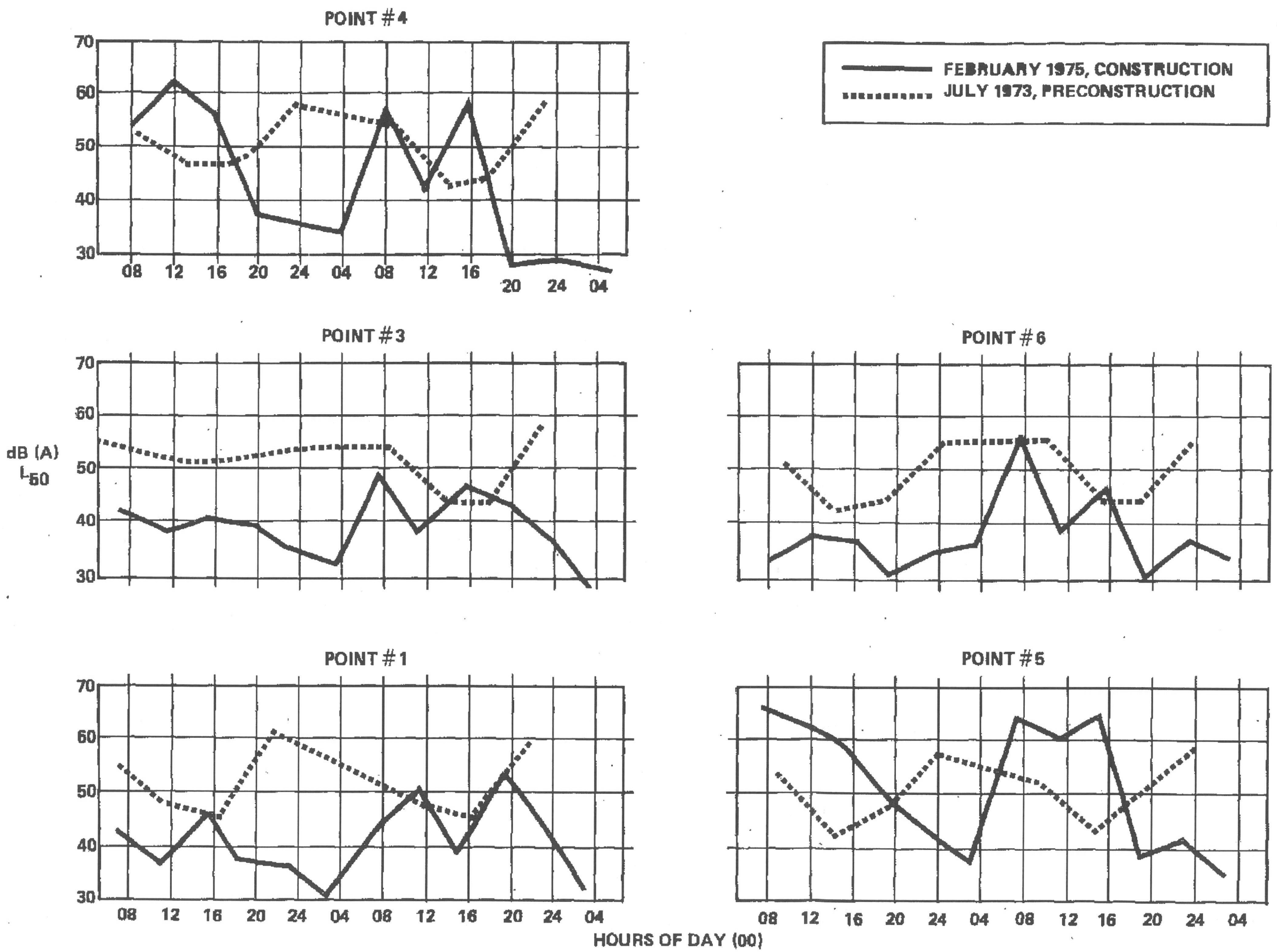
COMPARISON OF MEDIAN (L_{50}) dB(A) NOISE LEVELS BETWEEN JULY 1973 AND DECEMBER 1974 SURVEYS (FER FIGURE 2.7-9)

FIGURE 4.1-7 REV. 1



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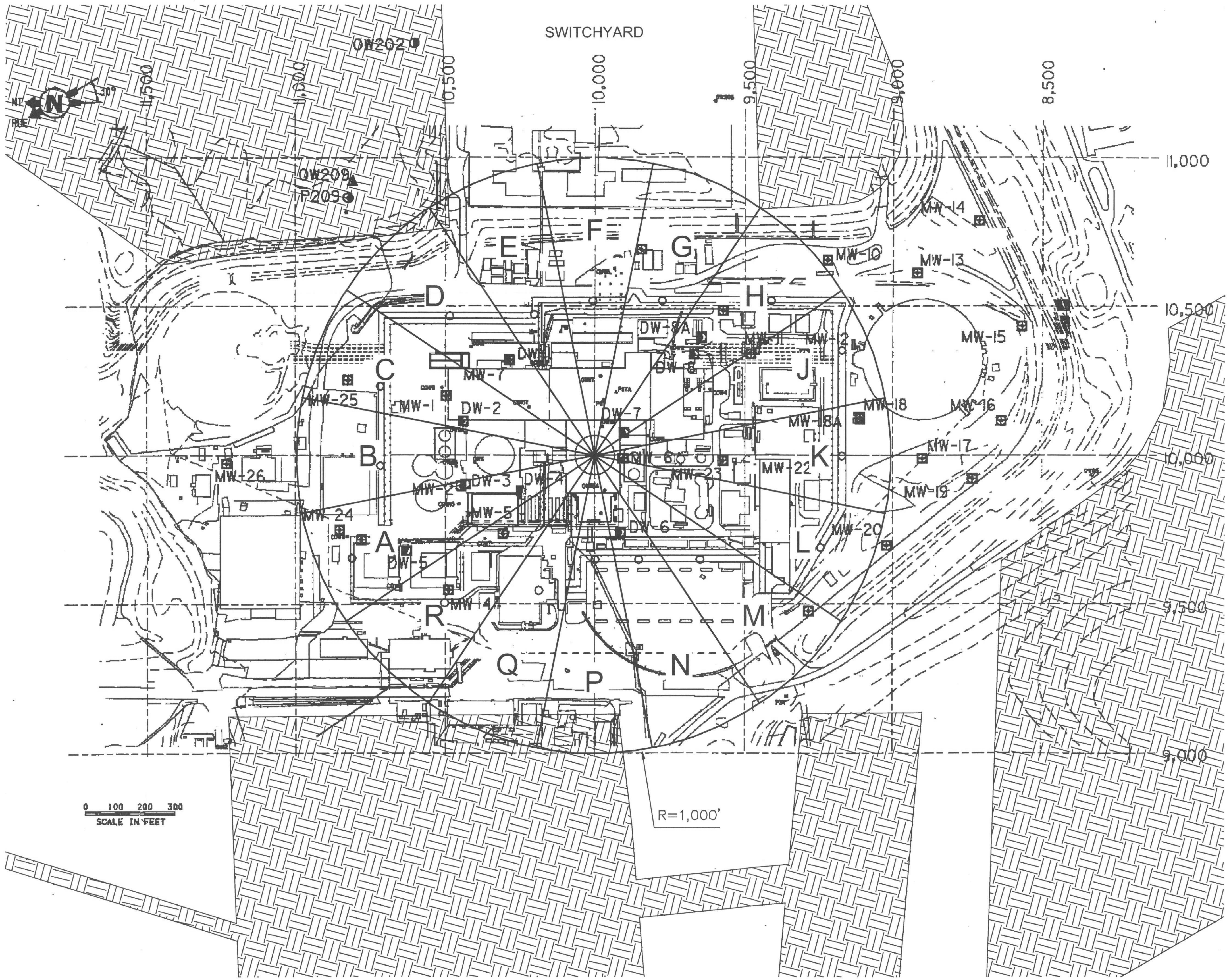
COMPARISON OF MEDIAN (L_{50}) dB(A) NOISE LEVELS BETWEEN THE JULY 1973 PRE-CONSTRUCTION AND FEBRUARY 1975 CONSTRUCTION NOISE SURVEYS, GRAND GULF SITE (FER FIGURE 2.7-10)

FIGURE 4.1-8 REV. 1



NOTES:

1. 16 TLD'S ARE LOCATED ON THE PROTECTED AREA FENCE; 1 IN EACH OF THE 16 RADIAL SECTORS. LOCATIONS SHOWN ARE APPROXIMATE.

LEGEND

- HISTORICAL MONITORING WELL - CATAHOULA FORMATION
- HISTORICAL MONITORING WELL - TERRACE DEPOSITS
- MONITORING WELL
- DEWATERING WELL
- TIE-BACK WALL PROJECTION
- PROPOSED NEW PLANT CONSTRUCTION AREAS.
- PROTECTED AREA FENCE
- PROTECTED AREA FENCE TLD LOCATION

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RELATIVE LOCATIONS OF
16 TLD STATIONS AT GGNS UNIT 1
PROTECTED AREA BOUNDARY

FIGURE 4.5-1 REV. 1