IV. The Hurricane Protection System

Executive Summary

This part of the report is an initial attempt to provide a comprehensive characterization of the Hurricane Protection System and the design assumptions used in its development. The first part provides a general description of the HPS including the distribution and character of the structures and features that comprise the system. This information is provided on a Parish by Parish and reach by reach basis as available. The degree and types of damage suffered from Katrina is also documented along with the repair strategies currently underway. This information is to serve as a system wide description for the overall IPET analysis.

A discussion is presented on the Standard Project Hurricane used for the design of the HPS. This includes how it was defined, assumptions made in determining the design elevations necessary to protect against the SPH, and the factors considered in arriving at these design criteria. This includes a reach by reach documentation of the surge and wave factors to include wave runup and freeboard, resulting in the design elevations. A detailed documentation is provide on the history of the 17th Street Outfall Canal component of the HPS. This provides a chronology of the key documents and communications that led to the system in place prior to Katrina. It serves as an example of the types and level of information that will be included for the remainer of the HPS in the IPET final report.

The scope of this part of the report as presented here represents only a portion of the information intended for the final report. In the IPET final report there will be additional information concerning the specific structural design assumptions, as-built and condition information to provide a more complete picture of the HPS. Some of this type of information is presented in the Part VI, Performance, of this report to include the geological information and geotechnical data available for the design and construction activities. This information currently focuses on the 17th Street Canal in support of the performance analysis of the breach site used as an example of the analyses to be provided for the major structures of the HPS.

Design Criteria for the System

The **Lake Pontchartrain, LA and Vicinity Hurricane Protection Project (HPP)** covers St. Bernard, Orleans, Jefferson and St. Charles Parishes in southeast Louisiana, generally in the vicinity of the city of New Orleans, and between the Mississippi River and Lake Pontchartrain. The Orleans East Bank portion of the project includes the east bank of the Mississippi River between the 17th Street Canal and Inner Harbor Navigational Canal (IHNC). Figure IV-1. is an index map showing the individual polders within the Lake Pontchartrain, LA and Vicinity HPP.

Plaquemines Parish Basin includes long, narrow strips of protected land on both sides of the Mississippi River between New Orleans and the Gulf of Mexico. The Mississippi River Levees (MRL) protect the Parish from floods coming down the river. Protection from hurricane induced tidal surges is achieved by the **New Orleans to Venice (NOV) HPP.** The NOV HPP is a system of levees on the gulf side of the protected lands and additional berms and floodwall on top of the MRL along the river. The NOV extends from Phoenix, LA to Venice, LA. A HPP map is not available for NOV however.

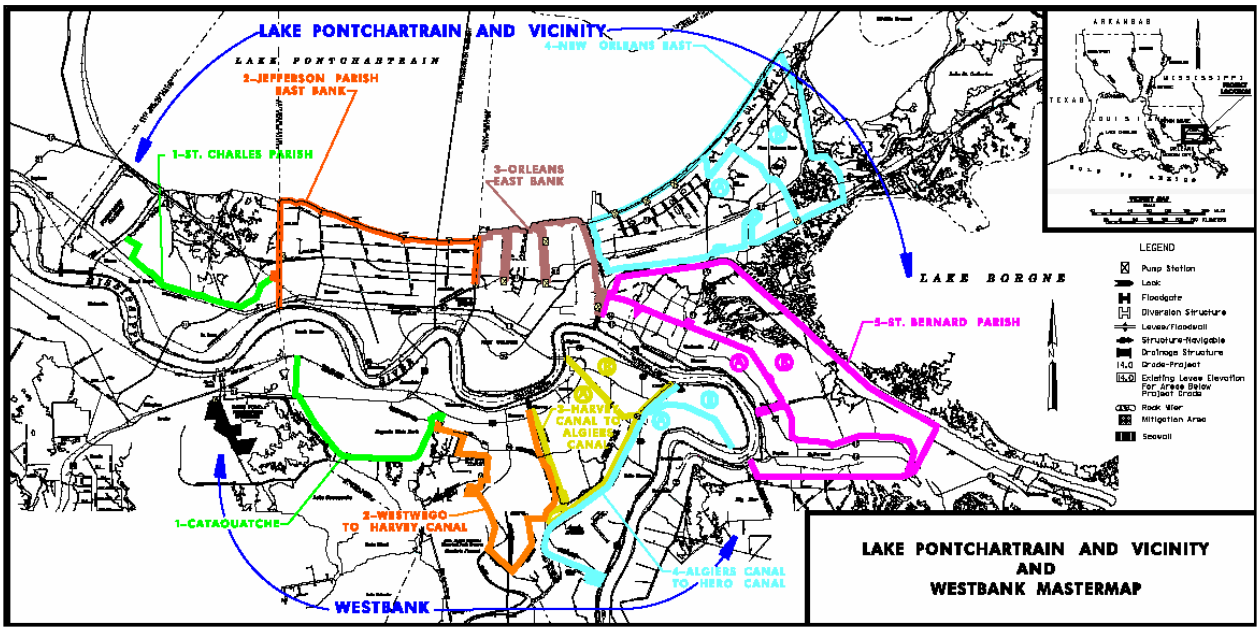

Figure IV-1. Index Map to Lake Pontchartrain, LA and Vicinity Hurricane Protection Project

Figure IV-2. Extent of NOV Hurricane Protection in Plaquemines Parish. The NOV consists of five distinct reaches; Reach C, Reach St. Jude to City Price, Reach A, Reach B-1 and Reach B-2.

Orleans East Bank – HPP Features. This portion of the project that protects the city of New Orleans was designed to protect 28,300 acres of urban and industrial lands. The levee portion is constructed with a 10-foot crown width with side slopes of 1 on 3. Along Lake Pontchartrain Lakefront the top elevation of the earthen levees range between elevation +13 and +18 ft National Geodetic Vertical Datum (NGVD). Floodwalls were designed to provide lines of protection on the east side of the 17th Street Canal, both sides of Orleans Avenue Canal and London Avenue Canal, and the west side of the IHNC. Floodwalls consist of reinforced concrete T-wall floodwalls and reinforced concrete I-wall floodwalls constructed on the top of sheet-pile, and sheet piling without a concrete section. Top elevations of the floodwalls vary between elevation +13 and +15 ft.

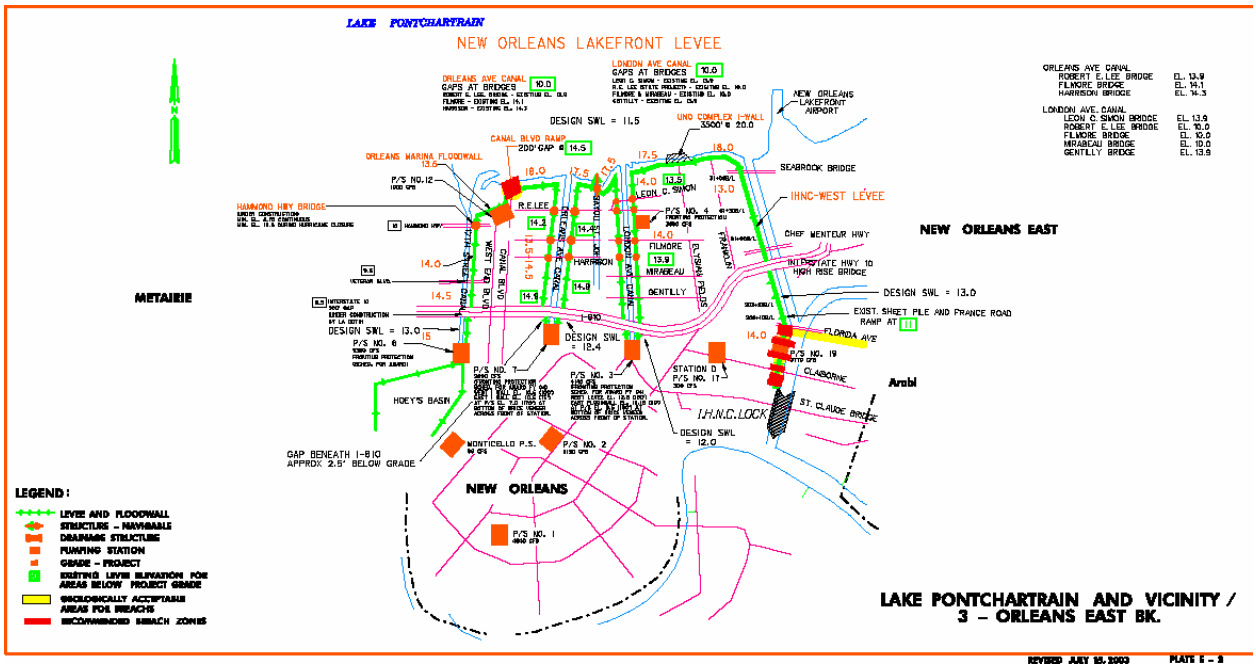

Figure IV-3. HPP features – New Orleans East Bank

Orleans East Bank Lakefront. A levee segment located in southeastern Louisiana in New Orleans and roughly parallels the shoreline of Lake Pontchartrain between the IHNC on the east and 17th Street Canal on the west. This levee segment is located in Orleans Parish.

IHNC Canal (West Bank). The Inner Harbor Navigation Canal is located in the east portion of Orleans Parish and is described in the IHNC section of this report.

17th Street Outfall Canal (Metairie Relief). The 17th Street Outfall Canal lies in Jefferson Parish immediately west of the Orleans Parish boundary line. The canal extends approximately three miles from Pump Station No. 6 near Interstate Highway 10 to its confluence with Lake Pontchartrain.

London Avenue Outfall Canal. The London Avenue Outfall Canal is located on the south side of Lake Pontchartrain in Orleans Parish. The London Avenue Outfall Canal lies to the east of 17th Street Canal and Orleans Avenue Canal.

Orleans Avenue Canal. The Orleans Avenue Canal extends about 2.4 miles from Pumping Station No.7 in the vicinity of I-610 to its mouth at Lake Pontchartrain.

Table IV-1 New Orleans East Bank Hurricane Protection System	
19.2 miles	levee and floodwall
13	pump stations
15	roadway floodgates

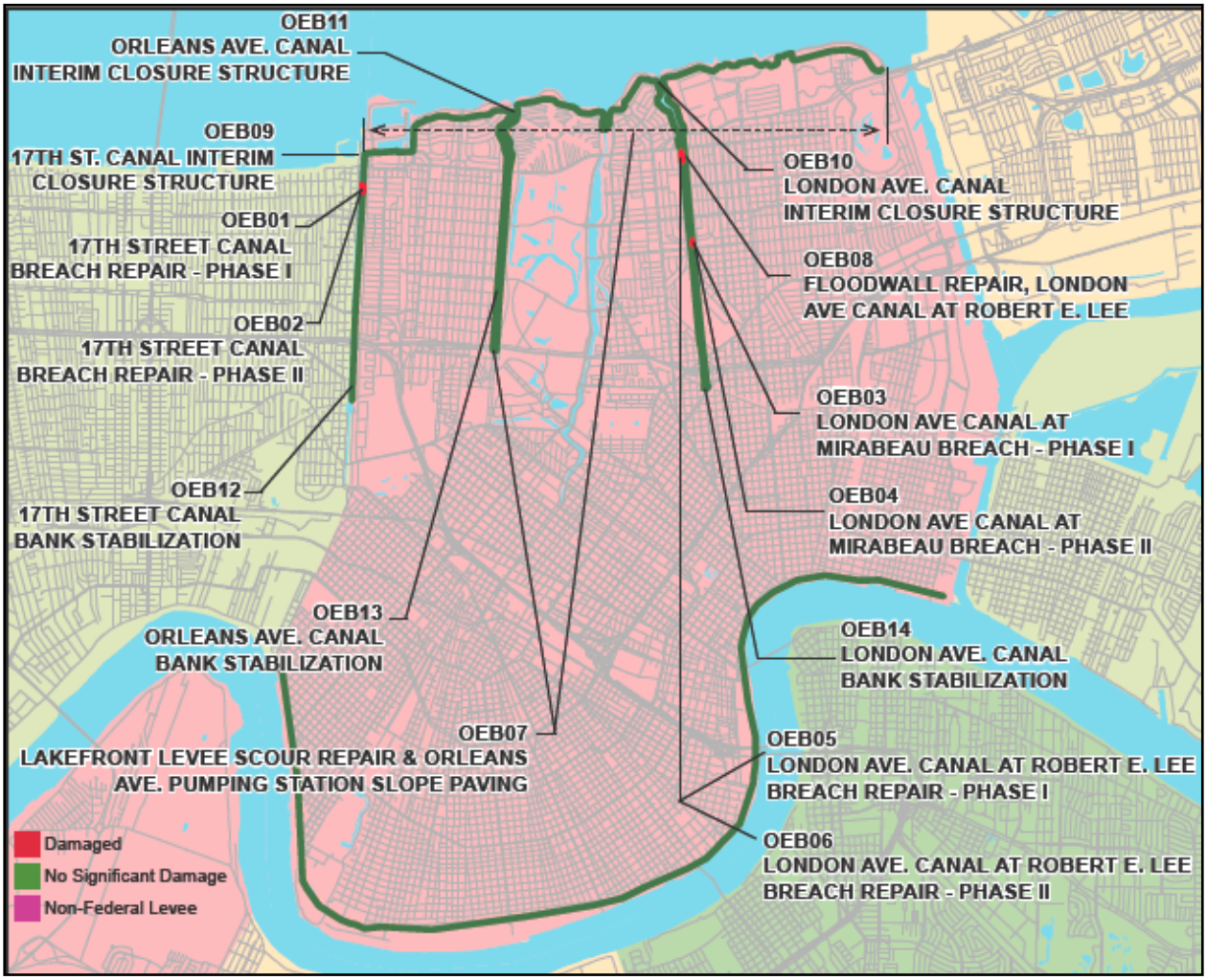

Figure IV-4. Damages and Repair Contracts – New Orleans East Bank

Primary damages to the flood protection in the Orleans East Bank basin consists of a 455- ft breach in the east side I-wall along 17th St. Canal, breaches on both the east side (425 ft) and west side (720 ft) I-wall along London Ave. Canal, breaches along the west side of IHNC floodwall and damages to all fifteen pumping stations.

New Orleans East Basin. The hurricane protection system for the New Orleans East (NOE) Basin was designed as part of the Lake Pontchartrain, LA and Vicinity Hurricane Protection Project. The NOE portion of the project protects 45,000 acres of urban, industrial, commercial, and industrial lands.

Figure IV-5. illustrates the boundaries and basic flood protection components within the NOE Basin. The levee is constructed with a 10-ft crown width with side slopes of 1 on 3. The height of the levee varies from 13 to 19 ft. There are floodwall segments along the line of protection that consists of sheet-pile walls or concrete I-walls constructed on top of sheet-pile. The line of protection was designed to provide protection from the Standard Project Hurricane (category 3 hurricane).

Figure IV-5. is used by the New Orleans District for planning and design, specifically because it shows as-built levee and floodwall elevations. The western border coincides with the Inner Harbor Navigation Canal (IHNC) and the eastern boundary of the Orleans Basin. It is bounded by the east bank of the IHNC, the Lake Pontchartrain shoreline (between the IHNC and Southpoint), the eastern boundary of the Bayou Savage National Wildlife Preserve, and the north side of the Gulf Intracoastal Waterway (GIWW) (between the IHNC and eastern edge of the Bayou Savage National Wildlife Preserve). The main components are described in the next section moving clockwise through the basin, beginning at the Lakefront Airport and ending at the western end of the GIWW.

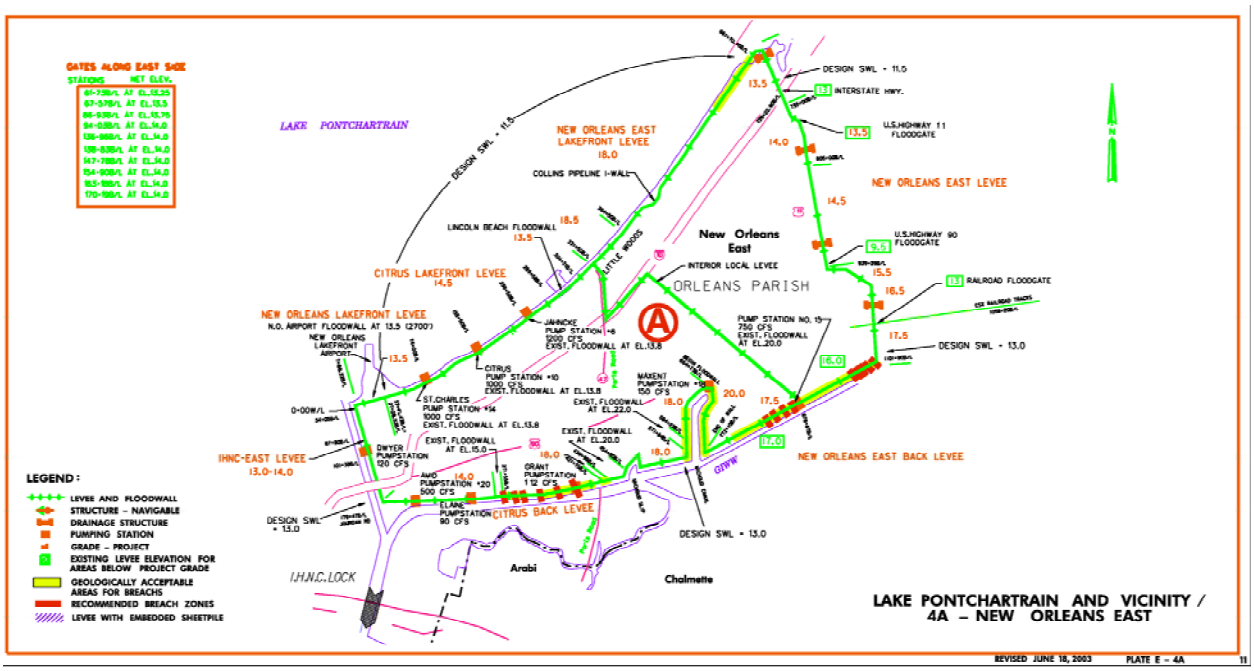

Figure IV-5. NOE Basin general components and top of levee/floodwall as-built elevations (feet) (source USACE, New Orleans District (Wayne Naquin)

Hurricane Protection Features New Orleans East Basin, Orleans Parish.

New Orleans East Lakefront includes the Citrus Lakefront Levee and New Orleans East Lakefront Levee consisting of 12.4 miles of earthen levee paralleling the Lakefront from the IHNC to Southpoint. It also includes floodwalls at the Lakefront Airport and Lincoln Beach.

The New Orleans East Levee consists of 8.4 miles of earthen levee from Southpoint to the GIWW along the eastern boundary of the Bayou Savage National Wildlife Preserve.

GIWW. The basin includes the Citrus Back Levee and New Orleans East Back Levee which consisting of approximately 17.5 miles of earthen levees and concrete floodwalls along the northern edge of the GIWW.

IHNC. The basin protection includes approximately 2.8 miles of levee and concrete floodwall along the eastern side of the IHNC. The IHNC is described in a separate report.

Pump Stations. Eight pump stations and numerous drainage structures, pipe crossings and culverts also lay on the boundaries

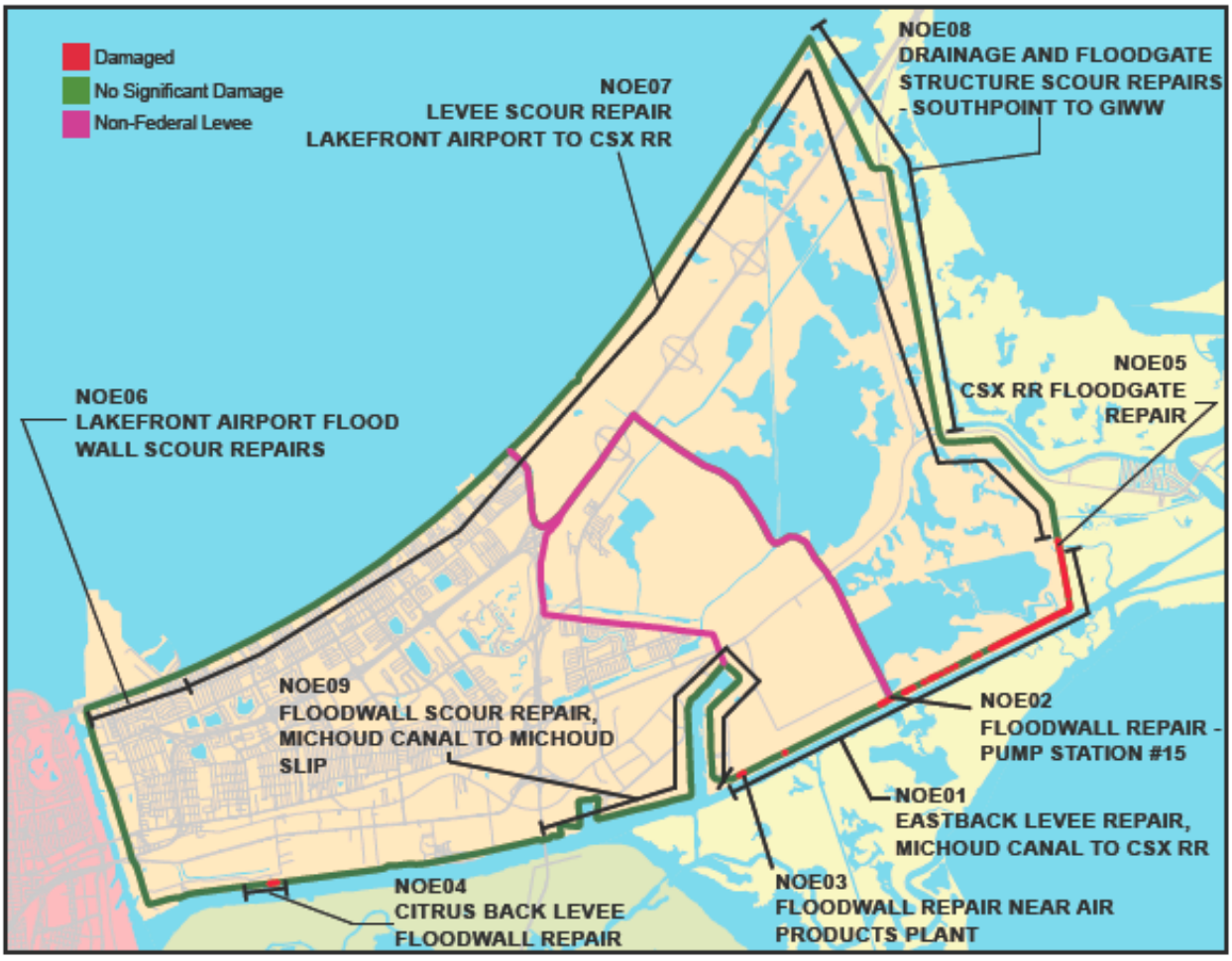

Figure IV-6. Hurricane Protection Features - New Orleans East Basin

Table IV-2 Summary of NOE Basin Hurricane Protection Features	
Exterior levee and floodwall (I wall)	39 miles
Drainage Structures	4
Pump Stations	8
Highway Closure Structures	2
Railroad Closure Structure	1

West and East Sides, IHNC, Orleans Parish. The Inner Harbor Navigation Canal (IHNC) HPP contains approximately 10 miles of levee and floodwalls along the Inner Harbor Navigation Canal in a heavily industrialized area

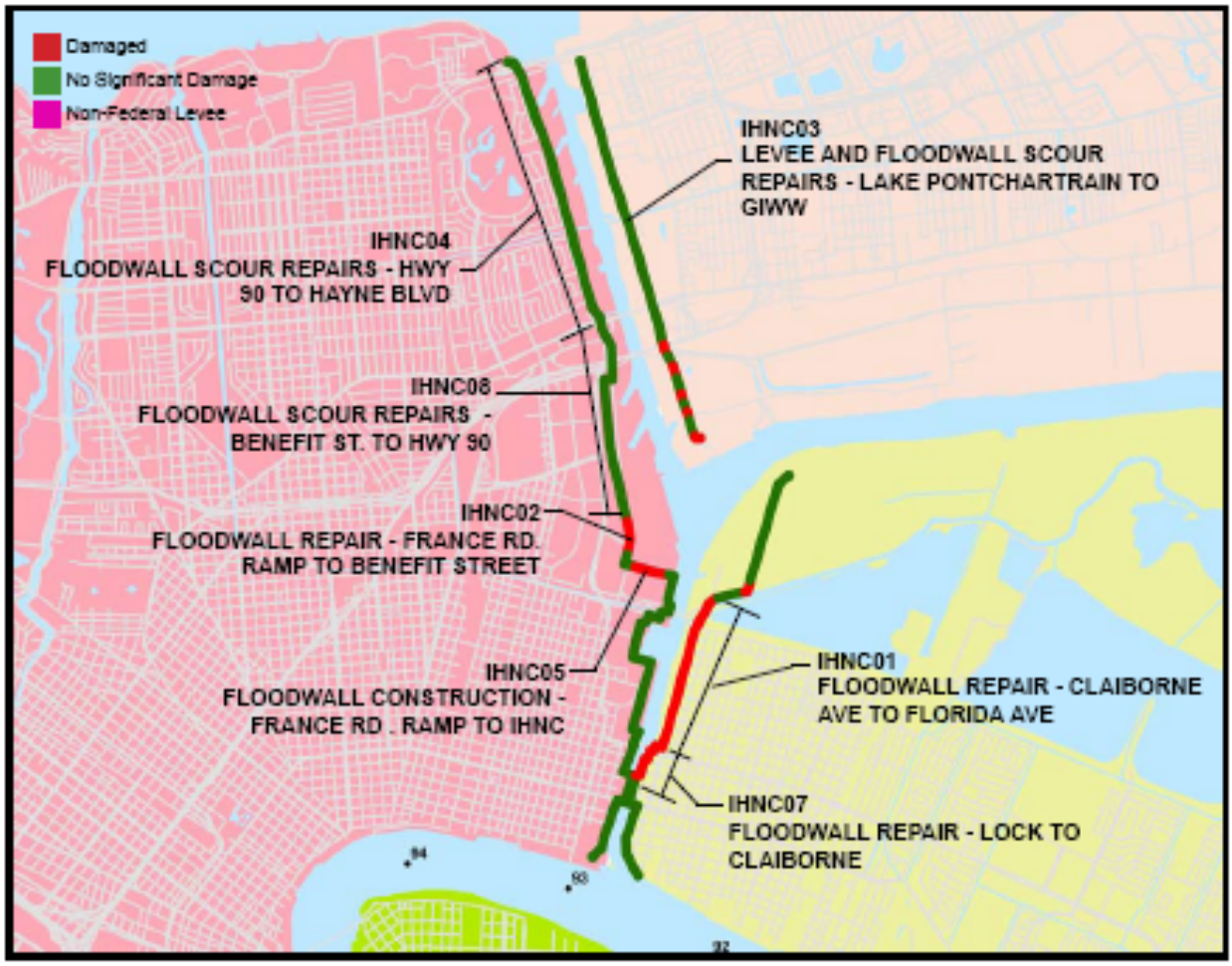

Figure IV-7. Hurricane Protection Features – IHNC

IHNC Damages. Overtopping of the hurricane protection by Hurricane Katrina was evident along nearly all portions of the canal. There were four breaches in the protection system, two on the east side and two on the west side.

The east side breaches are both located in the lower 9th ward neighborhood and the west side breaches are both in the vicinity of France Road and Benefit Street.

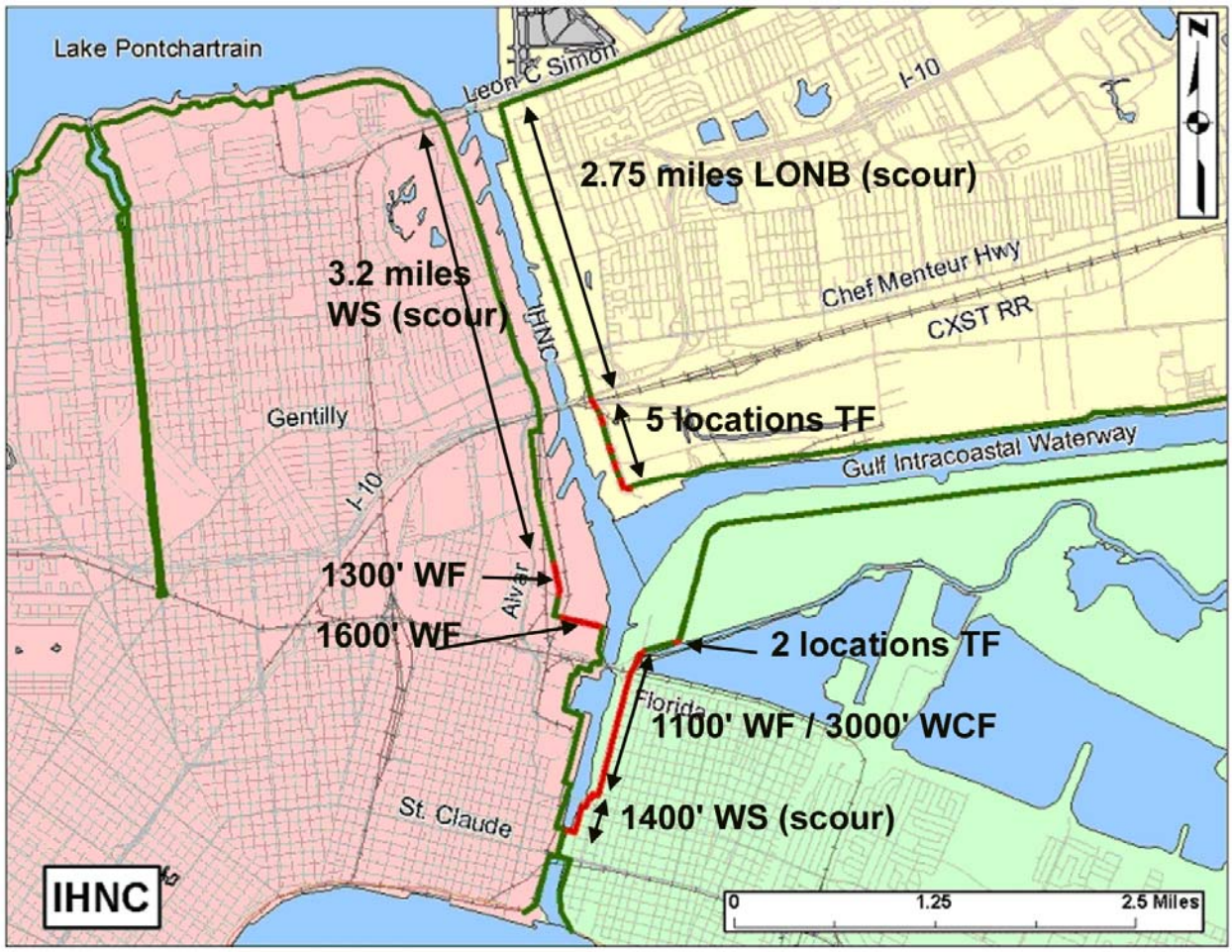

Figure IV-8. Damaged areas along the IHNC

Table IV-3 **Hurricane Protection System for IHNC Hurricane Protection System**	
12.3 miles	Levee and floodwall

St. Bernard Parish Basin. The St. Bernard Basin hurricane protection system includes the levee/floodwall extending from the Inner Harbor Navigation Channel (IHNC) easterly, along the Gulf Intracoastal Waterway (GIWW), to the Bayou Bienvenue Control Structure, continuing along the Mississippi River Gulf Outlet (MRGO) southeasterly, then turns generally to the west, where it ties into the Mississippi River Levee at Caernarvon, as shown on the map below. A portion of the hurricane protection system in this area also provides hurricane protection to the Lower 9th Ward area in Orleans Parish.

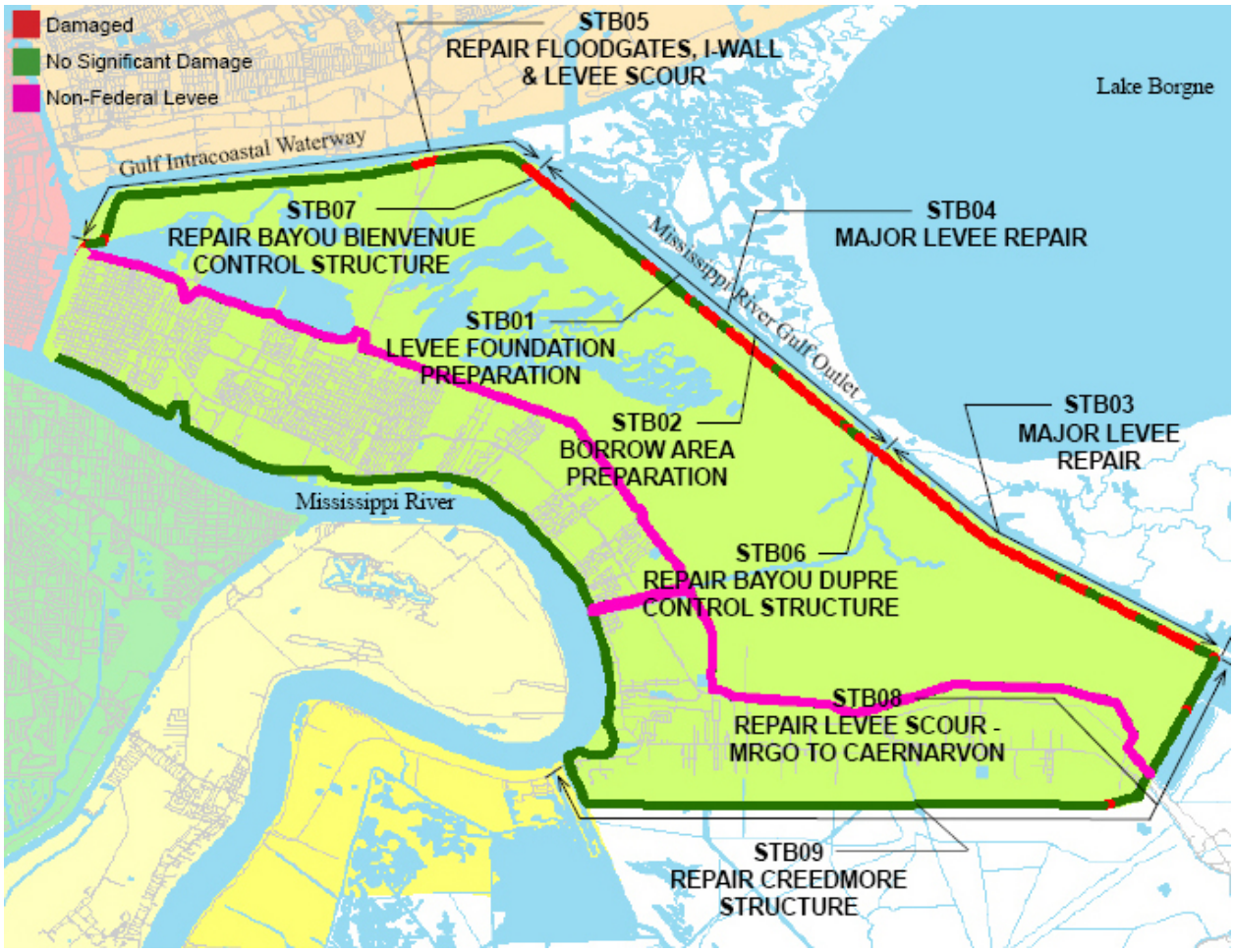

Figure IV-9. Hurricane Protection Project Features – St. Bernard

Table IV-4 **Summary of St. Bernard Basin Hurricane Protection Features**	
Levees and Floodwalls	157,800 ft
Road Closure Structures	6
Water Control Structures	2
Gravity Drainage Structure	1

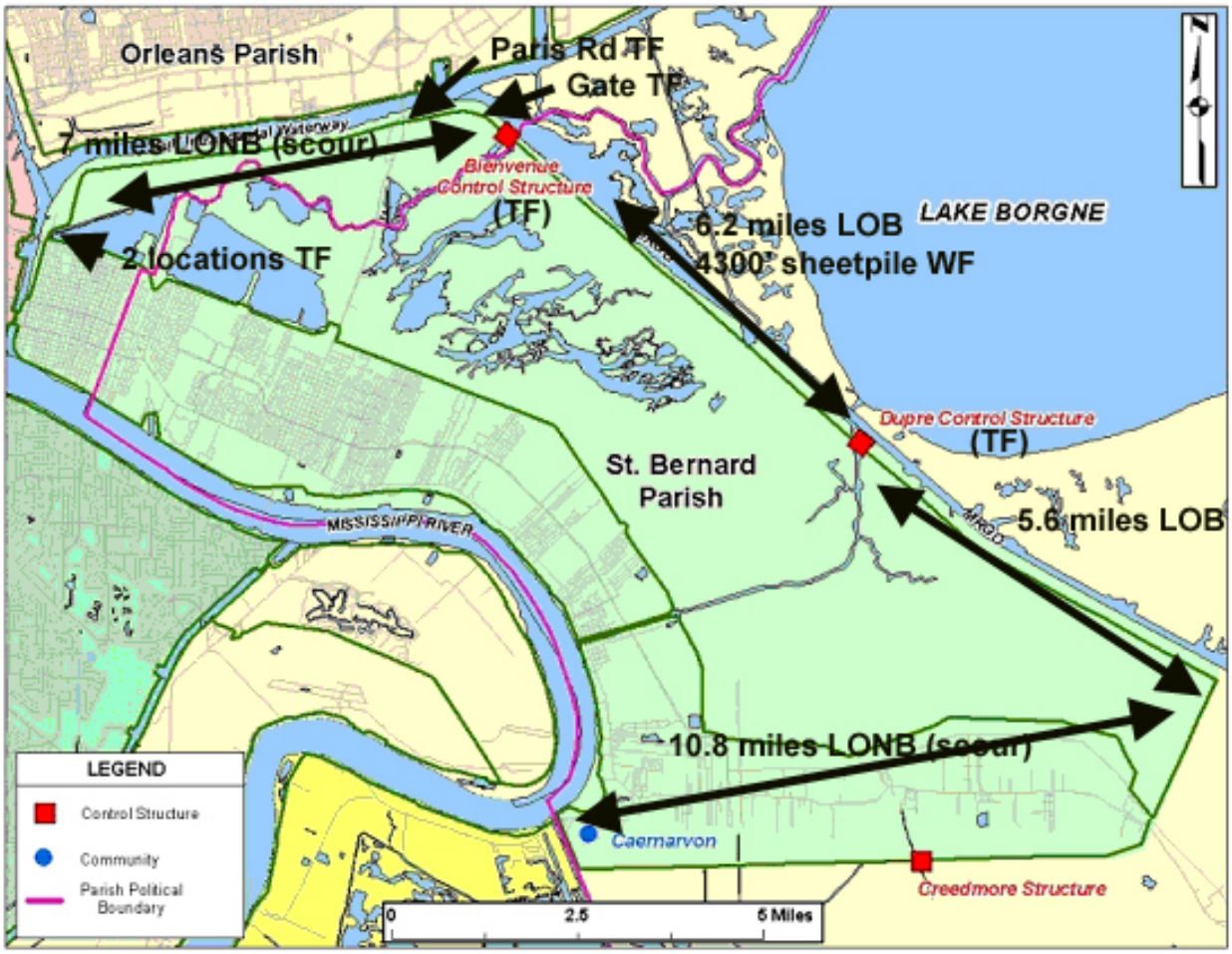

Figure IV-10.

Plaquemines Parish Basin. Altogether the Plaquemines Parish MRL and NOV systems include 162 miles of levee and 7 miles of floodwall. There are 19 non-federal pump stations for interior drainage. The levees are crossed by numerous pipelines, constructed in various manners. Some crossings bridge the levee without touching the embankment; some are constructed on top of the line of protection; and some pass through the line of protection with measures to prevent seepage. There is also a wicket gate closure on the back levee at Empire, where a shipping canal connects the Mississippi River to the Gulf of Mexico.

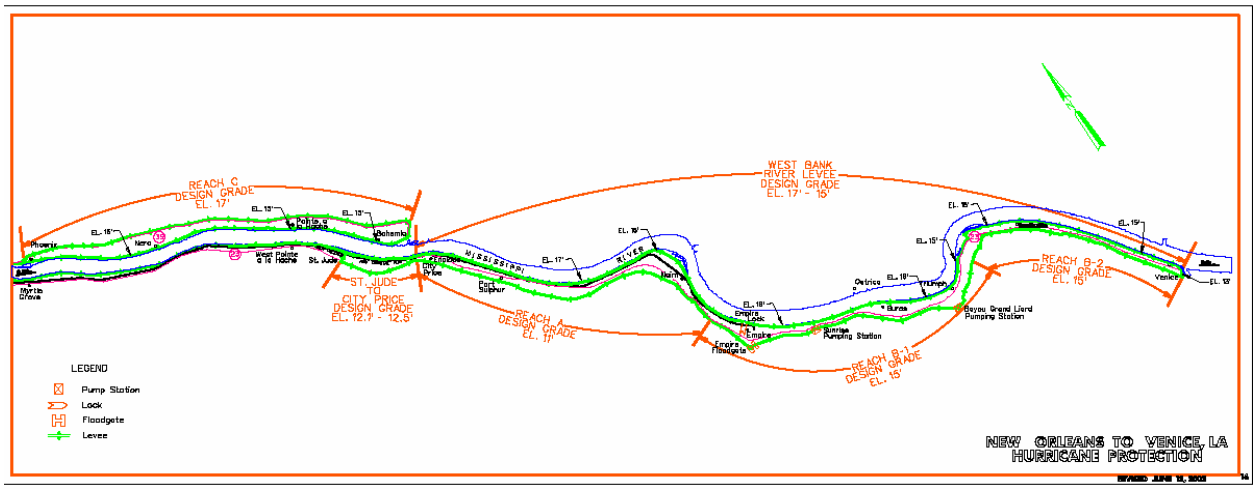

Figure IV-11. Hurricane Protection Project Features

Table IV-5 Summary Plaquemines Basin Hurricane Protection Features	
Mississippi River levee and floodwall	109 miles (34 miles part of NOV)
Floodwalls	6.4 miles
Hurricane Protection back levee	53 miles
Road Closure Structures	?
Numerous pipeline crossings	
Pump stations	19
Marine floodgate Empire	1

Design Criteria and Assumptions

Standard Project Hurricane

The Standard Project Hurricane (SPH) model is one of two approaches the Corps of Engineers (USACE) presently uses to model tropical storm wind fields. The second approach is Probable Maximum Hurricane (PMH). The first SPH was approved by USACE in a design study for Lake Okeechobee, Florida (U.S. Weather Bureau, Mar 1954).

Guidance on the selection of site-specific storm meteorological parameters was initially given in National Hurricane Research Project Report No. 33 (U.S. Weather Bureau, Nov 1959). The Weather Bureau and USACE jointly derived the specifications, criteria, procedures, and methods contained in this report. The goal of the guidance was to provide generalized hurricane specifications consistent geographically and meteorologically for use in establishing hurricane design criteria for hurricane protection works.

Report No. 33 defines the Standard Project Hurricane (SPH) as “the most severe storm that is considered reasonably characteristic of a region.” The SPH

index is based on an analysis of past hurricanes of record. Hurricane characteristics are correlated with intensity criterion, location, and other features.

The specifications for SPH were reviewed several times after 1959, and the Weather Bureau issued updates. After Hurricane Betsy in 1965, the Weather Bureau revised the wind field parameters, but did not change the other characteristics of the SPH (U.S. Weather Bureau, Aug 1965, Nov 1965, Feb 1966).

In 1979, a new report, NOAA Technical Report NWS 23, was published containing revised criteria for the SPH.

Probable Maximum Hurricane

The Probable Maximum Hurricane (PMH) is defined as a hypothetical steady state hurricane having a combination of values of meteorological parameters that will give the highest sustained wind speed that can probably occur at a specified coastal location.

The first PMH studies were requested by the Corps of Engineers for the Narragansett Bay and New Orleans regions. The central pressures were determined as a ratio to the central pressure for the SPH. The remaining factors for the PMH were essentially the same as for the SPH. An unpublished PMH study by the U.S. Weather Bureau in the 1960s generalized criteria for PMH along the East and Gulf coasts. The central pressure and peripheral pressure for the PHM differed from that of the SPH; values of the other parameters remained unchanged even though the list of hurricanes of record was updated.

Design Hurricane, Lake Pontchartrain, LA and Vicinity

SPH values for Lake Pontchartrain, Louisiana, and Vicinity, as presented in Lake Pontchartrain, Lousiana and Vicinity, Design Memorandum No. 1 Hydrology and Hydraulic Analysis, Parts I through IV, are shown in Table IV-6.

Table IV-6
SPH meteorological parameters

Central Pressure Index	27.6 inches
Radius to Maximum Winds	30 nautical miles
Forward Speed	Varied by location, 5, 6, or 11 knots
Calculated Wind Speed, V	100 miles per hour
SPH frequency	0.01 percent storm in Zone B

According to Design Memorandum No. 1, the standard project hurricane parameters were selected for the design hurricane due to the urban nature of the project area. The rationale presented is that a hurricane of a lesser intensity, which would indicate a lower levee grade and an increased frequency of occurrence, would expose the protected areas to “hazards to life and property that

would be disastrous in event of a standard project hurricane." The rationale for selection of the SPH as the design hurricane is being further investigated.

For the Lake Pontchartrain, LA, and Vicinity project, the hurricane surge height is defined as the elevation of the stillwater level at a given point resulting from hurricane surge action. It is the sum of tide, pressure setup, set up due to winds over the continental shelf, and buildup. Where appropriate, the wind tide level was used in lieu of the stillwater level.

The set up due to winds was computed using a general wind tide equation that is based on the steady state conception of water superelevation.

$$S = 1.165x10^{-3} \frac{V^2 F}{D} NZ \cos\theta$$

where

S = wind setup in feet
V = windspeed in statute miles per hour
F = fetch length in statute miles
D = average depth of fetch in feet
Θ = angle between direction of wind and the fetch
N = planform factor, generally equal to unity
Z = surge adjustment factor

For the portion of the project area outside Lake Pontchartrain, the project area was divided into ranges. Water surface elevations along a range were determined by summing the wind setup above the water elevation at the gulf end of a range. The low strip of marshland between Lake Borgne and the Gulf of Mexico was considered already submerged prior to the time of maximum elevation at shore. Initial elevation at the beginning of a range was determined from the predicted normal tide and the setup due to the difference between the central pressure and atmospheric pressure. An adjustment was made at the shoreward end of a range to compensate for the difference in pressure setup between both ends of the range.

This procedure was developed for an area along the Mississippi gulf coast where reliable data was available for several hurricanes to validate the methodology. Two historical storms, the September 1915 and September 1947 hurricanes, were used to establish and verify procedure. Isovel patterns, central pressure index, radius to maximum winds, forward speed, and maximum windspeed[1] parameters were available for these two storms.

The computed maximum surge height was compared to the observed high water marks from these storms. In order to reach agreement between computed maximum surge height and observed high water marks, a calibration coefficient or surge adjustment factor, Z, was introduced into the wind tide equation.

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[1] Windspeeds represent a 5 minute average 30 feet above ground level

The procedure was then applied to the Louisiana coast. In addition to the aforementioned hurricanes, a third hurricane, 1956, was used to verify the process. The surge adjustment factor was adjusted. Table IV-7 shows the surge computations and the comparison with observed high water marks from the three hurricanes.

Table IV-7
Verification of Hurricane Surge Heights

Location	Surge adjustment factor, Z	Sep 1915		Sep 1947		Sep 1956	
		Observed, ft MSL	Computed, ft MSL	Observed, ft MSL	Computed, ft MSL	Observed, ft MSL	Computed, ft MSL
Shell Beach	0.30	8.3	8.4	11.2	10.5	10.9	10.7
Violet	0.30	-	-	7.3	7.9	6.5	7.7
Michoud	0.30	11.0	11.4	-	-	-	-
Long Point	0.21	9.8	9.6	10.0	10.1	-	-

Table IV-8
Wave Runup and Design Elevations
Transition Zones Not Tabulated – Governing DM Is Listed

Location	DM	Average Depth of fetch, ft	Significant Wave Height Hs, ft	Wave Period, T, sec	Maximum Surge or Wind Tide Elevation, Ft	Runup Height Ft	Freeboard, Ft	Design Elevation Protective Structure, ft
Citrus back levee, west of Paris Road	Dm1, part 1, Aug 1966	-	-	-	13.0 MSL	-	1.0	14.0 MSL
Citrus back levee, east of Paris Road	DM2, Aug 1967	13.1	4.7	5.4	13.0 NGVD	5.0**	-	18.0 NGVD
New Orleans East back levee	DM1, Part 1, Aug 1966	13.1	4.7	5.4	13.0 MSL	4.5	-	17.5 MSL
Chalmette Loop IHNC to Paris Road	DM1, Part 1, Aug 1966	-	-	-	13.0 MSL	-	1.0	14.0 MSL
Chalmette Loop Paris Road to Bayou Lawler	DM1, Part 1, Aug 1966	16.3	7.0	6.4	13.0-12.5 MSL	4.7	-	17.5 MSL
Chalmette Loop Bayou Lawler to Violet	DM1, Part 1, Aug 1966	9.7	4.6	5.2	12.5-13.0 MSL	4.3	-	17.5 MSL
New Orleans East South Point to Highway 90	DM16, Sep 1987	-	-	-	11.5-12.2 NGVD	-	2.0	13.5-14.5 NGVD
Chalmette Extension MRGO	DM1, Part 4, Oct 1967	16.3	6.6	6.2	12.5 MSL	4.6	-	17.5 MSL
Chalmette Extension Verret	DM1, Part 4, Oct 1967	10.1	4.4	5.1	12.2 MSL	4.8	-	17.5-16.5 MSL

Table IV-8
Wave Runup and Design Elevations
Transition Zones Not Tabulated – Governing DM Is Listed

Location	DM	Average Depth of fetch, ft	Significant Wave Height Hs, ft	Wave Period, T, sec	Maximum Surge or Wind Tide Elevation, Ft	Runup Height Ft	Freeboard, Ft	Design Elevation Protective Structure, ft
Chalmette Extension, Toca	DM1, Part 4, Oct 1967	9.7	4.5	5.1	11.8 MSL	4.4	-	16.5 MSL
IHNC, Seabrook to Railroad	DM2 sup8, Feb 1968				11.4 – 12.9 MSL	0	1.0	13.0 – 14.0 MSL
IHNC, Railroad to Mississippi River	DM2 sup8, Feb 1968				12.9 – 13.0 MSL	0	1.0	14.0 MSL
New Orleans East Sta 1030+00 to GIWW	DM16, Sep 1987	13.1	4.7	5.4	13.1 NGVD	4.5	-	17.5 NGVD
New Orleans East Lakefront, Citrus to South Point	DM15, Apr 1985	24.4	7.8	7.3	11.5 NGVD	6.5-7.0	-	18.0-18.5 NGVD
Citrus Lakefront, 28+31 – 64+00*	DM14, Jul 1984	-	-	-	11.5 NGVD	-	3.0	14.5 NGVD
Citrus Lakefront, 64+00 to 331+5	DM14, Jul 1984	24.4	7.8	7.3	11.5 NGVD	3.0**	-	14.5 NGVD
Orleans Parish Lakefront Levee	DM13, Nov 1984	4.6 - 24.4	1.33 – 7.8	7.3	11.5 – 12.9 NGVD	3.5 – 8.5		17.5 – 20.0 NGVD
Orleans Parish Lakefront Seabrook Floodwall	DM13, Nov 1984	NA	4.1	7.3	11.5 NGVD	3.0	-	15.0 NGVD
Jefferson, St Charles Parish Return Levee	DM17A, Jul 1987				10.5-11.5 NGVD		3.0	13.5-14.5 NGVD
Jefferson Parish Lakefront	DM17, Nov 1987	24.6	7.9	7.2	11.5 NGVD	-	-	16.0 NGVD
Orleans Marina Floodwall and New Basin Canal Gate	DM22, Apr 1993	-	-	-	11.5 NGVD	-	2.0	13.5 NGVD
Bayou St John Closure	DM22, Apr 1993	-	7.8	7.3	11.5 NGVD	6.5	-	18.5 NGVD
Bayou St John Structure	DM22, Apr 1993	-	2.1	7.3	11.5 NGVD	5.0	-	16.5 NGVD
Pontchartrain Beach Levee and Floodwall	DM22, Apr 1993	-	6.1	7.3	11.5 NGVD	8.5	-	20.0 NGVD
Lincoln Beach and New Orleans Airport Floodwalls	DM22, Apr 1993	-	-	-	11.5 NGVD	-	2.0	13.5 NGVD

Table IV-8
Wave Runup and Design Elevations
Transition Zones Not Tabulated – Governing DM Is Listed

Location	DM	Average Depth of fetch, ft	Significant Wave Height Hs, ft	Wave Period, T, sec	Maximum Surge or Wind Tide Elevation, Ft	Runup Height Ft	Freeboard, Ft	Design Elevation Protective Structure, ft
St Charles, Citrus, and Jahncke PS Floodwalls	DM22, Apr 1993	-	-	-	11.5 NGVD	-	3.0	14.5 NGVD****
London Ave Outfall Canal	DM19a, Jan 1989	-	-	-	11.5 NGVD at Lake Pontchartrain	-	2.0	13.5 – 19.1 NGVD1
Orleans Ave Outfall Canal	DM19, Aug 1988				11.5 NGVD at Lake Pontchartrain		2.0	13.5 – 14.4 NGVD
17th St Outfall Canal	DM20, Mar 1990	-	-	-	11.5 NGVD at Lake Pontchartrain	-	2.0	14.0 – 16.0 NGVD

* at New Orleans Lakefront Airport, assume no waves
* includes 0.5 ft for change in levee footprint
**foreshore protection reduces wave runup
**** Existing floodwalls did not have 3 ft freeboard, but recommendation was not to raise them until elevation < 13 ft NGVD
1 Height of floodwall depends on flood proofing and pumping capacity
2 Waves determined with breakwater with crest elevation of 5.6 NGVD

Computed surge heights for Hurricane Betsy using the same Z factors averaged about 2.2 feet higher than observed surge heights. This was attributed to the effect of the high forward speed of Hurricane Betsy. A fast moving hurricane does not allow enough time for the surge heights to approach the steady state of water superelevation. The DM stated that the Z factors derived from the slow moving hurricanes should be used for design purposes.

In portions of the project area, such as along the GIWW and IHNC, the maximum surge height plus one foot of freeboard was used as the protective structures design elevation. It was believed that structures in these areas were not exposed to wave runup.

In some areas, wave runup on a protective structure was considered. Wave runup was considered to be the ultimate height to which water in a wave ascends on the slope of a structure. The condition occurs when the surge height is at a maximum. For the Lake Pontchartrain, LA and Vicinity project, the wave runup was calculated by the interpolation of model study data developed by Saville, which relates relative runup, wave steepness, relative depth, and structure slope.

The design elevation chosen for protective structures exposed to wave runup was an elevation sufficient to prevent all overtopping from the significant wave and waves smaller than the significant wave. Waves larger than the significant wave would overtop the protective structures; 14 percent of the waves are higher than the significant wave, and the maximum wave height is about 1.87 times higher than the significant wave. However, such overtopping was not considered a danger to the security of the structures or would not cause material interior

flooding. In cases of levees with berms, runup was computed for waves breaking on each berm to determine the required levee elevation.

Wave data, runup elevations, and required elevations of protective structures for St. Bernard protection structures are shown in Table IV-8. All calculations were made using the MSL datum.

Chalmette Extension. Maximum wind tide levels were computed using the same equation; surge reduction factors were developed. Consideration was next given to the limit of overland surge penetration, which is dependent on the height of the surge and the duration of high stages at the coast. A study of available observed high water marks at the coastline and inland was made. A consistent, simple relation between the maximum surge height and the distance inland from the coast was developed. The relationship appeared to be independent of forward speed, windspeed, or direction. The data indicated that the weighted mean decrease in surge height inland is at a rate of 1 ft per 2.75 miles. The location of maximum surge height was determined. The computed wind tide elevation at this location was reduced at the rate of 1 ft per 2.75 miles to the levee location. Table IV-9 shows the maximum surge heights and surge reduction factors for the Chalmette Extension.

Table IV-9
Surge Reduction Factors

Location	Surge Reduction Factor, Z	Wind Tide elevation, surge reference line, FT MSL	Wind Tide elevation, levee location, FT MSL
MRGO	0.30	12.5	12.5
Verret	0.48	15.1	12.2
Toca	0.52	15.8	11.8

Wave runup was computed using the same methodology as the Chalmette Loop. Wave data, runup elevations, and required elevations of protective structures are shown in Table IV-8. All calculations were made using the MSL datum.

Citrus Back Levee. The methodology used for the Chalmette Loop was used for the Citrus back levee for the computation of surge and wave runup. Along the GIWW west of Paris Road, it was assumed the structures in this area would not be exposed to wave runup; the maximum surge height plus one foot of freeboard was used as the protective structures design elevation. East of Paris Road, wave runup was incorporated into the design elevation. An additional 0.5 ft was added to the design elevation for the area east of Paris Road because of the adoption, based on soil studies and comparative cost estimates, of a levee cross section configuration different than used for the Chalmette Loop. Wave data, runup elevations, and required elevations of protective structures are shown in Table IV-8. All calculations were made using the MSL datum.

Lake Pontchartrain Lakefront. The Lake Pontchartrain Lakefront consists of New Orleans East, Citrus, New Orleans and Jefferson Parish protection systems. For these protection systems, the still water level and protective structure heights in DM1 assumed the barrier plan was in place. When the

decision was made to eliminate the barrier plan, the design heights were recomputed.

In Lake Pontchartrain, the still water level is the sum of the surge, tide, and runoff from rainfall. A method was developed to compute the water level associated with each factor and validated using the 1947 hurricane and Hurricane Esther (1957). The method used to compute the water level from surge started with a surge hydrograph at Long Point in Lake Borgne developed using a method developed by R.O. Reid, modified so that the peak of the hydrograph coincided with the maximum surge elevation computed using the general wind tide equation in DM1. The resulting hydrograph did not compare well with data from the two storms because of offshore wind directions prevailing after the peak stage; the recession side of the hydrograph was estimated to achieve a more comparable hydrograph.

Head versus flow rating tables, using reverse routings of observed storms, were developed for the three passes and one canal to route flow from Lake Borgne into Lake Pontchartrain. Runoff from rainfall associated with the storms was calculated using methods from NWS documents. It was assumed that moderate rainfall would be coincident with the storm. Mean normal tide was assumed to occur at the time of the storm. Lake Pontchartrain stage storage curves were developed and storage from included adjacent wetland areas. Adjustments were made in the routing procedure to account for overtopping shore protective structures.

The resultant hydrographs for the SPH are shown in Figure IV-12.

During hurricanes, strong winds blow over Lake Pontchartrain, driving large quantities of water toward the leeward shore. It is necessary to compute the wind tide level for the lake. The lake was divided into parallel segmental regions and setup and setdown were computed within these regions from the windward shoreline to the leeward shoreline using the average windspeeds from the isovel patterns and depths from hyrographic charts. Wind setup was computed using the following equation

$$\Delta S_i = d_t \left[\sqrt{\frac{2kU^2 \Delta x}{g(d_T)^2} + 1} - 1 \right]$$

$$d_T = d_{i\,i=1}^{\,i=M-1+\sum \Delta S_i}$$

$$S = \sum_{i=1}^{i=M} \Delta S$$

where

S = setup or setdown, in feet measured above or below the mean water level of the surge of the lake

Dt = average depth of fetch, in feet below mean water level
U = windspeed in miles per hour over fetch
F = fetch length in miles
N = planform factor, generally equal to unity

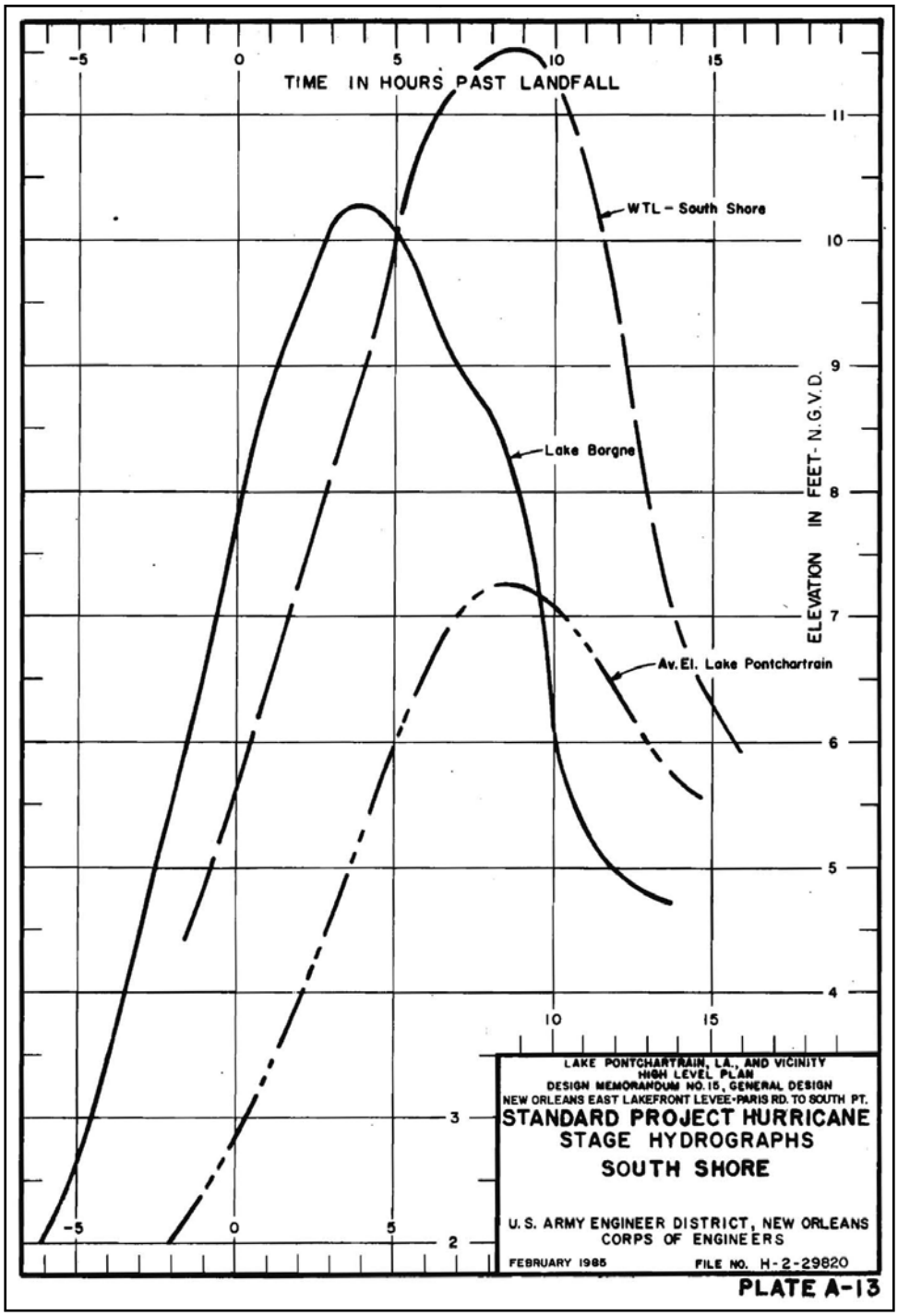

Figure IV-12.

Water surface contours were developed for the lake; tilt and wind tide levels were determined from the contours. Computed stages from the 1915 hurricane compared favorably with observed high water marks.

For the early DMs, wave heights and periods were developed using CERC Technical Report 4. Wave runup was calculated by the interpolation of model study data developed by Saville, which relates relative runup, wave steepness, relative depth, and structure slope. In the second endorsement to DM14, an evaluation was made of the runup height using the methodology contained in the Shore Protection Manual (SPM), 1977, and the SPM 1984. The computed runup varied from 2.7, for the method contained in SPM 1977, to 3.3, for the method contained in SPM 1984. It was concluded that the modest difference in wave runup from the value computed using the method in Technical Report 4 was not significant, and consistency in design was recommended.

For Jefferson Parish lakefront, the wave heights were developed based on waves breaking on the berms.

Wave data, runup elevations, and required elevations of protective structures are shown in Table IV-8. All calculations were made using the NGVD datum; it was assumed that MSL and NGVD datums were the same.

Jefferson-St Charles Parish Return Levee. For the Jefferson- St Charles Parish return levee, the method to compute wind tide elevation used for the lakefront levees was used. During the time of maximum wind tide, the winds are parallel or leeward to the levee; therefore, wave runup is not a factor. Three feet of freeboard was added to the maximum wind tide elevation. Design elevations are shown on Table IV-8. All calculations were made using the NGVD datum; it was assumed that MSL and NGVD datums were the same.

London Ave Outfall Canal. Backwater calculations were performed with a starting water surface elevation of 11.5 NGVD and varying outflow from Pump Station 3 and Pump Station 4. Several backwater calculations were made to represent conditions with bridges as of 1987, all bridges raised, two bridges floodproofed, and all bridges floodproofed. The computed water surface elevation at Pump Station 3 varied from 11.85 NGVD to 17.10 NGVD. The lowest elevation, 11.85 ft NGVD, represented all bridged floodproofed with a pump capacity of 3,475 cfs. This pump capacity was determined from information provided in the January 1986 report, “Hydraulic Study of London Ave Outfall Canal.” Pump Station 3, with a capacity of 4,300 cfs, was assumed to be ineffective. Pump Station 4, with a capacity of 3,980 cfs, was assumed to have an operational capacity of 2,475 cfs. The plan by the Sewage and Water Board to add 1,000 cfs capacity to Pump Station 4 was included in this analysis.

The highest elevation, 17.10 ft NGVD, assumed that all bridges were floodproofed, the pumping capacity of Pump Station 3 and 4 was 8,280 cfs, and 1,000 cfs would be added to Pump Station 4 in the future.

Design elevations, from backwater calculations, with 2.0 feet of freeboard, are shown on Table IV-8. All calculations were made using the NGVD datum; it was assumed that MSL and NGVD datums were the same.

Orleans Ave Outfall Canal. Backwater calculations were performed with a starting Lake Pontchartrain water surface elevation of 11.5 NGVD and varying outflow from the pumping station that put water into the canal. Several backwater calculations were made to represent conditions with bridges as of 1984, all bridges raised, and various combinations of floodproofing. The computed water surface elevation at Pumping Station 7 varied from 11.71 NGVD to 12.40 NGVD. The lowest elevation, 11.71 ft NGVD, represented all bridged raised with a pump capacity of 3,250 cfs. The highest elevation, 12.40 ft NGVD, assumed bridges floodproofed and a pump capacity of 4,450 cfs.

Design elevations, from backwater calculations, with 2.0 feet of freeboard, are shown on Table IV-8. All calculations were made using the NGVD datum; it was assumed that MSL and NGVD datums were the same.

17th Street Outfall Canal. Backwater calculations were performed with a starting Lake Pontchartrain water surface elevation of 11.5 NGVD and varying outflow from the pumping stations that put water into the canal. Several backwater calculations were made to represent conditions with bridges as of 1990, all bridges raised, and various combinations of raising, flood proofing, or existing conditions. The computed water surface elevation at the railroad bridge varied from 11.71 NGVD to 13.92 NGVD. The lowest elevation, 11.71 ft NGVD, represented all bridged raised with a pump capacity of 6,650 cfs. The highest elevation, 13.92 ft NGVD, assumed existing bridges and a pump capacity of 9,630 cfs.

Design elevations, from backwater calculations, with 2.0 feet of freeboard, are shown on Table IV-8. All calculations were made using the NGVD datum; it was assumed that MSL and NGVD datums were the same.

17th Street Design History

The chronology of the hurricane protection system features at the 17th Street Canal was prepared to meet the following objectives:

- To prepare a chronologic history comprehensive in nature to ensure the IPET is aware of all activities prior to Katrina that have value in accomplishing the IPET scope of work;

- To produce a report that includes descriptions of the various types of activities of value to the IPET and listings of documents that provide pertinent information.

The chronology serves, more or less, as an annotated bibliography of the most critical documents of the thousands of documents made available to the research team. The chronology is arranged with the most recent entries listed

first. An analysis of the paper trail reveals that four events serve as major turning points in the evolution of the project:

- The Report of the Chief of Engineers, dated March 4, 1964, recommends the barrier plan that serves as the basis for the feasibility report on the hurricane protection project and the subsequent project authorization in the 1965 Flood Control Act.

- The U.S. District Court Injunction of December 1977 (modified March 1978) enjoins the Corps from constructing the barrier complexes.

- The Reevaluation Study, dated July 1984, which serves as the basis for the feasibility report of the hurricane protection plan and becomes the vehicle for authorization of the high-level plan.

- General Design Memorandum No. 20, 17th Street Outfall Canal, dated March 1990, which examines two alternative plans for providing high-level protection: fronting protection (butterfly gates at canal entrances) and parallel protection (floodwalls and flood proofing of bridges).

The chronology is arranged with the most recent entries listed first. The parenthetical information following each entry represents one of the four locations from which the documents were obtained: (1) the IPET public website, (2) the New Orleans District ProjectWise Server, (with control numbers A followed by 7-digit number), (3) the New Orleans District geotechnical map files, and (4) compact disks prepared in response to the U.S. Senate Committee on Homeland Security and Governmental Affairs.

- *Agenda, Contract 02-C-0016, 17th St. Outfall Canal, Metairie Relief, Hammond Hwy. Complex Progress Meeting*, dated **May 18, 2005**. The purpose of this meeting was to review job progress (89% complete through April 30, 2005) of completed phases of work, current work underway, and scheduled work. The purpose of the meeting was also to review outstanding submittals, modifications, and corrective actions. (A0000150)

- *Agenda, Contract 02-C-0016, 17th St. Outfall Canal, Metairie Relief, Hammond Hwy. Complex Progress Meeting*, dated **April 20, 2005**. The purpose of this meeting was to review job progress (87% complete through March 31, 2005) of completed phases of work, current work underway, and scheduled work. The purpose of the meeting was also to review outstanding submittals, modifications, and corrective actions. (A0000160)

- *Agenda, Contract 02-C-0016, 17th St. Outfall Canal, Metairie Relief, Hammond Hwy. Complex Progress Meeting*, dated **March 16, 2005**. The purpose of this meeting was to review job progress (86% complete through March 1, 2005) of completed phases of work, current work underway, and scheduled work. The purpose of the meeting was also to review outstanding submittals, modifications, and corrective actions. (A0000159)

- *Annual Inspection of Completed Works Program, 2004 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District.* Memorandum dated **December 20, 2004**. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected October

15, 2004 and received an ACCEPTABLE rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Data pertaining to the Louisiana Hurricane Protection Study*, dated **March/April 2004**. The documents posit several proposed feasibility study alternatives to upgrade the hurricane protection project to accommodate a Category 4 or Category 5 storm. Alternatives include among others: raising all existing levees and building structures at outfall canal entrances; raising existing levees, with the exception of those along the IHNC and GIWW and placing a structure at the confluence of the GIWW and MRGO and a second structure at Seabrook; and structures at the Chef and Rigolets passes. (A0002025, A0002027, A0002028, A0002029, A0002030)

- *Annual Inspection of Completed Works Program, 2003 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **2003**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected September 19, 2003, and were assigned an ACCEPTABLE rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected June 4, 2003 and received an ACCEPTABLE rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Transmittal No. 56*, dated **June 12, 2002**. Document indicates that ED-FS has reviewed the H-pile compression load test at Hammond Highway at the 17th Street Canal. The H-pile test pile was driven to elevation -78.5, or 2.5 feet deeper than the tip elevation of -76.0 shown on the plans. ED-FS recommends a pile tip elevation of -76.0 which will result in a F.S.> than 2.0. (A0000152)

- *Annual Inspection of Completed Works Program, 2002 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **2002**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected November 22, 2002. They were found to be "exceptionally well maintained," and were assigned an ACCEPTABLE rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 31, 2002 and received an ACCEPTABLE rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Drawings, Test Pile Frame, 17th Street Outfall Canal, Hammond Highway Complex*, dated **April 10, 2002.** (MVN Geotech Map Files)

- *Annual Inspection of Completed Works Program, 2001 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **2001**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 12, 2001. They were found to be "exceptionally well maintained," and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 18, 2001 and received an OUTSTANDING rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Annual Inspection of Completed Works Program, 2000 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 12, 2000**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected

October 13, 2000. They were found to be "exceptionally well maintained," and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected June 2, 2000 and received an OUTSTANDING rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Correspondence regarding directional boring under the Inner Harbor Canal, London Canal, and the 17th Street Canal*, dated **May 2000**. This is a series of correspondence between the Corps of Engineers, the Gilbert Southern Corporation, and Bay Equipment Company concerning the guidelines and safety factors of the referenced subject material. File contains drawings depicting the fiber optic cable route at the outfall canals. (A0001813) Supporting information can also be found in A0003693 and A0003694.

- *Annual Inspection of Completed Works Program, 1999 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 16, 1999**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 8, 1999. They were found to be "exceptionally well maintained," and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 21, 1999 and received an OUTSTANDING rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Annual Inspection of Completed Works Program, 1998 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 15, 1998**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 9, 1998. They were found to be "exceptionally well maintained," and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 29, 1998 and received an OUTSTANDING rating. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Correspondence regarding Sediment Sampling, Lake Pontchartrain and Vicinity, Hurricane Protection Plan, (HLP), Fronting Protection for Pumping Station Nos. 3, 4, 6, and 7 at London, 17th Street, and Orleans Avenue Outfall Canals*, dated **1998**. This file contains a series of correspondence relating to the subject matter and includes maps and drawings of sediment sample locations. (A001811)

- *Lake Pontchartrain, LA, and Vicinity Hurricane Protection, High Level Plan, Orleans Parish – Jefferson Parish, Fronting Protection for Pumping Station No. 6 at the 17th Street Outfall Canal*. Construction drawings, DACW-29-99-C-0018, (98-B-0012) dated **1997**. (IPET)

- *Plans for Lake Pontchartrain, Louisiana and Vicinity, Hurricane Protection, High Level Plan, Orleans Parish – Jefferson Parish, Fronting Protection for Pumping Station No. 6 at 17th Street Outfall Canal*, plan drawings dated **1997.** File also contains supporting documentation for contract DACW29-99-0018. (Senate CD 15, 15 Nov 05, disk 1 of 2)

- *General Surveys, 17th Street Canal*, **1997**. This collection of documents contains survey data, field survey books and cross-section computations spanning the years 1979 through 1997. Sheets include: canal cross sections; cross

section data by Walker and Avery, Inc. (119 sheets); field notes and traverse computations by ED-SS; and field notes by Modjeski and Masters. (A0001001)

- *Annual Inspection of Completed Works Program, 1997 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 24, 1997**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected September 19, 1997, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 29, 1997 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Supplemental Agreement between the United States of America, the Orleans Levee District, the East Jefferson Levee District, and the Sewerage and Water Board of New Orleans*. Signed agreement dated **February 18, 1997**. (Senate CD 16 – 24 Oct 05)

- *Orleans Marina Permit* dated **January 13, 1997**. This is a series of correspondence regarding a request from the Sewerage and Water Board for a permit to jack pipe under the levee and storage monolith at the Orleans Marina. (A0001822)

- *Annual Inspection of Completed Works Program, 1996 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 13, 1996**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected September 20, 1996, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May 31, 1996 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Design Memorandum No. 20, General Design Supplement No. 1, Orleans Parish/Jefferson Parish, 17th Street Outfall Canal, Lake Pontchartrain, LA, and Vicinity Hurricane Protection Project, High Level Plan,* **January 15, 1996**. This supplement posits a historical, design, and engineering analysis for improvements to the fronting protection at pumping station no. 6, in an effort to propose improvements that will allow the station to meet design heights for the standard project hurricane. Document includes analysis of hydrology, hydraulics, geology, foundation investigations, and design. (IPET)

- *Annual Inspection of Completed Works Program, 1995 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 12, 1995**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected September 22, 1995, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May, 1995 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Lake* Pontchartrain*, LA, and Vicinity Hurricane Protection, High Level Plan, 17th Street Outfall Canal, Orleans Parish – Jefferson Parish, Veterans BLVD Bridges*. As built drawings, DACW-29-C-0093, (95-B-0095) dated **June 1995**. (IPET, Senate CD 13 – 15 Nov 05)

- *17th St. Outfall Canal, History of Surveys Used for Constructing Floodwalls and Canal Dredging*, dated **February 8, 1995**. This document analyses the surveys and concludes that the floodwalls on both sides of the canal were constructed approximately 5.5 inches lower than the elevations indicated on the plans and specifications. Also, the I-walls were supposed to have been constructed with 6 inches of allowable settlement; instead they were constructed with only an 0.5-inch overbuild. (A0001034)

- *17th Street Canal, East Side, Pittman Construction (DCAW29-93-C-0081), Concrete Compression Test Specimen Data*, dated **1995**. This collection contains 180-pages of test specimen data sheets ranging in dates from 1993 through 1995. (A0001112)

- *Annual Inspection of Completed Works Program, 1994 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 19, 1994**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 4, 1994, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected June, 1994 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Memorandum for File by Charlie Rome (CELMN-ED-G*), dated **November 21, 1994**, regarding 17th Street Canal Floodwall, Orleans Parish, Vets to Lake, Field Trip Report. This document is an account of the trip on November 8, 1994, to evaluate the extent of damage to an unidentified monolith after the contractor had removed defective concrete. The inspectors indicate that the monolith could be repaired by patching, and make several recommendations on how to complete the repairs. Photos of the defective monolith accompany the trip report. (A0001318)

- *Annual Inspection of Completed Works Program, 1993 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 22, 1993**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 22, 1993, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May, 1993 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *17th Street Canal Floodwall, Pittman Construction, (DCAW29-93-C-0081), Expansion Joint Filler Submittal*, dated **August 4, 1993**. In the supporting documentation, dated August 10, 1993 and contained within, the New Orleans District offers no objection to the recommended expansion joint filler provided that it meets all requirements of ASTM D 1752-84, including the .25-inch maximum for Extrusion. The document notes that the Recovery, reported as Compression Set, needs to be determined after 10 minutes or if the initial test fails, 1 hour and not the 24 hours reported. Documents also recommend that it be verified that the compression test results are in psi. (A0001075)

- *17th Street Canal Floodwall, Pittman Construction, (DCAW29-93-C-0081), Expansion Joint Filler Submittal*, dated **August 4, 1993**. The supporting

documentation includes a letter from Louisiana Industries to Pittman Construction, dated July 13, 1993, concerning the 17th St. Canal (DACW2993B0025). The letter certifies that the mix design will meet or exceed the indicated design strength at a designated age when tested in accordance with the applicable ASTM Standards. (A0001073)

- *Contract Award Information, Contract No. DACW29-93-C-0081*. Contract, dated **June 28, 1993**, for the Lake Pontchartrain, LA and Vicinity, Hurricane Protection Project, High Level Plan, 17th Street Outfall Canal, Flood Protection Improvement Project, Capping of Floodwall, East Side Improvements, Orleans Parish, LA, is awarded to Pittman Construction. Supporting contract documentation includes the court decision that settled the dispute between Pittman Construction and the Corps. The court decision posits a narrative history of the dispute. (Senate CD 15 – 15 Nov 05, disk 2 of 2)

- *Annual Inspection of Completed Works Program, 1992 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 14, 1992**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected September 24, 1992, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were inspected May, 1992 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Lake Pontchartrain, LA, and Vicinity Hurricane Protection, High Level Plan, 17th Street Canal, Excavation and Floodwall Protection, Capping of Floodwalls*. Construction drawings, including supplemental drawing from Modeski and Masters dated **November 1992**. (IPET, Senate CD 13 – 24 Oct 05)

- *Excavation and Flood Protection – 17th Street Canal, Capping of Floodwalls, East Side Levee Improvements*. As-built drawings (DACW29-93-0025) dated November 1992. (Senate CD 13 – 15 Nov 05)

- *17th Street Canal, West Side Levee Improvements* (Contract 92-1). Construction drawings from the Board of Levee Commissioners of the East Jefferson Levee District dated **March 1992**. Includes cross-section of levee and floodwall improvements and dredging cross-sections. (IPET)

- *Letter from the Sewerage and Water Board of New Orleans to Ron Ventola, Chief of Regulatory Function, New Orleans District*, dated **May 28, 1992**, regarding Permit No. LMNOD (17th Street Canal) 2, dated June 13, 1984. The intent of this letter is to seek an extension to the dredging permit issued by the Corps in 1984, but it also serves as a basic history of the three-phase dredging process carried out by the Sewerage and Water Board in the 17th Street Canal between June 1984 and May 1992. (CEMVN-OD)

- *Annual Inspection of Completed Works Program, 1991 Annual Inspection for Maintenance of Completed MR&T Flood Control Works in the New Orleans District*. Memorandum dated **December 10, 1991**. The hurricane protection levees and floodwalls within the East Jefferson Levee District were inspected October 29, 1991, and were assigned an OUTSTANDING rating. The hurricane protection levees and floodwalls within the Orleans Levee District were

inspected June, 1991 and received an OUTSTANDING rating. (Senate CD 09 Dec 05)

- *Permit Review Sheet: 17th St. Canal 2, Req. by Boh Bros. to deposit dredged material from SW&B project to dredge 17th St. Canal*, dated **August 31, 1990**. This is a series of correspondence regarding the request by Boh Bros. to deposit the dredge material at the Bucktown Marina site. The New Orleans district offers no objections to the request provided that the material is not placed in the areas of new levee section, including any berms. (A0000110)

- *Lake Pontchartrain, LA, and Vicinity, Lake Pontchartrain High Level Plan, Design Memorandum No. 20, General Design, 17th Street Outfall Canal,* **March 1990.** The DM examines two alternative plans for providing "high level" standard project hurricane protection: fronting protection (butterfly gates at canal entrances) and parallel protection (floodwalls and flood proofing of bridges), with the parallel protection plan representing the recommended plan. DM includes discussion of the project plan, hydrology, hydraulics, geology, foundation investigation and design, and structural designs, and is complete with plates and diagrams. Includes pre-construction plan drawings. (IPET, Senate CD 13 – 24 Oct 05)

- *Excavation and Flood Protection – 17th Street Canal, Phase IB, Hammond Highway* to *Southern Railway* (Contract 2043-0489). As built drawings (DACW-29-93-B-0025) from the Board of Levee Commissioners of the Orleans Levee District dated **February 7, 1990**. (IPET)

- *Letter from Frederick M. Chatry, Chief, Engineering Division, New Orleans District, to Modjeski and Masters, Consulting Engineers*, dated **October 20, 1989**, concerning the 17th Street Canal Parallel Flood Protection, Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. In this letter, the Corps posits two additional revisions to the final plans and specifications submitted by Modjeski and Masters on October, 10, 1989 reducing the requirement for each layer to be compacted to a least 90 percent of the maximum dry density of optimum water content, rather than the proposed 95 percent (ASTM D698); and a revision in the sheet pile tip elevations to a higher elevation as imposed by LMVD, which will result in lower overall cost for the project. Letter indicates that once these revisions are incorporated into the plans and specifications, the Corps will have no objection to Modjeski and Masters proceeding with the proposed work. (A0000100)

- *Letter from Modjeski and Masters, Consulting Engineers, to Frederick M. Chatry, Chief, Engineering Division*, *New Orleans District*, dated **October 10, 1989**, concerning the 17th Street Canal Parallel Flood Protection, Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. This letter posits the changes to the plans and specifications made in response to Corps letter of August 22, 1989, with a detailed description of the embankment construction process to address specific concerns toward the maximum density of the embankment material**.** (A0000099)

- *-Excavation and Flood Protection, 17th Street Canal, Phase 1B, Hammond Highway to Southern Railway*. "Preliminary" specifications for contract 2043-____, dated **October 10, 1989**, by the Board of Commissioners of

the Orleans Levee District. Document includes preliminary specifications for general specifications, demolition, dredging and levee construction, and steel sheet piling. (A0000095)

- *-Letter from Frederick M. Chatry, Chief, Engineering Division, New Orleans District, to Modjeski and Masters, Consulting Engineers*, dated **August 22, 1989**, concerning the 17th Street Canal Parallel Flood Protection , Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. In this letter, the Corps indicates that it has reviewed plans, specifications, and design calculations submitted by Modjeski and Masters on July 10, 1989, and posits four primary revisions to include: degrading the existing levee crown elevation at station 570+00 to elevation 5.5 as shown in the design analyses; correcting the new I-wall B/L offset at station 657+00 to 200 feet; and answering specific questions pertaining to the maximum density of the embankment material. Letter also acknowledges Corps concurrence to a request to delete the riprap specified for the east side levee between Hammond Highway bridge and station 615+00. (A0000088). See, also memorandum from Rodney P. Picciola, Chief, Foundations and Materials Branch, dated July 28, 1989. (A0000089)

- *Memorandum from Fred H. Bayley III, Chief, Engineering Division, Lower Mississippi Valley Division, to the Commander, New Orleans District, Regarding Sheet Pile Wall Design Criteria*, dated **July 24, 1989**. This memorandum summarizes the guidance for determining sheet pile wall penetrations, deflections, and other topics, and it references the sources detailing new I-wall design criteria for determining the penetration of sheet pile floodwalls founded in soft clays; estimating sheet pile deflections and design of I-walls to withstand these deflections; and sheet pile finite element-based design procedures for sheet pile walls**.** (A0000097, A0000101)

- *Letter from Modjeski and Masters, Consulting Engineers, to Frederick M. Chatry, Chief, Engineering Division*, *New Orleans District*, dated **July 10, 1989**, concerning the 17th Street Canal Parallel Flood Protection, Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. This letter contains plans and design calculations submitted Modjeski and Masters, Consulting Engineers. The document posits revised slope stability and sheet pile design calculations that address comments made by the Corps by letter of April 25, 1989. A brief description of the revisions made to the cross-sections is given for each of the eight reaches. Also given for each of the reaches is a listing of new submittals, stating which comments from the Corps were addressed. (A0000090, A0000091, A0000092)

- *17th Street Canal Drawings*, dated **June 16, 1989**. Drawings depicting shear soil strength, stability, and sheet pile analyses for reaches 1 through 8. (A0000094)

- *Letter from Frederick M. Chatry, Chief, Engineering Division, New Orleans District, to Modjeski and Masters, Consulting Engineers*, dated **April 25, 1989**, concerning the 17th Street Canal Parallel Flood Protection , Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. The letter posits revisions of the landside slope stability analysis furnished by Modjeski and Masters in letter dated April 10, 1989, and offers seven comments from the MVN Foundations and Materials Branch for consideration pertaining to

soil shear strength, landside and canal side stability, and I-wall stability at various reaches. (A0000083, A0000084)

- *Letter from Modjeski and Masters, Consulting Engineers, to Frederick M. Chatry, Chief, Engineering Division*, *New Orleans District*, dated **April 10, 1989**, concerning the 17th Street Canal Parallel Flood Protection , Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. This letter addresses comments posited by the Corps in a letter, dated October 21, 1989, with regard to preliminary plans submitted by Modjeski and Masters. Letter indicates that Modjeski and Masters' review of those comments reveal that the slope stability calculations for the first six reaches of the project do not properly reflect the actual factors of safety. The letter goes on to state that in order to achieve the required factors of safety using the cross-sections proposed by Eustis Engineers, a great deal of earthwork would be required on the landside of the levee. Because of proximity of development on the landside of the levee, Masters and Modjeski developed new levee cross sections that required no work on the landside slope, and provides descriptions of the revisions of cross sections, slope stability, and sheet pile analyses for reaches 1 thru 8. (A0000085, A0000086)

- *Letter from Eustis Engineering, Geotechnical Engineers, to Modjeski and Masters, Consulting Engineers*, dated **August 31, 1988**, concerning the geotechnical analyses of the Metairie Relief Canal (17th Street Canal) OLB Project No. 2043-0222. This report contains the results of revised cantilever floodwall analyses and revised slope stability analyses for the proposed modifications along the Orleans side of the canal between stations 553+70 and 670+00. (A0000105)

- *Letter from Frederick M. Chatry, Chief, Engineering Division, New Orleans District, to* Modjeski *and Masters, Consulting Engineers*, dated **January 4, 1988**, concerning the 17th Street Canal Parallel Flood Protection , Phase 1B, Hammond Highway to Southern Railway, OLB Project No. 2043-0207. This letter serves as the first review of Modjeski and Masters' in-progress plans and specifications for the project, and offers several comments pertaining to sheet pile tip penetration and floodwall stability between stations 636+00 and 638+31; 625+00 and 635+00; 614+00 and 615+00; and 589+00 and 590+00. Letter also addresses the issue of dredging on the Orleans Parish side of the canal and describes requirements necessary to detect scour/erosion and prevent levee failure. Requirements include adding control lines to drawings; cross-section surveys the existing levee and canal bank; initial cross-section surveys of the levee and dredged canal immediately after construction; and annual cross-sectional surveys to be provided to the Corps thereafter. Several enclosures accompany this document. (A0000109)

- *17th St. Canal, I-Wall Criteria*. This handwritten document, dated **August 16, 1988**, appears to be an agenda or notes from a meeting of New Orleans district personnel and representatives from Modeski and Masters and Eustis Engineering. Topics include I-wall stability (Q&S cases), and stress loading conditions for maximum tip penetration. Last topic indicates, "Never run S-CASE F.S. = 1.0; never run deflections on S-CASE." (A0000107)

- *Excavation and Flood Protection of the 17th Street Canal, Phase III: Lake Pontchartrain to Hammond Highway Bridge* (Contract 4117). Sewerage and Water Board of New Orleans specifications for phase III of the project, dated **April 1988**. (Senate CD 13 – 15 Nov 05)

- *17th Street Canal, (Contract 4117)*. These drawings from the Sewerage and Water Board of New Orleans are marked "Final Check Set, **August 12, 1987**," Drawings include typical sections, plans and profiles, canal contours, sheet pile wall details, cross sections, and pedestrian bridge. (MVN Geotech Map Files)

- *Supplemental Agreement between the United States of America and the Jefferson Levee District for Local Cooperation at Lake Pontchartrain and Vicinity High Level Plan*. Signed agreement, dated **January 16, 1987**. (Senate CD 16 – 24 Oct 05)

- *Supplemental Agreement between the United States of America and the Orleans Levee District for Local Cooperation at Lake Pontchartrain and Vicinity High Level Plan*. Signed agreement dated **June 21, 1985**. (Senate CD 16 – 24 Oct 05)

- *Interim Agreement between the United States of America and the Orleans Levee District for Local Cooperation at Lake Pontchartrain and Vicinity High Level Plan*. Signed agreement dated **February 20, 1985**. (Senate CD 16 – 24 Oct 05)

- *Memorandum from Maj. Gen. John F. Wall, Director of Civil Works, U.S. Army Corps of Engineers, to the Commander, Lower Mississippi Valley Division*, dated **February 7, 1985**, regarding the Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project. In this memorandum, the director of civil works indicates that he reviewed the revised Post Authorization Change (PAC) Notification Report, the July 1984 Reevaluation Report and the final supplement to the Environmental Impact Statement, and approves the PAC. (Senate CD 16 – 24 Oct 05)

- *Metairie Relief Canal As Built Cross Sections, Phase I, Sewerage and Water Board Contract No. 4053*. These drawings are after-dredge sections for stations 643-671, dated **December 1984**. (MVN Geotech Map Files)

- *17th Street Outfall Canal Hydraulic Grade Lines, Phase I, Contract 4053*. Sewerage and Water Board of New Orleans drawings dated **August 30, 1984**. Drawings also include cross sections. (MVN Geotech Map Files)

- Lake *Pontchartrain, LA, and Vicinity Hurricane Protection Project, Reevaluation Study*, **July 1984**. This study is conducted in response to a 1977 Federal injunction that halted portions of the project approved by the Flood Control Act of 1965, specifically the floodgate barrier components of the plan. The study examines the continued feasibility of the barrier plan and examines the feasibility of providing hurricane protection solely by the means of raising and strengthening levees or floodwalls (high level plans). The study concludes that a high level plan represents the most feasible plan of protection. The plan would provide for improved hurricane protection levee systems in Orleans Parish, St. Bernard Parish, and the east bank of Jefferson Parish; repairing and rehabilitating

the Mandeville Seawall in St. Tammany Parish; a new levee on the east bank of St. Charles Parish north of US Highway 61. The treatment of the outfall canals at the lakefront remained unresolved, with five potential solutions, ranging from higher and stronger levees to floodgates and auxiliary pumping stations at the canal openings, discussed. Volume II of the study contains all technical and engineering data used to support information in the reevaluation study, including hydrology and hydraulics, foundation design and geology, engineering alternatives. This reevaluation study serves as the basis for the feasibility report of the hurricane protection project and becomes the vehicle which leads to authorization of the high-level plan. (IPET)

- *Department of the Army Permit, Permit No. LMNOD-SP (17th Street Canal) 2*, dated **June 13, 1984**. Permit to allow Sewerage and Water Board of New Orleans to dredge, enlarge and maintain an area and install and maintain flood walls and mooring structures in the 17th Street Canal (Metairie Relief Canal) from Pumping Station No. 6 to a point about 400 feet north of the Bucktown Pedestrian Bridge, subject to the conditions listed in the permit. Complete with 11 sheets. (CEMVN-OD)

- *Chronology of the 17th Street Canal Permit Application by Sewerage and Water Board of New Orleans*, dated **June 13, 1984**. This handwritten chronology details, extensively, the permit application process of the Sewerage and Water Board from its first submission of an application to dredge in the 17th Street Canal on July 15, 1974 through the final permit issuance on June 13, 1984. (CEMVN-OD)

- *Letter from Frederick M. Chatry, Chief, Engineering Division, New Orleans District, to the New Orleans Sewerage and Water Board*, dated **January 31, 1984**, regarding the Eustis Engineering report on the 17th Street Outfall Canal Test Section, forwarded by Modjeski and Masters on January 17, 1984. In this letter, the Corps concurs with Eustis' conclusions that a "layer of contaminated sand acts as a seal in preventing the water in the canal from influencing the hydrostatic head at and beyond the levee toe," and "Upon completion of the proposed dredging to design grade in the canal, sedimentation will probably deposit on the bottom…further sealing off the water pressure in the canal from the surrounding ground water." (A0000087)

- *Seventeen Street Canal Drainage Basin Study***, January 1983**. This study, prepared under the direction of the Sewerage and Water Board of New Orleans and the Jefferson Parish Council, provides the first in-depth study of the 17th Street Canal drainage basin that comprises 7,860 acres in Orleans Parish and 2,550 acres of Jefferson Parish. (IPET)

- *Report to the Secretary of the Army by the U.S. General Accounting Office: Improved planning needed by the Corps of Engineers to resolve environmental, technical, and financial issues on the Lake Pontchartrain Hurricane Protection Project*, dated **August 17th, 1982**. This documents, which is critical of the Corps' planning effort with regard to the project, posits a general history of the hurricane protection project from its authorization 1965 through 1982. The treatment of the outfall canals is of great significance in this report. The document indicates that discussions between the corps and local sponsors about the alteration of the drainage canals were not conclusive, owing largely to

the sponsors lack of financial capability. The report notes that the Orleans Levee District "believed that the Corps' standards may be too high for what is really needed for adequate protection and for what is affordable by local sponsors." (A0001840)

- *Lake Pontchartrain, Louisiana and Vicinity, Hurricane Protection Project, Combined Phase I Type General Design Memorandum and Revised Environmental Impact Statement, Plan of Study*, dated **September 1981**. This plan of study was initiated in response to the court injunctions against the barrier complexes. The plan recommends the pursuit of a fast-track study effort and recommends a firm decision concerning the future study direction by mid-December, 1981. (Senate CD 13 – 15 Nov 05).

- *Modification of U.S. District Court Injunction*, **March 1978**. The court modified its order of December 1977 and lifted the injunction against all features of the authorized project other than the construction of the barrier complexes. The Corps determines the revised Environmental Impact Statement will need additional study and will not be complete until November 1985. As a result, in December 1981, the Corps directs future study efforts on toward the "high-level plan" that manifests itself in the July 1984 Reevaluation Study. (Contained within A0001840)

- *U.S. District Court Injunction*, **December 1977**. The Corps was enjoined by the court from constructing the barrier complexes, the New Orleans East levee system, and the Chalmette Area plan of the Lake Pontchartrain Hurricane Protection Project, authorized in 1965, pending the revision and acceptance of the Environmental Impact Statement. (Contained within A0001840)

- *Record of Public Meeting, Lake Pontchartrain, Louisiana, and Vicinity, Hurricane Protection Project*, dated **June 1975**. This document is a transcript of the public meeting held at the University of New Orleans on February 22, 1975. (Senate CD 13 – 24 Oct 05)

- *Final Environmental Impact Statement: Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project*, dated **August 1974**. This study describes the protective features and identifies the environmental effects of the hurricane protection project described in House Document 231, 89th Congress, 1st session (barrier plan) and approved by the 1965 Flood Control Act. (Senate CD 13 – 24 Oct 05)

- *17th St. Canal Boring Locations*, dated **1973**. This log of boring samples from 1971 through 1973 is accompanied by transmittals of the results of soil tests. (A0000393)

- *The Board of Levee Commissioners of the Orleans Levee District, Emergency Operations Plan*, dated **1972**. The document details responsibilities of the board under the emergency operations plan in terms of preparations and surveillance; high tide emergencies; and hurricane emergencies. (A0001839)

- *Hurricane Study, History of Hurricane Occurrences along Coastal Louisiana*, dated **August 1972**. This document, prepared by the New Orleans District, posits historical research, a summary of hurricane occurrences,

descriptions of hurricanes and hurricane tracks dating back to the 19th century. (Senate CD 13 – 24 Oct 05)

- *Orleans Parish Lakefront Levee West of IHNC: Outfall Canals*. Drawings, dated **1970**, depicting outfall canal cross-sections, piezometer ranges, and log borings for the 17th Street, London Avenue, and Orleans canals. (A0002038)

- *Lake Pontchartrain Louisiana and Vicinity, Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part II – Lakefront*, dated **September 1968**. This document covers the hydraulic design of the lakeshore protection under the authorized project. (Senate CD 13 –15 Nov 05)

- *Lake Pontchartrain Louisiana and Vicinity, Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part II – Barrier*, dated **August 1967**. This design memorandum includes the description and analyses of essential data, assumptions, and criteria used for studies which provide the basis for determining design surge heights, run-up, overtopping and frequencies for the Lake Pontchartrain Barrier. It also includes the average lake levels for the design hurricane on different tracks. (Senate CD 13 – 15 Nov 05)

- ***House Document No. 231, 89th Congress, 1st session.*** The report of the Chief of Engineers, **March 4, 1964,** transmitted to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the district and division engineers and the concurring reports of the Mississippi River Commission for those areas under its jurisdiction. The report posits a recommendation for what came to be known as the "barrier plan": "For protection from hurricane flood levels...the most suitable plan would consist of a barrier extending generally along US Highway 90...together with floodgates and a navigation lock in the Rigolets, and flood and navigation gates in Chef Menteur Pass; construction of a new lakeside levee in St. Charles Parish...; extension upward of the existing riprap slope protection along the Jefferson Parish levee; enlargement of the levee landward of the seawall along the 4.1 mile lakefront, and construction of a concrete-capped sheet pile wall along the levee west of the Inner Harbor Canal..." The report serves as the basis for the feasibility report on the hurricane protection project and subsequent project authorization in the Flood Control Act of 1965, also known as PL 298, 89th Congress, 1st Session. (IPET)

- *Effects on Lake Pontchartrain, LA., of Hurricane Surge Control Structures and Mississippi River Gulf Outlet Channel, Technical Report No. 2-636*, dated **November 1963**. This model study conducted by the Waterways Experiment Station from January 1960 through June 1961 analyzes the effects of gated structures under the proposed barrier system for hurricane protection on the salinity and hydraulic regimen of Lake Pontchartrain and its connecting waterways and lakes. (Senate CD 13 – 15 Nov 05)

- *Interim Survey Report, Hurricane Study, Lake Pontchartrain, Louisiana, and Vicinity*, dated **November 21, 1962**. This interim report posits the recommended plan for the Lake Pontchartrain basin. The recommended plan includes a barrier at the west end of the lake to exclude hurricane storm surges and the construction and enlargement of protective works fronting developed or potentially developable areas. (IPET)

- *Letter from Acting New Orleans District Engineer to the Board of Commissioners, Pontchartrain Levee District*, dated **September 5, 1962** regarding the 17th Street Canal Levees. The letter informs the board of commissioners that the 17th Street Canal Levee, Lake Pontchartrain Protection Levee, Station minus 3+62 lakeward of the Lake shore Hammond Highway to Station 118+12 at the Southern Railroad has been completed by the federal government under the 1928 Flood Control Act, as amended. (Senate CD 13 – 15 Nov 05)

- *Letter from the Board of Levee Commissioners of the Orleans Levee District to the District Engineer, New Orleans District*, dated **March 1, 1962**, concerning the board's view of hurricane protection along the south shore of Lake Pontchartrain. In this letter the board indicates that since the time of the 1950 study by Bedell & Nelson in 1950, the Orleans Levee Board had done considerable work along the seawall in the Lakeshore Parkway. In light of this, the Orleans Levee Board suggests that the breakwater recommended in the 1950 report is unnecessary and undesirable from an esthetic point of view. (Letter contained within ***House Document No. 231, 89th Congress, 1st session*****,** dated March 4, 1964).

- -A *Detailed Report on Hurricane Study Area #1, Lake Pontchartrain and Vicinity, Louisiana*, report by the Department of the Interior, dated **March 1962**. This report analyzes the environmental effects of barrier structures and high level plans on the hydrological regime of Lake Pontchartrain. (Senate CD 13 – 15 Nov 05)

- -*Levee Work, F.Y. 1957, Item C – 17th Street Canal Levee Enlargement, Lake Pontchartrain Protection Levee, Plan Profile and Borings* dated, **January, 1957**. Corps of Engineers drawings depicting boring and section data from west canal levee opposite current-day breach location. Dates of levee embankment borings are noted as Nov. 8-12 & 15, 1948; borrow area borings, Nos. 1-10, January 21, 1957. (MVN Geotech Map Files)

- -*Geological Investigation of the New Orleans Harbor Area, TM No. 3-391*, dated **June 1954**. This study, produced by the Waters Experiment Station, is based on boring logs collected in the late fall and winter of 1949-1950. A list of the borings is contained in Appendix C. (Senate CD 13 – 24 Oct 05)

- -{Unknown Document Title}, by Bedell & Nelson, dated **October 1950**. The Orleans Levee Board and the Corps conducted a study of the lakefront to protect New Orleans from Lake Pontchartrain storm surges. The report by Bedell & Nelson, prepared for the board and shared with the Corps, recommended the installation of a breakwater from the New Basin Canal to the Industrial Canal along the south shore of Lake Pontchartrain to prevent overtopping of the seawall by wave action caused by hurricane winds. (See *Letter from the Board of Levee Commissioners of the Orleans Levee District to the District Engineer, New Orleans District*, dated March 1, 1962).

- -*Review Report: Lake Pontchartrain, La., From the Orleans-Jefferson Parish Line Westward and Northward to the Vicinity of Frenie, La*. New Orleans District document dated **April 15, 1948**. This review report was prepared in the aftermath of the hurricane of September 19, 1947, and recommends modification

of the adopted project (Flood Control Act of 1946) to provide for increased protection against storm surge and waves from Lake Pontchartrain, by landside enlargement of the existing embankment along the lake, with suitable wave erosion protection, and the enlargement of return levees along the Orleans and St. Charles Parish lines. Document includes wind velocity records, hydrographs of Sept-Oct of 1947 and March 1948, rainfall frequencies; boring data, and levee profiles and typical cross-sections. (A00001300)

Finding Aid

MVN Records

Katrina Chronologic History Data Collection
-Lake Pontchartrain LA and Vicinity
-17th St. Canal
-ED-F Geotech

A0000083	A0000084	A0000085	A0000086
A0000087	A0000088	A0000089	A0000090
A0000091	A0000092	A0000094	A0000095
A0000097	A0000099	A0000100	A0000101
A0000105	A0000107	A0000109	A0000110
A0000150	A0000152	A0000159	A0000160
A0000393	A0001001	A0001073	A0001075
A0001112	A0001300	A0001318	

-ED-T Structures
A0001034
A0002065

-Lakefront Adjoining Orleans, London, 17th, IHNC Canals
-ED-F Geotech

A0001811	A0001813	A0001822	A0002025
A0002027	A0002028	A0002029	A0002030
A0002038	A0003693	A0003694	

-ED-T Structures
A0001839 A0001840

Senate CDs

CD 13 – 24 Oct 05
-01 General Documents
-02 Record of Public Meeting Hurricane Protect Plan (June 1975)
-06 Environmental Statement Final Hurricane Protection Project (Aug 1974)
-07 History of Hurricane Occurrences along Coastal LA (Aug 1972)
-10 TM 3-391 Geological invest of NO Harbor Area (June 1954)

-02 Lake Pontchartrain, Louisiana, and Vicinity
-02 17th Street Outfall Canal (Orleans Parish and Jefferson Parish)
-01 Plans and Specifications
-ED-T Pre Constr Plans
-M&M Supplemental DGNS
-Modeski & Masters Drawings

CD 13 – 15 Nov 05
-02 Lake Pontchartrain and Vicinity, Louisiana (Orleans Parish)
-As Built Drawings
-DACW29-93-0025 (Nov 1992)
-DACW29-95-C-0093 (June 1995)

-Pre-Construction Reports
-Detailed Report Hurricane Study Area No 1 (March 1962)
-DM1 Hydrology and Hydraulic Analysis Part II Barrier (Aug 1967)
-DM1 Hydrology and Hydraulic Analysis Part III Lakeshore (Sept 1968)
-DM Env Impact Statement Phase I REVISED (Sept 1981)
-Excav and Flood Prot of the 17th St. Canal Phase III, Contract 4117 (April 1988)
-TR 2-636 Effects on Lake Pont of Hurr Surge Cont Struc (Nov. 1963)

CD 15 – 15 Nov 05 (disk 1 of 2)
-Contracts
-DACW29-99-C-0018
-DACW29-99-C-0018 Drawings
-DACW29-99-C-0018 MiscDocNo1
-DACW29-99-C-0018 MiscDocNo2
-DACW29-99-C-0018 MiscDocNo3
-DACW29-99-C-0018 MiscDocNo4
-DACW29-99-C-0018 MiscDocNo5

CD 15 – 15 Nov 05 (disk 2 of 2)
-Annual Inspection Maintenance Completed MR&T Flood Contrl Work
-Ann Inspection Maint Completed Flood Contrl Works (2001)
-Ann Inspection Maint Completed Flood Contrl Works (2002)
-Ann Inspection Maint Completed Flood Contrl Works (2003)
-Ann Inspection Maint Completed Flood Contrl Works (2004)
-Ann Inspection Maint Completed MR&T Flood Contrl Works (1998)
-Ann Inspection Maint Completed MR&T Flood Contrl Works (1999)
-Ann Inspection Maint Completed MR&T Flood Contrl Works

(2000)

-Contracts
-DACW29-93-C-0081
-Inspector Quality Assurance Report (QAR)
-17th Street Outfall Canal
-DACW-29-02-C-0016 (Gulf Group Inc.)
-DACW-29-95-C-0093 (Johnson Bros. Corp of LA)

CD 16 – 24 Oct 05
-01 Lake Pontchartrain and Vicinity, LA Hurricane Protection
-Lake Pontchartrain and Vicinity 6
-Lake Pontchartrain and Vicinity 7
-Lake Pontchartrain and Vicinity 8
-Lake Pontchartrain and Vicinity 16 JAN 1987
-Lake Pontchartrain and Vicinity 18 FEB 1997
-LakePont-PAC-approval-7Feb85

CD 09 Dec 05
-HSGAC
(Q1) LTR LK Pontch 17th St canal, HamHwy to South RR, complete 09.05.62
(Q7) -insp91
-insp92
-insp93
-insp94
-insp95
-insp96
-insp97

Status of Remaining Efforts

NWS Technical Report No. 23, published in 1979, is the last update of SPH meteorological parameters, based on hurricane data through 1975. The New Orleans District has requested the National Climatic Data Center (NCDC) to update basic SPH meteorological parameters for Zone B along the central U.S. Gulf Coast. Three parameters will be updated; central pressure index (CPI), pressure gradient, and adjustment for filling over land. Additional work related to the determination of the SPH indices will be determined after the parameters are updated. New SPH windfields will be generated.

The CPI will be updated using data from 1900 through 2005. The updated CPI will be compared with values determined in previous technical reports, and changes in the CPI over the last 30 years will be identified. NCDC will determine the frequency, cumulative percent of occurrence, and occurrences per 100 years of the updated CPI in Zone B.

One of the most important indices used for determining SPH is the pressure gradient, defined as the difference between the hurricane central pressure and peripheral pressure. NCDC will review hurricane data from 1976 through 2005 to determine if any changes have occurred in the mean peripheral pressure since 1975.

As landfalling hurricanes move from open water onto rougher land surfaces, they weaken, and their central pressure fills (weakens). The factors for reducing hurricane wind speeds over land are dependent on the time that the storm center remains over land, the size of the land, and the roughness lengths present over the land mass. Using observations of landfalling hurricanes in Zone B since 1975, NCDC will update the adjustment factors for filling, determine the average rate of filling for hurricanes in Zone B, and compare the updated adjustment for filling over land with earlier results.

New Orleans District will also conduct modeling to evaluate how methodologies used to determine still water levels and waves can affect design elevations and to determine if changes in SPH meteorological parameters, landscape, and critical track can affect design elevations. IPET will assist in the coordination and technical review of this effort.