

Greater New Orleans Hurricane and Storm Damage Risk Reduction System

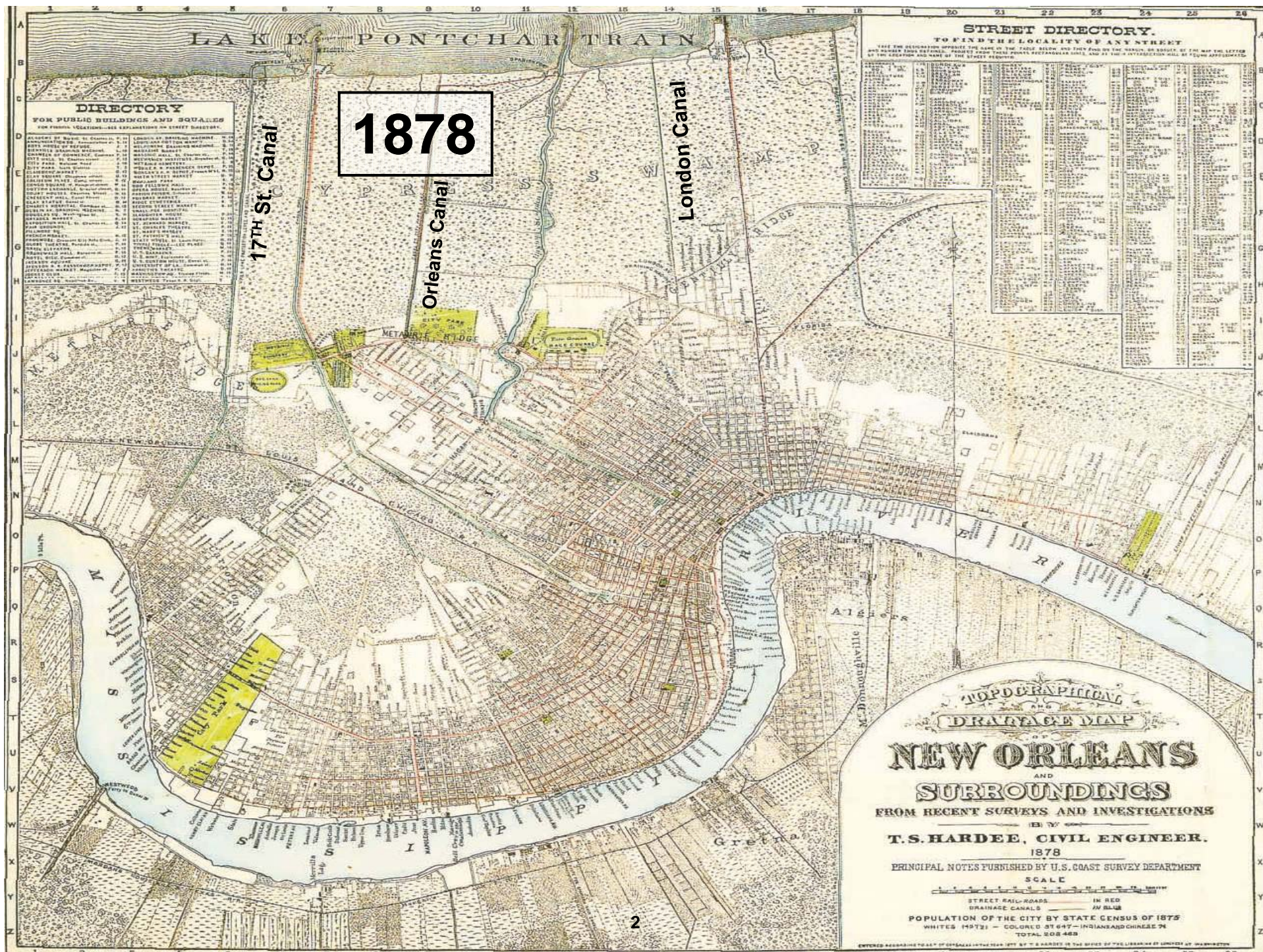
**Mike Park
Chief
Task Force Hope
U.S. Army Corps of Engineers**

May 21, 2014



**US Army Corps of Engineers
BUILDING STRONG®**





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New Orleans Topography

City of New Orleans Ground Elevations

FLOODWALL ALONG MISSISSIPPI RIVER

23 FT

A

MR&T PROJECT DESIGN FLOWLINE (18 FEET)

LONDON AVENUE CANAL FLOODWALL

HURRICANE LEVEE / FLOODWALL (14.0 FEET)

B

MISSISSIPPI RIVER BANK

CANAL ST AT RIVER

ST LOUIS CATHEDRAL

ESPLANADE AT ST. CLAUDE

DERBIGNY AT I-10

GENTILLY BLVD AT ALLEN

DILLARD UNIV CAMPUS

ST ANTHONY AT FILMORE AVE

WAINRIGHT DR AT L. C. SIMON

UNO SIDE OF WAINRIGHT DR

LAKE PONTCHARTRAIN SHORE

ELEVATIONS IN FEET NGVD

30

20

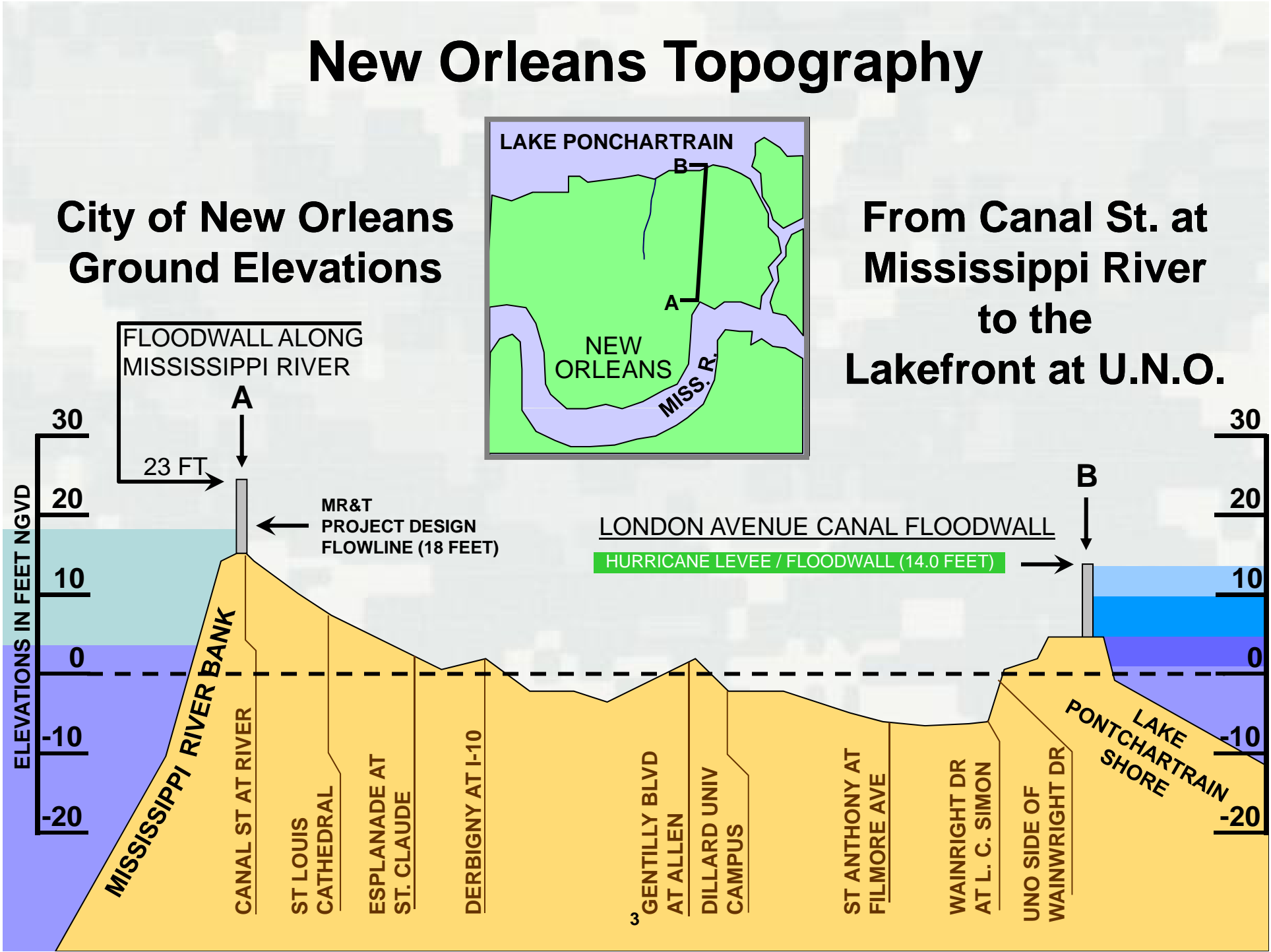
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From Canal St. at Mississippi River to the Lakefront at U.N.O.



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City of New Orleans Ground Elevations

From Canal St. at Mississippi River to the Lakefront at U.N.O.

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NEW ORLEANS

MISS. R.

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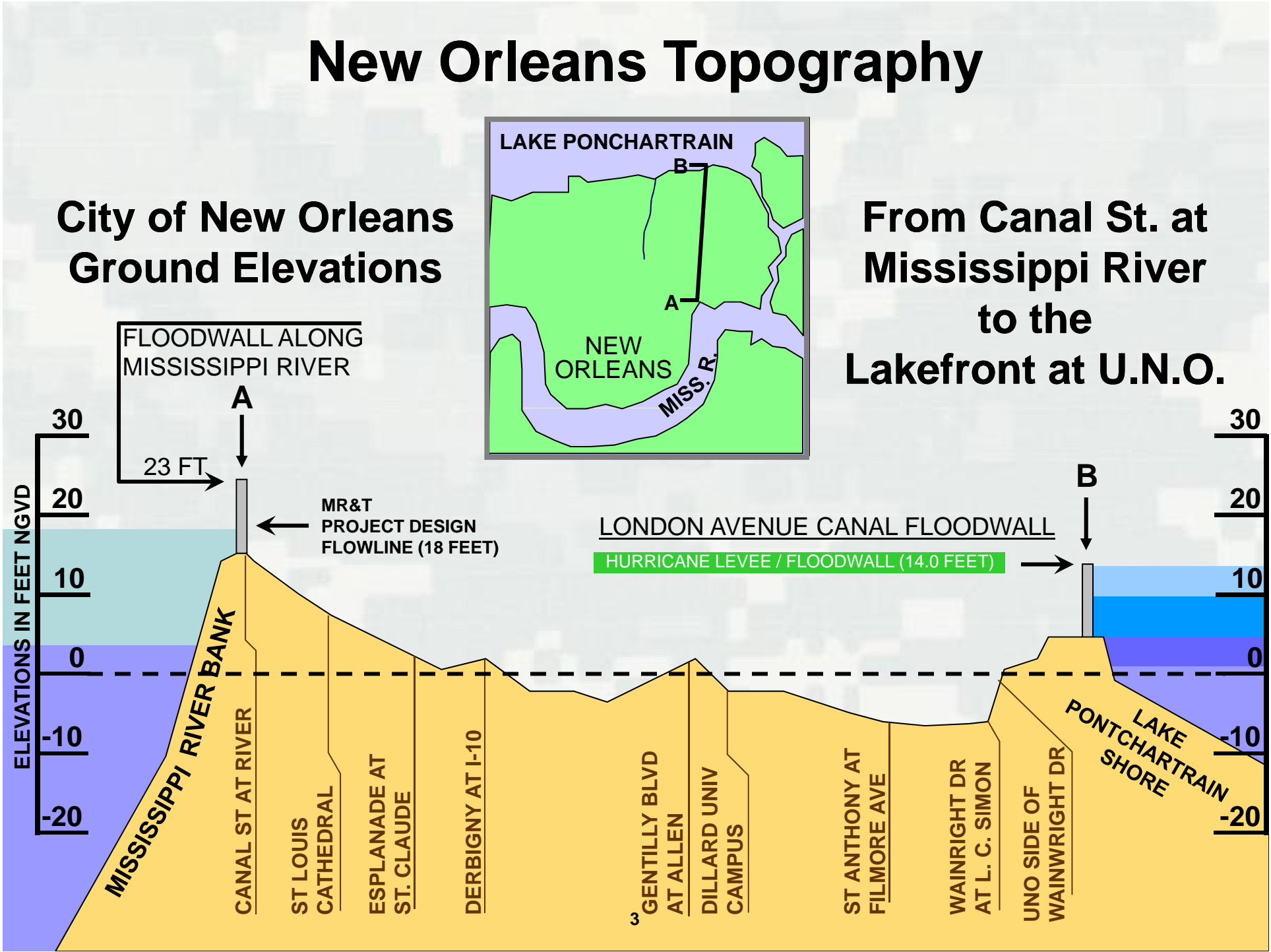
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Hurricane Katrina

Aug 29, 2005



- One of America's largest natural disasters
- Cat 5 less than 12 hrs before landfall
- 127 MPH wind at Louisiana landfall
- Maximum surge of 28 to 30 feet along Mississippi coast
- 80 percent of the city of New Orleans flooded

Hurricane Rita

Sep 24, 2005



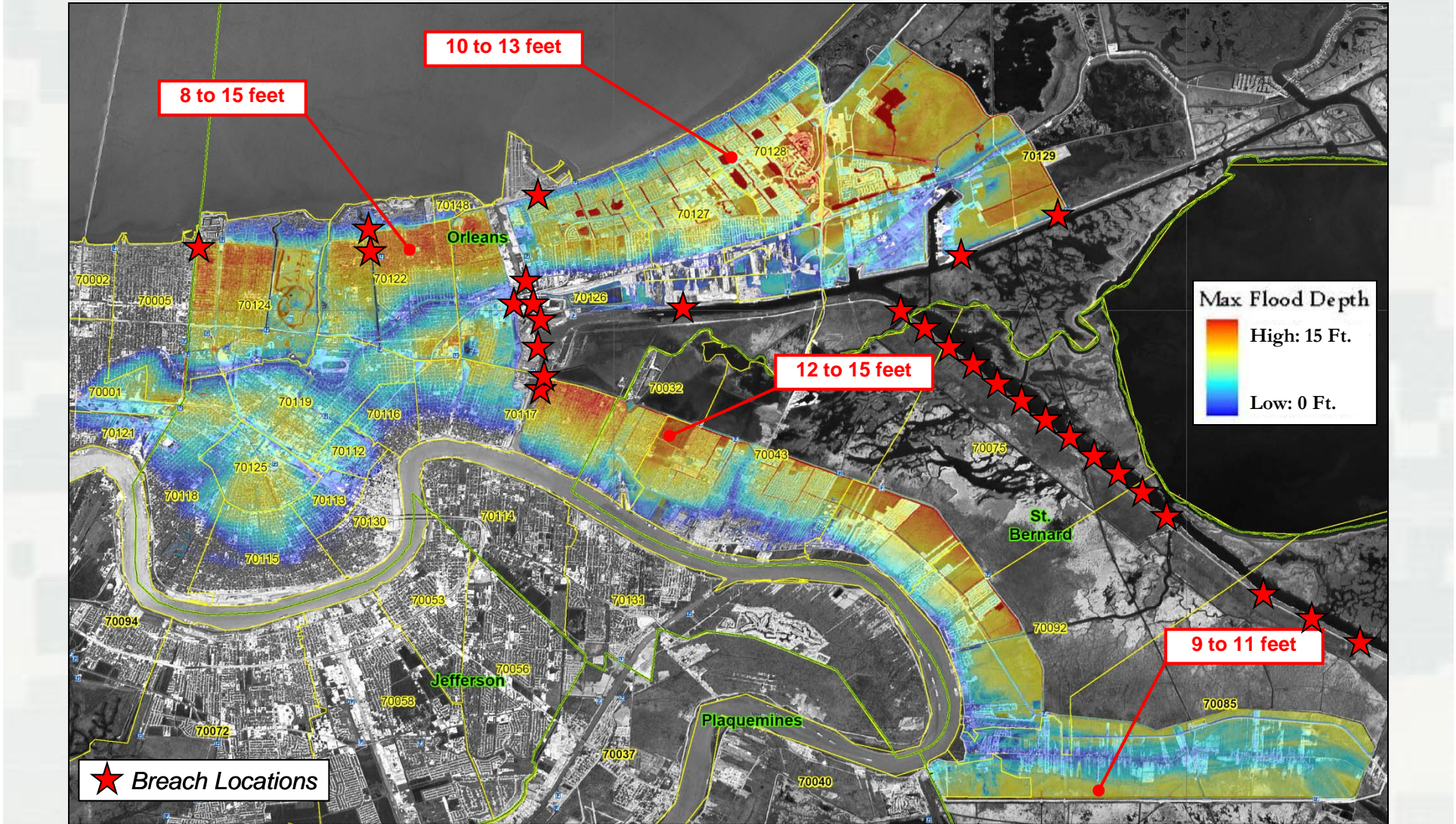
- Cat 4 less than 12 hrs before landfall
- 175 MPH max sustained winds in Gulf of Mexico
- 120 MPH max sustained winds at landfall
- Cat 3 strength at landfall



BUILDING STRONG®

New Orleans

Depth of Flooding



Katrina Floodwall Breaches



Wave Overtopping Effects



Effects of Hurricane Katrina

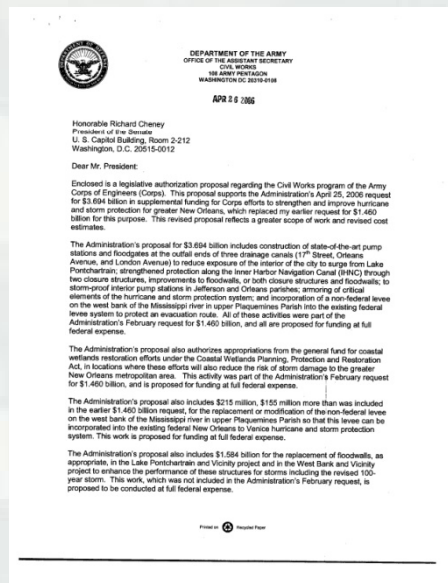


Transition Erosion

Levee Erosion



HSDRRS Authorization



4th Emergency Supplemental (June 2006)

...authorized to raise, as appropriate, levee heights and otherwise enhance the existing Lake Pontchartrain and Vicinity project and the existing West Bank and Vicinity project to provide the levels of protection necessary to achieve **certification required for participation in the National Flood Insurance Program...**

HSDRRS: Our Mission and Commitment

- *Repair the damages, making what was there before whole again.*
- *By 1 June 2011, strengthen and improve the system and provide 100-year level of risk reduction capable of withstanding the effects of a storm having a 1% chance of occurring each year.*
- *Current funding level \$14.48 B (fully funded).*



Deliver the Greater New Orleans HSDRRS Mission

Challenges

- ***Mandate to deliver \$14.6B construction program within budget and on schedule***
- Form design criteria, program cost estimate, acquire funding
- Intense scrutiny / oversight
- New governances
- ***NEPA compliance***
- Deliver a comprehensive system

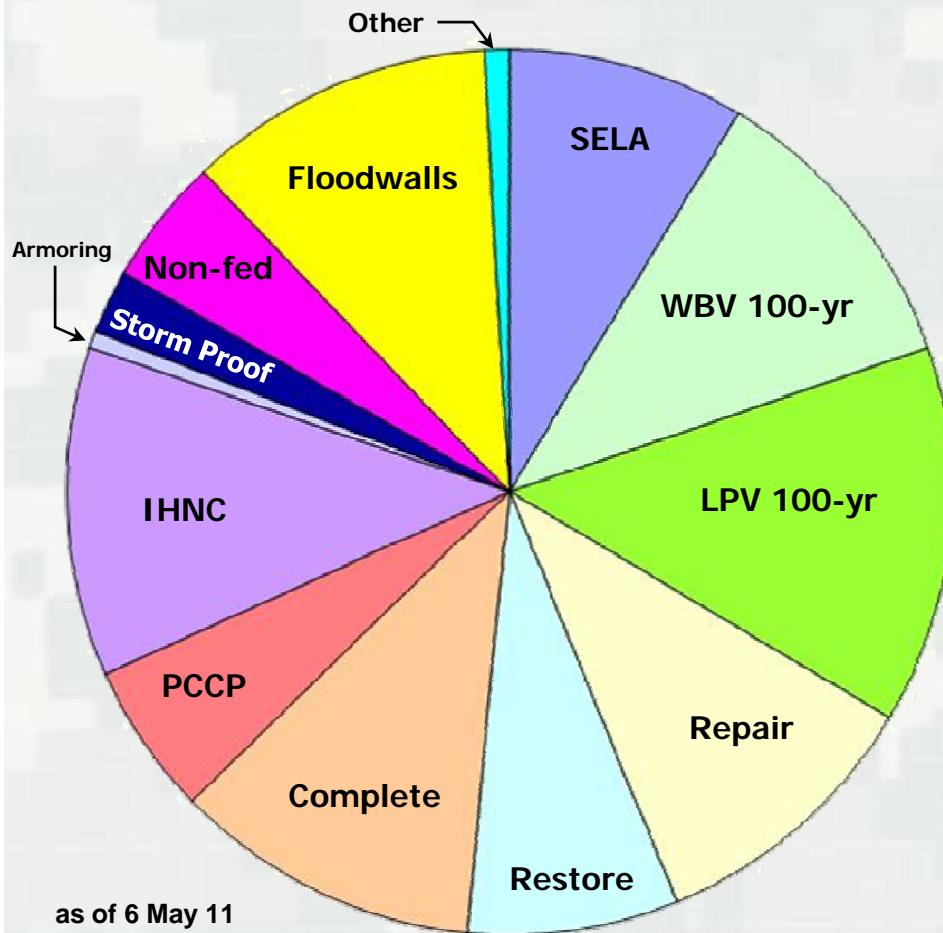
Enablers

- Administration / Congressional commitment
- ***Fully funded program***
- National / Regional Corps capabilities
- Local partners and stakeholders capabilities
- ***NEPA Alternate Arrangements***
- Full suite of acquisition strategies
- Favorable bidding climate



HSDRRS Funding Breakdown

TOTAL APPROPRIATED FUNDS: \$14.48 B



COMPONENT	\$ (M)
SELA (<i>Interior Drainage</i>)	\$1,253
WBV 100-year Level of Protection	\$1,610
LPV 100-year Level of Protection	\$1,997
Repair Existing System	\$1,475
Restore to Design Height	\$1,132
Complete Authorized System	\$1,619
Permanent Pump Stations	\$804
IHNC	\$1,743
Selective Armoring	\$89
Storm-proof Existing Pump Stations	\$340
Incorporate non-Fed Levees in Plaquemines Parish	\$671
Reinforce or Replace Floodwalls	\$1,626
Other	\$130

NEPA Alternative Arrangements

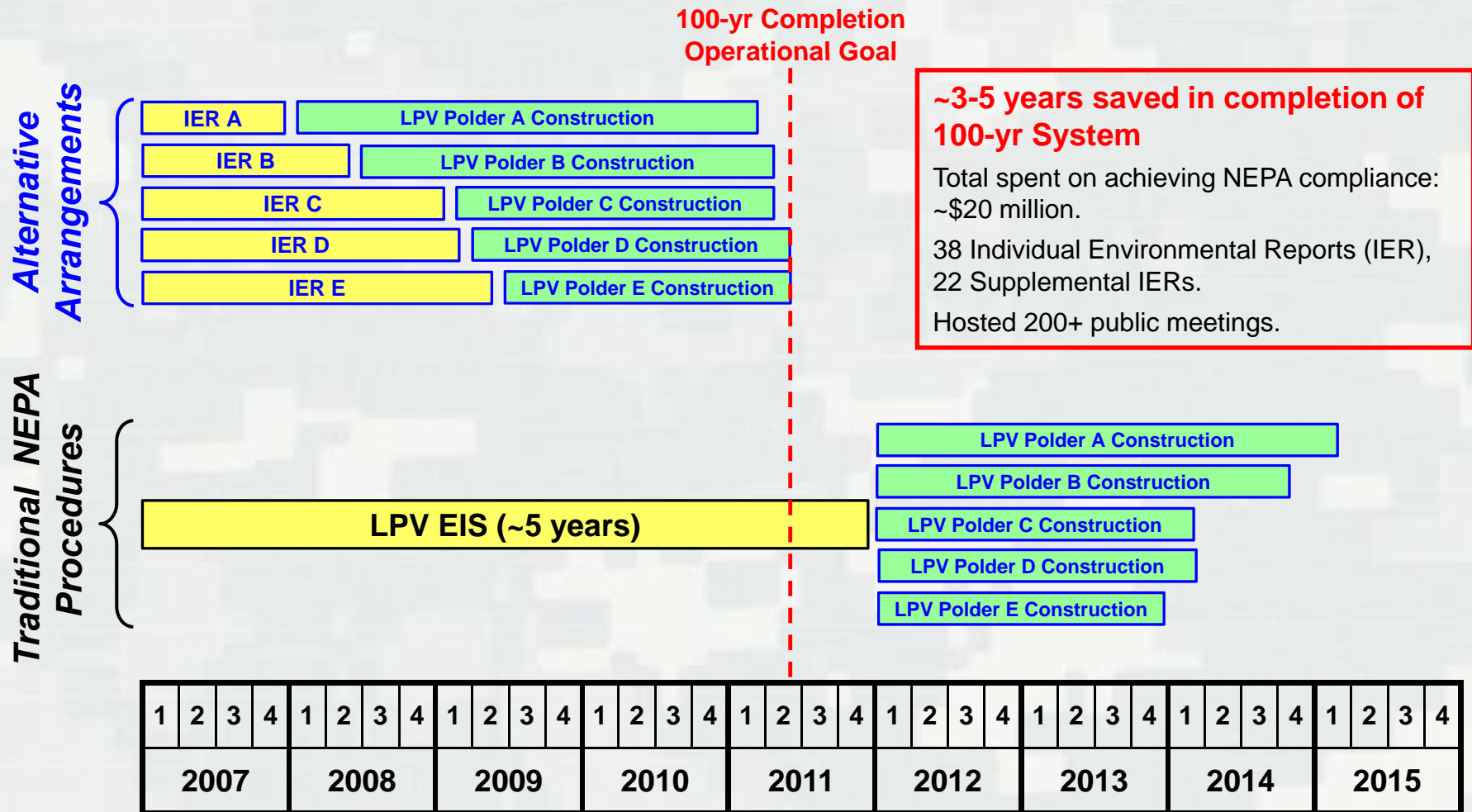
- **Alternative Arrangements Approved by CEQ** – to facilitate expedited construction of the 100-year level HSDRRS to abate extreme risk to life and property
- **NEPA Environmental Review** – achieved through concurrent development of multiple Individual Environmental Reports (IERs) for segments of the system in lieu of comprehensive Environmental Impact Statement (EIS)
- **Consolidated Environmental Document** – compilation of IERs into a single document assessing cumulative environmental impacts of HSDRRS



NOTIONAL

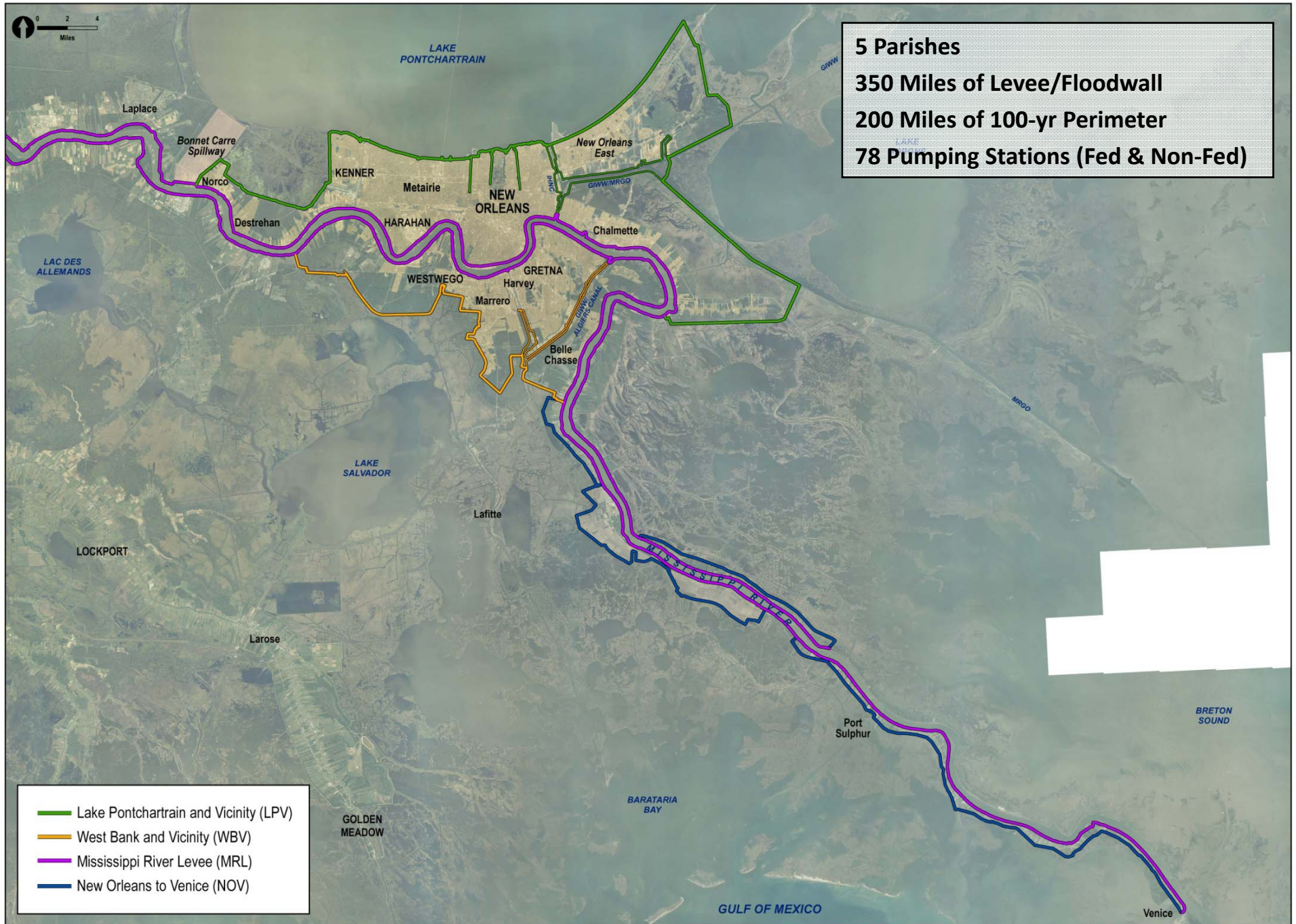
NEPA Compliance Schedule Impact

Estimated NEPA Compliance and Construction Times



HURRICANE AND STORM DAMAGE RISK REDUCTION SYSTEM

Lake Pontchartrain and Vicinity (LPV), West Bank and Vicinity (WBV), Mississippi River Levee (MRL), and New Orleans to Venice (NOV)



Environmental Impacts

Objective: Avoid, Minimize, Mitigate

Initial estimates (5,000+ acres)

Current Impacts (2,295 acres)

- LPV – 1,179 acres
- WBV – 1,116 acres

Current Plan

- 3 Mitigation Banks
- 10 Corps constructed projects



Bottomland Hardwoods Wet



Swamp



Marsh



Bottomland Hardwoods Dry

Bayou aux Carpes Wetland

- One of only 13 sites in the US protected as an important National asset under provisions of SEC 404(c) of the Clean Water Act
- 404(c) - Authorizes EPA to prohibit discharge of dredged or fill materials at so designated sites
- Bayou aux Carpes is a 3,000 acre site characterized by unique wetlands including rare flotant marsh
- May 2009 – EPA approved the modification of the 1985 Bayou aux Carpes 404(c) designation to allow construction of the West Closure Complex



West Closure Complex Alternatives

Alternative 1: Floodgate on GIWW

Floodgate and permanent bypass channel in the GIWW below the confluence of the Algiers and Harvey Canals to the 100-yr level of protection



Lapalco Floodgate and Cousins PS Discharge Channel Walls at previously authorized level of protection



Proposed Floodgate and pump station at 100-yr level of protection



GIWW permanent bypass channel



Levees and Floodwalls to the previously authorized level of protection or greater



Levees and Floodwalls to the 100-yr level of protection



Pump Stations



Bayou Aux Carpes 404 (c) Site



Alternative 2: Floodgate on GIWW

Floodgate and permanent bypass channel in the GIWW below the confluence of the Algiers and Harvey Canals to the 100-yr level of protection



Lapalco Floodgate and Cousins PS Discharge Channel Walls at previously authorized level of protection



Proposed Floodgate and pump station at 100-yr level of protection



GIWW permanent bypass channel



Levees and Floodwalls to the previously authorized level of protection or greater



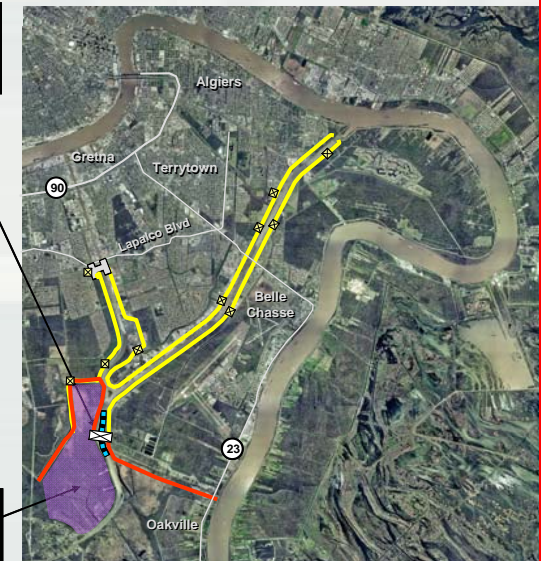
Levees and Floodwalls to the 100-yr level of protection



Pump Stations



Bayou Aux Carpes 404 (c) Site



Alternative 3: Floodgate on Algiers Canal

Sector floodgate in the Algiers Canal to the 100-yr level of protection



Lapalco Floodgate and Cousins PS Discharge Channel Walls (raised to provide 100-yr level of protection)



Proposed Floodgate and pump station at 100-yr level of protection



Levees and Floodwalls to the previously authorized level of protection or greater



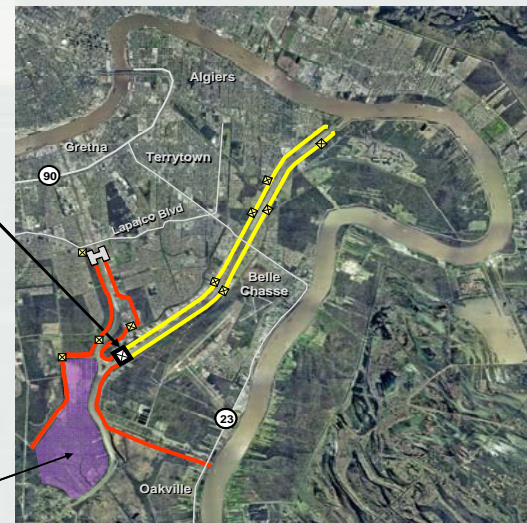
Levees and Floodwalls to the 100-yr level of protection



Pump Stations



Bayou Aux Carpes 404 (c) Site



Alternative 4: Parallel Protection



Lapalco Floodgate and Cousins PS Discharge Channel Walls (raised to provide 100-yr level of protection)



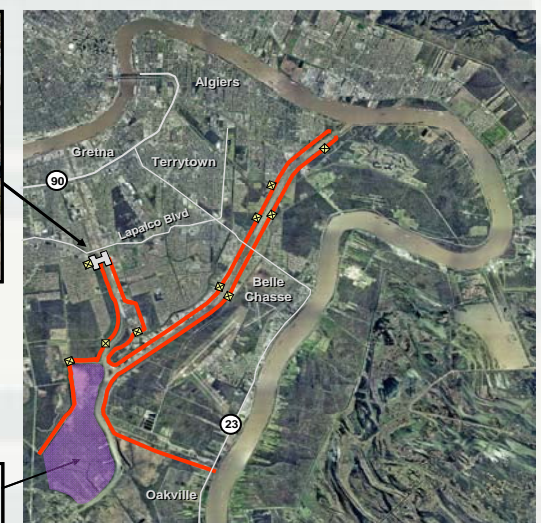
Levees and Floodwalls to the 100-yr level of protection



Pump Stations



Bayou Aux Carpes 404 (c) Site



West Closure Complex



- Largest drainage pump station in the world – 19,140 cfs
- Largest sector gates in US – 225 ft clear width
- Removed 26 miles of levees and floodwalls from the first line of defense
- ~\$1 B Delivery cost
- Early Contractor Involvement (ECI)

West Closure Complex

Pump Station

**5400 hp diesel engines
drive 11 flowerpot pumps**



New Orleans East Deep Soil Mixing



- Largest ever deep soil mixing application in US
- 1.7 million cubic yards of land treated
- 500,000 tons of cement used
- 5.3 mile stretch
- ECI

New Orleans East Levee

- 2 ft. thick sand blanket with 9 in. layer of gravel on top
- 1,000,000 total cubic yards of sand



Bayou Sauvage
National Wildlife
Refuge

Old
Levee

New Levee

~1 Football Field

*Over 1 Superdome of Clay
(4.9 mil cy) Required*

Wick Drains



The Big Picture



IHNC Lake Borgne Surge Barrier

- 36 in dia steel pipe battered piles (240 ft long)
- 66 in dia spun cast concrete soldier piles (140 ft long)
- Precast and cast in place deck and parapet wall



- \$1.3 B Delivery cost
- Design-Build Cost Reimbursable



- 1.8 mile span
- 150 ft sector gate and barge gate
- 54 ft vertical lift gate



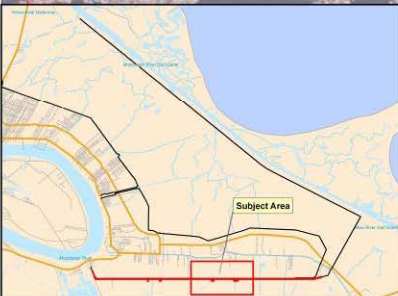
St. Bernard T-walls vs. Levees

Existing ROW =
410 ft.

Option 1: Earthen Levee
Est. ROW = 1,350 ft.

Option 2: Earthen Levee
and T-Wall Floodwall / Cap
within existing ROW

- 23-mile perimeter provides storm surge risk reduction for St. Bernard Parish
- Pre-Katrina elevation ~20 feet
- Post-Katrina 100-year design elevations ~30 feet



0 200 400 800 1,200 1,600 Feet



St. Bernard Floodwall

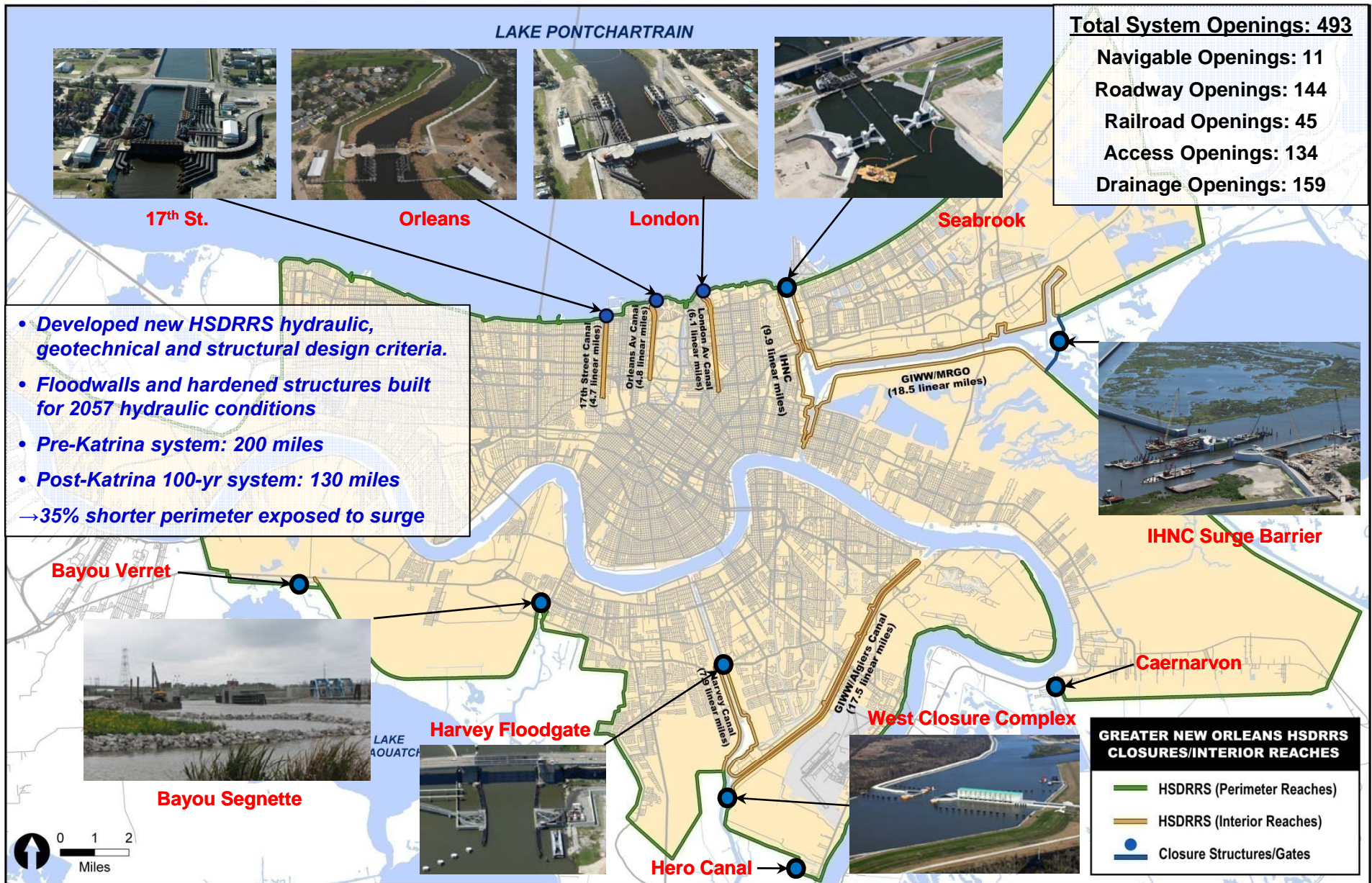


- 3 contracts
- ~\$1 B
- 23 miles (2 mi completed per month at peak of construction)
- ECI



St. Bernard Floodwall Construction – Southern Reach

A Stronger System Than Ever Before



New Orleans East

Surge Barrier Tie-In



St. Bernard Floodwall, near the IHNC Tie-In

Top of Floodwall:
EL +32'

Katrina Storm Surge:
EL +25'

500-yr Still Water
Elevation*: EL +22'

100-yr Still Water
Elevation*: EL +18'

* Still water elevation does not include waves
DESIGNED FOR A 100-YR STORM SURGE EVENT

Seabrook Gate Complex



- 95 ft sector gate
- Two 50 ft vertical lift flow control gates
- ~\$200 M Delivery cost
- Early Contractor Involvement (ECI)

Bayou Segnette Pump Station

Completed Safe House

- 5 new safe houses built
- 5 existing safe houses improved / hardened



HSDRRS Remaining Work



~\$1.38 B
~\$460 M unobligated

SELA Interior Drainage



~\$850 M
~\$160 M unobligated

Permanent Pump Stations



~\$300 M
~\$40 M unobligated

Mississippi River / HSDRRS Co-located Levees



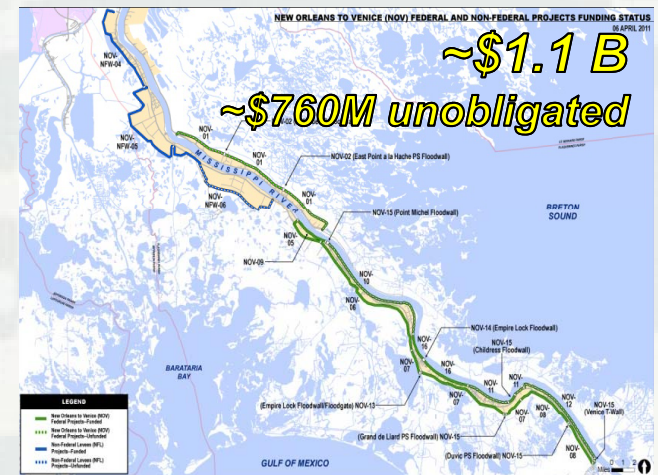
\$414 M
~\$340 M unobligated

Armoring



\$280 M
~\$240 M unobligated

Environmental Mitigation



~\$1.1 B
~\$760M unobligated

New Orleans to Venice / Non-Federal Levees

In 2007, you had a 1% chance every year of flooding this deep from Hurricanes

Notes:

- The depth map tool is a relative indicator of progress, over time, demonstrating risk reduction as a function of construction progress
- The water surface elevations are mean values
- The scale sensitivity of the legend is +/- 2 feet
- The info does not depict interior drainage modeling results
- The storm surge is characterized as the result of a probabilistic analysis of 5 to 6 storm parameters of a suite of 152 storms and not a particular event



With the 100-year level of protection, you have a 1% chance every year of flooding this deep from Hurricanes

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With the 100-year level of protection, you have a 0.2% chance every year of flooding this deep from Hurricanes

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Discussion / Questions