UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF LOUISIANA

IN RE: KATRINA CANAL BREACHES CONSOLIDATED LITIGATION	*	**CIVIL ACTION**
	*	**NUMBER: 05-4182 "K"(2)**
	*	**JUDGE DUVAL**
PERTAINS TO: MRGO, Robinson (No. 06-2268)	*	**MAG. WILKINSON**

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PLAINTIFFS' TRIAL BRIEF

The United States Army Corps of Engineers (Corps) was tasked to design a hurricane protection system to protect among other areas, New Orleans East, the Lower Ninth Ward, and St. Bernard Parish from a maximum hurricane event. This project was termed the Lake Pontchartrain Vicinity Hurricane Protection Plan (LPVHPP).[1]

Plaintiffs contend that the Corps design, construction, operation, and maintenance of the navigation channel, the Mississippi River Gulf Outlet (MRGO) caused or contributed to the failure of the LPVHPP along Reach 2 of the MRGO causing catastrophic flooding of St. Bernard Parish and the Lower Ninth Ward in Orleans Parish, along the southern border of New Orleans East, New Orleans East; and along the east bank of the IHNC at the Lower Ninth Ward and causing flooding of both the Ninth Ward and St. Bernard Parish.[2]

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[1] A hurricane is a meteorological event characterized by a track or path, a central low pressure, a forward speed, and a maximum surface wind velocity that equals or exceeds 75mph.

[2] The plaintiffs believe that flooding in this area was contributed to by the Corps remediation and demolition of the east bank industrial area (hereinafter "EBIA") in the Inner Harbor Navigation Channel (hereinafter "IHNC"). Plaintiffs do not seek recovery for liability for this conduct but seek to apportion the contribution that the EBIA may have had to the failure in this area

LPVHPP LEVEE DESIGN

Hurricane Protection Levee Design is the evaluation and assessment of the height of an obstructing structure. As part of the process for choosing a height for the Levee system, a Standard Project Hurricane ("SPH") had to be created. The Corps' surveys, reconnaissance, and feasibility studies relating to the development for LPVHPP were commenced in the late 1950's, after Congressional Authorization for the MRGO.

The Corps relied upon the historic storm conditions experienced during actual hurricanes from September 1915, September 1947, and September 1957 to create the variables for the SPH.[3] The SPH parameters became the design for the LPVHPP levees.[4] Accordingly, in creating the LPVHPP, the Corps relied upon topography, bathymetry and habitat conditions that actually existed during these historic hurricane events that became the SPH. This design did not accommodate potential future changes in terrain, habitat, or topographic conditions.[5] Accordingly, the existing topography, bathymetry and habitat were fixed design components of the LPVHPP.[6]

In the process of developing the hurricane protection system and the SPH, the Corps evaluated the most severe combination of hurricane parameters reasonably characteristic of the

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[3] Varuso Deposition, page 53, Lines 10-20, page 50 lines 7-16). (Interim Survey Report, 1962, A-13 §A-3b.1-3; Powell Volume I page 135 lines 17-24; 1962 Interim Survey Report, at Appendix A, Pg. A-15, ¶ A-3c(1)(a)(b)(c), Appendix C for wind-field computation program used for the SPH and PMH; Powell Volume I, page 20, Lines 18-21, page 88 lines 23-25page 89, lines 10-13, page 91, Lines 20-23; page 106, lines 14-19, page 95, lines 5-9, page 99 lines 4-7, page 107, Lines 3-12, 20-23, page 109 lines 13-18, page 120, lines 10-14, page 122 lines 16-23, page 124, Lines 1-18, page 129, Lines 1-12, 18-25; Powell Volume II page 215 lines 14-19, page 219, lines 7-12, page 222, Lines 7-10; Varuso Deposition page 50 lines 7-13, 14-16, Soileau Deposition, Exhibit 3, p 53; Soileau Deposition, page 28, Lines 13-21, page 33, Lines 1-5, page 39, Lines 3-9, 13, page 41, Lines 15-25, page 41, Lines 1-3, page 42, Lines 22-25, page 45, Lines 22-23, page 46, Line 8, page 51, Lines 15-19; Plate 7 of Exhibit 26; See also, Plate 9 on 1966 Hydrology Report page 26 ¶ 9 a(3)

[4] Powell Deposition, Volume I, page 98, Lines 20-25, page 105, Lines 17-21, page 112, Lines 13-21, page 126, Lines 1-6, Volume II page 215, lines 7-11; Soileau Deposition, page 128, Lines 13-18; 1962 Interim Survey Report, at Appendix A, page A-14, ¶ A-3c

[5] Powell Deposition, Volume II, Page 291, Lines 1-6, see also, 1962 Interim Survey Report; Varuso Deposition, Page 73, Lines 17-23, Page 74, Lines 1-7

[6] (Powell 30(b)(6), Volume I, Page 58, Lines 24-25, Page 59, Lines 1-4); The appendix to Exhibit 36, the Review of Reports, shows the equation used to determine surge and the calibration of the equation, but there's no mention as to the source of the topography and bathymetry that would be used to calculate the average depths; it just shows the average depth used in the sample calculation. (Powell Deposition, Volume II, Page 233, Lines 4-12)

Chalmette area. The SPH assumed a hurricane that would produce the highest surge hydrograph considering local hydraulic characteristics.

In assessing the levee heights for the LPV, the Corps computed surge, plus waves, plus freeboard, all based on the SPH.[7]

The surge calculations evaluated: "wind set up" in feet, which is the vertical rise in water level on the leeward side of a body of water caused by wind stresses on the surface of the water;[8] "wind speed" in terms of miles per hour (m.p.h.) which would drive large quantities of water;[9] ; "fetch length" which is the continuous area of water over which the wind blows essentially in a constant direction having unobstructed contact with the water surface;[10] "average depth of fetch in feet", angle between direction of wind and the fetch, planform factor and the surge adjustment factor for the SPH.[11]

Based on the information from the historic storms, including calibration to reflect actual

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[7] Soileau Deposition, Exhibit 1, Page A-17.

[8] 1962 Interim Survey Report, at Appendix A, Pg. A-17, ¶ A-3d(2); The Shore Protection, Planning and Design Manual, Technical Report Number 4 page A-42.

[9] 1962 Interim Survey Report, at Appendix A, Pg. A-21, ¶ A-3f(1) Soileau Deposition, page 59, Lines 12-14, 17-24, page 64, Lines 12-20, page 65, Lines 5-12.

[10] Lake Pontchartrain, Louisiana and Vicinity Design Memorandum Number 1 Hydrology and Hydraulic Analysis, Part I Chalmette, August 1966; Soileau Deposition, page 66, Lines 9-12, page 67, Lines 19-24, page 69, Lines 17-23, page 75, Lines 20-25, page 76, Line 3, 13-15, 25, page 77, Lines 1-3, page 82, Lines 5-6, page 105, Lines 7-21; Powell Deposition, Volume I, page 156, Lines 12-16, page 158, Lines 2-3; Powell Deposition, Volume II, page 222, Lines 1-4, page 223, Lines 23-25, page 224, Lines 1-3, page 227, Lines 1-6, page 279, Lines 14-20Soileau Deposition, page 77, Lines 9-11, 15-17, 22-25, page 79, Lines 3-6, page 80, Lines 4-6, page 82, Lines 20, 22-23, page 83, Lines 5-9; The Shore Protection, Planning and Design Manual, Technical Report Number 4 pages 4-7; Soileau Deposition, page 74, Lines 3-6, 8-9, page 95, Lines 9-18; Powell Deposition, Volume I, page 166, Lines 2-5; Powell Deposition, Volume II, page 233, Lines 13-17,;(Soileau Deposition, Page 102, Lines 16-19, 23, 25, page 103, Lines 1-5; Soileau Deposition, page 84, Lines 8-11, page 89, Lines 9-12; The Shore Protection, Planning and Design Manual, Technical Report Number 4, pages 57 - 62).

[11] Powell Deposition, Volume I, page 51, Lines 13-16, page 58, Lines 7-11, 16-18, 24-25, page 59, Lines 1-4, page 60, Lines 4-9; Soileau Deposition, page 10, Lines 21-25(1962 Interim Survey Report, at Appendix A, Pg. A-16, ¶ A-3c(1)(d)), A-24, ¶A-3g(3); 1966 Hydrologic Survey page 19, ¶8c(2)(d)(1); Soileau Deposition, page 33, Lines 9-10, page 35, Lines 11-12, page 37, Line 2, page 56, Lines 5-6, 9-12, 15-16, page 61, Lines 4-5, 10-11, 19-21, page 62, Lines 11-16, page 66, Lines 5-7, page 75, Lines 13-17, page 109, Lines 11-16, page 158, Lines 12-14; Powell Deposition, Volume II, page 220, Lines 1-2, page 301, Lines 7-15, page 302, Lines 1-4, page 304, Lines 24-25, Page 305, Lines 1-2). (Interim Survey Report for Lake Pontchartrain, 1966 Plate A4 on page 71; Powell Deposition, Volume I, page 46, Lines 4-11, page 47, Lines 7-13, 16-19; Powell Deposition, Volume II, page 220, Lines 10-16, page 221, Lines 10-17, page 247, Lines 15-20, page 248, Lines 11-15, page 251, Lines 16-23, page 253, Lines 8-14(Soileau Deposition, Page 67, Lines 9-15 Page 69, Lines page 86, Lines 20-25, page 87, Lines 19-20 1-12; Powell Deposition, Volume II, page 223, Lines 9-17, page 238, Lines 1-5, 7-12.

measured high water marks, the Corps determined that the SPH produced maximum surge heights of 11.9 feet in the Chalmette area and 12.5 feet at the Citrus and New Orleans East back levees, and 13 feet in the Rigolets and Chef Mentur Pass.[12] The SPH hurricane was assessed to travel on a specific track characterized as "Track F" and given a forward speed of 11 knots, a central pressure of 27.6, and maximum winds of 100 m.p.h.[13]

Once the Corps determined what it perceived to be the relevant surge, it then calculated the waves evaluating the SPH in terms of "wave period" (which is the time it takes for a wave trough to move past a given point and another wave trough to arrive)[14] and "wave break" (which considered the placement and effect of berms in preventing waves from running up the slope of the levees.[15] All of these values were included in the calculation of "wave run-up" which was assessed to be 4.5 feet, mean sea level at New Orleans East back levee, 4.5 feet, mean sea level at Citrus Back, 4.7 and 4.3 feet mean sea level at both Chalmette, and 4.5 feet, mean sea level in the MRGO area.[16]

"Freeboard" calculations were assessed and added to the evaluation of historic experiences of "wave run up", "residual flooding", "overtopping" and "overflow". Levee heights were the sum of calibrated "surge", "wave run-up" and a factor of "free board".[17] Based

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[12] The Interim Survey Report Lake Pontchartrain and Vicinity, 21 Nov 1962, P.24

[13] The Interim Survey Report Lake Pontchartrain and Vicinity, 21 Nov 1962, Plate A-7,PA-16 Table A-10.

[14] Soileau Deposition, page 135, Lines 2-7, 25, page 136, Lines 1-10, 19-20, page 154, Lines 9-10, 12-14, 19-20, page 155, Lines 1-5; Powell Deposition, Volume II, page 212, Lines 4-7, page 245, Lines 2-7, page 266, Lines 13-18; The Shore Protection, Planning and Design Manual, Technical Report Number 4, Plate D-1, Plate D-1a, Plate D-2, Plate D-8, pages D-28, D-29, D-30, D-41; Soileau Deposition, Page 137, Lines 7-12 Page 138, Lines 4-8, 18-21, page 139, 1-3; The Shore Protection, Planning and Design Manual, Technical Report Number 4, Plate D-1, Plate D-1a, Plate D-2, pages D-28, D-29, D-30; Soileau Deposition, Page 137, Lines 15-20

[15] Powell Deposition, Volume II, page 257, Lines 24-25, page 258, Lines 1-4, page 283, Lines 12-16, 20-23 Powell Deposition, Volume II, page 264, Lines 9-13, 18-20, page 278, Lines 15-16

[16] 1962 Interim Survey Report, at Appendix A, Pg. A-23, ¶ A-3g(1)(2); 1966 Hydrologic study, Pg. 23, ¶ 8e(1) (2); Powell Deposition, Volume II, Page 229, Lines 18-23;1962 Interim Survey Report, at Appendix A, Pg. A-23, ¶ A-3g(2)Table A-13;Powell Deposition, Volume II, Page 240, Lines 21-25, page 241, Lines 1-3, page 264, Lines 1-4; 1966 Hydrologic Study at page 23, ¶ 8e(1);Varuso Deposition, page 91, Lines 10-17; Powell Deposition, Volume II, page 246, Lines 4-11,page 272, Lines 22-25, page 280, Lines 1-6, page 285, Lines 22-25, page 286, Lines 1-5; Powell Deposition, Volume II, page 255, Lines 16-24, page 276, Lines 5-9; Varuso Deposition, Page 91, Lines 10-17

[17] Powell Deposition, Volume II, Page 283, Lines 20-23); Page 260 Line 5-25.

on the topographical, bathymetric and habitat conditions that existed, the Corps concluded that, at design elevations no material flooding would result from waves.[18]

MRGO CONSTRUCTION

Construction of the MRGO was a multiphase project spanning over a decade. "The first phase of channel construction to full project dimensions between the IHNC (mile 66.0) and Paris Road (mile 60.9) was initiated March 17, 1958 and completed May 7, 1959. The second phase of channel construction, an access channel from the GIWW (mile 60.3) to Breton Sound (mile 23.0), was initiated May 8, 1959 and completed February 27, 1961. The third phase interim channel full depth and half width between Paris Road (mile 60.8) and the -38 foot contour in the Gulf (mile -9.75) was initiated February 28, 1960 and completed July 5, 1963. The fourth phase channel construction to full dimensions of the project between Paris Road and the -38 foot contour in the Gulf was initiated March 2, 1961 and completed July 22, 1965, with the exception of a narrow restriction at Paris Road, which was removed January, 20, 1968."[19]

With the completion of the MRGO, the residents of St. Bernard Parish and the surrounding areas foresaw the threat of exacerbated hurricane impacts on the community. The flooding in New Orleans East, the Lower Ninth Ward and St. Bernard Parish caused by Hurricane Betsy in 1965 seemed to confirm their belief.

In 1966 in the Corps retained the National Engineering Science Company (NESCO) to analyze "Storm Surge Effects of the Mississippi River-Gulf Outlet" as applied to "design hurricanes" on three different tracks. The Objective of the study was to evaluate the effects of the MRGO channel, spoil banks, and existing protection works on the hurricane surge

[18] Powell 30(b)(6), Volume II, Page 288, Lines 16-23; Page 255, Lines 16-24.

[19] "Development of the Mississippi River-Gulf Outlet" by Brent M. Johnson, Supervisory Civil Engineer, U.S. Army Engineer District, New Orleans, Corps of Engineers, published in: Journal of the Waterways Division, Proceedings of the American Society of Civil Engineers.

environment within the Chalmette area.[20] The conclusion of the NESCO evaluation by Bretschneider and Collins was that depending on the speed of the storm, the MRGO had a marked impact on surge in the area. Curiously, however, although the authors of this study were specialists in wave analysis and the Corps understood the relationship between surge, waves and resulting flooding, the Corps did not request that the study also explore the impact of waves from the MRGO on the LPVHPP.

Despite its conclusions to the contrary, the Corps advocated the position that its analysis concluded that the MRGO had no impact on hurricane surge.[21] Nonetheless, in 1968, the Corps supplemented and re-stated its design parameters for the LPVHPP and, based on a higher still-water level for the standard project hurricane[22] determined that for the Chalmette area, the most suitable Hurricane Protection Plan would now consist of about 17.3 miles of new and enlarged levees extending generally along the southerly banks of the Gulf Intercoastal Waterway (GIWW) and the MRGO channel to Bayou Dupre and thence westerly to the Mississippi River levee at Violet.[23] The re- calculated levee heights were to be 17.5 feet west of Paris Road, through, from Bayou Bienvenue to the Bayou Dupre drainage structure, and after the turn back toward Violet.[24]

The 1968 Supplement to the LPVHPP General Design Memoranda also noted that the rate of subsidence within the project area was approximately 0.39 feet per century.[25] The Corps was aware of the dependence of the levees on the stability of the banks of the MRGO. Indeed,

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[20] Soileau Depo., Exhibit 2, pp 2-3, Exhibit 3, p 1.

[21] Ultimately, the Corps did not actually evaluate the substantive impact of the MRGO and the changes of the surrounding area on the progress of hurricane surge and waves until after 2000.

[22] Powell Deposition, Volume I, page 38, Lines 2-16, page 40, Lines 22-25, page 41, Lines 15-16, page 148, Lines 5-11; Volume II, page 294, Lines 13-16, page 302, Lines 12-23.

[23] Lake Pontchartrain, Louisiana and Vicinity Chalmette Area Plan Design Memorandum # 3, pages 1, 3, 6-8, 12, 66, November, 1966

[24] Lake Pontchartrain, Louisiana and Vicinity Chalmette Area Plan Design Memorandum # 3 page 8, page 32, page 33, Plate 9, 23, 24, 25; Powell Volume II, page 292, lines 21-25, page 293 lines 1-19; Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part I - Chalmette; Soileau Deposition, Page 116, 19-2 2, 25, Page 117, Lines 1-3, page 149, Lines 4-8, 13-16)

[25] Lake Pontchartrain, Louisiana and Vicinity Chalmette Area Plan Design Memorandum # 3 Supplement #1 1968, pages 7-10, 13).

the Corps acknowledged the potential for rotational failure into the MRGO should its banks erode substantially towards the toe of the levees. Acknowledging the potential threat posed by the MRGO, in 1967 the Corps changed the MRGO project design to include foreshore protection on the southern bank.[26]

Although after Hurricane Betsy, the Corps raised the levee heights, the Corps insisted that these modifications had nothing to do with contributing storm surge hazards presented by the MRGO.

After its initial 1965 NESCO Bretschneider and Collins investigation of concerns presented by the MRGO, the Corps engaged in no additional inquiry into the effects of the MRGO on hazards to the human environment and despite its knowledge that the ongoing operation and maintenance of the MRGO eroded the banks of the channel and thereby contributed to the known potential for rotational failure of the levees the Corps at no time alerted Congress to these threats in the form of an Environmental Impact Statement, as mandated under NEPA. Indeed, none of the perceived problems introduced by the MRGO found their way into a dialogue with Congress addressing the impacts that the Corps' continued operation and maintenance of the MRGO had on the health and safety of the human environment.

[26] Seventh Endorsement Letter, May 1967, attached to Lake Pontchartrain, Louisiana and Vicinity Chalmette Area Plan Design Memorandum # 3; Varuso Deposition, page 95, Lines 12-20, page 97, Lines 1-4, 8, page 120, Lines 1-14).

PROBLEMS INTRODUCED
BY THE MRGO

The MRGO's five major adverse effects —creation of a direct surge conduit from the Gulf of Mexico, the "funnel effect," destroyed wetlands, substantial channel widening, and accelerated and increased subsidence of LPV structures—were substantial contributing factors to the catastrophic flooding of the Robinson plaintiffs' homes and communities.[27]

The Corps was aware that bank erosion caused by the vessel wave wash from operation of the MRGO would impair the stability of the levees along Reach 2.[28] Subsequently, in 1967 the Corps admitted that the MRGO itself was the threat to the LPVHPP which necessitated the remedial action and as a feature and expense to the MRGO project the Corp adopted foreshore protection measures.[29] These measures however were not implemented for several decades.

From the inception of the MRGO, the Corps recognized that the channel provided a pathway for salt water to reach as far as Lake Pontchartrain. This shift in habitat from fresh water swamp and marshes along the banks of the MRGO to increased salinity caused the death of 11,000 acres of swamp including cypress forest, dense reeds and mangle brush and over 20,000 acres of brackish marsh were converted to less productive saline wetlands. This salinity shift forever altered the topography, bathymetry and habitat that existed during the design of the LPVHPP-- features that were critical to the calculations of the elevation heights of its levee structures.

In addition, as indicated by the Bretschneider and Collins study the progressive widening

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[27] Kemp Expert Report (Ex. 3) at pp. 2-3, 7, 38, 196.

[28] GDM #3 p.35 Foreshore Protection, Ultimately, the banks of the MR-GO will stabilize generally at a slope not flatter than 1 on 3. However, erosion of the foreshore area between the levee and the channel bank by ship-generated waves will pose a threat to the integrity of the levee. Accordingly, a stabilization dike to protect the levee from such erosion will be provided on the channel ward slope of the existing front retaining dike …

[29] See, memo dated April 12, 1967, Lake Pontchartrain, Louisiana and Vicinity-modification of the Chalmette Area plan, from the Chief , Engineering Division Civil Works, to the Division Engineer, Lower Mississippi Valley Division, re: directing that costs for foreshore protection along the MRGO be chargeable to the Navigation project.

of the MRGO changed the variables that were relied upon in calculations for the design of the LPVHPP. These new changed dimensions increased the process of wave regeneration during hurricanes and magnified the energy of the waves in the vicinity of the LPVHPP. This increased energy enhanced the run up effect and further undermined the Corps initial levee calculations resulting in earlier and more profound overtopping during Hurricane Katrina.

Boring samples conducted by the Corps as late as October 1966 revealed that the careless maintenance and proximity of dredging activity MRGO would adversely impact the strata below the structures of the LPVHPP and undermine the levee foundations.[30] Excavation of the MRGO channel adjacent to the LPVHPP created a void that permitted lateral displacement of the interdistributary clays in the strata beneath the LPVHPP, which resulted in accelerated settlement of the levees. Annual maintenance of the MRGO included dredging outside the authorized channel dimensions which caused the banks of the MRGO to become increasingly close to the toe of the LPVHPP. This repeated removal of displaced clays from the channel, recreated the void adjacent to the levee structures continuously depleting the substrate beneath the levees adjacent to the MRGO and consequently causing the levees to sink.

From the completion of the initial channel for the MRGO in 1965 until 2005, the Corps, as part of its Operation and Maintenance, conducted over 140 dredging events affecting removal of over 5,400,000 cubic yards of dredge material from the MRGO channel. These actions added to the known risk of rotational failure of the levee by increasing the rate at which the interdistributory layer moved from beneath the levee and into the MRGO channel. These dredging acts also rendered the calculations upon which the LPV protection had been based

[30] Plate 28 and 29 of the GDM #3. In the 1966 Lake Pontchartrain and Vicinity Chalmette Area Plan, Design Memorandum Number 3, November 1966, Plate 28 and 29 of the GDM #3, the Corps documented soil borings that revealed a thick interdistributary layer of very soft to soft clays in the vicinity of the proposed levee structures. This layer was documented to contain lenses and layers of silt and sand

moot. Additionally, the environmental changes caused by the dredging, including wetlands loss and widening of the MRGO channel increased the effect of storm surge in the vicinity, and rendered a levee system that was decreasing in effectiveness due to subsidence, subject to increasingly powerful hurricane effects.

At the time of the O&M of the MRGO, from 1970 onwards, the Corps was subject to NEPA, which required the Corps to routinely report to Congress environmental changes that its actions were causing, particularly if the effected the 'human environment".

The Corps, despite an ever increasing awareness of the detrimental environmental impact of the MRGO that began prior to its construction, never informed Congress of the dangers that the MRGO posed for the LPV. Additionally, the Corps never informed Congress of the increasing hazards posed by the ongoing O&M.

Plaintiffs will demonstrate that in addition to causing an increased surge height during Katrina, the expanded dimensions of the MRGO channel increased the energy of the waves by a factor of 5. Thus, waves which would have broken once they reached land in fact regenerated as they passed over the channel. These regenerated waves attacked the hurricane protection structure along Reach 2 earlier in the hurricane event and thus for a longer period of time. Over time, the introduction of saltwater into the wetland environment by the MRGO, its changed dimensions, depth and proximity to the levees caused a change in the local hydrology which resulted in the levees overtopping earlier and for longer time.

The location of the channel itself created a funnel by convergence of the Gulf Intercoastal Waterway and Reach 2. Plaintiffs will demonstrate that the six mile portion of the combined MRGO/GIWW flooded after Katrina in much the same way it did after Hurricane Betsy. The levee structures at the southern border of New Orleans East were over topped because of the increase in the height of the surge and the increase in flow caused by the funnel created by the MRGO channel.

This channel reach added between three and four feet of surge in the IHNC which contributed to the breaching in the IHNC before Katrina made landfall.[31] The structures at the IHNC east were subjected to increased stress created by an additional 20 - 25 % of the hydrostatic pressure which resulted when the MRGO added 3 - 3 ½ feet of additional surge to the IHNC. Not only was the water level higher but the velocity of the flow substantially increased causing and/or contributing to early and extreme levee over- topping.

Louisiana Negligence Law

It is well settled that, under Louisiana law, every act of the Corps that causes damage to another as a result of the fault of the Corps obliges the Corps to repair that damage. LSA C.C. Art. 2315(A); *Graci v. Corps*, 435 F.Supp. 189, 195 (E.D. La. 1977). The elements of a cause of action under Article 2315 are Fault (which embraces all conduct falling below a proper standard), Causation, and Damage. *Weiland v. King*, 281 So.2d 688, 690 (La. 1973); *Graci v. Corps*, 435 F. Supp., at 195. Under Louisiana law, the Corps is responsible for the damage it occasions not only by its acts, but also by its negligence, imprudence, and want of skill. LSA C.C. Art. 2316; *Graci v. Corps*, 435 F.Supp. at 195.

The Corps as grantee of the right of way, builder and maintainer of the MR-GO assumed a high standard of care with relation to damages caused by the MR-GO to neighboring lands and individuals. LSA C.C. Art. 667; *Carr v. City of Baton Rouge*, 314 So.2d 527 (La. App. 1975); *Graci v. Corps*, 435 F.Supp. at 195. The failure to exercise that degree of care ordinarily expected of a reasonably prudent person under similar circumstances constitutes negligence. *Fire & Gas Ins. Co. of Conn. v. Garick*, La. App. 312 So.2d 103,writs denied, 313 So.2d 845 (La. 1975); *Graci v. Corps*, 435 F.Supp. at 196.

Plaintiffs will demonstrate by a preponderance of the evidence fault and negligence by

[31] P. 59-60 Team Louisiana

the Corps in the MR-GO's design, construction, operation, and maintenance as well as evidence a causal connection between the MR-GO's defective conditions and negative effects and the damages sustained by Plaintiffs.

The duty-risk analysis is the governing negligence standard for determining whether to impose tort liability under Louisiana Civil Code Article 2315. *See In re Katrina Canal Breaches Consol. Litig.*, 2007 WL 4573052, at *2 (E.D. La. 2007) (citing *Lemann v. Essen Lane Daiquiris,Inc.*, 923 So. 2d 627, 632-33 (La. 2006)). To prevail on a claim of negligence, the plaintiff must satisfy the five elements of the duty-risk analysis: (1) the defendant had a duty to conform his conduct to a specific standard; (2) the defendant's conduct failed to conform to the appropriate standard; (3) the defendant's substandard conduct was a cause-in-fact of the plaintiff's injuries; (4) the defendant's substandard conduct was a legal cause of the plaintiff's injuries; and (5) the actual damages.

In terms of the first requirement, the pertinent inquiry on the scope of duty is "whether the plaintiff has any law—statutory, jurisprudential, or arising from general principles of fault—to support his claim." *Faucheaux v. Terrebonne Consol. Govt.*, 615 So. 2d 289, 292 (La. 1993); *In re Katrina Canal Breaches Consol. Litig.*, 2007 WL 4573052, at *2 (E.D. La. 2007). There are numerous sources of Louisiana law establishing a legal duty on the Corps to design, construct, operate, and maintain the MR-GO in a safe manner that did not enhance the risk of flooding during hurricanes, *i.e.*, the MR-GO had to be "hurricane neutral."

Under long-established Louisiana law, the Corps is responsible for any loss or injuries caused by defects in the MR-GO. Louisiana Civil Code Article 2315 establishes that the Corps—as owner and operator of the MR-GO—has a duty to avoid "every act whatever . . . that causes damages to another" and must compensate those "by whose fault it happened . . . ." La. Civ. Code Art. 2315. Moreover, as a landowner/proprietor, the Corps is liable for any of the MR-GO's defects "which may deprive [its] neighbor[s] of the liberty of enjoying [their] own

[properties], or which may be the cause of any damage to [them]." La. Civ. Code Art. 667.

Louisiana courts have historically held landowners and proprietors liable for flooding a neighbor's property. *See, e.g., Lombard v. Sewerage & Water Bd.*, 284 So. 2d 905, 914 (La. 1973) (damage to homes resulting from construction of drainage canal); *Branch v. City of Lafayette*, 663 So. 2d 216, 220 (La. App. 1995) (water damages to home after heavy rainfall caused by defective drainage system). Liability for causing flooding—which the landowner/proprietor is uniquely capable of preventing—implements a salutary public policy: "The persons at whose disposal society has placed the potent implements of technology owe a heavy moral obligation to use them carefully and to avoid foreseeable harm to present or future generations." *Pitre v. Opelousas Gen. Hosp.*, 530 So. 2d 1151, 1157 (La. 1988).

Louisiana law also imposes a duty on a landowner/proprietor to warn the public of the risk of damage to the nearby property posed by the known defects of, and hazards created by, its facility or property. Thus, in addition to the duty not to create a hazard in the first instance, "a landowner owes a plaintiff a duty to discover any unreasonably dangerous conditions and to either correct the condition or warn of its existence." *Socorro v. City of New Orleans*, 579 So. 2d 931, 939 (La. 1991); *see also Shelton v. Aetna Cas. & Sur. Co.*, 334 So. 2d 406, 410 (La. 1976) (citations omitted); *Faucheaux, supra*, 615 So. 2d at 294 (duty of parish in maintaining an automatic canal gate and providing warnings of perilous conditions).

Government agencies like the Army Corps therefore have a legal duty to repair defective conditions and warn of known defects. *Indian Towing Co. v. Corps*, 350 U.S. 61, 69 (1955) (in operating a coastal lighthouse, Coast Guard had the duty to maintain the facility in good working condition and to warn users if it went out of service). This is particularly true where the agency's own construction activities have created the dangerous situation. *See Brandon v. State, Through Dept. of Highways*, 367 So. 2d 137, 143 (La. App. 1979) ("It is a breach of that duty for the Department to undertake construction, partially complete the project, and then leave the

project unfinished with hazardous conditions existing for an unreasonable period of time, particularly when it is within the capacity of the Department to complete the project and eliminate the hazard.")

Applying these norms to our case, the Corps had a duty to assure that the MR-GO did not enhance the risk of flooding during hurricanes. A public authority is charged with a duty to design, construct, operate, and maintain its facilities to avoid "presenting an unreasonable risk of injury" to the public. *Faucheaux, supra*, 615 So. 2d at 293.

Defendant's legal duty to prevent the MR-GO from causing flood damages has already been determined. In *Graci v. Corps, supra,* 435 F. Supp. at 195-96, Chief Judge Heebe concluded that as a matter of law:

(a) Under Louisiana law, the Corps is responsible for the damage it occasions not only by its acts, but also by its negligence, imprudence and want of skill. LSA C.C. Art. 2316.

(b) The Corps as grantee of the right of way, builder and maintainer of the MRGO assumed a high standard of care with relation to damages caused by the works to neighboring lands and individuals. LSA C.C. Art. 667; *Carr v. City of Baton Rouge*, 314 So. 2d 527 (La. App. 1975).

(c) The failure to exercise that degree of care ordinarily expected of a reasonably prudent person under similar circumstances constitutes negligence. *Fire & Gas Ins. Co. of Conn. v. Garick*, La. App., 312 So. 2d 103, writs denied, 313 So. 2d 845 (La. 1975).

The Government has a duty to avoid causing flooding in building, operating, and maintaining federal projects such as the MRGO. *See, e.g., Kennewick Irrig. Dist. v. Corps*, 880 F.2d 1018 (9th Cir. 1989) (U.S. Bureau of Reclamation built defective irrigation canal whose breaks caused property damage and personal injuries); *see also Alabama Elec. Co-op, Inc. v. Corps*, 769 F.2d 1523 (11th Cir. 1985) (Corps caused property damage due to defective construction of a dike); *Seaboard Coast Line R.R. Co. v. Corps*, 473 F.2d 714 (5th Cir. 1973)

(Army Corps-designed drainage system diverted water that damaged railroad right-of-way). As the Fifth Circuit has held, "[t]he Corps may be liable under the Federal Tort Claims Act for negligent provision of services upon which the public has come to rely." *Gill v. Corps*, 429 F.2d 1072, 1075 (5th Cir. 1970) (citing *Indian Towing Co., supra*, 350 U.S. at 76).

The duty-risk analysis requires that the negligence be both a cause-in-fact of the plaintiff's injury and a legal cause of the injury. *See In re Katrina Canal Breaches Consol. Litig.*, 2007 WL 4573052, at *4 (E.D. La. 2007). The issue of "legal cause"—also expressed as "scope of duty"—is a purely legal question for the Court. *Ibid.* Clearly, the risk of serious property damage here is easily associated with a duty not to cause flood damage to "neighboring lands and individuals." *Graci, supra,* 435 F. Supp. at 195-96; *see also Roberts v. Benoit*, 605 So. 2d 1032, 1054 (La. 1991); *Faucheaux, supra*, 615 So. 2d at 294.

Cause-in-fact is a factual determination that may be proven by direct or circumstantial evidence. It is well settled that "[t]here can be more than one cause in fact, making multiple wrongdoers liable." *Hennigan v. Cooper/T. Smith Stevedoring Co., Inc.*, 837 So. 2d 96, 102 (La. App. 2002). Here there is only one alleged wrongdoer/tortfeasor.

Plaintiffs will demonstrate that the MRGO was a substantial factor, in causing their harm, nonetheless, it need not be the only factor, rather; "*it need only increase the risk of harm.*" *Hennigan, supra*, 837 So. 2d at 102 (citing *Spinks v. Chevron Oil Co.*, 507 F.2d 216 (5th Cir. 1975)) (emphasis added). In cases involving concurrent causes of damages, "'the proper inquiry is whether the conduct in question was a substantial factor in bringing about"' plaintiff's damages. *Chaisson v. Avondale Indust., Inc.*, 947 So. 2d 171, 187-88, (La. App. 2006) (quoting *Perkins v. Entergy Corp.*, 782 So. 2d 606, 611-12 (La. 2001)).

The Corps' articulation of Louisiana law on cause-in-fact is flawed. While Plaintiffs must demonstrate that the Corps' negligent management of the MRGO was a substantial factor in causing their damages, it is not true that they must also demonstrate that "but for" the widening

of the waterway and the loss of the wetlands the alleged damages would have been less or would not have occurred at all. The Corps' attempt to impose a "but for" requirement is contrary to controlling Louisiana law as expressed in *Perkins, Chaisson* and *Bonin.* See also, *In re Manguno,* 961 F.2d 533 (5th Cir. 1992),(Fifth Circuit held "but-for" instruction to be in error and inappropriate for a concurrent cause Louisiana tort action)

Similarly, Louisiana's comparative fault statute, Article 2323, does not apply where there is only one potentially liable party. Comparative fault concerns allocation among people, not causes.

Article 2324 B of the Louisiana Civil Code provides that liability for damages caused by *two or more persons* shall be a joint and divisible obligation; however, where only one person/entity causes the damage, art. 2324 has no application. Where a single actor through multiple acts of negligence causes damage, that defendant is liable for the whole.

There has been no evidence, indeed no allegation, in this lawsuit that any other person or entity exacerbated the effects of Hurricane Katrina by their conduct. There certainly is no allegation that Norman Robinson, Kent Lattimore, Lattimore & Associates, Tanya Smith, Anthony Franz, Jr. or Lucille Franz—the Plaintiffs—are at fault for this catastrophe. Accordingly, this Court should find that, as a matter of law, the Army Corps is liable for 100% of Plaintiffs' damages.

THE CAUSATIVE IMPACTS OF THE MRGO DURING KATRINA

Plaintiffs will demonstrate that, without major breaching in Reach 2 but with overtopping EBSBs in Chalmette and the Lower 9th Ward there would have been some water in the Central Wetlands Unit but it would not have flooded by storm surge waters (Figure 11). Indeed no volume of over topped water would have exceeded the Forty Arpent levee. Peak storm surge heights, above the height of the Reach 2 LPV structures, existed only for a few hours. If the Reach 2 system had withstood this brief peak water level, as did many other structures in the area which were not subjected to the negative impacts of the MR-GO channel, much of the flooding of the populated areas would not have occurred.

Exh. 83, Bea Technical Report I (Jan. 2009) at p. 11, Fig. 11.

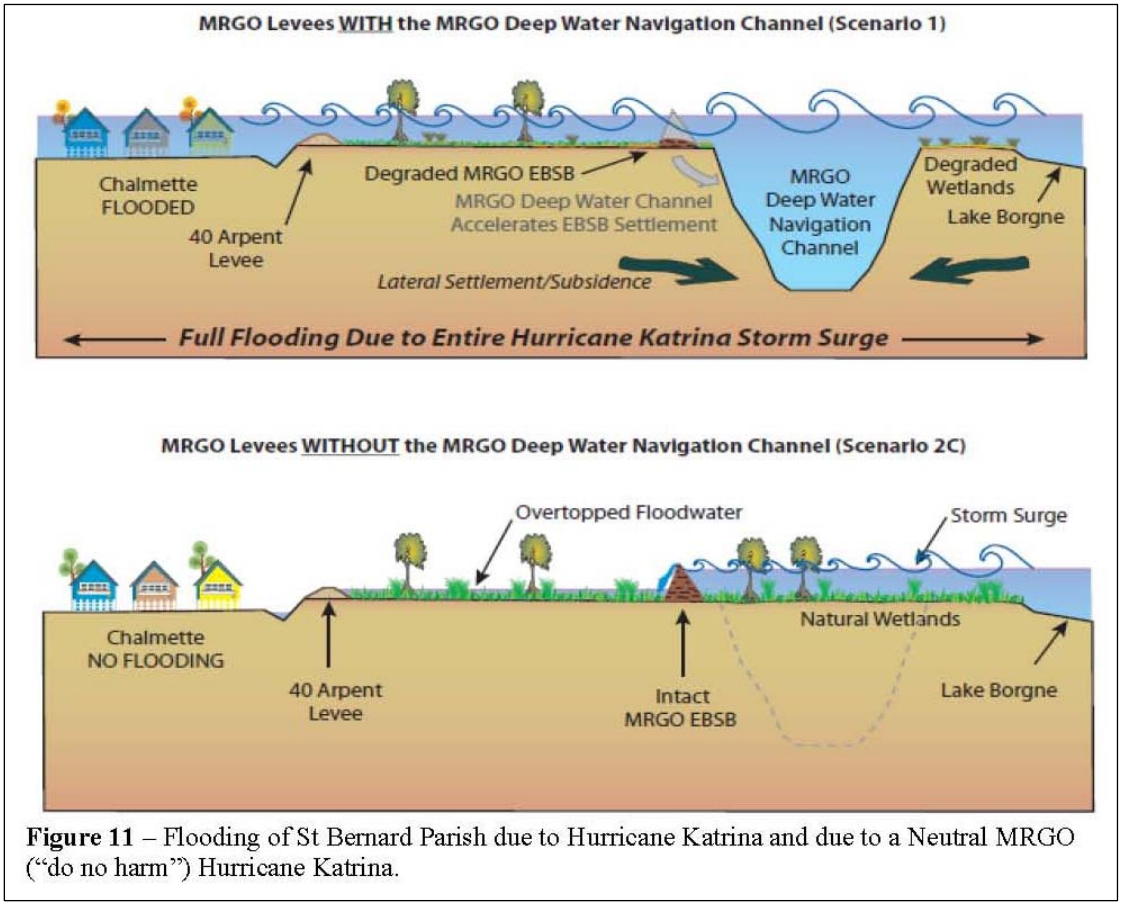

Figure 11 – Flooding of St Bernard Parish due to Hurricane Katrina and due to a Neutral MRGO ("do no harm") Hurricane Katrina.

At reach 2 and the St Bernard Parish section of the MRGO where the area experienced

surge elevation of about 10 feet above sea level in previous storms such as Betsy in 1965, during Hurricane Katrina the surge approached the 10 ft elevation at about 03:50 am LT, approximately 2.5 hours prior to landfall at Buras near the mouth of the Mississippi River.

At 04:00am with the surge at an elevation of 10.2 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were in the 60-70 knots (69 – 80 mph) blowing from the northeast (Gautier etal, 2008) pushing up a wind wave field of 6-7 feet in Lake Borgne and up to 6 feet in the MRGO channel. In the wetland area between MRGO and Lake Borgne the waves were knocked down to 2-3 feet. This demonstrated the efficiency of wetland marsh grass in reducing wave energy. However, as illustrated above, once the waves encountered the deep waters of the MRGO, the waves increased in size by a factor of 2.

At a point midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 3.8 seconds with significant wave heights of 4.8 feet – this equates to 16 waves per minute. At this time the surge was 3.7 feet above the 6.5 feet high toe of the levee. At this rate the waves would have been extremely erosive.

Plaintiffs will show that at 04:30 am the peak velocity at the storm surge elevation was determined to be 10 feet per second (Bea, 2008) with the geometric configuration of the EBSB inducing the waves to 'run-up' and 'rundown' the front-side of the levees. Erosion of the only armoring of the grass cover on the levees had begun. Although areas with good grass cover would have been more resistant than those with poor grass cover.

At this time, there was no overtopping of any EBSB sections.

At 05:00am the surge reached 12.0 feet (between Bayou Dupre and Bayou Bienvenue)

the winds along Reach 2 had increased to between 60 and 80 knots (69 – 92 mph) blowing from the northeast (Gautier etal, 2008) generating a wind wave field of 7-8 feet in Lake Borgne and 6-7 feet in the MRGO channel.

In the wetland area between MRGO and Lake Borgne the waves are still knocked down to 3-4 feet again reflecting the efficiency of wetland marsh grass in reducing wave energy. As the waves encounter the deep waters of the MRGO, the waves increase in size by a factor of 2.

Midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 3.8 seconds with a significant wave height of 5.8 feet – this equates to 16 waves a minute. At this time the surge was 5.5 feet above the toe of the levee, and the waves would have been extremely erosive. The front-side velocity at 05:30 am significantly exceeded the critical erosion values. Front side erosion and scour would have occurred as a result of wave impact at this elevation. The peak shear velocity (which is the rate at which the velocity cuts) was determined to be 12 feet per second (Bea, 2008). At this rate, the front-side levee faces (whether with good or with poor grass cover armoring) would have experienced complete liftoff and rapid erosion of the levee itself would have been begun. Sections of levee with very erodible soils started to see significant retreat of the levee face with a notch-like erosion scar at about 10 feet elevation. As this notch ate into the levee it permitted the waves to penetrate at an increasing rate.

At this time there still would have been very little if any overtopping of even the lowest EBSB sections.

At 06:00am the surge reached 13.8 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were in the 70-90 knots range (92 - 103 mph) blowing from the

northeast (Gautier etal, 2008) pushing up a wave field of up to 9 feet in Lake Borgne and 7-8 feet on the MRGO. At a point midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 4.2 seconds with a significant wave height of 7.1 feet.

Waves coming off the marsh almost double in size as they cross the MRGO, this created a 4- fold increase in wave energy. At this time the surge was 7.3 feet above the toe of the levee, and the waves were extremely erosive. At 06:30 am the peak front-side erosion velocities were 15 feet per second. By 06:05 am all levee sections with highly erodible soils would have been completely breached. Once levees were breached by front side wave attack and erosion there would have been significant levee lowering as the surge water flowed through from the MRGO to the Central Wetlands Unit. The Central Wetlands Unit started to fill.

At 07:00am the surge elevation reached 16.0 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were in the 90-100 knots (103 – 115 mph) blowing from the northeast (Gautier etal, 2008) pushing up a wind wave field of greater than 9 feet in Lake Borgne and 7-9 feet on the MRGO. At a point midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 4.7 seconds with a significant wave height of 8.6 feet. Waves coming off the marsh grew by 150% as they crossed the MRGO this caused a 2.25-fold increase in wave energy. At this time the surge was 9.5 feet above the toe of the levee and would have been overtopping the lowest section of Reach 2 (14.5 ft) EBSB for approximately 30 minutes. The waves were extremely erosive.

Notably, although by 07:05 am all levee sections made up of high erodibility soil (no matter how good the grass cover) were completely breached by front side wave attack. In contrast, levees of low erodibility soils did not breach at all during the storm.

This despite the fact that at 07:30 am the peak shear velocity was determined to be 14 feet per second and at this storm surge elevation the associated wave action results in active overtopping of the EBSB.

At 08:00am the surge was at an elevation of 18.1 feet (between Bayou Dupre and Bayou Bienvenue), all sections of the MRGO EBSB were overtopped by the surge, no matter their elevation. The winds along Reach 2 were 50-90 knots (69 – 80 mph), the range reflecting that the southern edge of Reach 2 was falling under the influence of the calmer winds within the eye of the hurricane. Winds were blowing from the southeast in the south to northeast in the funnel (Gautier etal, 2008) and were generating a wind wave field greater than 9 feet in Lake Borgne and 8-9 feet on the MRGO.

At a point midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 5.1 seconds with a significant wave height of 9.6 feet. At this time the surge was 11.6 feet above the toe of the levee, and the waves were extremely erosive and combined with overtopping would have torn up levee sections weakened previously by front side wave attack, as well as causing lowering of levee crests in many locations.

This combination of high waves and overtopping would have reshaped eroded levee section removing most evidence of the original cause of many levee failures, namely front – side wave attack.

The surge peaked at 08:10am at an elevation of 18.2 feet. Shortly thereafter the surge waters overtopped the 40 Arpent levee and started to fill the St Bernard bowl. This process continued until about 11:20 am, at which time the surge had fallen to about the height of the 40 Arpent levee, approximately 7 feet.

At 09:00am with the surge at an elevation of 13.1 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were in the 30-50 knots (34 - 57 mph) blowing from the northwest (Gautier etal, 2008) reflecting that the eye of the storm was now over Lake Borgne on its way to its second Gulf coast landfall around Pearlington, Mississippi at approximately 09:30am.

Waves were 0-5 feet in Lake Borgne and 2-6 feet on the MRGO. At a point midway between Bayou Dupre and Bayou Bienvenue the waves were arriving every 4.7 seconds with a significant wave height of 5.1 feet.

At 10:00am the surge was at an elevation of 9.4 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were weak from the west and the wave field hardly developed with the waves moving to the east away from Reach 2. The wind was blowing floodwater out of the St Bernard Bowl across the 40 Arpent Levee and from the Central Wetlands unit across the remnants of the Reach 2 levees to Lake Borgne.

At 11:00am with the surge at an elevation of 7.4 feet (between Bayou Dupre and Bayou Bienvenue) the winds along Reach 2 were weak blowing from the west and all waves were heading east. The wind continued to blow water out of the St Bernard Bowl and especially the Central Wetlands Unit.

The St Bernard polder continued to fill until about 11:20 am, at which time the surge had fallen to about the height of the 40 Arpent levee, approximately 7 feet. However, the flooding level was much higher, approximately 11.5 feet as the St Bernard bowl continued to fill from the

Central wetlands unit until parity was reached.

a. Contribution of Reach 2 to the conveyance of surge into Lake Borgne and then Reach 1

Plaintiffs will demonstrate that the southern section of the Reach 2 MRGO channel was a fairly efficient conduit of surge from Breton Sound to Lake Borgne adding to the surge elevation in this water body, and to the surge experienced along the EBSB's. If the MRGO channel had not cut through the Bayou La Loutre ridge then this northward directed surge from Breton Sound would not have added to the surge along the upper reaches of Reach 2.

Plaintiffs will also demonstrate that the upper section of Reach 2 at the height of the storm, conveyed 264,000 cubic feet per second (cfs) of surge water into the funnel. This accounted for approximately 61% of the surge heading into Reach 1 (GIWW) and the Inner Harbor Navigation Channel. This meant that the Reach 1 channel was at its absolute maximum capacity and as a consequence the surge rose much quicker and significantly higher than if the Reach 2 had not been allowed to contribute flow to the funnel. Significantly, had the Reach 2 been restricted to a neutral condition, its surge contribution to the funnel would have been a mere 48,000 cfs. Simply stated, plaintiffs will demonstrate that the operation and maintenance of the MRGO Reach 2 exacerbated surge delivery to the funnel by 578%.

Additionally, had Reach 1 been maintained at its pre-MRGO dimensions it would have conveyed only 157,000 cfs during Hurricane Katrina, about 36 % of what was conveyed during the actual storm. This massive increase in flow exacerbated the flooding potential from levee overtopping and the subsequent levee failures.

Reach 1 and St Bernard Parish and Lower Ninth Ward

Plaintiffs will demonstrate that at Chalmette close to the Paris Road Bridge the consequences of the dredging of MRGO meant that during the actual storm 252,200 cubic feet of surge water overtopped the levee per linear foot (cubic ft/ft) compared to 76,500 cubic ft/ft if the MRGO had not being constructed; thus, the MRGO channel in its condition as of 2005 increased the flooding rate by 330% during Katrina.

This added contribution increased the timing of the flooding and overtopping by an additional 90 minutes. This overtopping flooding impacted the Lower Ninth Ward and St Bernard Parish.

Reach 1 and Orleans East

Plaintiffs will demonstrate that at the Citrus Back Levee close to the Paris Road bridge the consequences of the dredging of MRGO was that during Katrina 118,300 cubic feet of surge water overtopped the levee per linear foot compared to 17,600 cubic ft/ft if the MRGO had not being constructed. Thus, the MRGO channel as it existed in 2005 increased the rate of flooding rate in Orleans East by 672% during Katrina.

This added contribution again reflected that overtopping would have occurred for 90 fewer minutes, meaning the operation and maintenance of the MRGO was a significant contributing factor to the levee failure and resultant flooding.

IHNC and Lower Ninth Ward

Plaintiffs will similarly demonstrate that at the Lower Ninth of levee overtopping flooding from the Industrial Canal would have occurred for 100 minutes less if the MRGO had not been built and the reduction in overtopping would have been about 6.7 times less; from

230,200 down to 34,700 cubic ft/ft. In short, the MRGO was a significant contributing factor to the levee failure and resultant flooding in both the IHNC and the Lower Ninth Ward.

IHNC and Orleans East

Plaintiffs will also demonstrate that the area of Orleans East that faces the IHNC would have experienced levee overtopping from the IHNC for about 45 minutes less if the MRGO had not been built and would have experienced 3.8 times less overtopping; from 47,100 down to 12,300 cubic ft/ft. Again, less duration and less overtopping would have decreased the flooding. It is noteworthy that this site, close to Lake Pontchartrain, having experienced relatively low surge elevations still felt the impacts of the MRGO during Katrina and the flooding along Reach 1 and from locations along the IHNC, which led to the extensive flooding of Orleans East.

Plaintiffs will demonstrate that the depth of floodwaters at their respective properties—would have been significantly less without the MR-GO's impact on LPV structures (Scenario 2c)—to wit:

	Actual	Scenario 2c
Norman and Monica Robinson	13'	<2'
Lattimore and Lattimore & Assoc.	8'	<1'
Lucille and Tony Franz	>8'	<0.5'
Tanya Smith	>8'	1'

Exh. 1771, Delft University, Comparison flood depth development between Katrina event and Scenario 2C (Jan. 2009).

In conclusion, Plaintiffs will demonstrate that the design construction, operation and maintenance of the MRGO was a foreseeable and substantial contributing cause of the failure of

the LPVHPP in the areas of New Orleans East, the Lower Ninth Ward and the St. Bernard Parish.

Respectfully Submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I have served a copy of the above and foregoing upon all counsel of record by placing same in the United States mail, properly addressed and with first-class postage, or by facsimile or other electronic transmission this 6th day of April, 2009.

/s/ Joseph M. Bruno
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