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### New Orleans Hurricane Protection System

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#### HPS Legend

E

- ----- Federal Floodwall
- ----- Federal Hurricane Levee
- Federal Levee

- Federal River\Hurricane Levee and Floodwall
- Federal River Floodwall
- Federal River Levee
- Federal T Floodwall
- ----- Local Drainage Levee
- ----- Local Hurricane Levee
- Local Hurricane Levee and Floodwall
- Local Levee to Federalized
  - Structure Gap
- Levee Breaches
- Pumping Stations
  - Interstate





Source: Hurricane Protection Decision Chronology Study



### **The Storm**



### **Early Morning 29 August During Katrina**





### Katrina Peak Surge, ft





### **System Performance**



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### HPS 2007

Lake Pontchartrain and Vicinity Westbank and Vicinity Levees

### **Repaired system**

- -220 total miles of levees and floodwalls repaired-2.3 mi new floodwall
- -22.7 mi new levee

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- -195.3 mi scour repair (98 mi MRL completed 17 Mar)
- -3 interim gated closure structures (IGCS) with pumping
- -4 closure structure repairs





#### US Army Corps of Engineers.

Southeast Louisiana

Hurricane Protection System and Major Evacuation Routes

- Pump Stations
- ---- New Floodwalls
- New/Raised Levees
- Advertised, Awarded or Underway Levees Added Scour Protection

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- Added Scour Protection Existing Mississippi River Levees
- Existing HPS Levees
- Parish Boundaries
- Interstate
- Major Highway

New Orleans to Venice Levees 4 6

# HPS ~2011









### **Risk & Reliability Modeling**

**RISK** 

Χ Hazard

Chance of

Index of possible life & property losses

Based on surge & wave levels estimated at 138 locations from

> **152 possible** hurricanes

300 to 5000 Year storm events



Performance of entire 350-mile system

Three scenarios:

**Pre-Katrina** 1)

- 2) Current
- 3) Future

**Probability of Flooding** 

### Consequences



Potential Loss of Life\*\*

**Potential Property Damage\*\*** 

\*\*Based on Pre-Katrina population and property values

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Hazard



### Hurricane Surge Frequency Estimates



Note, 10,000-year surge estimates for New Orleans are extrapolated from 3500-year estimates, Dutch data derived from Dutch literature, Hoek van Holland, 1985





### **Fragility Relationships**







### Pre-Katrina HPS, 100-Year Flood Depths

\* Assumes 0% internal pumping capacity



>8 6-8 4-6 2-4 0-2

### 100-Year (1%) Hurricane Flood Depth Maps



### 500-Year (0.2%) Hurricane Flood Depth Maps







# Risk Maps (Draft) Pre-Katrina

Hurricane Protection System in place before Katrina with no pumping There was a 1% (1 in 100) chance for this number of fatalities



ne Protection System in place before Katrina with no pumping vas a 1% (1 in 100) chance of this percentage property loss





### Loss of Life 1% Risk Maps (Draft)



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# **Economic 1% Risk Maps (Draft)**



PAST

PRESENT

#### FUTURE





# **Nature Bats Last**



### **Hurricane Surge Potential**

Katrina was a 400-year meteorological event

Katrina Surge varied from <50- year to >500-year





### **JPM-OS Hurricane Paths**







### **Surge Exceedence**



Figure 15. Cumulative probability plot and determination of the 100- year surge.

