US Army Corps
of Engineers

Weekly Brief

4 April 2006

One Team: Relevant, Ready, Responsive, Reliable

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Topics

- Hurricane Katrina & Rita
- Corps emergency missions
- Hurricane protection system
- Congressionally authorized levels of hurricane protection
- Hurricane protection system restoration summaries
- New Orleans outfall canals
- Louisiana Coastal Protection and Restoration (LaCPR)
- Additional improvements

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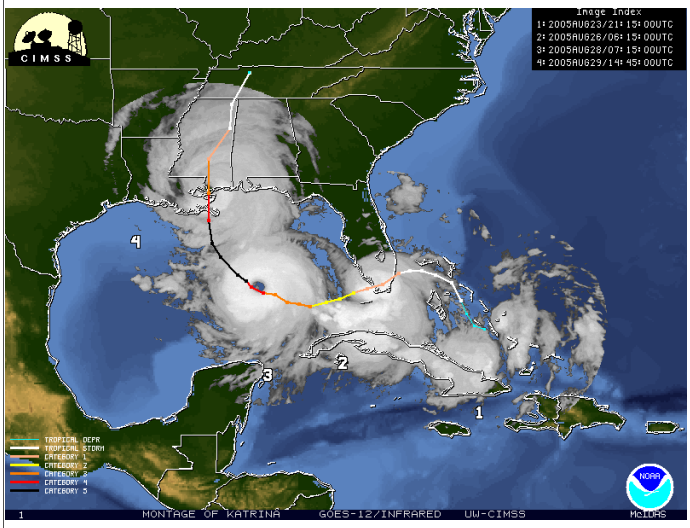
Hurricane Katrina



- *One of America's largest natural disasters*
- Cat 5 strength less than 12 hours before landfall
- *127 MPH wind at Louisiana landfall*
- Maximum surge of 28 to 30 feet along Mississippi coast
- *75 percent of New Orleans flooded*
- More than 1,300 dead

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**Katrina's initial Louisiana landfall at Buras, Louisiana, 6:10 a.m. 29 Aug, 2005

**Dropped from Category 5 to 4 at approximately 2100, 28 Aug. (MVN H&H interpolation of National Hurricane Center data)

**Dropped from Category 4 to 3 at approximately 0500, 29 Aug. (MVN H&H interpolation of National Hurricane Center data)

**Caused an estimated $100 billion damage (per 27 Jan NOAA news release)

**New Orleans flood percentage per IPET.

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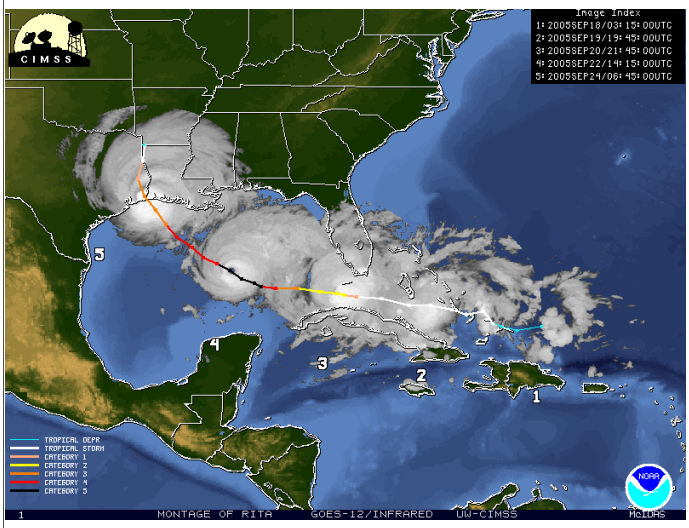
Hurricane Rita



- ***175 MPH max sustained winds in Gulf of Mexico***
- **120 MPH max sustained winds at landfall**
- ***Cat 3 strength at landfall***

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**Hurricane Rita made landfall at about 2:30 a.m CDT, 24 Sept. 2005 on the extreme southwest coast of Louisiana between Sabine Pass, Texas, and Johnson's Bayou, La. (per NOAA).

**Hurricane Rita caused an estimated $9.4 billon in damage (per NOAA).

** Hurricane Rita produced the fourth-lowest central pressure ever recorded by a Gulf of Mexico/Atlantic Hurricane,

(per MVN H&H, pressure estimated, final report pending).

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Corps of Engineers Emergency Missions

Task Force Hope Personnel: 2,368 currently assigned

- **Water:** *Completed*
- **Ice:** *Completed*
- **Emergency power:** *299 generators installed*
- **Flood water removal:**
  - *By pumping*
  - *Accomplished in 53 days*
  - *Volume -- more than 732,000 acre-feet (250 billion gallons) removed*
- **Temporary roofing:**
  - *131,210 structures*
  - *100 % complete*
- **Temporary structures**
  - *1,036 total required*
  - *89 % complete*
- **Debris removal**
  - *38.9 million cubic yards removed*
  - *80 % complete*
- **Structural debris removal**
  - *0.7 million cubic yards removed*
  - *4 % complete*

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**Personnel includes 475 MVD employees, 274 other USACE employees, 101 other government agency employees, 48 military, 1361 Contractor QA and Title II staff, and 109 rehired annuitants.

**Primary ongoing missions assigned to the Corps by the Federal Emergency Management Agency are debris removal, structural debris removal, and temporary public buildings missions.

**160 generators installed in Mississippi, 139 generators installed in Louisiana.

**Temporary roofing mission provides protection to private homeowners, schools, daycares, public buildings and other buildings used as shelters or relief locations. Estimate includes both Louisiana and Mississippi.

**The Corps is providing critical public structures to areas where the storms have damaged or destroyed buildings, including classrooms in communities absorbing dislocated students from other areas. Estimate includes both Louisiana and Mississippi.

**Debris removal mission assigned to the Corps by the Federal Emergency Management Agency.

**Debris removal includes both Louisiana (20.7 mil cy removed) and Mississippi (18.2 mil cy removed).

**Structural debris removal includes structures on public rights of way and on private property. Before removal, local governments need to provide demolition plans and rights of entry. Structural debris removal includes both Louisiana and Mississippi. To date mission is 4 % complete based on quantity of debris. Total structural debris estimated at 14.8 million cubic yards.

****Current as of 5-APR-2006**

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Louisiana & Mississippi Debris Missions

	Louisiana	Mississippi
Debris Removal – Estimated Total	26.4	22.2
Structural Debris Removal – Estimated Total	13.5	1.3
Totals **(million cubic yards)**	39.9	23.5

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**Debris removal mission assigned to the Corps by the Federal Emergency Management Agency.

**FEMA estimates debris volume of 60.3 million cubic yards in Louisiana and 46.0 million cubic yards in Mississippi.

**Corps responsible for the following debris: Hurricane Katrina created an estimated 20.3 million cubic yards of debris in Louisiana, while Hurricane Rita accounted for an estimated 6.1 million cubic yards. Hurricane Katrina created an estimated 22.2 million cubic yards of debris in Mississippi.

**Largest debris removal mission in U.S. history

**Previous largest debris mission resulted from 1992's Hurricane Andrew in Florida, which produced more than 15 million cubic yards.

**Katrina generated more debris in Mississippi alone than Hurricane Andrew (15 million cubic yards) the previous most destructive hurricane in U.S. History. The final debris removal total for Katrina and Rita in Mississippi alone is estimated to be three times greater than Andrew.

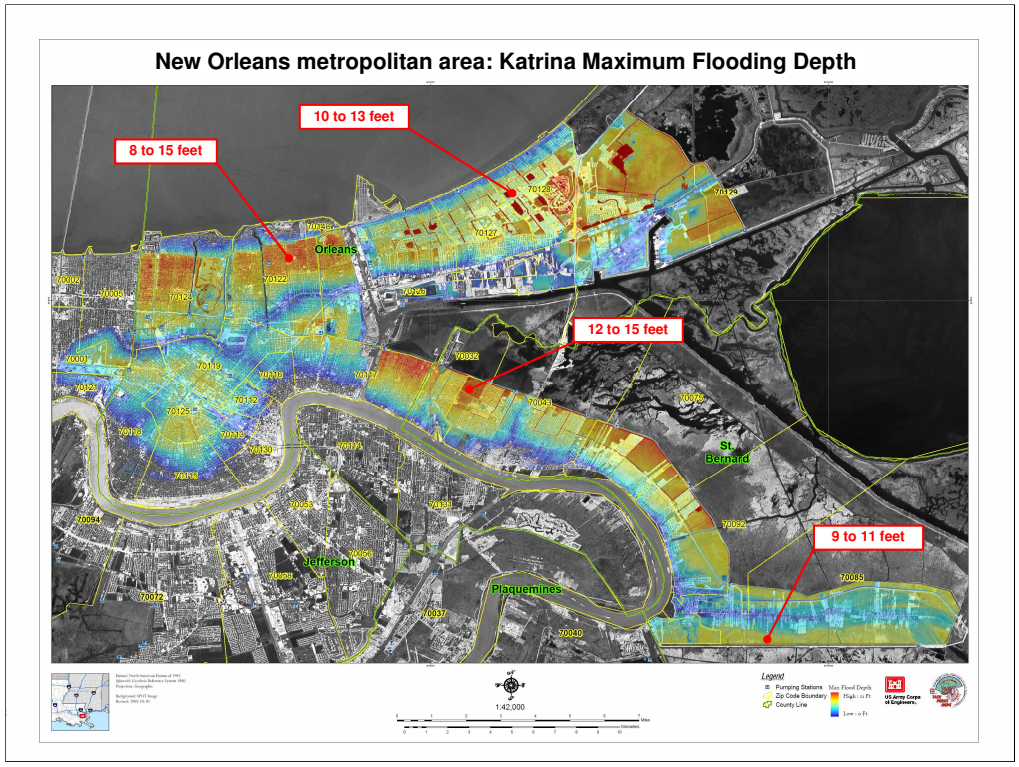
**Total estimated Corps debris mission in both Louisiana & Mississippi would fill the Louisiana Superdome nearly 10.6 times (total 48.9 million cubic yards/4.6 million cubic yards = 10.6 times; Superdome volume = 4.6 million cubic yards)

****Current as of 5-APR-2006**

**More than 350 miles of levees in the southeast Louisiana area

**41 miles sustained severe damage

**128 miles of levee sustained minor damage



**75 percent of the city of New Orleans flooded (per IPET)

**Illustrated flood depths based on preliminary data and high water marks. Numbers will become more specific as data is verified.

(maximum New Orleans flood depths pending from MVN hydrology)

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Authorized Protection Levels

Design Hurricanes

Project Location	Date Authorized	Central Pressure Index	Wind		Forward Speed
			Speed	*At Radius of*	
Lake Pontchartrain & Vicinity	October 1965	27.6 inches	100 mph	34.5 miles	5.75 – 12.66 mph
Grand Isle & Vicinity	1965 – 1976	28.15 inches	87 mph	35 miles	13 mph
New Orleans to Venice	October 1962	28.1 inches	90 mph	34.5 miles	11 mph
West Bank & Vicinity	1986	27.4 inches	115 mph	34.5 miles	12.6 mph

Congress currently authorizes protection from flood waters resulting from winds of 90-115 MPH.

Saffir-Simpson Scale (1970)

Scale Number	Winds (mph)
1	74 – 95
2	96 -110
3	111 – 130
4	131 – 155
5	155 +

Katrina at LA Landfall

Category 3
127 mph wind
27.17 inches central pressure
15 mph forward speed
90 miles – extent of hurricane force winds
230 miles – extent of tropical force winds

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**Note the differences between Katrina and the specifics of the various hurricane protection projects.

**Various Louisiana hurricane protection projects were designed and approved at different times the last 50 years and do not match up precisely with any specific rating on the Saffir-Simpson Scale, which was established in 1970.

**Katrina made landfall at Buras, Louisiana, 6:10 a.m. 29 Aug, 2005

****Current as of 5-APR-2006**

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Southeast Louisiana Hurricane Protection

CURRENT WORK

- **Repair:**
  - Return pre-Katrina protection to hurricane-damaged components by 1 June 2006
- **Restore:**
  - Restore undamaged levees/floodwalls to originally authorized heights by 1 Sep 2007
- **Complete:**
  - Accelerated completion of unconstructed portions of authorized projects by Sep 2007
- **Improve:**
  - Make improvements to optimize the performance of the existing system
- **Higher Levels of Protection:**
  - South Louisiana Hurricane Protection and Restoration Report - preliminary report due June 2006, final December 2007

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**REPAIR -- 1 June marks arrival of new hurricane season

**RESTORE -- raising levees to compensate for settlement and subsidence

**COMPLETE -- original completion date had been 2017

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New Orleans and Vicinity Hurricane Protection System Emergency Supplemental Funding to Date ($M)

(Repair, Restore, & Complete)

Component	Funded
Repair Existing System and Rebuild to Design Height	$1,533
Complete Authorized System	
New Orleans to Venice (Hurricane Protection)	$ 33
West Bank and Vicinity (Hurricane Protection)	$147
Lake Pontchartrain and Vicinity (Hurricane Protection)	$120
Southeast Louisiana (Interior Flood Damage Reduction)	$225
Grand Isle (Hurricane Protection)	$ 15
Larose to Golden Meadow (Hurricane Protection)	$ 4
TOTAL	$2,077 M

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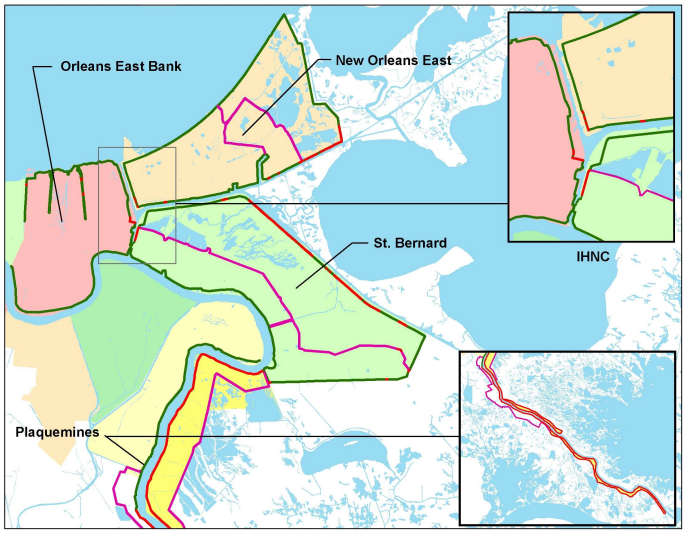
Hurricane Protection System Restoration Program Summary



Hurricane Protection System
- 350 miles
- 71 pump stations

Damage
- 41 miles severe, 128 miles moderate damage
- 34 pump stations were non-operational

Cost
- $ 770 million

Percent of Pre-Katrina Protection Restored

59 % Complete

20 of 59 contracts complete

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**Map shows areas damaged by Katrina and to be repaired by the 1 June hurricane season.

**More than 350 miles of levees in the southeast Louisiana area

**41 miles sustained severe damage, 128 miles of levee sustained minor damage

**IHNC = Inner Harbor Navigation Canal, St. Bernard and Plaquemines are local parishes

**The following seven slides address segments of the above system in greater detail and identify the contracts required to complete the repair work.

** Initially 34 pump stations were considered damaged base on non-operational status. A total of 66 pump stations received hurricane damage.

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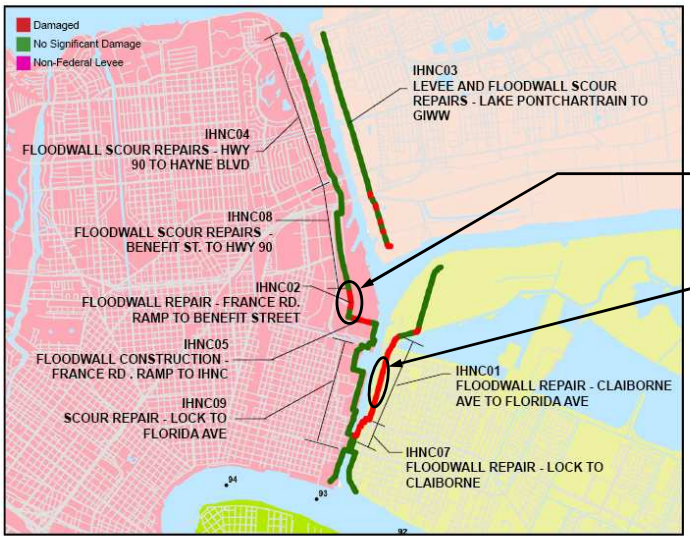
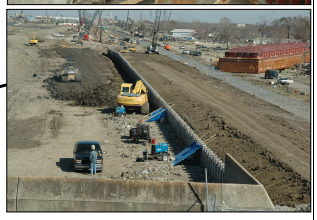
Inner Harbor Navigation Canal





Percent of Pre-Katrina Protection Restored

67 % Complete

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**Majority of this segment is I-wall construction, damaged portions being constructed by T-wall construction.

**In this area, storm surge overtopped the flood walls which resulted in backside scouring and ultimately led to flood walls being breached.

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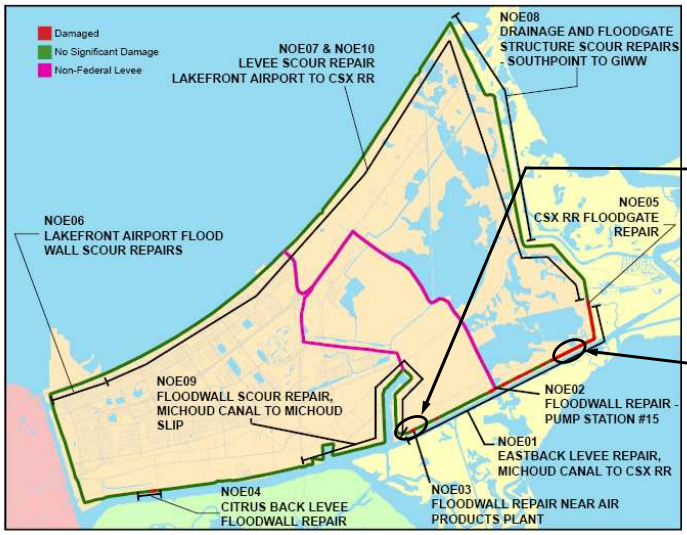
New Orleans East



Percent of Pre-Katrina Protection Restored

70 % Complete

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**In this area, flooding resulted from the overtopping of flood walls and levees.

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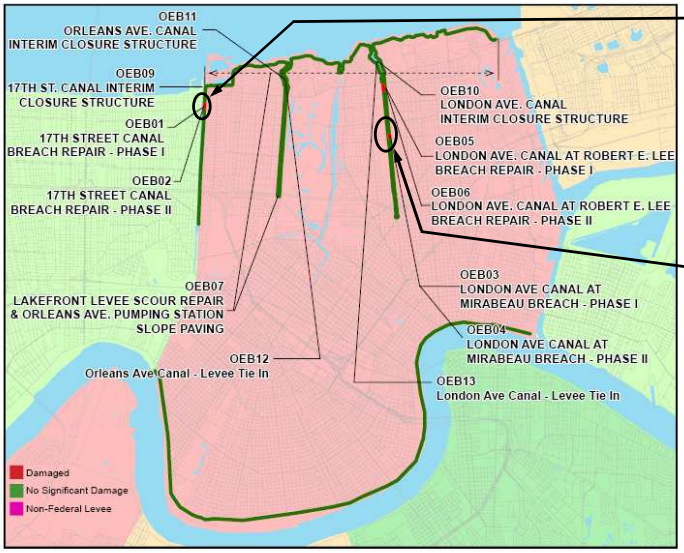
Orleans East Bank



Percent of Pre-Katrina Protection Restored

34 % Complete

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**New Orleans' three outfall canals provide rainwater drainage from the New Orleans area into Lake Pontchartrain.

**For reasons that are still being investigated, flood walls in the canals were breached after storm surge entered from Lake Pontchartrain.

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Outfall Canal Challenge

- **Determine best solution to outfall canal issue given:**
  - Canal levee/floodwalls will not perform to design levels without major reconstruction/strengthening.
  - Interdependence of hurricane protection system.
  - Need to provide public confidence to inspire near-term return.

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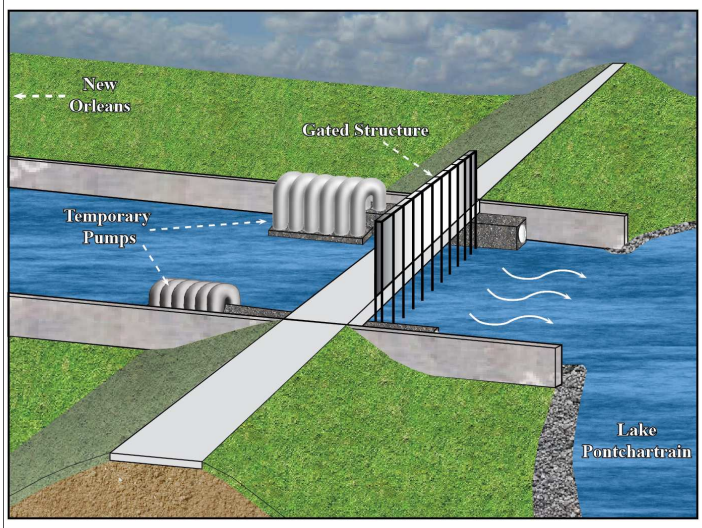
New Orleans Outfall Canal Interim Closure Plan



- Three locations on Lake Pontchartrain
- Provides protection by 1 June 2006
- Provide New Orleans with rainwater drainage
- Prevent storm surge
- Pumps permit drainage while closed

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**Outfall canals provide rainwater drainage from the New Orleans area into Lake Pontchartrain.

**Gates that can be opened and closed protect the canals from storm-induced surges from Lake Pontchartrain. The pumps will move water into the lake even when the gates are closed.

**The gates will only be closed when water levels in Lake Pontchartrain reach an elevation of 7 feet above sea level, which has only occurred one time the last 74 years (during Hurricane Katrina).

**Lake Pontchartrain has only risen to 6 feet above sea level three times the last 74 years.

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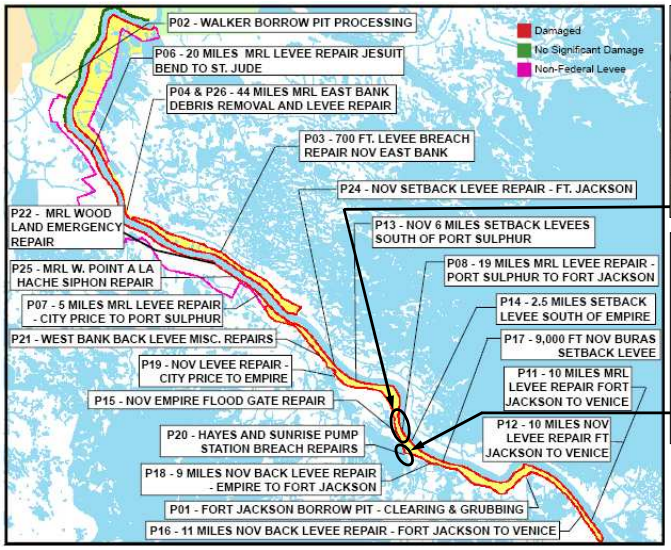
Plaquemines Parish



Percent of Pre-Katrina Protection Restored

77 % Complete

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**In this area, flooding resulted from extensive overtopping.

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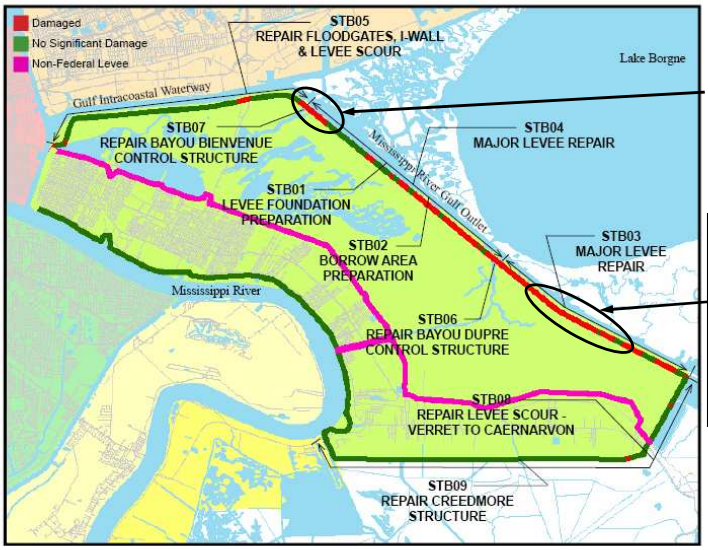
Saint Bernard Parish



Percent of Pre-Katrina Protection Restored

78 % Complete

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**In this area, flooding resulted from overtopping and extensive backside scouring.

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Louisiana Coastal Protection and Restoration (LaCPR)

Congress directed analysis and design of:

- Category 5 Hurricane Protection
- Full range of measures for flood control, coastal restoration, and hurricane protection
- Preliminary Report to Congress – June 2006
- Final Technical Report – December 2007
- Submit reports on component areas for authorization as practicable

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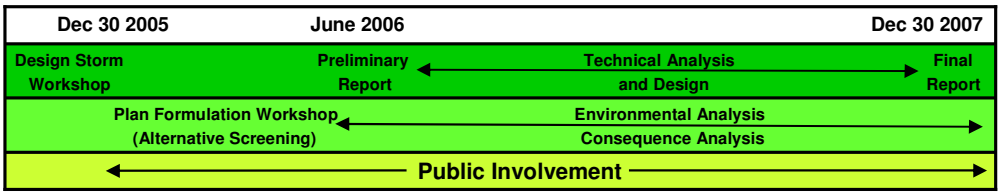
Louisiana Coastal Protection and Restoration (LaCPR) - Status

- Partnership with State Coastal Protection and Restoration Authority
- Team formed
- Project Management Plan drafted
- Finalizing HQ guidance
- Frequent broad based public involvement planned



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**Current as of 5-APR-2006

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Louisiana Coastal Protection and Restoration (LaCPR) - Report

- Study approach requires innovation
- Accelerated schedule
- IPET forms basis for analysis and design
- Expert Team
- Outside and independent review
- Extensive public input

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Southeast Louisiana Hurricane Protection

ADDITIONAL IMPROVEMENTS

The Bush Administration on Feb. 16 asked Congress to support an additional $1.46 billion in new funding for improvements to southeast Louisiana's hurricane protection system. If approved, the proposal would pay for:

- **Permanent pumps and closures for New Orleans' three outfall canals. ($530 million)**
- **Two navigable closures that would prevent hurricane surge from entering the Industrial Canal area. ($350 million)**
- **Storm-proofing existing interior drainage pump stations in Jefferson and Orleans Parishes. ($250 million)**
- **Selective armoring for critical portions of the New Orleans levee system. ($170 million)**
- **Incorporation of Plaquemines Parish west bank, non-federal levees into the federal levee system. ($60 million)**
- **Restoration of critical areas of coastal wetlands and ecosystems needed to improve long- term hurricane and storm protection. ($100 million)**

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**New Orleans' three outfall canals provide rainwater drainage from the New Orleans area into Lake Pontchartrain.

**Outfall canal gates and closures would protect outfall canals from storm surge out of Lake Pontchartrain, and pumps will move water from the canals into the lake when gates are closed.

**Navigable closures would remain open except when surge is imminent, when they would close to protect the Industrial Canal area.

**Storm-proofing pump stations would allow them to function through storms by hardening them, raising critical equipment, providing emergency power and fuel systems and providing for crew safety.

**Armoring would be placed at such critical areas as pipeline crossings, backsides of levees and floodwalls most exposed to storm surge, and areas where floodwalls transition to earthen levees.

**Non-federal levees in Plaquemines Parish would be raised to the same design heights as other federal levees for frequent flooding of state Highway 23 – a major hurricane evacuation route.

**Restored wetland systems can have a buffering effect on storm surge and waves.

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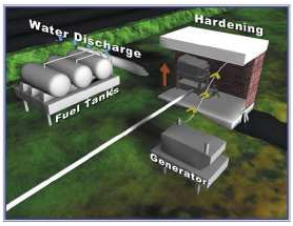
Southeast Louisiana Hurricane Protection

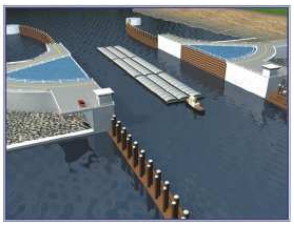
ADDITIONAL IMPROVEMENTS

Permanent Pumps & Closures

Selective Armoring



Storm-Proofing Pump Stations



Navigable Closures

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**Examples of the proposed additional improvements.

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