US Army Corps
of Engineers

Interagency Performance Evaluation Task Force

Strategic Overview
Performance Evaluation Status and Interim Results
for
NRC Committee on New Orleans Regional Hurricane Protection Projects
20 March, 2006

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Activities Supporting NRC Committee Comments

- More emphasis on evaluating strengths and vulnerabilities of the entire HPS
  - HPS characterization
  - Performance evaluation of all structures based on knowledge of breach sites and unbreached analogs
  - Risk and reliability analysis
- More emphasis on gathering regional and detailed in-situ soils and geologic data
  - Regional data base for Risk and Reliability
  - Additional field investigations ongoing
- Greater emphasis on characterizing foundation conditions and the properties of the entire HPS
  - Bore holes and CPT
  - Risk and Reliability Geotechnical analysis
- Use ensemble approach to modeling impacts of future hurricanes
  - 1200 + storms being simulated for Risk and Reliability joint probability analysis
- Use GIS for descriptions and display
  - GIS Information repository and application team established and working
- Clarification of SPH and authorized protection levels
  - Integral to description of design criteria and assumptions
- Portray accuracies and uncertainties in data.
  - Component of risk and reliability analysis
  - Formal examination of uncertainty in inputs to surge/wave simulations
  - Rigorous QA/QC of data in repository
  - Validation of all analyses via ground truth (HWM), orthogonal approaches and methods (Centrifuge)
- Time may be insufficient for scope of study efforts
  - Substantial products by 1 Jun in all areas; follow-on support to Recover and Completion work and Future Alternative Analysis

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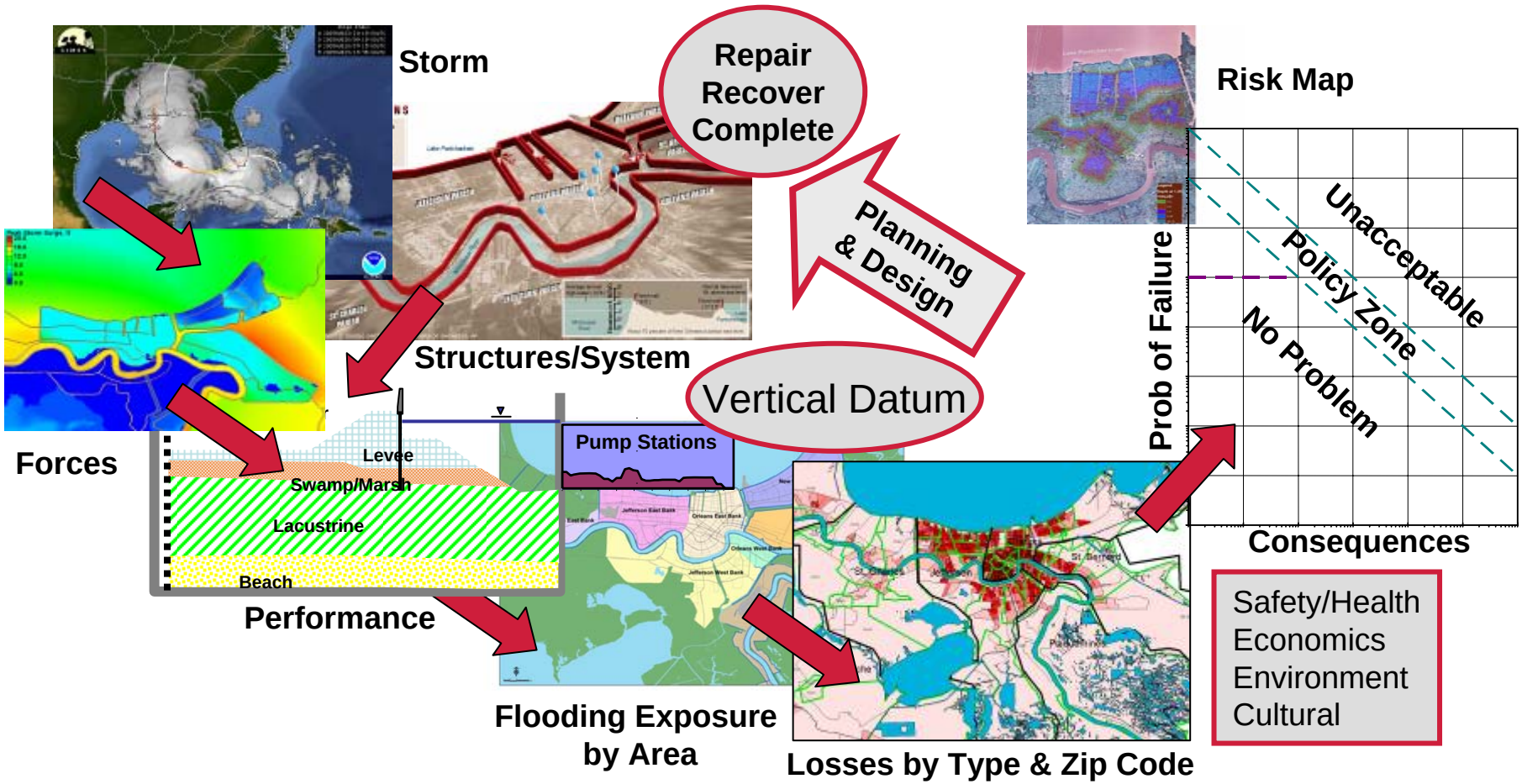
Systems / Spiral Approach



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Architecture of Report 2

The Five Questions

Geodetic and Water Level Datum and DEM

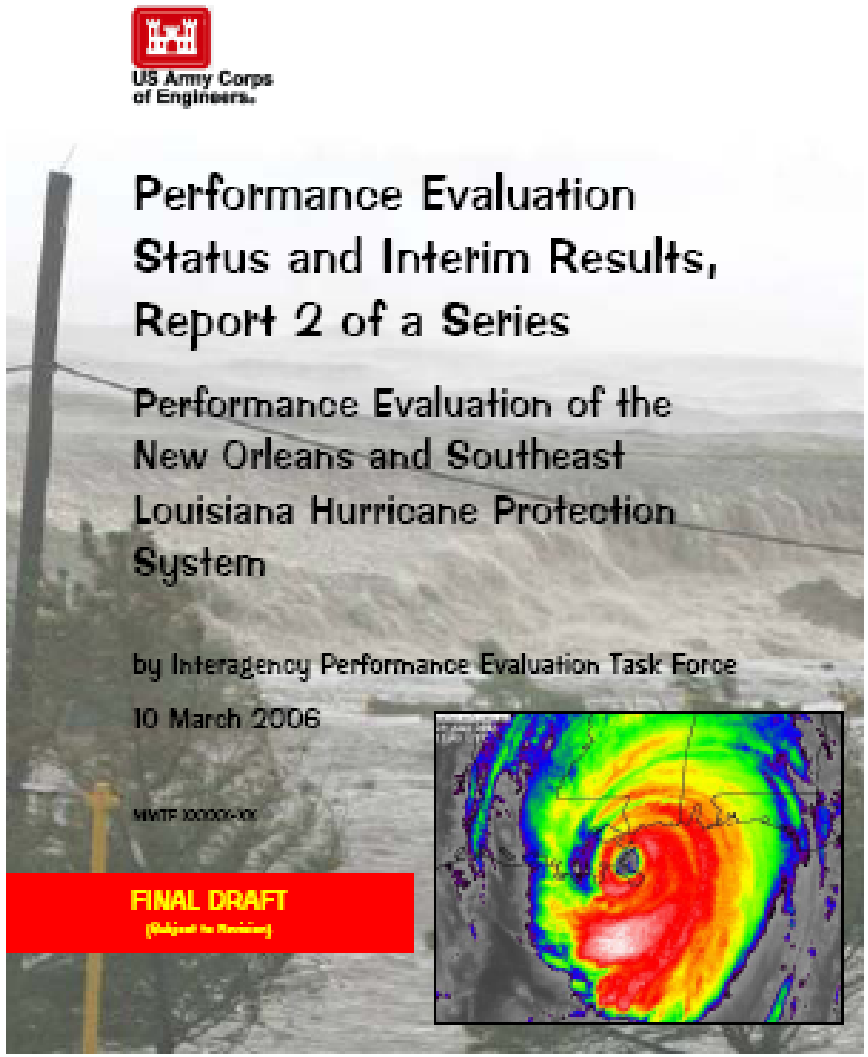
System
- ***Baseline***
- ***SPH***
- ***Design***

Storm
- ***Hydrodynamics***
- ***Time Line***
- ***MRGO***

Performance
- ***17th Street breach***

Consequence
- ***Orleans East***

Risk & Reliability
- ***Orleans East***



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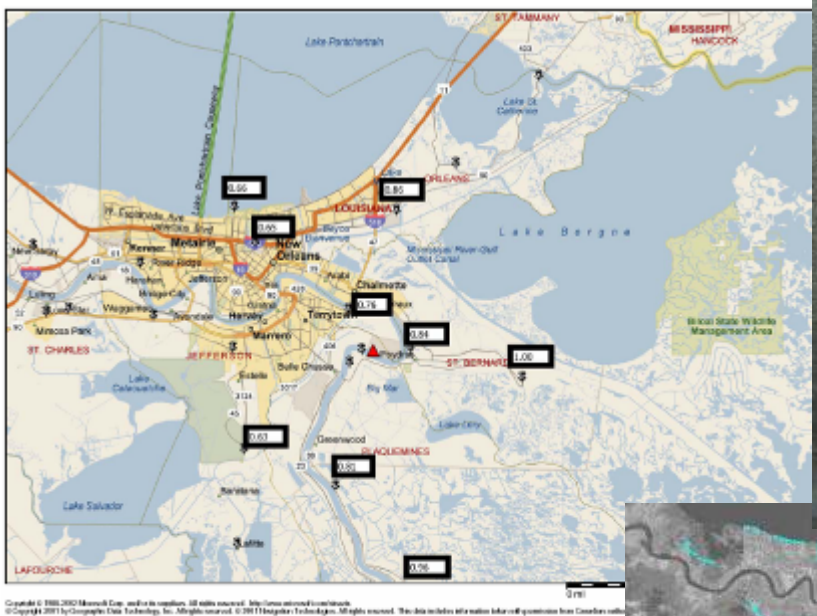
Geodetic Vertical and Water Level Datum and DEM

Vertical Datum

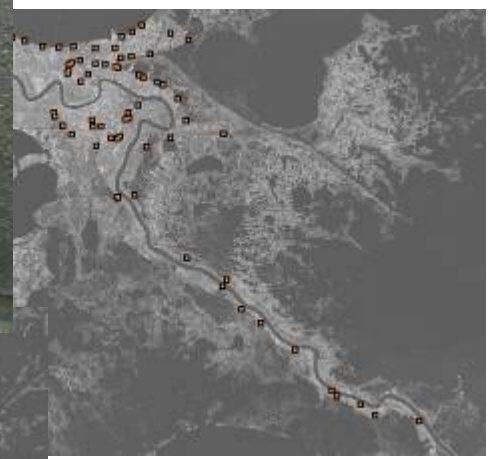
Updated heights for NAVD88



Redefinition of LMSL with respect to NAVD88

High Water Mark Surveys

Pump Station Elevations



Structure Elevations

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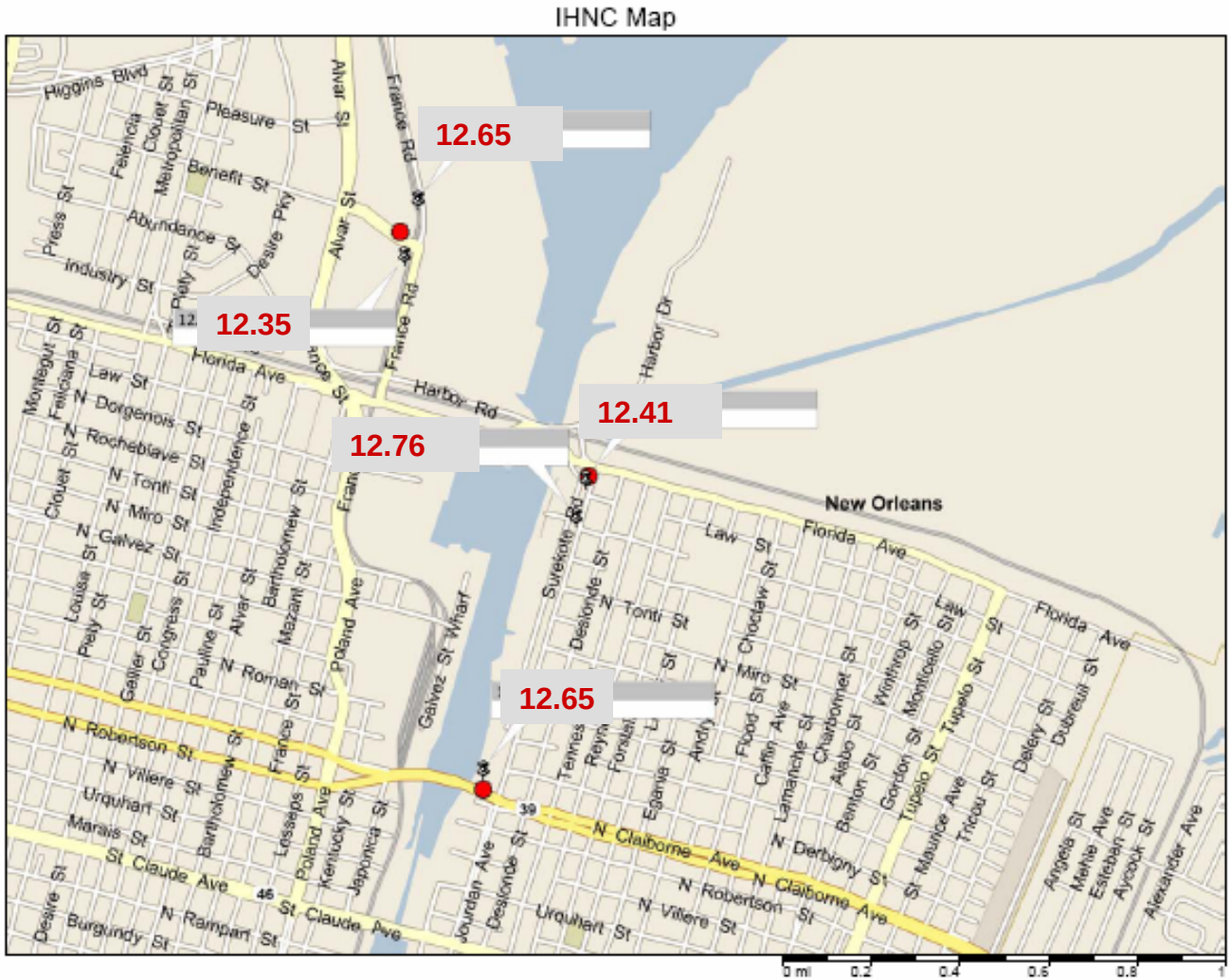
Survey of Structures

IHNC Subsidence Results

Vertical Datum



This represents approximately a 2.7 ft loss of protection since the 15.0-ft floodwall was constructed ca 1969.

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The Hurricane Protection System

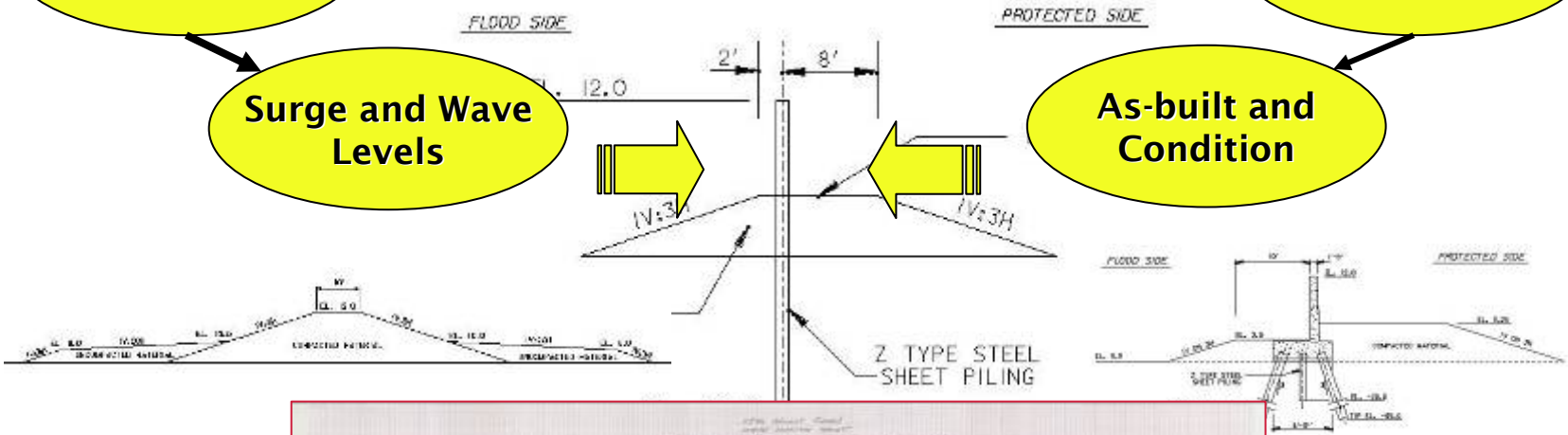
What forces were the structures designed and built to withstand?

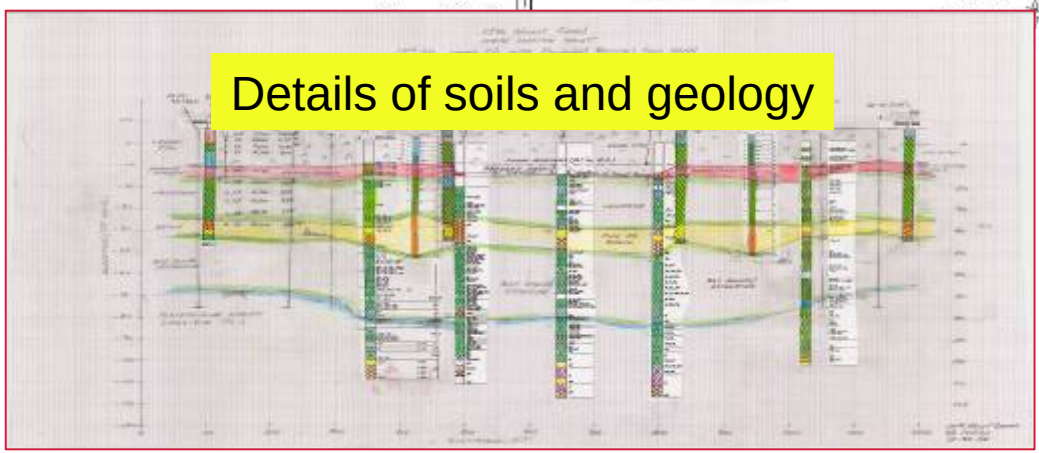
SPH & Auth Protection

Design & Intent

Surge and Wave Levels

As-built and Condition





Details of soils and geology

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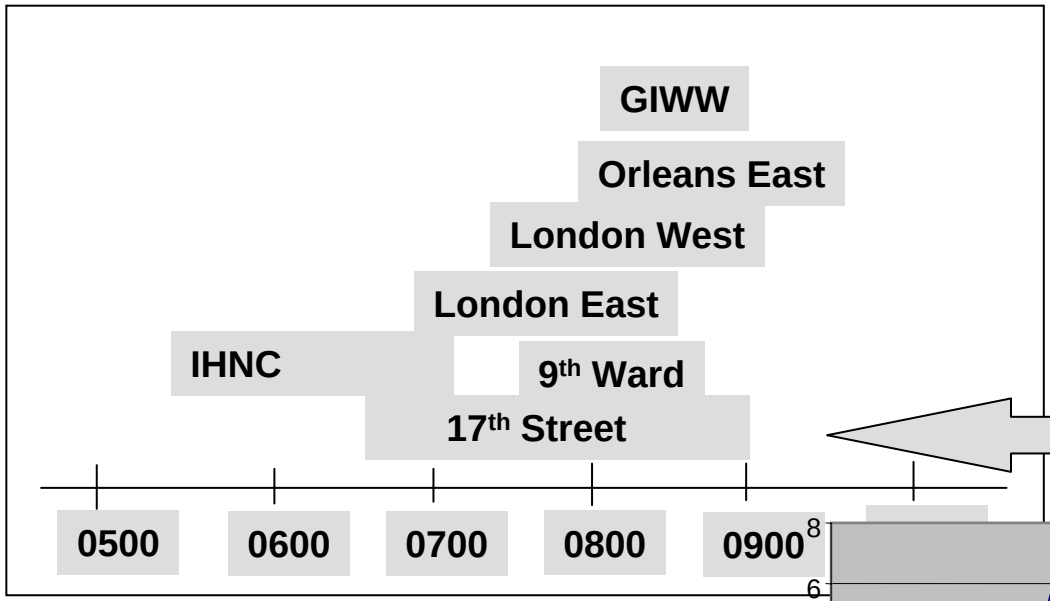
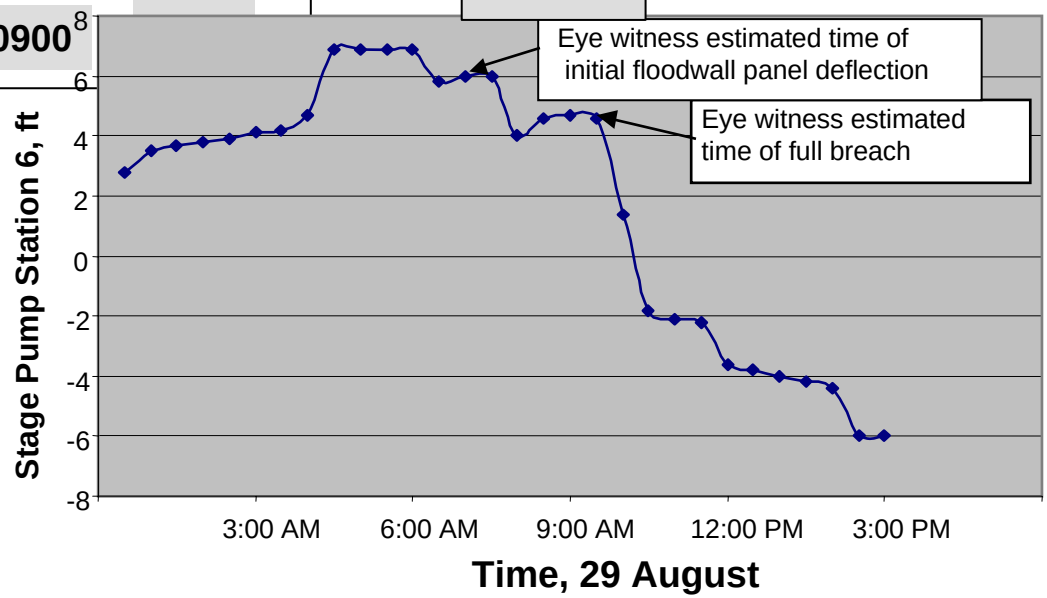
Storm

Development of Event Timeline

29 AUG Breaching Time Line (notional)





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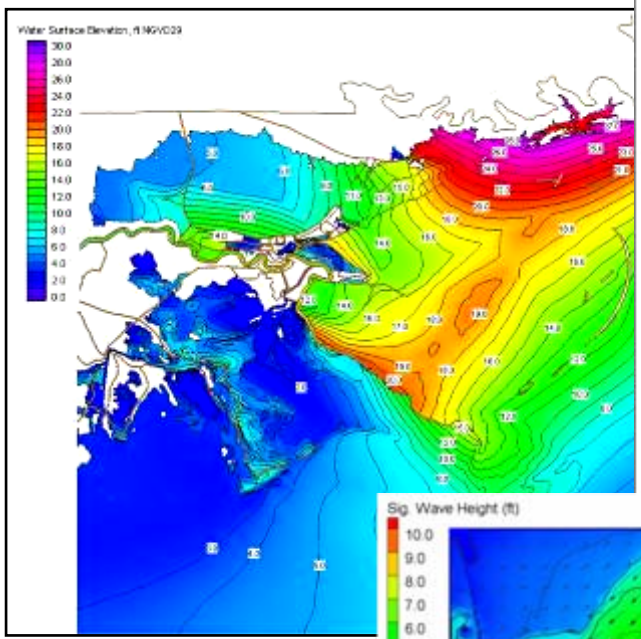
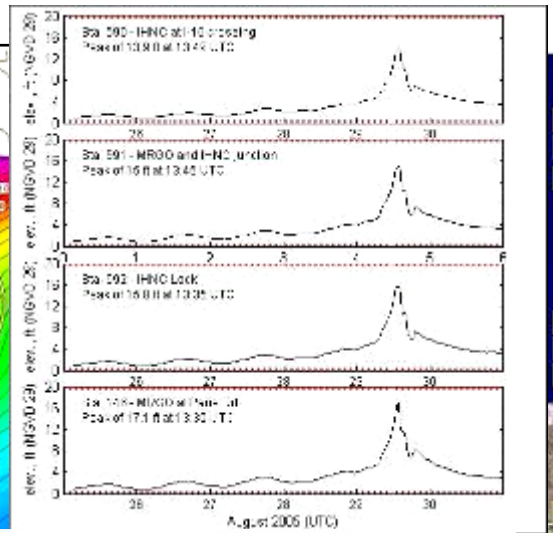
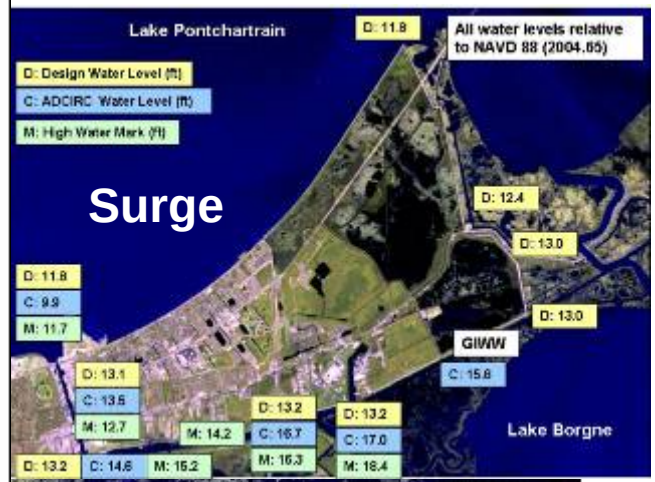
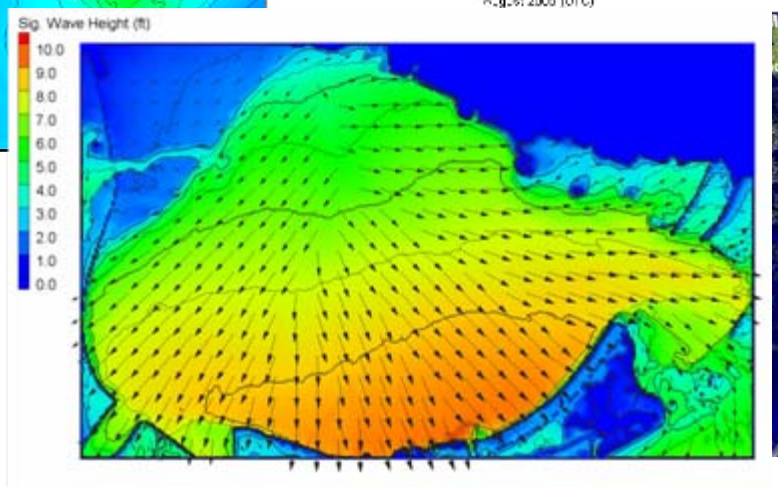
The Storm

What surge and waves did the levees and floodwalls experience?









Katrina Surge and Wave Time Histories

Katrina vs Design

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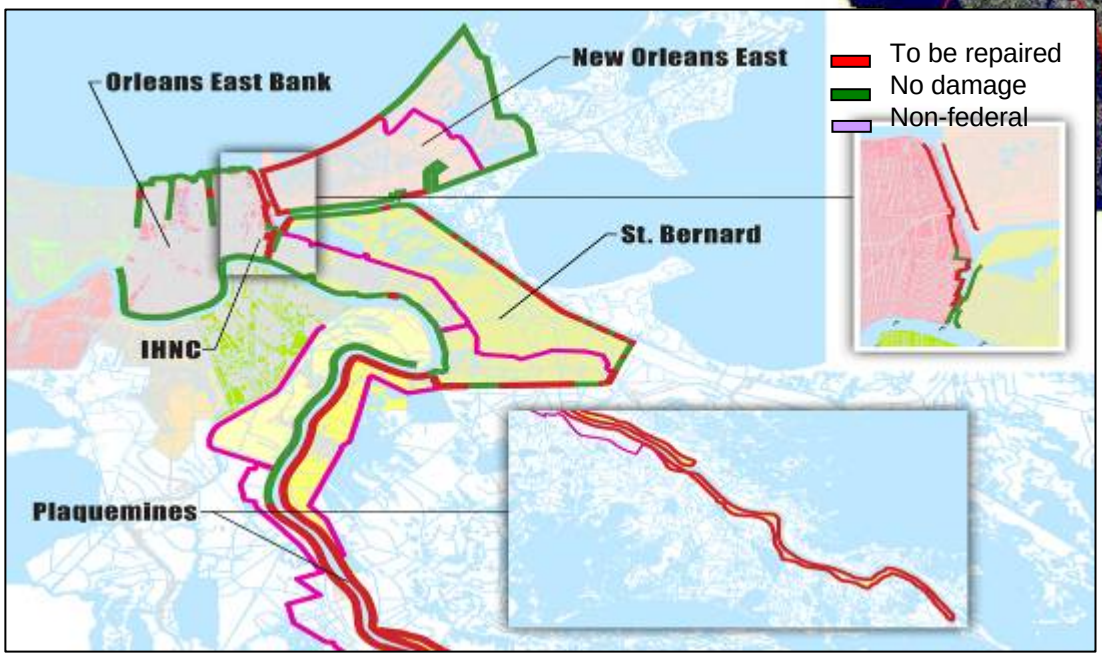
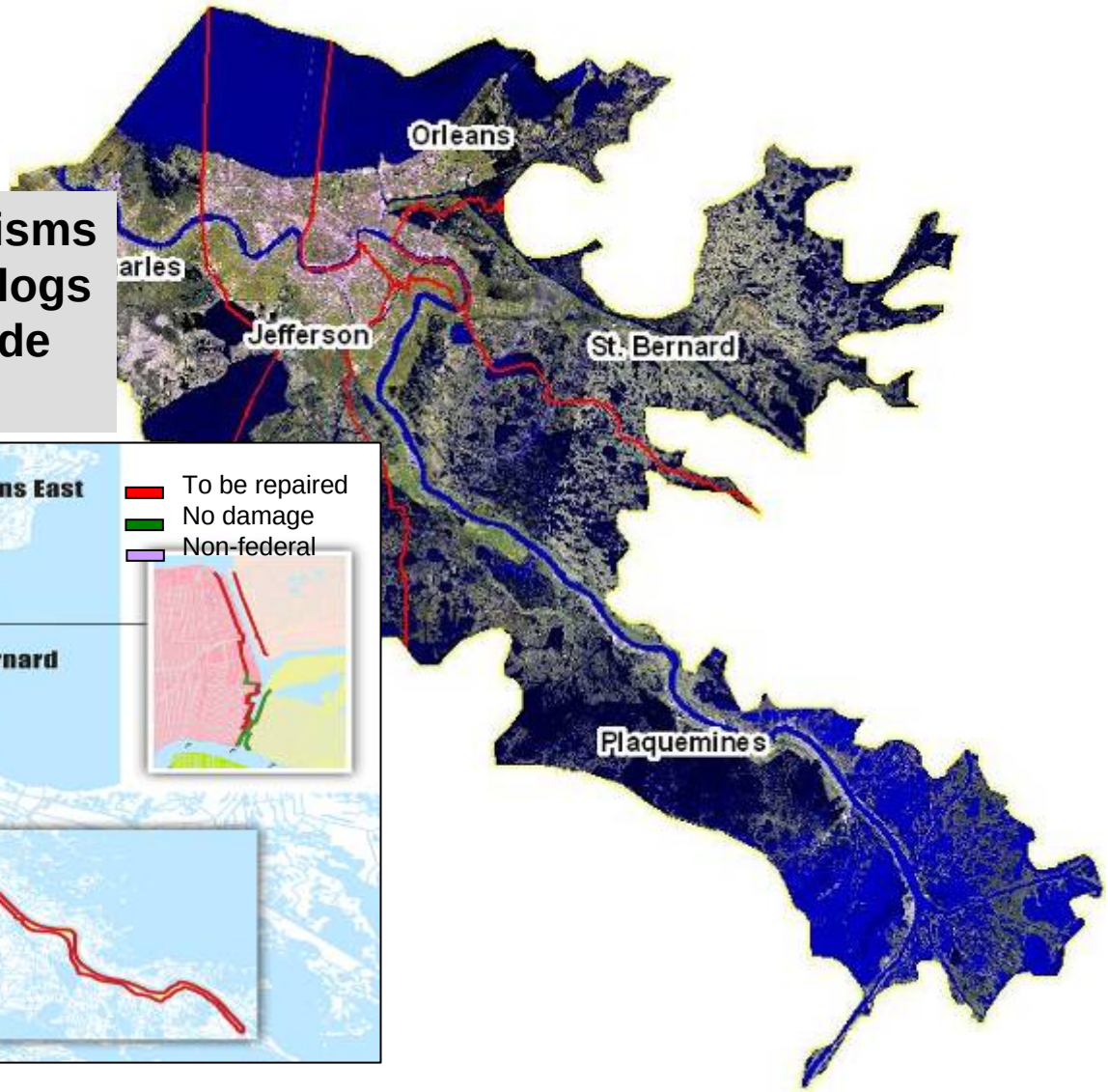
Performance

How did the structures perform and why?

System-Wide Strategy

- Understand breach mechanisms
- Understand non-breach analogs
- Extend to assess system-wide integrity





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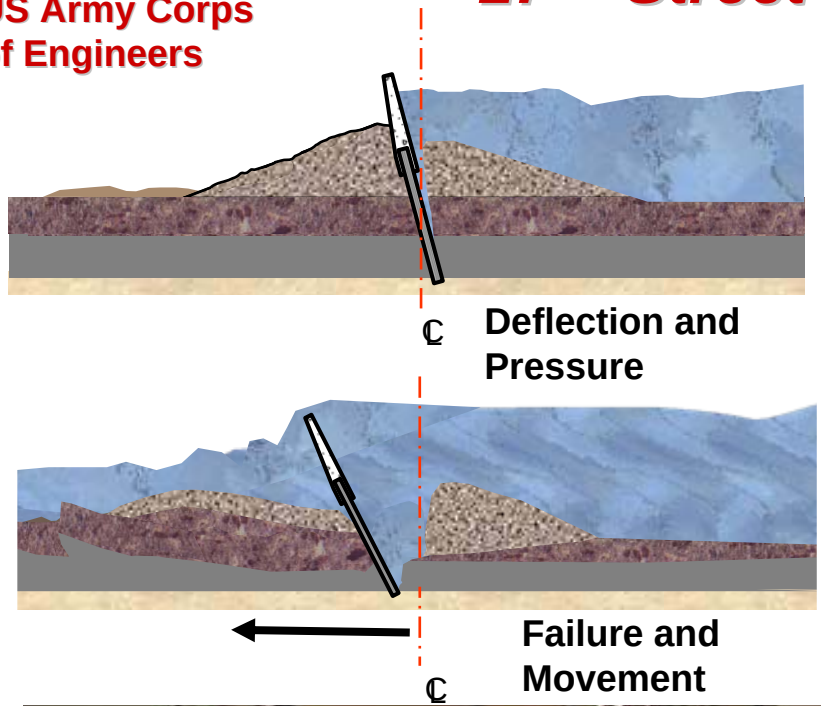
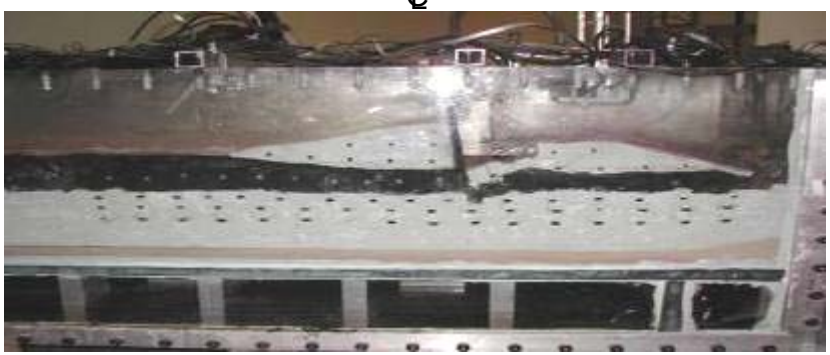
Performance

17th Street Canal Breach Analysis





Confirmation in Centrifuge

17th Street Canal Breach Mechanism

- Deflection of I–Wall by surge/waves
- Full hydrostatic pressure along wall splits levee into two blocks
- Weaker clay at levee toe causes failure in subsurface clay layer
- Soil block from wall back displaced

Displacement of wall and part of levee

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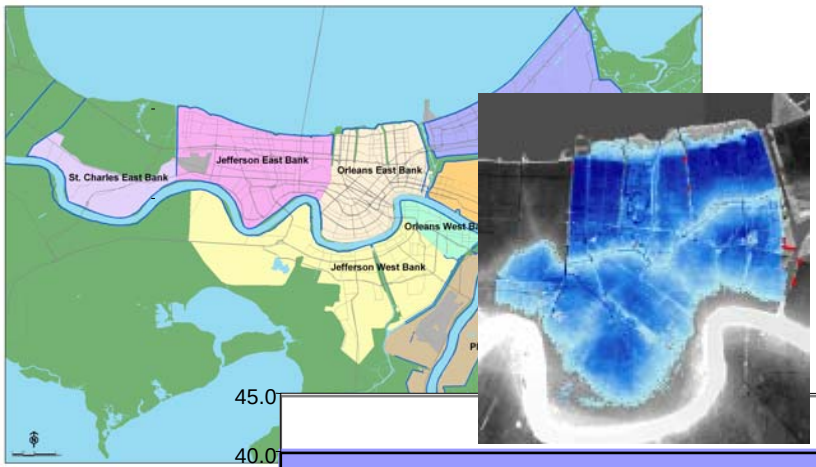
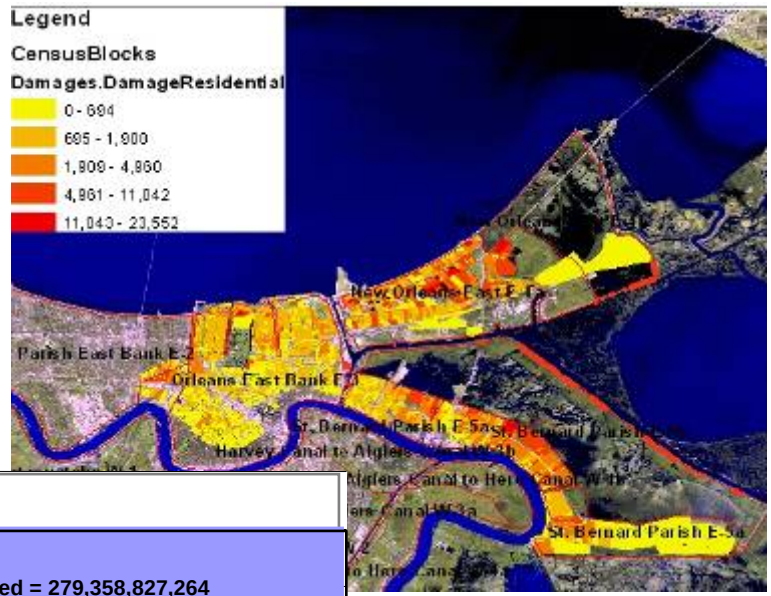
Consequences

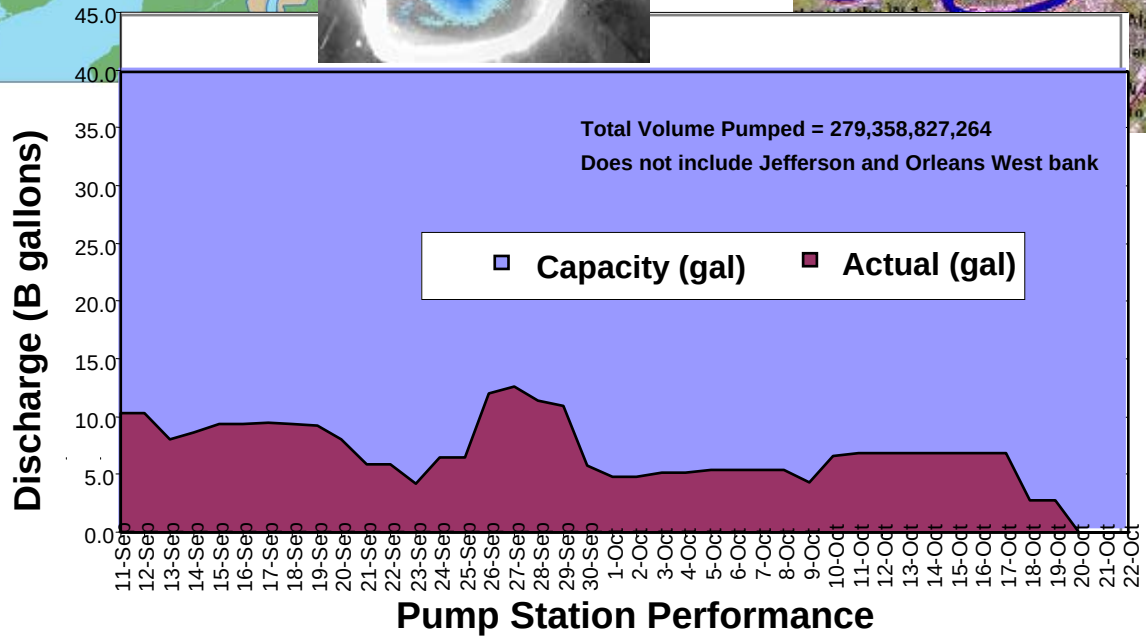
What were the consequences of Katrina?

Flooding Exposure by Polder





Residential Damage



Pump Station Performance

Risk

What is the risk for the future?

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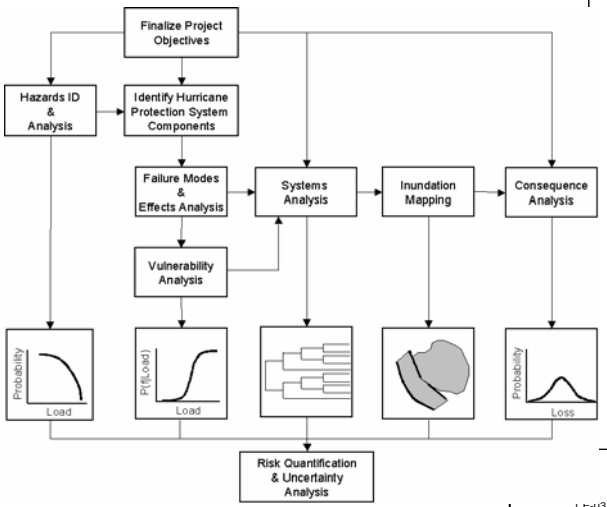
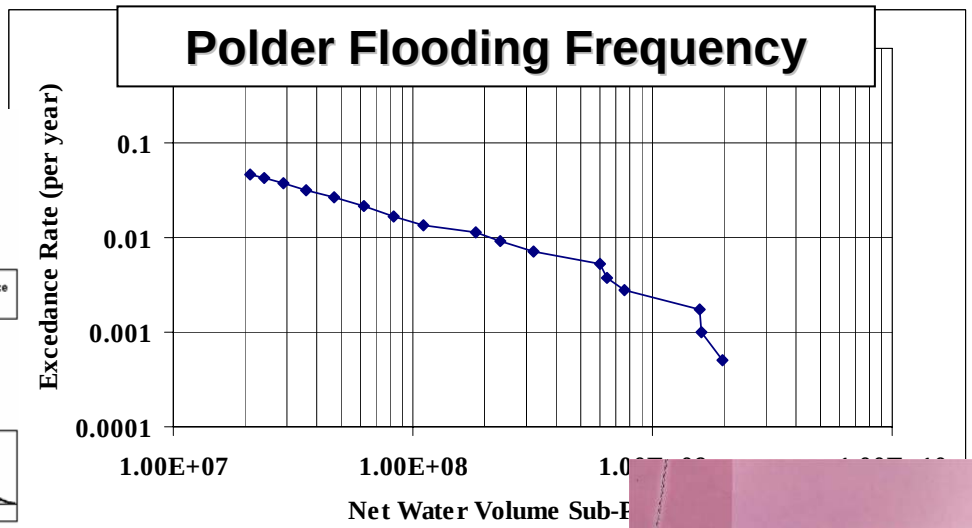
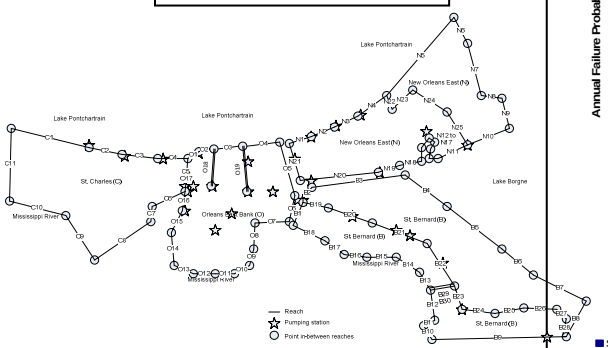
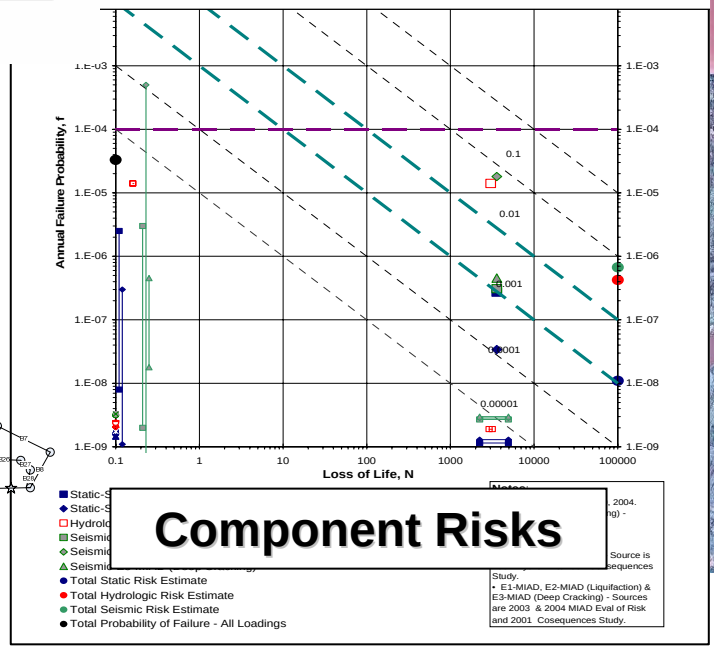


Risk Model

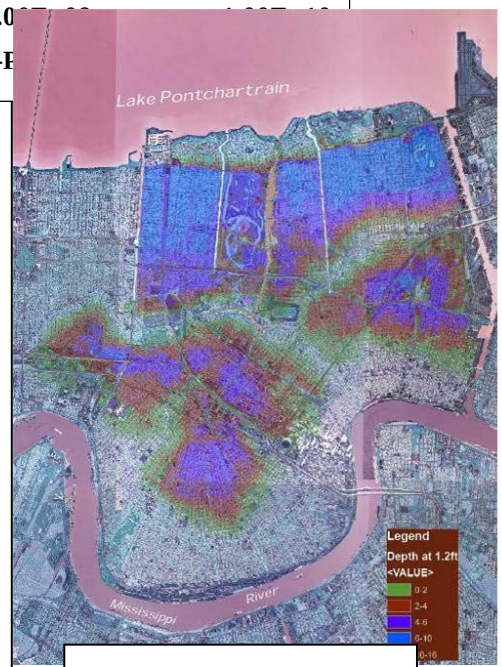




System



Component Risks



Risk Mapping

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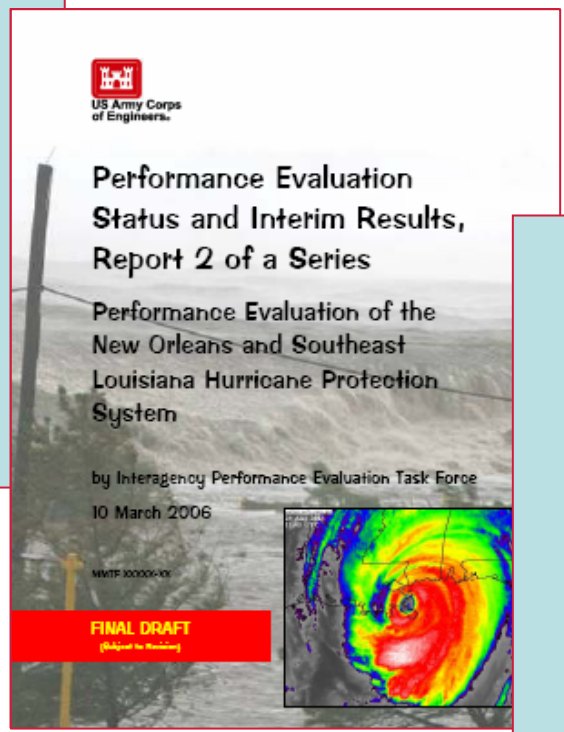
IPET Report Series

Performance Evaluation Plan and Interim Status, Report 1 of a Series

10 Jan 2006

Vetted by ASCE ERP, Reviewed by NRC Committee



Performance Evaluation of the Hurricane Protection System, Report 3 of a Series

1 June, 2006

Structural Performance Component Provided to NRC May 2006