SECTION 3
SECTION 404(b)(1) EVALUATION
MRGO, NEW LOCK AND CONNECTING CHANNELS

NOTE: A Separate Evaluation Has Been Prepared for the Graving Site.

I. PROJECT DESCRIPTION

a. Location

The proposed new lock would be constructed in the Inner Harbor Navigation Canal (IHNC), Orleans Parish, Louisiana. The lock would be constructed between the Claiborne Avenue Bridge (Judge Seeber Bridge) and the Florida Avenue Bridge. The IHNC connects the Mississippi River-Gulf Outlet (MRGO) and the Gulf Intracoastal Waterway (GIWW) with the Mississippi River and Lake Pontchartrain.

b. General Description

The following narrative describes the major construction items in the recommended plan. The Galvez Street wharf and the U.S. Coast Guard facility on the west bank of the IHNC, along with businesses along the east side of the IHNC between the river and Florida Avenue, would be demolished and removed. Utilities crossing the IHNC would be relocated to three corridors - one corridor to be located adjacent to each bridge that crosses the IHNC between the river and the GIWW. A temporary bypass channel (the north bypass channel) would be excavated on the east side of the site designated for the new lock. Bank protection, either rip-rap or sheet piling, would be used to stabilize the east side of the bypass channel. Protection cells would be provided at each end of the bypass channel to prevent vessels from striking bridges. The site for the new lock would be prepared by dredging the canal bottom, placing bedding material, and driving pilings. Material dredged for the bypass channel and from the canal bottom would be hydraulically deposited along the south bank of the MRGO in an area previously used for dredged material disposal and in a shallow open water area to develop marsh as mitigation for impacts of an offsite construction yard. Meanwhile, reinforced concrete lock modules would be partially constructed at the offsite construction yard (graving site) along the north bank of the MRGO/GIWW, just west of Paris Road. The existing hurricane protection levee, running parallel to the waterway, would be reconfigured to form a slip, within which the lock modules would be constructed. (A separate Section 404 evaluation has been prepared for the graving site.) The four partially completed lock modules would be individually floated to the present site of the Galvez Street wharf where lock walls and accessories would be added. (In order for the lock sections to be floated into place, the Florida Avenue bridge would already have been removed and replaced by others.) The completed modules would be floated to the prepared foundation site and ballasted into position.

A detour road would be constructed through an undeveloped area in St. Bernard Parish to link St. Bernard Highway, Judge Perez Boulevard, and Florida Avenue. The road would allow commuters to easily access the Florida Avenue bridge and thereby bypass the chronically congested St. Claude and Claiborne Avenue bridges. Two temporary, single bascule bridges would be constructed adjacent to the St. Claude Avenue bridge to provide a comparable level of traffic flow at this location while the St. Claude Avenue bridge is replaced with a low-level, double bascule bridge. The towers and lift-span of the Claiborne Avenue Bridge will be replaced to allow for the lift-span to be raised higher. Levees and floodwalls would be relocated and upgraded as necessary to provide uninterrupted hurricane and river flood protection. The new lock would become operational and the north bypass channel would be back-filled mainly with material taken from a south bypass channel (demolition bypass channel) to be excavated around the east side of the old lock.

The existing lock would be demolished and material hauled away. Final dredging would be required in the vicinity of the old lock site, the old lock fore-bay, and the new lock fore-bay. Some of this material would be used for additional backfill around the new lock site, with the excess pumped to the Mississippi River. The new lock guide walls would be installed and permanent mooring facilities would be constructed. The entire construction phase is expected to take about 11 years.

The majority of the soil and sediment excavated for lock site preparation and for the north bypass channel would be hydraulically pumped to the northeast of the new lock site into previously-used, MRGO disposal areas. This material has been determined to be unsuitable for aquatic disposal or for wetland restoration. Part of the area required is jurisdictional wetland, and therefore disposal into this area is covered in this evaluation.

The soil from the east bank of the IHNC, below 5 feet in depth, is not contaminated. It would be used to develop wetlands as mitigation for impacts of the graving site. The material would be deposited into an area of shallow, brackish water. Low level dikes would be used to contain the material until settlement occurs. Afterwards, the dikes would be breached to allow tidal exchange.

c. Authority and Purpose

Authority for replacement of the navigation lock connecting the Mississippi River Gulf Outlet (MRGO) and the Mississippi River was established in the River and Harbor Act of 1956 (Public Law 84-455), and amended by Section 186 of the Water Resources Development Act of 1976 (Public Law 94-587). The Water Resources Development Act of 1986 (Public Law 99-622) provides that a new lock and connecting channels shall be in the area of the existing lock or at the Violet site and specifies cost sharing procedures for the project.

The purpose of the proposed project is to provide sufficient lock and channel capacity for waterborne commerce between the Lower Mississippi River and the MRGO, IHNC, and GIWW.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material. The Holocene soils which would be excavated are alluvial deposits. Such soils generally contain varying thicknesses of interfingering layers of fat and lean clays and sandy silt. Grain size analysis indicates most of the soil would be classified as silt or clay, with most particles (90 percent) less than 0.1 mm in size, and approximately 50 percent less than 0.02 mm in size. The soil pH ranges from 6.1 to 8.4, but approximately 18 inches below the surface the range is 7.4 to 8.4.

(2) Quantity of Material. The total estimated amount of material to be excavated and redeposited is 3,043,000 cubic yards. Table 1 shows the locations and quantities of material that would be excavated along with the proposed disposal sites.

The total amounts of dredged material that would be deposited into each of the disposal areas are: 200,000 cubic yards replaced in the utility corridors; 172,000 cubic yards in the Mississippi River; 1,364,000 cubic yards in the MRGO disposal area; 667,000 cubic yards in the mitigation area; and 640,000 cubic yards used for random backfill in the construction area.

(3) Source of Material. All of the material to be excavated for project construction is alluvial sediment. During construction of the IHNC and the existing lock in the 1910's and 1920's, some of the excavated material was used to raise the elevation of the banks and build levees on the banks of the canal. Hydraulic dredges were used to remove the remaining material, some of which was deposited on the opposite sides of the levees. Two bypass channels would be constructed; one alongside the IHNC across from the Galvez Street Wharf and the other around the east side of the

TABLE 1
ESTIMATED DREDGING QUANTITIES

Location of Dredging and Disposal		Quantity
Utility Corridors (Stockpiled and used for backfill)	St. Claude Avenue	75,000 cu yds
	Claiborne Avenue	87,000 cu yds
	Florida Avenue	38,000 cu yds
North Bypass Channel	Above 5 feet deep (Pumped to MRGO site)	206,000 cu yds
	Below 5 feet deep (Pumped to mitigation site)	667,000 cu yds
New Lock Excavation (Pumped to MRGO site)		1,100,000 cu yds
Main Channel North of New Lock (Pumped to MRGO site)		58,000 cu yds
South Bypass Channel (Random Backfill)		145,000 cu yds
Main Channel Between New Lock and Old Lock (Random Backfill)		440,000 cu yds
Main Channel From Old Lock Site to River (Random Backfill)		55,000 cu yds
(Pumped into River)		172,000 cu yds

existing lock. One of these areas is industrial and the other is an undeveloped area containing a grove of live oak trees.

e. Description of the Proposed Discharge Sites

(1) Location. Four disposal sites are covered in this evaluation: the main channel of the Mississippi River (river site); an area where clean soil would be deposited to develop wetlands as mitigation for the graving site (mitigation site); previously-used MRGO disposal area where soils and sediments considered too contaminated for aquatic disposal, because of contaminant levels, would be deposited (MRGO site); and backfill around the new lock (IHNC site). Refer to Plate 1, at the end of this evaluation.

The river site would be used to dispose some of the material excavated between St. Claude Avenue and the Mississippi River. The remaining material from this area would be used for random backfill along the construction corridor. This effort would occur near the end of the construction period. Material deposited in the river would be discharged beyond the 50-foot contour of the river, in the vicinity of the IHNC.

The mitigation site is located to the northeast of the new lock construction site, in a large triangular-shaped body of shallow, brackish water. The triangular area is bounded by Bayou Bienvenue (Main Outfall Canal) on the north and west, the Back Protection Levee of the 9th Ward on the south, and a landfill and sewerage treatment plant on the east. Wetlands would be created within the large triangular area, adjacent to the south bank of Bayou Bienvenue.

The MRGO site is located between Bayou Bienvenue and the MRGO/GIWW, near the intersection of the MRGO/GIWW and the IHNC. This area has not been used in recent years and has overgrown with early successional woods and scrub/shrub.

The IHNC site would be within the corridor of the IHNC. Since the new lock would be built in the IHNC, large amounts of backfill would be required to fill in the canal on both sides of the new lock.

(2) Size. The river site is not defined by topographical limits. Material deposited in the river would mix with the suspended and bedload material and be transported downstream. The mitigation site is approximately 137 acres, consisting shallow, brackish water with scattered, remnant cypress stumps. Confinement dikes would be erected around the border of the site to confine the dredged material. The MRGO site would require about 240 acres. Existing dikes would be upgraded and new dikes

would be constructed as necessary to confine the dredged material. The IHNC site extends from the Claiborne Avenue Bridge to the Florida Avenue Bridge and from the levee on the east side of the IHNC to the levee on the west side. This area measures approximately 4,150 feet long (north to south) by a maximum of 1,150 feet wide (east to west), or about 110 acres. Only the existing canal is currently subject to Section 404(b)(1). The canal banks are completely developed.

(3) Type of Site. The river site is the main channel of the Mississippi River where the depth is over 50 feet. Under the Cowardin, et al. (1979) system, the area is riverine, lower perennial, unconsolidated sand and mud bottom. The mitigation site consists of shallow, open, tidal, brackish water. According to the Cowardin, et al. (1979) system of classifying wetlands, the area is estuarine, subtidal, unconsolidated mud and organic bottom. The MRGO site consists of early succession woods with pioneer species including black willow and Chinese tallow, and scrub/scrub areas. The Cowardin, et al. classification is palustrine, forested and scrub/scrub wetland, broad-leaved deciduous, saturated to seasonally flooded soil, and impounded. The IHNC site is all developed area, with existing industrial activity, and the IHNC itself. Under the Cowardin, et al. system, the IHNC is estuarine (excavated), subtidal, unconsolidated mud bottom. The shoreline of the IHNC is nearly all bulkheaded. Remaining shoreline is rip-rapped or dominated by upland grasses.

(4) Type of Habitat. The existing subaqueous habitat at the river site is characterized by moving sediments, mostly of fine sand and silt. The number of fish species that utilize the main channel of the Mississippi River is limited by high flow rates, lack of food items, and normally high turbidity levels. Some species that may be found in this area are blue catfish, gizzard shad, channel catfish, buffalo fish, and river shrimp.

The mitigation site provides sheltered, shallow water, estuarine habitat. The most economically important species utilizing the area are blue crab, brown and white shrimp, spotted seatrout, and menhaden. Common wildlife include mottled ducks, red-breasted mergansers, lesser scaup, and various species of terns, seagulls, wading birds, and shorebirds. The area has been heavily impacted by human activities. A large municipal landfill forms the eastern border, and the area receives significant quantities of urban stormwater runoff which is pumped out of the developed areas to the south.

The MRGO site consists of dredged sediments placed on top of historic forested wetlands. The site is isolated from the tidal system by its elevation which ranges from approximately +3 to +10 above sea level. Confinement dikes and hurricane protection levees surround the area.

The IHNC disposal site provides poor habitat for aquatic species and no habitat for terrestrial species since it is entirely industrialized.

(5) Timing and Duration of Discharge. The entire project construction schedule is expected to last about 11 years. Discharge of material in the river disposal site would occur at the end of the construction period and would last for up to several weeks. Discharge of material into the mitigation site and the MRGO site would occur during the first, second, and third years of the construction period and may be intermittent over a period up to two years. Discharge of material into the IHNC disposal site for backfill would occur intermittently from the sixth year of the construction period to the end of the construction period.

f. Description of Disposal Method

The material deposited at the river site would be in a hydraulic slurry. The slurry would be deposited at the surface of the river. Heavier suspended particles would fall through the water column and become part of the river's bedload. Finer, lighter particles would remain in suspension and would be carried with the river's suspended sediments, eventually to the Gulf of Mexico or coastal estuaries. The material deposited in the mitigation site and MRGO site also be deposited hydraulically and would be confined by low level dikes. Material at the mitigation site would be restricted to a settled height of approximately +1.5 feet National Geodetic Vertical Datum (NGVD) so that the area develops into a vegetated wetland.

The material used for backfill at the IHNC site may be deposited by either hydraulic and bucket dredge. All material deposited hydraulically would be deposited inside of containment levees to prevent the material from running into the IHNC.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. Disposing of material in the river site would have a insignificant effect on the bottom elevation since it would be spread out for a distance downstream. The depth of the Mississippi River in the vicinity of the proposed disposal is approximately 95 feet. The elevation of mitigation site would be purposefully altered in order to

establish an emergent wetland. The existing elevation of about -2 feet NGVD would be raised to as much as +1.5 feet NGVD. Slope of the created marsh would range from approximately 1 vertical on 25 horizontal to 1 vertical on 50 horizontal. The elevation of the MRGO site is about +3 to + 10 NGVD. The elevation would be raised about 3 to 6 feet. The IHNC disposal site varies from about +10 feet NGVD along the industrialized banks of the canal which is a non-wetland area to the bottom of the canal which varies between 30-40 feet deep in the center of the channel. Parts of the channel would be deepened, while other areas would be filled-in.

(2) Sediment Type. The material to be excavated is limited to the confines of the IHNC from the existing lock forebay to the Florida Avenue crossing. It will include canal sediments as well as in-situ material on the east and west banks of the canal. The material to be dredged consists of Holocene soils, classified as alluvial deposits, generally containing varying thicknesses of interfingering layers of fat and lean clays and sandy silt.

The bottom of the Mississippi River has been described as unconsolidated sand and mud. Since disposed material will not become a part of the Mississippi River bottom, but instead be transported as part of the river's sediment load to the gulf, no sediment type effects are expected to arise as part of this site disposal.

The bed material at the mitigation site currently consists of unconsolidated mud and organic bottom. Since the IHNC excavation site and the mitigation site are located in a geographically similar area, it is expected that sediment types would be similar although the mitigation site would have a higher fraction of organic material. The in-situ material on the canal banks would also be expected to be similar, especially in areas where excavated material from IHNC construction in the 1910s and 1920s was used on the banks of the canal.

The bed material at the MRGO site currently consists of previously dredged sediments of the MRGO placed on top of historic forested wetlands. It is expected that sediment types disposed into this are would be similar.

The sediment material of the IHNC is described as an unconsolidated mud bottom. It is made up of the same material which will be used as backfill, therefore no effects on sediment type are expected.

(3) Dredged Material Movement. The Mississippi River will transport the finer dredged material deposited in the river disposal site downstream and eventually to the Gulf of Mexico.

Heavier sediment particles would settle out downstream of the disposal site but would gradually shift downriver with the bed load.

The material deposited at the mitigation site is expected to subside due to dewatering and consolidation of the soil. Minimal export of dredged material out of the confinement dikes is expected. The material deposited at the previously-used MRGO disposal area will also be confined by low-level dikes and is not expected to shift or move.

Material deposited at the IHNC disposal site will be used to create land around the newly constructed lock. Movement of dredged material out of the confined disposal area would not be allowed.

(4) Physical Effects on Benthos. Because of high turbidity, high current velocities, and shifting substrates, the Mississippi River does not support a large benthic population. Therefore, the potential impact to benthos would be slight at the river disposal site.

Sessile benthos living in the mitigation site would be buried beneath the material deposited there. Primary effects should be limited to the 41 acres of emergent land and the 96 acres surrounding the wetland islands which would be made shallower, approximately 137 acres total. A benthic population similar to that which now occurs in the area would establish in the shallow waters within the site.

Benthos living in the sediments at the MRGO site would be largely destroyed by dredging operations. The disposal site would be expected to become drier because of increased elevation. The benthic community could then be expected to switch to species more adapted to drier conditions.

The IHNC disposal site probably contains a limited benthic population due to poor water quality. Whatever benthos are present would be buried beneath in the area to be back filled.

(5) Other Effects. The mitigation site currently contains a large number of cypress tree stumps and standing dead cypress trees. The stumps and dead root systems would be covered to varying degrees with dredged material. The woody debris not believed to be critical to the aquatic ecosystem of the site.

(6) Actions Taken to Minimize Impacts. No actions at the river and IHNC disposal sites are warranted. Confinement of dredged material at the mitigation site and MRGO site would minimize impacts outside of those areas.

b. <u>Water Circulation, Fluctuation, and Salinity Determinations</u>

(1) Water.

(a) Salinity. Salinity levels in the mitigation site and the IHNC disposal site can be attributed mainly to the MRGO because the MRGO provides a direct route of flow from the high salinity waters of the gulf. The MRGO is a straight and deep channel in comparison with the natural meandering streams and sluggish water movement found in the area. No salinity changes are expected at the river and IHNC disposal sites as a result of disposal activities. Since the mitigation site is a confined type of disposal, salinity differences may occur within the confined area as compared to tidal waters outside of the disposal area until dikes are breached following consolidation of dredged material. No long-term changes in salinity levels are expected.

(b) Water Chemistry. Ambient pH values in the Mississippi River and IHNC range from: 6.9-8.2 with an average of 7.6 su; 3.4-9.8 with an average of 7.5 su, respectively. There is no historic pH data for the mitigation or MRGO sites. The Mississippi River data was taken from USGS station 07374508, Mississippi River at New Orleans from the period 1970-1988. The IHNC data was taken from various sampling stations on the IHNC during the time period 1970-1982. Factors typically associated with dredging activities may cause pH in receiving area waters to shift toward more acidic conditions. These factors include increased turbidity, organic enrichment, chemical leaching, reduced dissolved oxygen, and elevated carbon dioxide levels among others. Based on these factors, a temporary reduction in pH in the surrounding waters would be expected, specifically for the mitigation site, MRGO site, and IHNC site. These pH variations would be minor and short-lived. The pH levels would return to background shortly after the end of disposal activities at each site.

(c) Clarity. The highest turbidity effects of the project are expected to occur in the mitigation site and MRGO site, with turbidity levels expected to remain elevated until exposed substrate is colonized by vegetation. Turbidity levels would be increased in Bayou Bienvenue by runoff from the MRGO site.

Turbidity affects water quality in several ways. The suspended sedimentary particles decrease the light penetration and interferes with the photosynthetic production of oxygen. At the same time these particles absorb solar energy from the sunlight and transform this energy into heat, thus elevating the temperature of the water. The fact that oxygen is less soluble in warm water than in cold water coupled with the decreased photosynthetic oxygen production can result in decreased oxygen levels.

Increased concentrations of suspended sediments being discharged at the river disposal site would not cause any significant adverse impacts because of the normal heavy sediment load carried by the river. Turbidity levels in the Mississippi River are naturally high, thus any increase in turbidity as a result of the disposal activity would only minimally reduce water clarity. It is estimated that the amount of dredged material discharged into the river would only be about 4% of the average sediment load.

Placement of sheetpiles, transport and placement of material, placement and driving of pilings, and operation of equipment during construction would cause effects on IHNC water clarity, although the effects are expected to be localized and short term. Excavation, dredging and disposal into the IHNC disposal site would be expected to increase turbidity levels, at a minimum, for the duration of disposal operations.

(d) Color. During construction, temporary changes in color may occur at the four disposal sites. These temporary color changes would be associated with the disturbance of organic soils at the mitigation site as a result of dredging and disposal as well as other construction activities. Water color would return to background conditions after completion of disposal activities at each site, and no significant long-term changes in water color would occur.

(e) Odor. Since the soils to be excavated are not considered highly organic in nature, no odor is expected from excavation of the materials in the IHNC due to the organic nature of the soil. Dredging of organic sediments at the mitigation site for the construction of retaining dikes may produce a locally noticeable odor for a short period of time until sediments are oxidized.

Soils along the east bank of the IHNC where past industrial activities have taken place are known to have been contaminated with odorous constituents such as petroleum hydrocarbons and chlorinated hydrocarbons. As a result of the hazardous, toxic, and radioactive waste (HTRW) remedial investigation, conducted as a part of the engineering investigations for this project, all "industrial waste" soil materials will be excavated and removed to an industrial landfill. This material is currently estimated at approximately 26,000 cubic yards. Excluding this material which has been deemed industrial waste, other materials excavated from the east bank of the canal should have no odor associated with them. No information is available from the west bank HTRW investigation which would indicate an odor problem.

During IHNC vibracore sampling in May 1993, bottom sediments of the IHNC were noted to have a slight petroleum odor associated with them. However, results of testing did not classify the bottom sediments as hazardous or industrial waste. A previous investigation of toxic substance chemistry of the tidal passes into Lake Pontchartrain was conducted by the University of New Orleans under contract from the Corps of Engineers as part of the Lake Pontchartrain, Louisiana, and Vicinity, Hurricane Protection Study. One sampling station was located in the IHNC near the entrance to Lake Pontchartrain. The majority of pollutants detected in the IHNC were polynuclear aromatic hydrocarbons (PAHs). It is noted that of the three tidal passes into Lake Pontchartrain, the IHNC has the highest general organic pollutant burden, the highest level of PAH contaminations, and the highest level of industrial organic pollution. It was also noted during the HTRW initial assessment and HTRW remedial investigation that many of the industrial facilities located on the IHNC banks reportedly had spills, deteriorated drums and tanks, and in some cases dumped materials directly into the canal, or allowed spills to runoff into the canal. Chemicals and compounds are too numerous to list and tanks and drums stored on the premises have not been tested to determine contents, but it is obvious that a large variety of chemicals are present on these industrial sites or once were present. All drums and underground storage tanks have subsequently been removed from Port property by the Port of New Orleans.

Since the material to be disposed in the river will only constitute about 4% of the river's normal sediment load, mixing is expected to confine odor to the immediate disposal site with no odor expected to be associated with the Mississippi River water downstream of the disposal site. The nearest municipal water supply intake is 4.7 miles downstream of the proposed disposal activities and odor is not expected to be a concern.

Urban runoff from the industrialized area surrounding the IHNC canal in combination with a total pumping capacity of 3,770 cubic feet per second (cfs) from stormwater drainage pumping and small amounts of domestic sewage from infiltration/exfiltration of the sewer system, all combined with sluggish flow in the canal creates additional potential odor problems. Stagnant water and sewerage odors may also be present during dredging and disposal activities of the IHNC sediments. Petroleum and sewerage odors may occur both at the dredging site and the disposal sites.

Material used as fill at the IHNC disposal site will be obtained from the south bypass channel (excavation around east side of existing lock) and the main channel south of the new lock as well as dredging at the old lock forebay and the old lock site. Material obtained from the east side of the existing lock is an area of open land covered with oak trees. This land has had no prior land use for the last 50 years and is not expected to have a potential odor problem during excavation and disposal. However, dredging and disposal activities in the main channel south of the new lock and old lock forebay and the lock site may have a slight petroleum or sewage odor associated with them.

(f) Taste. The nearest potable water intake along the Mississippi River is 4.7 miles downstream of the IHNC entrance. Any possible effects would diminish long before reaching the closest municipal water intake. There are no potable water intakes along the IHNC or in the vicinity of the mitigation site or the MRGO site. Therefore alteration of taste in these areas will also be of no consequence.

(g) Dissolved Gas Levels. The only dissolved gas of concern affected by construction, dredging, and disposal would be dissolved oxygen. Ambient dissolved oxygen levels in the Mississippi River ranged from 5.4 to 13.3 mg/L with an average of 8.2 mg/L for the period 1970-1988. Ambient levels in the IHNC over the time period 1970-1982 ranged from 0.1 to 13.4 mg/L with an average of 7.2 mg/L. Lake Pontchartrain averaged 8.2 mg/L with a range of 1.1 to 13.6 mg/L for the time period 1967-1981. Short-term decreases in dissolved oxygen could occur due to release of nutrients from the organic soils and increased turbidity levels. Turbidity affects water quality in several ways, one which may markedly affect dissolved oxygen levels. The suspended sedimentary particles decrease the light penetration and interfere with the photosynthetic production of oxygen. At the same time these particles absorb solar energy from the sunlight and transform this energy into heat, thus elevating the temperature of the water. The fact that oxygen is less soluble in warm water than in cold water coupled with the decreased photosynthetic oxygen production can result in decreased oxygen levels. These turbidity and nutrient effects are expected to be most significant at the mitigation site. Significant effects on oxygen levels in the tidal waters outside of the confinement dikes are not expected, but within the disposal site, low oxygen levels, coupled with high turbidity would eliminate fish and shellfish during dredging operations. Low dissolved oxygen levels are also expected within the confinement dikes for the MRGO disposal site. In a New Orleans Harbor dredging study, dissolved oxygen decreased from 8.0 mg/L to 4.0 mg/L at the discharge point, but returned to 7.8 mg/L within 100 yards downstream. Therefore, for the Mississippi River, no effects on dissolved oxygen levels are expected except in the immediate disposal area. Beside the effects listed above, no long term effects on dissolved oxygen levels are expected.

(h) Nutrients. No nutrient testing was undertaken for this study. Existing conditions of nutrient-related problems were addressed in an investigation of the nutrients and toxic substance chemistry of the tidal passes into Lake Pontchartrain, conducted by the University of New Orleans under contract with the Corps of Engineers as part of the Lake Pontchartrain, Louisiana, and Vicinity, Hurricane Protection Study. Nutrient data at the sampling station located in the IHNC near the entrance to Lake Pontchartrain indicated that in comparison to the passes at Chef Menteur and Rigolets, the IHNC had higher average concentrations of ammonia, nitrite plus nitrate, orthophosphate, and total phosphorus. Although none of these constituents exceeded the EPA criteria, the ammonia concentration indicated that certain industries along the waterway could be contributing additional quantities of ammonia above natural levels.

The 1986 EPA Quality Criteria for Water presents the following rationale in limiting total phosphate phosphorus concentrations. EPA recommends that to prevent the development of biological nuisances and to control accelerated or cultural eutrophication, total phosphates as phosphorus should not exceed 50 ug/L in any stream at the point where it enters any lake or reservoir, nor 25 ug/L within the lake or reservoir. A desired goal for the prevention of plant nuisances in streams or other flowing waters not discharging directly to lakes or impoundments is 100 ug/L total phosphorus. Existing data on total phosphorus is available for the IHNC, Lake Pontchartrain, and the Mississippi River. IHNC total phosphorus data averaged 189 ug/L, with a minimum of 30 ug/L and a maximum of 310 ug/L. This data was recorded from 1970-1982. For Lake Pontchartrain, data recorded from 1967-1981 shows high total phosphorus concentrations on average at 97 ug/L, minimum of 10 ug/L and a maximum of 600 ug/L. The Mississippi River exceeded the EPA established level of 100 ug/L for total phosphorus during the time frame 1970-1988 with an average of 251 ug/L (minimum of 20 ug/L, maximum of 860 ug/L). Increases in total phosphorus above the ambient levels are not expected as a result of construction, dredging, and disposal activities. Existing conditions are already conducive to eutrophication, and no impacts are expected to increase this tendency to eutrophy. In addition, the study of New Orleans Harbor dredging showed nitrates and phosphates returned to ambient levels within 100 yards downstream of the discharge point in the Mississippi River.

Elutriate data from a mixture of IHNC water and sediment taken from the bottom in a 1982 study indicates that one of the potential problem constituents would be ammonia. The concentration of ammonia as NH_4^+ is approximately 50% higher than the level which contains the criterion amount of un-ionized ammonia. Short-term increases in ammonia levels at all four disposal sites may occur, but will return to ambient levels shortly after the end of dredging and disposal operations.

(i) Eutrophication. Increased nutrient levels occurring during construction, dredging, and disposal activities should not be substantial enough to cause an increase in eutrophic conditions. After completion of the project, no additional nutrients would be available to contribute to an increase in eutrophication.

(j) Others as Appropriate. None.

(2) Current Patterns and Circulation. Tidal currents will be blocked from the mitigation site so that dredged material is not transported out of the site. For a period of 1-3 years following disposal into the mitigation site, tidal flows would be curtailed by the confinement dikes. The dikes would be breached following consolidation and colonization of dredged material by vegetation, thereby reestablishing tidal flows. Although the mitigation site is currently open to tidal fluctuation, tidal currents are very sluggish. There is no flow through the area into other wetlands or water bodies. It is a "dead-ended" area. Tidal flows enter and exit the site through several connections with Bayou Bienvenue. No stratification of waters at this site is expected because of its shallow nature. Current and circulation patterns are not expected to change at the river and IHNC disposal sites. The MRGO site is elevated above tidal influence. The area impounds water and would continue to do so after the project.

The proposed IHNC lock would be located further north into the IHNC than the existing lock. The IHNC between the river and the new lock site would then be influenced by the Mississippi River instead of Lake Pontchartrain. This is not expected to significantly change current patterns, flows, and velocities through the proposed lock, as opposed to currents passing through the existing lock. Stratification in the vicinity of the project area is not expected to be significantly altered as a result of project implementation.

No effect is expected on the current patterns, flow, and velocity of the Mississippi River as a result of dredged disposal activities in the river. No effect on the stratification in the Mississippi River is expected.

(3) Normal Water Level Fluctuations. Normal water levels at the mitigation site and the IHNC disposal site are generally dependent upon tidal action and storm water runoff. Water level fluctuation at the river disposal site is dependent upon upstream runoff and, to a lesser extent, tidal fluctuation.

The water levels within the confined mitigation site would vary from normal tidal levels during deposition of dredged material and afterwards, until confinement dikes are breached. Water levels would be elevated during the deposition of material and may be either higher or lower than normal levels until dikes are breached depending on rainfall and evaporation.

Water levels within the MRGO site currently are affected by rainfall and evaporation and are not affected by tidal action. The site is generally isolated from tidal influence due to the retaining dike along it's south end (Bayou Bienvenue) and the hurricane protection levee to it's north along the MRGO. Water levels would be elevated during the deposition of material and may remain elevated for a period of time depending upon rainfall and evaporation rates.

Water level fluctuations will remain the same at the IHNC disposal site except in that portion of the IHNC between the existing lock and the new lock site. That area would be influenced by the river instead of tidal fluctuations. No change in water levels fluctuations in the Mississippi River are expected from lock construction.

(4) Salinity Gradients. The salinity levels within the mitigation site would vary from the tidal waters nearby during deposition of material and for a period afterwards, until dikes are breached. Salinity levels may be higher or lower within the confined disposal site depending on rainfall and evaporation. The MRGO site would receive estuarine water associated with the dredged material from the IHNC. The salinity of the water within the MRGO site is likely to be nearly fresh, since salinity associated with material deposited there years ago would have leached from the sediments and been carried away in runoff. The MRGO site would likely experience an increase in salinity. Salinity levels at the IHNC between the existing lock and the new lock site would have considerably lower salinity levels since it would be open to the Mississippi River instead of estuarine tidal waters.

(5) Actions That Would Be Taken to Minimize Impacts. Breaching of confinement dikes at the mitigation site following consolidation and colonization of dredged material with vegetation would return the site to normal salinity and water level patterns. No particular actions are warranted at the other sites.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Excavation, dredging and

disposal into the mitigation site, the MRGO site, and the river disposal site would be expected to increase turbidity levels, at a minimum, for the duration of disposal operations. Placement of sheetpiles, transport and placement of material, placement and driving of leveling piles, and operation of equipment during construction would cause effects on IHNC turbidity levels, although the effects are expected to be present only during construction activities.

The most pronounced turbidity effects of the project are expected to occur in the mitigation site and MRGO site, with turbidity levels expected to remain elevated until the dredged material consolidates and becomes vegetated. Turbidity affects water quality in several ways. The suspended sedimentary particles decrease the light penetration and interferes with the photosynthetic production of oxygen. At the same time these particles absorb solar energy from the sunlight and transform this energy into heat, thus elevating the temperature of the water. The fact that oxygen is less soluble in warm water than in cold water coupled with the decreased photosynthetic oxygen production can result in decreased oxygen levels.

Increased concentrations of suspended sediments discharging into the river disposal site would not cause any significant adverse impacts because of the normal heavy sediment load carried by the river. Turbidity levels in the Mississippi River are naturally high, thus any increase in turbidity as a result of the disposal activity would only minimally reduce water clarity. It is estimated that the amount of dredged material discharged into the river would only be about 4% of the average sediment load.

Discharge of material into the IHNC disposal site will be in a confined manner, using a ring levee to prevent material from flowing into the IHNC. A slight increase in turbidity is expected in the local area outside of the levees as a result of back filling, but effects will be short term and turbidity levels in the IHNC will soon return to normal levels with the end of dredging activities.

(2) Effects on Chemical and Physical Properties of the Water Column.

(a) Light penetration. Decreased light penetration would be associated primarily with water-column turbidity and suspended material generated during construction, dredging and disposal activities. This condition would be localized and short-lived at the river and IHNC disposal sites. For these two areas, once construction is completed, and dredging and disposal activities cease, light penetration would return to background levels.

Turbidity levels are expected to remain elevated at the mitigation site and MRGO site until material consolidates and vegetation is established. Therefore, light penetration within the confined disposal sites is expected to remain low for this time period. This will interfere with the photosynthetic production of oxygen. No significant effects outside of the confined disposal site are expected after dredging operations are completed. Vegetation is expected to occur within the time frame of two to three years after material deposition is completed.

(b) Dissolved oxygen. Dissolved oxygen levels will be affected by construction, dredging, and disposal activities. Ambient dissolved oxygen levels in the Mississippi River ranged from 5.4 to 13.3 mg/L with an average of 8.2 mg/L for the period 1970-1988. Ambient levels in the IHNC over the time period 1970-1982 ranged from 0.1 to 13.4 mg/L with an average of 7.2 mg/L. Lake Pontchartrain averaged 8.2 mg/L with a range of 1.1 to 13.6 mg/L for the time period 1967-1981.

At the mitigation site and MRGO site, where turbidity levels are expected to remain high until deposited sediments are vegetated, dissolved oxygen levels may remain low for an extended period of time within the disposal site. High turbidity levels affect water quality in several ways. The suspended sedimentary particles decrease the light penetration and interferes with the photosynthetic production of oxygen. At the same time these particles absorb solar energy from the sunlight and transform this energy into heat, thus elevating the temperature of the water. The fact that oxygen is less soluble in warm water than in cold water coupled with the decreased photosynthetic oxygen production can result in decreased oxygen levels. Once vegetation is established and the mitigation site is opened to tidal circulation, dissolved oxygen levels are expected to return to pre-construction levels. Once vegetation is established at the MRGO site, dissolved oxygen levels are also expected to return to pre-construction levels.

(c) Toxic metals and organics. The elutriate data collected for the lock replacement study are attached as Tables B-26 through B-36. Samples were collected on May 10 and 11, 1993 by New Orleans District personnel. Analyses utilized sediment samples taken from the IHNC at four sites, which were mixed with the appropriate disposal site water.

Sampling Site A is located in the IHNC south of the existing lock between the St. Claude Avenue crossing and the Mississippi River. This sediment was mixed with Mississippi River water to generate the elutriate. The elutriate from this site will determine the effects at the river disposal site. Sampling Site C is located in the IHNC north of the existing lock and south of North

Claiborne Avenue. This sediment was mixed with the IHNC water sample. This elutriate is an indicator of the effects of dredging activities as opposed to disposal activities. Sampling Site G is located adjacent to the Galvez Street Wharf in the IHNC between North Claiborne Avenue and Florida Avenue. This sediment was mixed with water from the mitigation site. Sampling Site E is located in the IHNC near the turning basin at Florida Avenue. The sediment from these samples was also mixed with water from the mitigation site.

The elutriate test is a simplified simulation of the disposal process wherein predetermined amounts of dredging site water and sediment are mixed together to approximate a dredged material slurry. The test provides an indication of the chemical constituents likely to be released to the water column during a disposal/filling operation.

For the 1993 elutriate testing effort, the mixtures were tested for twenty-seven metals and ninety-seven organic. A composite sample of material from various depths at Sampling Site A was analyzed and the results are in Table B-26. At Sampling Site C the vibracore sample was divided into top, middle, and bottom sections and the results are in Tables B-27 through B-29. Tables B-30 through B-32 show the analysis of Sampling Site G's top, middle, and bottom vibracore layers. Sampling Site E was analyzed with two vibracore samples, both divided into two samples. These are shown in Tables B-33 through B-36.

Sampling Sites G and E were analyzed as indicators of the effects of disposal into the mitigation site. For Sampling Site G (adjacent to the Galvez Street Wharf in the IHNC between North Claiborne Avenue and Florida Avenue), two metals showed an increase in elutriate concentration over ambient water concentration to a concentration above the stated criteria, namely copper and zinc. Copper concentrations increased from an ambient water concentration of <14 ug/L to a maximum of <100 ug/L for the three layers sampled from the vibracore. The acute saltwater aquatic life criteria for copper is 2.9 ug/L. It should be noted that the ambient water concentration possibly exceeds this acute saltwater copper criteria. Zinc concentrations rose from an ambient water level of <20 ug/L to a maximum of 310 ug/L from the three samples taken in the vibracore. The acute saltwater aquatic life criteria for zinc is 95 ug/L. Other parameters which have no saltwater aquatic life criteria, but show significant increases from ambient water concentrations to elutriate mixture concentrations for Sampling Site G were: barium (increased from 120 ug/L to 810 ug/L maximum), iron (increased from 530 ug/L to 1,600 ug/L maximum), manganese (increased from 250 ug/L to 1,300 ug/L maximum), and bis(2-ethylexyl)phthalate (increased from 1 ug/L to 75 ug/L maximum). Barium, manganese, and phthalate esters are discussed in the paragraph which follows for Sampling Site C. Iron, because it is complex and relatively inactive chemically or physiologically, has little effect of aquatic life.

For Sampling Site E (IHNC near the turning basin at Florida Avenue), the same two metals were again shown to increase to concentrations above the stated criteria, these two metals being copper and zinc. Copper increased from an ambient water concentration of <14 ug/L to a maximum of 60 ug/L. It should be noted that the ambient water possibly exceeds the acute saltwater copper criteria of 2.9 ug/L. Zinc concentrations increased from an ambient water concentration of <20 ug/L to a maximum of 120 ug/L. The acute saltwater zinc criteria is 95 ug/L. Other parameters which have no saltwater aquatic life criteria, but show increases in concentrations of elutriate at Sampling Site E over the ambient water samples were: barium (increased from 120 ug/L to 890 ug/L maximum), calcium (increased from 100,000 ug/L to 300,000 ug/L maximum), iron (increased from 530 ug/L to 1,500 ug/L), manganese (increased from 250 ug/L to 1,300 ug/L maximum), acenaphthene (increased from 10 ug/L to 70 ug/L maximum), and 2-methylnaphthalene (increased from 10 ug/L to 30 ug/L). The available data for acenaphthene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 970 ug/L and would occur at lower concentrations among species that are more sensitive than those tested. The available data for naphthalene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2.35 ug/L and would occur at lower concentrations among species that are more sensitive than those tested.

Sampling Site C was analyzed as an indicator of IHNC area disposal effects. For Sampling Site C (IHNC north of the existing lock and south of North Claiborne Avenue), two metals were shown to increase to a concentration above the LDEQ saltwater acute criteria: copper and zinc. Copper increased from an ambient water concentration of <14 ug/L to a maximum of 200 ug/L from the three layers collected from the vibracore at Sampling Site C. It should be noted that the ambient water possibly exceeds the acute saltwater copper criteria of 2.9 ug/L. Zinc concentrations rose from an ambient water concentration of <20 ug/L to a maximum of 220 ug/L for the three levels of samples taken from the vibracore. The acute saltwater criteria for zinc is 95 ug/L. Other parameters showing significant increases from ambient water concentration to elutriate concentrations were: barium (increased from 66 ug/L to 420 ug/L maximum), magnesium (increased from 250,000 ug/L to 290,000 ug/L maximum), manganese (increased from 180 ug/L to 2,300 ug/L maximum), and bis(2-ethylexyl)phthalate (increased from 1 ug/L to 7 ug/L maximum). No saltwater aquatic life criteria exists for the above four parameters. The physical and chemical properties of barium generally will preclude the existence of the toxic soluble form under usual marine and fresh water conditions. Calcium and magnesium are the two most common cations defining the hardness of a waterbody. In general, these metal ions are not cause for concern to health, although there are some indications that they may influence the effect of other metal ions on some organisms. Few data are available on the toxicity of manganese to marine organisms. The major problem with manganese may be concentration (bioaccumulation) in the edible portions of mollusks. The available data for phthalate esters indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2,944 ug/L and would occur at lower concentrations among species that are more sensitive than those tested.

In summary, the water quality impacts due to metals and organic at the mitigation site, the MRGO site, and the IHNC disposal site are mostly related to the potential of temporarily increased concentrations of copper, manganese, and zinc. Copper is relatively plentiful in the natural environment and is the result of industrial sources including petroleum refiners. Copper criteria is based upon the protection of animal species and does not appear to bioaccumulate in animal tissues. Although the 1993 elutriate copper concentrations ranged from two to fourteen times above the ambient water concentration, most were still generally within the range of concentrations normally found in the Mississippi River, the IHNC and surrounding areas. Historic monitoring shows that copper levels in the waters of the project area frequently exceed the applicable acute criteria under ambient conditions. Manganese is normally imported to the United States, and is used in metal alloys, dry-cell batteries, fertilizer additives, and chemical reagents. Available data indicate manganese is a cargo transported on the GIWW and MRGO, and spillage during off-loading could be a source of the high levels in the sediments. In addition, manganese tends to flocculate and settle out of the water column. Elutriate samples from 1993 showed levels of manganese at a maximum of 2,300 ug/L, with greater concentrations in the upper sediment levels. The relatively small amount of material containing high levels of manganese would be dredged in a short time frame, and its effluent would be diluted by the effluent from continued placement of dredged material. Zinc is abundant in surface water and is used as an oxide pigment in rubber and paint, in agricultural fertilizers and sprays, and battery production. Zinc is known to bioaccumulate in animal tissues. Elutriate testing in 1993 showed zinc concentrations at a maximum of 310 ug/L.

Sampling Site A was analyzed as an indicator of disposal effects in the Mississippi River. This sampling site (IHNC south of the existing lock between the St. Claude Avenue crossing and the Mississippi River), showed three metals which increased to a concentration above the stated criteria: chromium, copper and zinc. Total chromium increased from 4 ug/L for ambient Mississippi River water conditions to 17 ug/L. This concentration possibly exceeds the acute criteria of 16 ug/L for chromium VI. It should be noted that the criteria is for chromium VI and not for total chromium and therefore should only be interpreted as a possible criteria violation. Copper increased from <14 ug/L to 190 ug/L, exceeding the freshwater acute criteria of 22 ug/L. Zinc's freshwater criteria of 165 ug/L is exceeded by the elutriate concentration of 190 ug/L, up from an ambient Mississippi River water concentration of 100 ug/L. Other parameters which have no freshwater aquatic life criteria but show a significant increase from ambient water to elutriate mixture were: aluminum (increased from 4,200 ug/L to 12,000 ug/L), iron (increased from 3,900 ug/L to 12,000 ug/L), magnesium (increased from 14,000 ug/L to 34,000 ug/L), manganese (increased from 160 ug/L to 2,400 ug/L), and potassium (increased from 4,000 ug/L to 14,000 ug/L). A large percentage of the parameters were not analyzed due to breakage of the sample jars. Aluminum, magnesium, and potassium are also common cations defining the hardness of a waterbody. In general, these metal ions are not cause for concern to health, although there are some indications that they may influence the effect of other metal ions on some organisms. For example, freshwater criteria levels for metals become less stringent as the hardness of a waterbody increases.

In summary, water quality effects due to metals and organic in the Mississippi River as the result of disposal of dredged material at the river disposal site are expected to be minimal, with increases in chromium, copper, zinc, and manganese expected. The toxicity of chromium to aquatic life will vary with valence state, form, pH, and the species of organism present. In long-term studies on the effects of heavy metals on oysters, it was shown that mortalities occurred at concentrations of 10 to 12 ug/L chromium. Copper is relatively plentiful in the natural environment and is the result of industrial sources including petroleum refiners. Copper criteria is based upon the protection of animal species and does not appear to bioaccumulate in animal tissues. Although the 1993 elutriate copper concentrations were elevated to 190 ug/L, it is still generally within the range of concentrations normally found in the Mississippi River, the IHNC and surrounding areas. Historic monitoring shows that copper levels in the waters of the project area frequently exceed the applicable acute criteria under ambient conditions. Manganese is normally imported to the United States, and is used in metal alloys, dry-cell batteries, fertilizer additives, and chemical reagents. In addition, manganese tends to flocculate and settle out of the water column. Elutriate samples from 1993 showed levels of manganese at 2,400 ug/L. The relatively small amount of material containing high levels of manganese would be dredged in a short time frame, and its effluent would be diluted by the effluent from continued placement of dredged material. Zinc is abundant in surface water and is used as an oxide pigment in rubber and paint, in agricultural fertilizers and sprays, and battery production. Zinc is known to bioaccumulate in animal tissues. Elutriate testing in 1993 showed zinc concentrations at a maximum of 190 ug/L. Other studies on dredging and disposal into the Mississippi River have shown similar increases expected in the immediate area of dredging and disposal, but no toxic metal or organic constituents were found to exceed state or Federal water quality criteria beyond 100 yards downstream from the effluent discharge point.

(d) Pathogens. The waterbodies in the vicinity of the project area, the Mississippi River, the IHNC, and Lake Pontchartrain, fall under the fecal coliform criteria cited for primary contact recreation. The criteria states that based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100 mL nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100 mL.

Mean fecal coliform levels in the Mississippi River over a period of 10 years averaged 392/100 mL. Levels in Lake Pontchartrain historically averaged 269/100 mL. In the IHNC, urban runoff, storm water discharge, and small amounts of domestic sewage combine with a sluggish flow in the canal (between the GIWW/MRGO and the river) to yield the highest levels of bacterial contamination in the study area. Sewer line settlement and fracture has occurred to the degree that much of the stormwater runoff is contaminated with domestic sewage. A composite of data from various measurements in the IHNC yield an average of 8119/100 mL fecal coliform.

Although existing conditions in the IHNC are not good with respect to pathogen levels, the project would not have any significant effect on fecal coliform or pathogenic organism concentrations.

(e) Aesthetics. During excavation, the river at and below the river disposal site would not be visually pleasing to many observers, even though disposal of dredged material into the river is not uncommon in the New Orleans area. The mitigation site is in close proximity to populated areas, but it is separated by levees and floodwalls and is visually isolated. The only people who would be able to see the disposal operations would be those who venture to the area to fish, hunt, or sight-see. Increased turbidity from the disposal operations would likely extend into Bayou Bienvenue which flows past a small developed area along Louisiana Highway 47 (Paris Road). Persons in this area would likely view the turbid water in the bayou as undesirable, but would probably be more concerned about the effect of the turbidity on aquatic life than on its appearance. Bayou Bienvenue, on the other side of Paris Road is a heavily used recreational fishing area. Dredging and disposal at the IHNC disposal site would be part of the overall construction plan, which would not be aesthetically pleasing to nearby residents and commuters. No adverse, long-term aesthetic impacts would be expected from dredging and disposal activities. Exposed soils at the mitigation site would become vegetated with marsh plants and the IHNC disposal site would be landscaped. Neither area would be aesthetically unappealing.

(f) Others as Appropriate. None

(3) Effects on Biota.

(a) Primary production. The decrease in light penetration from increased suspended sediment would result in a decline of phytoplankton populations in the mitigation site until the deposited material becomes consolidated and vegetated and the area is reconnected to tidal waters. The decline in primary productivity would also reduce zooplankton populations and populations of filter feeders and higher order predators.

Primary production is not the major food energy source in the Lower Mississippi River. Instead, the system is based more on detritus and other organic particles, and that would not be significantly affected by the disposal process.

Disposal activities at the IHNC disposal site are not likely to cause a decrease in primary production outside of the immediate work area. Low current velocities in the IHNC between the Mississippi River and the junction with the GIWW/MRGO would tend to confine impacts to this section of the IHNC. This section of the IHNC suffers from poor water quality and is considered to be poor habitat for aquatic organisms.

(b) Suspension/filter feeders. Increased turbidity levels at the mitigation site and in connected waters are expected for a period of up to 2 years for disposal activities. Effects within the confined disposal site may continue for an additional 1-3 years afterwards. This would have a negative impact on filter feeders including gulf menhaden, threadfin shad, and gizzard shad. Menhaden and gizzard shad support commercial fisheries and all three species provide forage for predators. These fish, as well as other estuarine species, would probably be absent from the confined mitigation site until the site is reconnected to tidal waters.

The MRGO site does not contain enough permanent water to support filter-feeding fish populations.

The main channel of the Mississippi River probably contains a very limited number of suspension/filter feeders due to high velocity and turbidity levels, although gizzard shad are likely present. No adverse impacts are expected for this site.

The IHNC in the vicinity of the new lock site likely has a limited population of filter feeders due to poor water quality. Gizzard shad may be attracted to the fresh water discharged from the lock since they are known to congregate around other structures which divert freshwater from the lower Mississippi River into estuarine waters. Whether or not congregations of shad occur in the IHNC is unknown. The gizzard shad congregations around freshwater flows are seasonal, occurring mainly in the spring.

(c) Sight feeders. Species which depend solely on sight for feeding are likely not numerous at the mitigation site because of high turbidity levels common in the area. Wind blown wave action tends to keep the area quite turbid from re-suspension of bottom sediments. Also, storm water runoff pumped into connecting waters is normally very turbid. Sight feeders which are likely present include spotted and sand seatrout, southern flounder, and various species of killifishes. Other species which may feed by sight, smell, or other senses include Atlantic croaker, spot, red drum, black drum, spotted and alligator gar, and blue crab. All of these species trapped within the site by confinement dikes would likely be killed when dredging operations commence, and these species (except for killifish) would probably not occur in the mitigation site until tidal influence is reestablished. Sight feeders outside of the confined site would also be adversely affected by turbid runoff during dredging operations. Once the dredged material islands become vegetated and shallow water habitats develop around the islands, the area would likely be more productive for most aquatic organisms including forage feeders and sight feeders (compared to the future without-project condition). This would be due to the organic material production from the emergent wetlands created by the dredged material deposition, the marsh-water edge habitat developed, and the aquatic vegetation expected to establish in the shallow waters around the islands.

Sight feeders in the main channel of the Mississippi River are probably uncommon due to normally high turbidity levels. Since increased turbidity is expected only a short distance downstream of the dredging operations, no adverse impacts are expected to sight feeders.

Sight feeders are also likely uncommon at the IHNC disposal site due to disturbances from vessel traffic, poor water quality, and lack of forage organisms. Whatever sight feeders were in the area would be displaced by dredging and disposal operations. Impacts to sight feeders at the IHNC disposal site are not considered to be a high concern because of existing poor quality habitat.

(4) Actions Taken To Minimize Impacts. Confinement of dredged material at the mitigation site for a period of time after dredging operations would prevent significant adverse impacts in the tidal waters outside of the site. No actions are proposed to reduce impacts inside of the site. Impacts at the river, MRGO, and IHNC disposal sites are not a concern, and no actions to minimize impacts at those locations are proposed.

d. <u>Contaminant Determinations</u>

The elutriate data analyzed in 1993 indicate, with the exception of copper, chromium, zinc, and manganese, contaminants would not be introduced into the water column in concentrations that would exceed applicable criteria. This is based upon samples of sediment taken in the IHNC, and would simulate dredging and disposal activities from IHNC sediments into the proposed disposal sites.

Although no soil samples were collected and analyzed as elutriates from the existing industrialized east bank of the IHNC nor the west bank of the IHNC, the HTRW Remedial Investigation which was conducted as a part of the lock replacement study presented soil contaminant concentrations on the east bank of the IHNC. The HTRW testing indicated that the total concentrations of constituents in soils below depths of 5 feet on the east bank of the IHNC had levels ranging from comparable to moderately higher than the levels of constituents found in canal bottom sediments. Some soils within the first 5 feet have been designated "industrial waste" and will not be used for aqueous disposal, but rather will be disposed at an industrial landfill. No material was deemed "hazardous". HTRW testing conducted on the west bank of the IHNC uncovered no hazardous material. No material which is deemed "industrial" or "hazardous" from this proposed testing will be used for aqueous disposal. The material on the east bank and west bank is designated to be used at the mitigation site, MRGO site, and the IHNC disposal site, and similar constituents found in the 1993 elutriates from canal bottoms would be expected to be present in this material. Since constituent levels ranged from comparable to moderately higher than the canal bottom material, levels would be expected to be the same to moderately higher than what was found for these two disposal sites.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton. Plankton populations at the mitigation site and MRGO site would be decreased substantially during the period of dredged material disposal. Adverse, but less definitive effects would linger for a period of time afterwards due to elevated turbidity levels which would decrease light penetration and photosynthetic processes. Once the disposed material becomes consolidated and vegetated and the site is reconnected to the tidal system, planktonic populations should return to levels similar to existing conditions.

At the river disposal site, effects are expected to be localized at the site of disposal, and no adverse impacts to plankton populations are expected.

At the IHNC disposal site, plankton levels would be expected to decrease during project construction and disposal operations. This is not considered to be a major consideration, since the existing water quality of this portion of the IHNC is poor and no significant amount of fishery resources occur there.

(2) Effects on Benthos. The benthic population would likely change in the mitigation site. No benthic information is available from the site or areas nearby, but the diversity of the benthic community is expected to be low due to the substrate type and the proximity of the site to urban stormwater pumping stations and urban landfills. The bottom of the site consists of fine-grained sediments mixed with a larger portion of decaying organic material. Most of the organic material is the remains of cypress trees and other woody vegetation which once occurred on the site. Cypress wood is very resistant to decay organisms and organisms which live in decaying wood. The dredged material to be deposited at the site would be mainly alluvial, mineral soils. Benthic organisms typical of muddy, silty water bottoms would be expected to colonize the area after placement of dredged material. Limiting factors to the colonization would be water quality and the pollutants found in the dredged sediments.

Benthic populations at the MRGO site would be expected to return to approximately the same as exiting conditions following deposition of dredged material.

No effects to the benthic population at the river disposal site are expected. The benthic population at the IHNC disposal site is likely very limited by poor water quality conditions and is not considered to be of major concern. Once dredging and disposal operations are completed, benthic populations would likely re-inhabit the remaining water areas similar to existing conditions.

(3) Effects on Nekton. Nekton populations in the mitigation site, and nearby tidal waters, are expected to be adversely impacted by turbidity plumes which would cause a decrease in primary productivity, plankton concentrations, and oxygen levels. Once the deposited material consolidates and becomes vegetated, and the site is reconnected to the tidal system, populations of nekton and other aquatic organisms are expected to be higher than existing conditions due to the primary production of the created wetlands.

Nekton populations are not significant at the MRGO site due to the intermittent nature of surface water.

Nekton populations at are not expected to be affected due to the paucity of nekton in the main channel of the river and the very localized area of disturbance expected from dredged material disposal. Nekton populations at the IHNC disposal site are also likely low. Whatever species are present would be displaced during dredging and disposal activities.

(4) Effects on the Aquatic Food Web. The aquatic food web would be affected at the mitigation site for a period of months after deposition of dredged material. Populations of organisms at all levels of the food web would be decreased or eliminated from a combination of effects including turbidity, decreased dissolved oxygen, and physical burying and displacement. A viable food web is expected to re-establish after cessation of dredging, consolidation of sediments, and re-connection of the site to tidal influence.

The aquatic food web of the MRGO site is not a significant resource.

The aquatic food web at the river disposal site is not expected to be adversely affected due to the localized effect of the disposal. The aquatic food web in the vicinity of the IHNC disposal site is probably stressed, at best, due to poor water quality and pollutants. Harmful effects to aquatic organisms would be restricted to the IHNC between the river and the junction with the GIWW/MRGO.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. No sanctuaries or refuges are located at or near any of the four disposal sites.

(b) Wetlands. Deposition of dredged material at the MRGO site may occur in scrub/shrub wetland and freshwater marsh. The disposal site would be situated so that impacts on the wetland areas would be minimized.

(c) Mud Flats. No mud flats would be impacted directly by the deposition of dredged material. Around the perimeter of the mitigation site and nearby water bodies, small mud flats occur between the marsh fringe and areas which are always inundated. These mud flats would not be altered by the disposal of dredged material. New mud flats would be created around the perimeter of the newly created islands. No mud flats occur at or near the other disposal sites.

(d) Vegetated Shallows. The only site which may contain vegetated shallows is the MRGO site. Disposal areas would be situated to minimize impacts to this habitat.

(e) Coral Reefs. No such areas would be affected.

(f) Riffle and Pool Complexes. No such areas would be affected.

(6) Threatened and Endangered Species. Consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service has revealed that no threatened or endangered species, nor their critical habitats, would be impacted by the disposal activity.

(7) Other Wildlife. Wildlife species that are known to occur in the mitigation site are avian species which feed in the shallow open water. Some species observed in the area are lesser scaup, red-breasted mergansers, double-crested cormorants, great egrets, and several species of gulls and terns. Some of these species would be displaced during disposal operations, while others would likely continue to forage in nearby open waters and marshes. The created wetlands would, after vegetation establishes, provide habitat suitable for marsh wrens, clapper rails, mottled ducks, and other species commonly found in brackish marshes. The species now utilizing the area would also be able to forage in the shallow waters around the dredged material islands.

At the MRGO site, nutria, swamp rabbit, muskrat, and otters, which are semi-aquatic mammals, are found. These animals would be displaced during dredging operations, but would recolonize the area afterwards.

(8) Actions to Minimize Impacts. Confinement of dredged material at the mitigation site and MRGO site until the material consolidates and becomes vegetated would minimize impacts to the aquatic organisms and ecosystem outside of the site. No actions are proposed to reduce impacts within the site. Impacts at the river and IHNC disposal sites are expected to be minimal, and no actions to reduce impacts are proposed.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. A mixing zone is defined as a region where the concentrations of constituents in a discharge are different from those of the receiving water and are in transition, decreasing steadily in concentration from the source to the receiving system. Mixing zones are those portions of waterbodies where effluent waters are dispersed into receiving waters. Mixing must be accomplished as quickly as possible to ensure that the waste is mixed in the smallest practicable area.

Whenever contaminant concentrations at the point of discharge are above receiving water quality standards, there will be some limited "initial" mixing zone (or zone of initial dilution) in the vicinity of the discharge point where receiving water quality standards may be exceeded. The size of this zone of initial dilution depends on a number of factors including the contaminant concentrations in the effluent, the applicable water quality standards, effluent density and flow rate, receiving water flow rate and turbulence, and the geometry of the discharge structure and the receiving water boundaries. Generally, the zone of initial dilution is restricted to the immediate point of discharge and is substantially smaller than the designated mixing zone (usually not exceeding 10 percent of the size of the mixing zone). Numeric acute aquatic life criteria apply, beginning at the edge of the zone of initial dilution. Numeric mixing zones and other water quality criteria, including both aquatic life acute and chronic water quality criteria, will not apply inside these zones of initial dilution.

The mixing zone is a larger area outside of the zone of dilution where the applicable criteria transitions from acute to chronic aquatic life. The chronic aquatic life criteria apply outside the mixing zone, beginning at the edge of the zone. This is the criteria which must be met in order to meet mixing zone regulations. For the IHNC lock replacement project, four separate mixing zones will need to be determined, one for each of the disposal sites.

LDEQ Environmental Regulatory Code, Part IX, Water Quality Regulations, states that in cases such as wetlands where the application of a specific mixing zone is not applicable, the LDEQ office may specify geometric limits for mixing zones. Assuming an average depth of 4 feet in the mitigation site, the total volume of open water in the diked area is approximately 884,000 cubic yards. A hydraulic dredge will produce a slurry estimated by 4 parts of water to 1 part of usable soil, so it will take approximately 2,668,000 cubic yards of water to produce the 667,000 cubic yards of sediment material.

The two constituents of concern in the mitigation site from 1993 elutriate testing are copper and zinc. Copper levels increased from an ambient level of <14 ug/L to a maximum of 60 ug/L (the range of elutriates were 18 ug/L to 60 ug/L, with an average of 36.7 ug/L for all elutriates analyzed). The saltwater acute aquatic life criteria for copper is 2.9 ug/L, no chronic criteria exists. Zinc levels increased from an ambient level of <20 ug/L to a maximum of 310 ug/L (the range of elutriates were 69 ug/L to 310 ug/L, with an average of 123 ug/L). The saltwater acute aquatic life criteria for zinc is 95 ug/L, with the chronic criteria at 86 ug/L. The mixing of the existing water with the dredged operation water provides a small reduction in the constituent levels expected. Using the elutriate concentration for the dredged volume of water and taking into consideration the ambient copper levels, it is estimated that copper will be found at levels averaging 29 ug/L within the 137 acre diked disposal site. This calculation is done by combining 2,668,000 cubic yards of water produced by dredging (at the elutriate average of 36.7 ug/L) with the ambient water volume available of 884,000 cubic yards (at the ambient level of 7 ug/L, assumed at half the detection limit) and dividing by the total volume of water. Since ambient levels were measured at <14 ug/L (assumed to be 7 ug/L), no amount of water available at the site would dilute the water to the criteria of 2.9 ug/L, therefore the standard cannot be achieved by dilution. For zinc, the dredged volume of water (8,864,000 cubic yards) will be at an average of 123 ug/L while the ambient water is estimated at 10 ug/L (half of the ambient level of <20 ug/L), yielding zinc levels estimated to average 93 ug/L. Zinc will generally be found at levels acceptable to the 95 ug/L saltwater acute aquatic life criteria and very close to the 86 ug/L chronic criteria.

It should be noted that although mixing is not capable of diluting copper levels to acceptable criteria levels, dredging effects are short term and copper levels will return to background shortly after dredging operations cease. The advantages of creating wetlands from this dredged material rather than discharging directly into the Mississippi River (or to an upland site) should outweigh the effects of short-term increases in copper levels at the mitigation site. Waters of the Mississippi River and the IHNC historically have either violated or possibly violated the applicable criteria for copper.

The constituents of concern in the MRGO site are again copper and zinc. Since there is no water quality data in this direct area, we have assumed that the water in the mitigation site would be similar and therefore has been used in this analysis. The area of confined disposal in the MRGO site is 240 acres. For these mixing zone calculations we have assumed that 2 feet of water is currently in the area. The mixing of the existing water with the dredged operation water provides a small reduction in the constituent levels expected. Using the elutriate concentration for the dredged volume of water and taking into consideration the ambient copper levels, it is estimated that copper will be found at levels averaging 33 ug/L within the 240 acre site. This calculation is done by combining 5,456,000 cubic yards of water produced by dredging (at the elutriate average of 36.7 ug/L) with the ambient water volume available of 871,000 cubic yards (at the ambient level of 7 ug/L) and dividing by the total volume of water. Since ambient levels were measured at <14 ug/L (assumed to be 7 ug/L), no amount of water available at the site would dilute the water to the criteria of 2.9 ug/L, therefore the standard cannot be achieved by dilution. For zinc, the dredged volume of water (5,456,000 cubic yards) will be at an average of 123 ug/L while the ambient water is estimated to be 10 ug/L, yielding zinc levels estimated to average 107 ug/L. Therefore, it is estimated that zinc will generally be found at levels just above the 95 ug/L saltwater acute aquatic life criteria.

It should be noted that although mixing is not capable of diluting copper and zinc levels to acceptable criteria levels, dredging effects are short term and copper levels will return to background shortly after dredging operations cease. The advantages of creating wetlands from this dredged material rather than discharging directly into the Mississippi River (or to an upland site) should outweigh the effects of short-term increases in copper and zinc levels at the MRGO site.

The river disposal site falls into LDEQ's category 1, streams with 7Q10 flow greater than 100 cfs. This categorization is for determination of appropriate dilution and mixing zone application for aquatic life. The 7Q10 for the Mississippi River is approximately 142,000 cfs. The designated mixing zone for category 1 streams is 1/3 of the 7Q10 flow or 47,333 cfs. To determine the dilution factor for application of the freshwater aquatic life chronic criteria, one must divide 47,333 cfs by the point discharge flow (dredge flow). For a 18" hydraulic dredge, the flow is estimated to be 26.5 cfs. The calculated 473,333 cfs/26.5 cfs equals a dilution factor of 1:1,786. Given the constituents of concern on the Mississippi River (copper, chromium, and zinc), levels will be diluted below the chronic criteria in all instances where ambient conditions are below the criteria. Copper levels increased from <14 ug/L for ambient conditions (7 ug/L used for calculations) to 190 ug/L for the elutriate. The freshwater acute aquatic life criteria for copper is 22 ug/L, the chronic criteria is 17 ug/L. The 1 part elutriate to 1,786 parts ambient Mississippi River water will dilute copper to 7.1 ug/L. This level of dilution is acceptable to both the acute and chronic freshwater aquatic life criteria. Total chromium levels increased from 4 ug/L for ambient water conditions to 17 ug/L for the elutriate. The freshwater acute aquatic life criteria for chromium (VI) is 16 ug/L, the chronic is 11 ug/L. The dilution factor for the Mississippi River will dilute total chromium to 4.0 ug/L, acceptable to both the acute and chronic freshwater aquatic life criteria for chromium (VI). Note that the criteria is for chromium (VI) and not total chromium but is conservative in light that only a fraction of total chromium is of the hexavalent form. Zinc levels increased from ambient conditions of 100 ug/L to 190 ug/L for the elutriate. The freshwater acute aquatic life criteria for zinc is 165 ug/L, the chronic is 149 ug/L. Zinc will be diluted to approximately 100.1 ug/L, acceptable to both the acute and chronic aquatic life criteria. Therefore, in all instances the mixing zone is acceptable to decrease constituents to levels which meet the freshwater chronic aquatic life criteria for material disposal at the river disposal site.

The amount of material to be placed at the IHNC disposal site is approximated at 640,000 cubic yards. This area is located at the new lock construction area, north of the Claiborne Avenue crossing and south of the Florida Avenue crossing. Tidal flows from the Gulf of Mexico into Lake Pontchartrain via the MRGO generally flow through the portion of the IHNC channel which links the MRGO with Lake Pontchartrain. The section of the IHNC from the existing lock north to the MRGO intersection is essentially isolated from flows along the MRGO and has little mixing and dispersion associated with it, with the exception of slight flows from the locking of vessels through the existing IHNC lock. Since flow is basically nonexistent in this portion of the IHNC channel, a mixing analysis similar to what was constructed for the mitigation site was used. Utilizing cross sectional data from the existing IHNC channel, it was determined that the volume of the IHNC channel from the existing lock to the intersection with the MRGO is roughly 3,800,000 cubic yards. Assuming a worst case scenario, the assumption is made that all of the dredging will be accomplished by a hydraulic dredge and none will be done by mechanical dredge. The hydraulic dredge will produce a slurry of approximately 640,000 cubic yards of soil material mixed with 2,560,000 cubic yards of water.

The two constituents of concern in the IHNC from 1993 elutriate testing are copper and zinc. Copper levels increased from an ambient level of <14 ug/L to a maximum of 200 ug/L (the range of elutriates were 81 ug/L to 200 ug/L, with an average copper level of 130 ug/L for all elutriates analyzed). The saltwater acute aquatic life criteria for copper is 2.9 ug/L, no chronic criteria exists. Zinc levels increased from an ambient level of <20 ug/L to a maximum of 220 ug/L (the range of elutriates were 82 ug/L to 220 ug/L, with an average zinc level of 141 ug/L). The saltwater acute aquatic life criteria for zinc is 95 ug/L, with the chronic criteria at 86 ug/L. The mixing of the existing water with the dredged operation water provides a reduction in the constituent levels as follows. Using the average elutriate level for the amount of dredged water available and taking into consideration the ambient copper levels, it is estimated that copper will be found at levels averaging 57 ug/L.   This calculation is done by combining 2,560,000 cubic yards of water produced by dredging (at the elutriate average of 130 ug/L) with the ambient water volume available of 3,800,000 cubic yards (at the ambient level of 7 ug/L, assumed at half the detection limit) and dividing by the total volume of water. Since ambient levels were measured at <14 ug/L (assumed to be 7 ug/L), no amount of water available at the site would dilute the water to the criteria of 2.9 ug/L, therefore the standard cannot be achieved by dilution. For zinc, the dredged volume of water (2,560,000 cubic yards) will be at an average of 141 ug/L while the ambient water is at 10 ug/L (half the ambient of <20 ug/L), yielding zinc levels estimated to average 63 ug/L. Zinc will generally be found at levels acceptable to the 95 ug/L saltwater acute and the 86 ug/L chronic criteria.

It should be noted that although mixing is not capable of diluting copper levels to acceptable criteria levels, dredging effects are short term and copper levels will return to background shortly after dredging operations cease. Disposal of material is confined with ring levees and the effluent over the levees is expected to be lower than the estimations given above due to settling of the solids in the confined disposal area. The advantages of using this existing dredged material rather than purchasing and transporting fill material should outweigh the short-term effects of elevated copper levels at this backfill site.

(2) Determination of Compliance with Applicable Water Quality Standards. The 1989 LDEQ Numerical Criteria for Specific Toxic Substances, 1989 LDEQ Numerical Standards Applicable to Surface Waters in the Study Area, 1986 EPA Freshwater Aquatic Life Criteria, 1986 EPA Saltwater Aquatic Life Criteria, and the 1986 EPA Human Health Criteria are contained in the Engineering Appendix, Water Quality Section. Acute and chronic criteria are

included. The chronic criteria are intended to protect aquatic organisms from long-term exposure to contaminants while the acute criteria are intended to protect them from short-term exposure to contaminants. Since dredging and disposal activities will not produce a continuous discharge, the acute criteria would apply. The freshwater criteria would apply to the river disposal site, while the saltwater criteria would apply to the other disposal sites.

The purpose of the elutriate test is to provide information on the potential effects of a disposal operation on water quality. The results can be compared to appropriate water quality criteria. A comparison of elutriate test concentrations with criteria is conservative. Water quality criteria have an implied exposure time ranging from 96 hours to many months, while dredged material perturbations persist for 30 minutes to two hours. Because of the nature of the comparisons, an elutriate test result showing a pollutant level less than established criteria would indicate that adverse water quality impacts would not be expected. However, an elutriate test result exceeding established criteria would not necessarily imply that adverse water quality impacts would occur.

The acute criteria were employed due to the localized, short-term water quality effects which dredging/disposal operations typically produce. Only criteria violations of the applicable acute aquatic life criteria are noted in the following paragraphs. Existing conditions show that maximum values for ambient chromium, copper, and toxaphene in the Mississippi River from the period 1970-1988 exceeded the applicable freshwater acute aquatic life criteria. Chromium is noted as a possible exceedance because the maximum value is <20 ug/L and the criteria for chromium VI (not total chromium) is 16 ug/L. The maximum copper level during this time frame was 26 ug/L, exceeding the acute freshwater aquatic life criteria of 2.9 ug/L. A maximum toxaphene level of <1.0 ug/L also possibly exceeds the acute aquatic life criteria of 0.73 ug/L.

The IHNC under existing ambient conditions has been shown to violate the acute saltwater aquatic life criteria of 2.9 ug/L for copper in historic sampling (maximum values of 11 ug/L as well as the mean value of 3.42 ug/L are in exceedance). The IHNC has also violated the dissolved oxygen minimum of 4.0 mg/L in the past with a minimum value of 0.1 mg/L. pH levels ranging from a minimum of 3.4 su to 9.8 su violated both ends of the 6.5-9.0 su acceptable range.

Lake Pontchartrain under existing ambient conditions experiences frequent violations of aquatic life criteria as well. The maximum copper concentration of 9 ug/L exceeds the saltwater acute criteria of 2.9 ug/L. Cyanide maximum historic levels were at 30 ug/L, exceeding the acute criteria level of 1 ug/L. The maximum concentration of chlordane (<0.1 ug/L) possibly exceeds the acute criteria level of 0.09 ug/L. Dissolved oxygen levels have historically been measured in Lake Pontchartrain near the IHNC entrance as low as 1.1 mg/L, in violation of the 4.0 mg/L minimum state criteria. pH levels ranged from 4.1 su to 9.7 su, violating both ends of the acceptable stated range of 6.5-9.0 su.

As noted in previous sections, no historic sampling of the mitigation site exists. From the 1993 water sample, it is seen that copper possibly exceeds the EPA saltwater aquatic life criteria of 2.9 ug/L, at <14 ug/L. Since only one sample was analyzed, a generalization cannot be made as to the existing water quality in the area. However, the water quality appears to be similar to the quality of water in the IHNC, although fluctuations do occur.

Fecal coliform violations are not discussed in this section, but are addressed in Section 2(d) Pathogens. Other parameters which violated (or possibly violated) the applicable chronic criteria of the Mississippi River are as follows: lead, mercury, cyanide, chlordane, mirex, PCBs, heptachlor, DDT, dieldrin, and endrin. The chronic criteria violators for the IHNC are lead, mercury, and nickel. The chronic criteria violators for Lake Pontchartrain are lead, mercury, cyanide, chlordane, mirex, PCBs, and toxaphene.

The only constituents which showed the potential to violate water quality criteria during construction, dredging, and disposal activities were determined through the 1993 elutriate testing. For the Mississippi River (shown by Sampling Site A results) it was shown that possible increases in the levels of chromium, copper, and zinc may occur during dredging and disposal activities. However, mixing zone determinations show no acute aquatic life criteria violations outside of the zone.

The 1993 elutriate samples analyzed for Sampling Site C show that two constituent levels increase at the IHNC disposal site to possibly exceed the saltwater acute aquatic life criteria. These constituents are copper and zinc. The maximum elutriate level experienced for copper was 200 ug/L, exceeding the acute saltwater criteria of 2.9 ug/L. The maximum elutriate level experienced for zinc was 220 ug/L, exceeding the acute saltwater criteria of 95 ug/L. Mixing calculations show that copper is the main parameter of concern and levels cannot be diluted to meet the criteria as ambient copper levels themselves are above the saltwater acute aquatic life criteria.

The 1993 elutriate samples analyzed for Sampling Sites G and E show that two constituent levels increase in the mitigation site and MRGO site to possibly exceed the saltwater acute criteria. These constituents are again copper and zinc. The maximum elutriate level experienced for copper was 60 ug/L, exceeding the acute saltwater criteria of 2.9 ug/L. The maximum elutriate level experienced for zinc was 310 ug/L, exceeding the acute saltwater criteria of 95 ug/L. Again, mixing calculations show that copper is the main parameter of concern and levels cannot be diluted to meet the criteria as the ambient copper levels themselves are above the saltwater aquatic life criteria.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and private water supply. The nearest downstream water intake on the Mississippi River is 4.7 miles from the IHNC lock, and no impact to this public water supply is expected for the following reasons. A study of the disposal of hydraulic dredged material in the New Orleans Harbor indicated constituents settled out of the water within 100 yards downstream of the dredge. The constituents would be discharged in a highly sediment-laden mixture into the river which contains a large amount of sediment, providing an excellent environment for adsorption of the constituents. It should be noted that water in the Mississippi River presently contains levels of copper which exceeds the freshwater aquatic life criteria, and also chromium which possibly exceeds the freshwater aquatic life criteria.

Since the 1993 elutriate tests for the river disposal site do not include elutriate levels for the 97 organics analyzed for this effort (due to breakage of the sample jars), the effects of these organics cannot be analyzed through the elutriates. Only the 27 metals for which elutriate levels were analyzed are presented. Considering the drinking water supply human health criteria reveals the following: only arsenic possibly violates the human health criteria for drinking water supplies of 50 ug/L. Arsenic increases from an ambient level of <3 ug/L to <60 ug/L. No other metals are shown to increase to levels which may violate the drinking water system. The mixing zone is adequate to reduce levels of arsenic below the human health criteria for the Mississippi River.

(b) Recreational and commercial fisheries. The mitigation site and nearby water bodies are used recreational and commercial fishermen. Crab traps are common throughout the area and in typical years thousands of pounds of shrimp are harvested in Bayou Bienvenue, which is the only tidal channel connecting the mitigation site and adjacent waters with the tidal system. Some recreational angling also occurs, mainly for spotted seatrout, red drum, and Atlantic croaker. Commercial gill nets have also been observed in the area. Likely target species for these nets are gar fish, sheepshead, black drum, and southern flounder. Disposal operations could adversely impact fisheries occurring in the site and nearby waters. Fisheries in the area west of Paris Road (Louisiana Highway 47) between Bayou Bienvenue and the Back Protection Levee would be most seriously impacted. Impacts detailed in other sections of this evaluation, including turbidity, reduced dissolved oxygen levels, physical disturbance, and release of contaminants, would reduce populations of harvested species.

Disposal operations at the MRGO site would also affect Bayou Bienvenue and adjacent waters. The highly turbid runoff from the site would cause the same type of impacts as those described for the mitigation site.

No impacts to fisheries at the river and IHNC disposal sites are expected. Virtually no fishing occurs in the main channel of the river near the IHNC. Bank fishing along the river should not be affected by disposal activities. The IHNC is closed to all types of fishing activities, by regulations of the Port of New Orleans, because of the danger associated with navigation traffic.

(c) Water-related recreation. The only types of recreational activity known to occur in the mitigation site is fishing. Some hunting for rabbits and wild hogs may occur in the MRGO site, although the site is in Orleans Parish and is technically off-limits to this activity. These areas are not especially scenic, being flanked by development and landfills. When the landfills were still open, bird watching was a common activity. The landfills attracted tremendous numbers of birds, especially during winter months, to feed on the discarded refuse. Effects to fishing activities are described in the preceding paragraph. No effects to hunting activities would be expected.

No effects to water-related recreation would be expected from disposal of dredged material at the river and IHNC disposal sites.

(d) Aesthetics. Dredging and deposition of dredged material are not aesthetically pleasing sights. The mitigation site and MRGO site are isolated from the view of all but those who venture into the area. These people would likely be much more concerned about the effects on resources that they intend to harvest than on the diminished aesthetic qualities of the area. The wetlands created with dredged material would likely become vegetated with wetland plant species and would be considered aesthetically pleasing to those who enjoy viewing marsh landscapes.

During disposal activities at the river and IHNC disposal sites, these areas would not be visually pleasing; however, such activities are not uncommon in the New Orleans Harbor.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar preserves. The Galvez Street Wharf and the St. Claude Avenue Bridge, both located on the IHNC are eligible for the Federal Register. Both structures would be demolished as part of the lock replacement plan, regardless of the dredging and disposal plan. Mitigation has been coordinated with the State Historic Preservation Officer and would consist of recordation to accepted standards. Additional coordination with the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be accomplished prior to project construction. Two Historic Neighborhoods, the Bywater Historic Neighborhood and the Holy Cross Historic Neighborhood, lie on either side of the IHNC. Both of these neighborhoods would be adversely impacted by the lock replacement plan, but not specifically by dredging and disposal operations.

g. <u>Determination of Cumulative Effects on the Aquatic Ecosystem</u>

All four proposed disposal sites have had a history of being manipulated by humans. The mitigation site was leveed, drained, and used for agricultural purposes up until early in this century. After levee systems failed and were abandoned, the area was again subjected to tidal flows. Since the soils had subsided and compacted while the area was drained, the elevation was no longer sufficient to sustain most plant species; only the existing cypress trees were able to survive. The MRGO, completed in the 1960's provided a straight channel to the Gulf of Mexico and caused an increase in salinity levels, killing the remaining cypress trees. Nearby marshes converted from fresh and intermediate marshes to brackish marshes. Adjacent areas were used as landfills and the area received urban stormwater runoff with associated pollutants. Dredged material disposal for mitigation restoration is an attempt to increase the existing value of the area for terrestrial and aquatic fish and wildlife resources. As stated in other sections, the disposal area would be disturbed for a period of time during disposal and afterwards, but the long-term effect is expected to be positive.

The MRGO site has been previously subjected to disposal of dredged material.

The cumulative effect of disposal at the river disposal site is insignificant. The average amount of sediment dredged from the New Orleans Harbor is approximately 2,400,000 cubic yards/year (15-year average). The amount of material to be deposited in the river is 172,000 cubic yards or about 7 percent of the total dredged in the harbor annually. Because of the existing sediment load, rapid movement of material by the river, and normal scouring, the cumulative effect of the added sediment would be minimal.

The IHNC disposal site is almost completely developed for industrial and urban uses. The proposed dredging and disposal activities would cause a rearrangement of the canal banks and lock site but not add to the effects that humans have had on the area.

h. Determination of Secondary Effects on the Aquatic Ecosystem

No secondary effects, other than the effects discussed in previous sections, some of which may be considered secondary, are expected.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

a. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation

No significant adaptations of the guidelines were made relative to this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impacts on the Aquatic Ecosystem

Disposal sites other than those proposed are potentially available. Also the disposal plan could be changed to alter the percentages of the total amount of dredged material which would be deposited into each of the proposed sites.

c. Compliance with Applicable State Water Quality Standards

The proposed disposal plan would violate several Louisiana Department of Environmental Quality numerical standards. Concentrations of copper and zinc at the four proposed disposal sites would violate acute criteria levels during dredging operations. The concentration of chromium VI may exceed the acute criteria level at the river disposal site. Copper levels in the vicinity of the disposal sites frequently exceed applicable acute criteria levels under ambient conditions. Therefore, standards for copper may not be achievable through dilution.

d. <u>Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act</u>

The 65 pollutants designated as toxic under Section 307(a)(1) of the Clean Water Act as revised under EPA Water Quality Criteria, Federal Register dated 28 November 1980, have not been adopted by the State of Louisiana as regulatory. They are used in a comparative context only.

e. <u>Compliance with the Endangered Species Act of 1973</u>

Disposal of the excavated material is not anticipated to have adverse impacts on any threatened or endangered species.

f. <u>Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972</u>

All disposal sites and effects of disposal are in inland waters. No effects would occur beyond the shoreline of the Gulf of Mexico.

g. <u>Evaluation of Extent of Degradation of the Waters of the United States</u>

(1) Significant Adverse Effects on Human Health and Welfare

(a) Municipal and Private Water Supplies. No effect on water supplies is expected.

(b) Recreational and Commercial Fisheries. Disposal into the mitigation site and MRGO site would have an adverse effect on the recreational and commercial fisheries for a period of up to about 2 years after the conclusion of disposal activities. Once dredged material island become vegetated with wetland species and turbidity levels return to pre-project conditions, fisheries catches would likely return to conditions approximating those now occurring or improve somewhat over these conditions due to the positive effects of restored marshes. No effects are expected at the other two sites.

(c) Plankton. Plankton populations at the mitigation site would likely be reduced for up to about 2 years following the conclusion of disposal activities due to elevated turbidity levels. No adverse effects are expected at the other sites.

(d) Fish. Fish trapped in the mitigation site by confinement dikes would be forced out of the area or killed by the discharge of hydraulically dredged material. After the wetlands become vegetated and the area is reconnected to tidal influence, fish populations should improve to levels higher than existing conditions from the positive effects of the created wetlands. No significant adverse effects are expected at the other disposal sites.

(e) Shellfish. Shrimp and crabs are the primary shellfish inhabiting the area. Effects on these species would be the same as those described under the previous section.

(f) Wildlife. Wildlife species would be forced to leave the MRGO site during disposal operation. Wildlife would benefit from the creation of wetland habitat at the mitigation site. Species normally found in coastal brackish marshes are expected to rapidly colonize the marsh islands at the site once vegetation becomes established.

(g) Special Aquatic Sites. No special aquatic sites would be impacted.

(2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems. The mitigation site is used as a nursery area by the juveniles and sub-adults of a variety of migratory estuarine species of fish and shellfish. Migratory, in this sense, means species whose adults spawn in the Gulf of Mexico (or estuarine areas closer to the gulf) and their larval offspring are carried into the shallow, marsh-fringed estuaries by tides and currents. The juveniles and sub-adults of such species would be prevented from utilizing the disposal site for a period of time afterward. A reduction in the populations of these species from the general area due to the exclusion of organisms from the disposal site would be expected until the site is reconnected to tidal waters. No significant adverse effects are expected at the other disposal sites.

(3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability. The diversity of the aquatic ecosystem at the mitigation site is probably limited due to the proximity of the site to urban areas, landfills, urban storm water runoff, and restrictions to free interchange with the tidal system. The ecosystem of the disposal site would be significantly altered until the area is reconnected to the tidal system. No long-term adverse impacts to ecosystem diversity are expected. The site would likely become more diverse after the emergent vegetation is established. No significant long-term, adverse effects are anticipated at the other disposal sites.

(4) Significant Adverse Effects on Recreational, Aesthetic, and Economic Resources. Recreational catches of shrimp, crabs, and finfish would probably be reduced in waters near the mitigation

site and MRGO site during dredged material disposal and for a period of time afterwards, but no adverse long-term effects are expected. Aesthetic and economic resources would not be significantly affected by disposal of dredged material at any of the four sites from disposal activities.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

The confinement of dredged material at the mitigation site and MRGO site would minimize adverse impacts to the aquatic ecosystem outside of these areas. The area of the MRGO disposal site to be used for disposal of dredged material would be minimized. The MRGO disposal site selected has been chosen to minimize impacts to the aquatic ecosystem and to restrict dredged material disposal to low-quality wetlands. The Corps will abide by any restrictions placed on the project by the Louisiana Department of Environmental Quality to prevent the degradation of coastal waters.

i. On the basis of the guidelines, the discharge of dredged material into the four proposed sites is specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem.

______________________	______________________
Date	William L. Conner Colonel, U.S. Army District Engineer

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Sampling Site A (between existing lock and river)
Composite of sediments from various depths

Sampling Site C (between existing lock and Claiborne Ave)
Sediments from 0' to 1' deep

Sampling Site C (between existing lock and Claiborne Ave)
Sediments from 1' to 5' deep

Sampling Site C (between existing lock and Claiborne Ave)
Sediments from 4' to 9' deep

Sampling Site G (adjacent to the Galvez Street Wharf)
Sediments from 0' to 1' deep

Sampling Site G (adjacent to the Galvez Street Wharf)
Sediments from 1' to 4' deep

Sampling Site G (adjacent to the Galvez Street Wharf)
Sediments from 4' to 9' deep

Sampling Site E (at turn basin just south of Florida Ave)
Vibracore #1. Sediments from 1' to 1.5' deep

Sampling Site E (at turn basin just south of Florida Ave)
Vibracore #1. Sediments from 0' to 8' deep

Sampling Site E (at turn basin just south of Florida Ave)
Vibracore #2. Sediments from 0' to 8' deep

Sampling Site E (at turn basin just south of Florida Ave)
Vibracore #2. Sediments from 8' to 12' deep