St. Tammany Parish Risk Reduction

Troy Constance
Jun. 16 2009
Northshore Harbor Center
Agenda

I. Greater New Orleans Hurricane and Storm Damage Risk Reduction System

II. Hydraulic and Hydrology impacts of the Hurricane and Storm Damage Risk Reduction System

III. Southeast Louisiana Urban Drainage Flood Control Project

IV. Louisiana Coastal Protection and Restoration

V. Discussion
Buying Down Risk

Initial Risk

- Nonstructural - Zoning / Building Codes
- Coastal Protection
- Outreach
- Evacuation Plan
- Insurance
- Levees / Floodwalls / Structures

Risk

Residual Risk
Hurricane and Storm Damage Risk Reduction System
Inner Harbor Navigation Canal
Surge Barrier
Inner Harbor Navigation Canal Surge Barrier Project Area
Hydraulic and Hydrology Impacts of the Hurricane and Storm Damage Risk Reduction System
Advanced Circulation Grid

• For coastal Louisiana modeling, the ADCIRC grid contains tens of millions of pieces of information

• New features are added routinely
500 Year Event Surface Water Elevations

Surface Water Elevations
2007 condition vs 2010 condition

LACPR_MSCIP_2007(LA)/ 500 year event shown in Black
LACPR_MSCIP_2010(LA)/ 500 year event shown in Red
500 Year Event Surface Water Elevations
Time Series
Time Series of Surface Water Elevations
(Storm 18 aprx.500-year event)
2007 vs 2010 Condition

Storm 18 (500 Yr)
Time Series of Surface Water Elevations
(Storm 18 aprx. 500-year event)
2007 vs 2010 Condition
Storm 18 (500 Yr)
# Technical Review Organization

**TECHNICAL REVIEW COORDINATOR – Ryan Clark**

<table>
<thead>
<tr>
<th>FEMA TR Team Coordinator</th>
<th>USACE TR Team Coordinator</th>
<th>EPR (ASCE &amp; Other National Experts) Team Coordinator</th>
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<tr>
<td>Joe Suhayda LSU/URS</td>
<td>Pam Deloach MVN</td>
<td>Ed Link</td>
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<td>Don Slinn ASCE U of F</td>
<td>Bill McAnally Mississippi State U</td>
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<td>John Richardson ASCE Blue Hill Hydraulics</td>
<td>Thomas Gambucci USACE Rock Island, IL</td>
<td>With Informal Representation from NRC *</td>
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<td>Lee Butler ASCE Veritech</td>
<td>John McCormick – GIS USACE Wilmington, DE</td>
<td>Billy Edge ASCE/NRC TAMU</td>
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<td>Hans Graber U of Miami</td>
<td>John Winkelman USACE New England Dist.</td>
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<td>Bob Gilbert ASCE UT</td>
<td>Jon Hubertz Consultant</td>
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**FEMA Oversight TR Team Coordinator**
- Dale Kerper DHI

**ASCE MEMBERS**
- With Informal Representation from NRC *

**TR** Independent Technical Review

**ASCE** American Society of Civil Engineers

**NRC** National Research Council

**EPR** External Peer Review

* NRC Formal Review will occur over the next several months as part of review for IPET Volume 8, Hazard Definition Process
Southeast Louisiana Urban Drainage Flood Control Project (SELA)
The St. Tammany Parish Portion of the Southeast Louisiana Urban Drainage Flood Control Project
Study Reports

- Schneider Canal, Slidell, Louisiana Hurricane Protection Reconnaissance Report (May 1990)
- The Tangipahoa, Tchefuncte and Tickfaw Rivers Reconnaissance Report (June 1991)
- St. Tammany Parish, Louisiana Reconnaissance Report (July 1996)
St. Tammany
Mandeville Hurricane Protection

Lake Pontchartrain

Bayou Chinchuba

Bayou Castine

Little Bayou Castine

U.S. 190

Illinois Central Railroad

Hyw. 59

1088

Levee

Floodwall

Pump Station

Ramps
St. Tammany—Slidell W-14 Canal

Project scope includes

- channel improvements
- bridge replacements
- detention ponds
- pump station

Draft Environmental Assessment is currently available for public review and download at www.nolaenvironmental.gov

Section 533(d) final report scheduled for approval December 2009
Louisiana Coastal Protection and Restoration (LACPR) Draft Final Technical Report to Congress
Congressional Direction

• Conduct a comprehensive hurricane protection analysis and design

• Present a full range of flood control, coastal restoration, and hurricane protection measures

• Exclusive of normal policy considerations
Congressional Direction

• Consider providing protection for a storm surge equivalent to a Category 5 hurricane

• May submit reports on component areas of the larger protection program for authorization

• Conducted in coordination with the State
Corps/State Collaboration

• We jointly developed objectives for LACPR consistent with the State Master Plan
• Worked with the state team to develop needs, opportunities, and alternatives.
• Continued collaboration in the evaluations
Alternatives Development

- State Master Plan provides the overarching vision of LA coastal protection and restoration
- Multiple lines of defense strategy
- Coastal restoration was foundation of all alternatives
- Added on various structural, nonstructural, or combined structural/nonstructural components
Planning Units
Multi Criteria Decision Analysis

• Allows stakeholders to express preferences and values

• Analyze and compare dissimilar outputs

• Provides multiple alternatives and does not provide a single answer
Multi Criteria Decision Analysis

Stakeholder Feedback Loop

- Iterative process
- Post Technical Report: current with PU evaluation and plan selection
- Completes loop with stakeholders
## Initial Stakeholder Feedback

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<th>Metrics (in order of importance)</th>
<th>Planning Unit</th>
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<td>Population impacted (people/year)</td>
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<td>Direct wetland impacts (acres)</td>
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<td>Indirect environmental impact</td>
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<td>(unit-less scale, -8 to +8)</td>
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<td>Residual damages ($ million/year)</td>
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<td>Archeological sites protected (# of sites)</td>
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| Total Number of Survey Respondents | 45 | 27 | 30 | 25 | 27 | 154 |

*Indicates the number of respondents who ranked a particular metric as being most important.
How We Built on MCDA Process

• Developed additional rankings focused on criteria related to:
  o Stakeholder Input
  o Environmental Impact
  o Cost Efficiency
  o Effectiveness in reducing Risk
  o Life cycle costs
  o “Category 5” per Congressional Direction

• Compared MCDA and additional rankings in a “Consumer Reports” style format

• Demonstrated the level of consistency between MCDA and traditional evaluations
## Sample Table for Planning Unit 1

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<th>Planning Unit 1 Alternatives</th>
<th>Stakeholder (Multi-Criteria Decision Analysis)</th>
<th>Minimizing Environmental Impacts</th>
<th>Investment Decision (Efficiency)</th>
<th>Minimizing Remaining Risk (Effectiveness)</th>
<th>&quot;Category S&quot; Design Level</th>
<th>Year 2025 Present Value Life Cycle Costs 2011-2073 ($ Millions)</th>
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**Scoring based on normalized values determined within each evaluation criteria as shown:**

- **Best:** ☐
- **→.99:** ☐
- **→.95:** ☐
- **→.79:** ☐
- **→.49:** ☐
- **→.39:** ☐

**Worst:** ☐
From Tables to Rankings

• Tradeoffs aren’t immediately apparent through MCDA alone
• All the criteria considered have relative importance
• Rankings were produced by combining groups of the criteria considered including MCDA
• Comparison of the combined criteria rankings demonstrated that a suite of best performing alternatives could be identified
## Sensitivity Analysis of Multiple Rankings

<table>
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<th>Plan Rank</th>
<th>Stakeholder MCDA Trend Analysis</th>
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Final Array of Alternatives in Planning Units 1 and 2

- Alternatives include coastal restoration
- Planning Unit 1 options:
  - Coastal only
  - Nonstructural (3 levels)
  - Lake Pontchartrain barrier-weir (with or without nonstructural)
Louisiana Coastal Protection and Restoration
Planning Unit 1
Pontchartrain Basin

Nonstructural Plan
PU1 - NS - 1000
(1000-Year Risk Reduction)

April 2008

Legend
- Primary Roads
- Authorized 100-Year Levee
- Planning Unit 1

Voluntary Nonstructural Measures
Inundation Zones:
- Water Depths < 14 feet, Raise-In-Place of Structures
- Water Depths ≥ 14 feet, Buyout of Structures

Velocity Zones:
- Buyout of Structures

NOTE:
“Velocity zones (Vzones): Areas exposed to storm surge velocity, defined by FEMA, closest to shoreline subject to wave action, high-velocity flows, and erosion from a 100-year (1 percent annual chance) flood. Structures in Vzones would be eligible for voluntary buyout.”
Post Report Submission Path Forward

- Follow VTC Fact Sheet Process to Define the Work
- State/Corps Develops Priorities and Options
- State/Corps coordinate with Federal Agencies, Local Entities, NGOs, and the Public
- HQ establishes Program Guidance Memorandum
- Execute the Work for Appropriate Action

Examples:
  - Modification of on-going projects
  - Post Authorization Change Reports
  - Amendments to Existing FCSA
  - New authorizations
Options for Implementation PU1

- Current final array contains:
  - 1 – basin wide restoration alternative
  - 1 – major structural alternative
  - 3 – independent nonstructural alternatives
  - 1 – comprehensive (structural / nonstructural) alternative

- Options:
  - 1 – execute through a comprehensive basin plan
  - 2 – focus on only structural features
  - 3 – focus on coastal features
  - 4 – focus on non-structural actions
  - 5 – develop hazard mitigation efforts
PU1: Option 1 Comprehensive Basin Plan Implementation

Use PAC of Lake Pontchartrain and Vicinity authority

- Integrate coastal features, structural features, and nonstructural features
- Identify optimal risk reduction alternative
- Complete engineering analysis
- Complete NEPA
- Select the recommended plan
PU1: Option 2 Structural Only Features Implementation

Use PAC of Lake Pontchartrain and Vicinity authority

- Focus on the existing project (high level plan)
- Identify optimal risk reduction alternative
- Complete engineering analysis
- Complete NEPA
- Select the recommended plan
Risk Informed Decision Framework

• MCDA can be an effective means to inform trade-offs
• MCDA communicates the risks and consequences of key decisions
• MCDA allows Stakeholders to self-assign risk through tradeoffs

"The corps can't and won't tell us how safe our cities need to be, how sustainable our coast should be, what values we should enhance and protect. They can't do that because it's not their job. It's our job."

- Mark Davis
# LACPR Technical Report Status

<table>
<thead>
<tr>
<th>Milestone</th>
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<tbody>
<tr>
<td>✓ Draft Final Technical Report submitted to MVD/HQ</td>
<td>19 Dec 08</td>
</tr>
<tr>
<td>✓ Agency Technical Review completed</td>
<td>25 Feb 09</td>
</tr>
<tr>
<td>✓ HQ policy review and issue resolution initiated</td>
<td>26 Feb 09</td>
</tr>
<tr>
<td>✓ NAS external peer review initiated</td>
<td>3 March 2009</td>
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<tr>
<td>✓ Resolution of HQ Comments</td>
<td>April/May 09</td>
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<tr>
<td>✓ Senior Leader Panel Briefing</td>
<td>21 May 09</td>
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<tr>
<td>✓ Printed copies of Final Technical Report available</td>
<td>7 Jun 09</td>
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<tr>
<td><strong>Public, State, &amp; Agency review of Final Technical Review</strong></td>
<td>8 Jun – 8 Jul 09</td>
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<tr>
<td>Final NAS report (tentative)</td>
<td>8 Jul 09</td>
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<tr>
<td>Complete comment documentation and print supplement</td>
<td>4 Aug 09</td>
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<tr>
<td>Final Technical Report transmitted to Chief of Engineers</td>
<td>6 Aug 09</td>
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<tr>
<td>Transmittal of Final Technical Review to ASA-CW</td>
<td>31 Aug 09</td>
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Buying Down Risk

Initial Risk

Nonstructural - Zoning / Building Codes

Coastal Protection

Outreach

Evacuation Plan

Insurance

Levees / Floodwalls / Structures

Risk

Residual Risk
Discussion
Barrier Plan Chronology

1. **INTERIM STUDY IN 1962** - The original project plan, termed the “Barrier Plan,” included floodgates (surge barriers) in the passes to Lake Pontchartrain to prevent “Standard Project Hurricane” (SPH) - driven surges from entering the lake accompanied by levees and floodwalls in other locations designed to withstand SPH surges.

2. **BARRIER PLAN AUTHORIZED IN 1965** - To provide protection from a storm with the SPH wind speed and central pressure parameters established in the report of the Chief of Engineers. Project would be cost-shared 70% federal and 30% local.

3. **ENGINEERING DESIGN PHASE** - At the time of authorization, the District estimated that the project would be completed by the mid-to-late-1970s.

4. **HURRICANE BETSY IN 1965** - The District requested and received permission from the Corps’ Lower Mississippi Division (the Division) and Corps Headquarters to increase structure heights by 1-2 feet across the project network.

Barrier Plan Chronology

6. OPPPOSITION TO THE BARRIER PLAN - Potential adverse environmental effects were the most widely-cited concern of organized opponents to the Barrier Plan.

7. ENVIRONMENTAL IMPACT STATEMENT CHALLENGED IN 1975 - Environmental Defense Fund challenged the adequacy of the project environmental impact statement (EIS). The court found that the project EIS did not meet NEPA requirements.

8. FEDERAL COURT INUNCTION IN 1977 - Court issued injunction on further construction of the Barrier Plan until the analytical deficiencies were resolved.

9. INJUNCTION LIFTED FOR ALL NON-BARRIER ELEMENTS IN 1978 - Court lifts the injunction for all non-barrier elements (levees and floodwalls). Injunction effectively placed on hold project work on certain lakefront levees and the outfall canals, since the design and construction of those features would be affected by the final resolution of the proposed barriers.

10. HIGH LEVEL PLAN APPROVED IN 1985 – The Corps initiated an engineering and environmental reevaluation of both the Barrier Plan and the alternative “High Level Plan,” which involved higher lakefront levees (southshore levees) in lieu of barrier complexes. The Director of Civil Works approved replacing the barriers with increased levee heights along the lakefront.
Project Background

- The IHNC Lake Borgne Surge Barrier project was the first construction contract awarded for the 1 percent storm damage risk reduction system.
- The largest civil works Design-Build Cost-Reimbursable project in Corps history.
- Lake Borgne Surge Barrier contract awarded to Shaw Environmental & Infrastructure, Inc., on Apr. 4, 2008 for $695,489,766.
  - Local Contractor based in Baton Rouge.
  - Using multiple local subcontractors in Mississippi and Louisiana.
  - ~$200M worth of local skilled labor planned.
- National Environmental Policy Act Decision Record signed by COL. Alvin Lee on Oct. 21, 2008.

Construction of the Lake Borgne Surge Barrier began on Dec. 4, 2008.
Lake Borgne Construction Status

- Limited Notice to Proceed on construction for Lake Borgne Surge Barrier on Nov. 3, 2008
- Overall Design is currently ~ 71 percent complete
- Dredging completed Jan. 21, 2009
- Barrier Walls (8,000 ft)
- MRGO Crossing Fill started May 2009
- Barge Gate Abutments: Notice to Proceed issued
- Sector Gate: In design ~30 percent
- Bayou Bienvenue Lift Gate: In design
- Transition Walls (1,100’) in design

As of Jun. 9, 2009, 231 concrete piles have been driven into Lake Borgne
IHNC Program Features

Lake Borgne Project

Interior Floodwalls / Levees
Lake Pontchartrain (Seabrook Sector Gate)
IER 11 Tier 2 Pontchartrain

Location Pontchartrain 2

Conceptual
GIWW Sector Gate – Bypass Open
GIWW Sector Gate – Bypass Closed
Barrier Wall
Advance Measures Case
Barrier Wall
Final Protection
Spun Cast Piles

These vertical concrete piles are 66” in diameter and will be used in the construction of the IHNC Lake Borgne Surge Barrier Project.
Hurricane Size Matters

Storm surge potential increases as a function of intensity, size and track.

Though Rita and Betsy had similar intensities, Betsy, because of its larger size, had the potential to produce a 4 foot higher storm surge.
Comprehensive Assessment of Risk
Hydrodynamic Analyses

- Magnitude of the effort unprecedented
- DOD priority on supercomputers
- Basis of LACPR/MsCIP—beyond HSDRRS
- Risk-based analysis
  - 5 frequency events (10-yr, 100-yr, 400-yr, 1,000-yr, 2,000-yr)
  - 3 design levels (100-yr, 400-yr and 1,000-yr)
  - 3 confidence levels (10%, 50%, 90%)
Economic Evaluation

- GIS-based
- 72,000 census blocks
- 2 million structures
- Inventory of residential, non-residential, agriculture, vehicle, transportation, emergency costs
- 111 alternatives evaluated in detail
- 4 future scenarios
  - 2 development & land use projections
  - 2 relative sea level rise projections
Environmental Analysis

- Multi-agency team
- Formulated coastal plans targeting long-term sustainability of the coastal landscape
- Evaluated 100 years of performance for 5 coastal plans
- Assessed potential direct/indirect impacts of structural plans
Flood Damages

• In May 1995, 6-hour rainfall amounts averaging 12 inches caused extensive flooding in Orleans, Jefferson, and St. Tammany Parishes.

• Since 1978, the three parishes have sustained damages of over $1 billion in rainfall flooding events.
Congressional Authorizations

• Fiscal Year 1996 Energy and Water Development Appropriations Act
  (Authorized work from three Corps of Engineers Reconnaissance Reports)

• Water Resources Development Act of 1996
  (Added work from fourth COE Recon Report)
Terms of the Authorizations

- authorized all economically justified work described in previously completed New Orleans District reports

- established that the project would be cost-shared at a rate of 75% Federal and 25% non-Federal (min 5% cash contribution)

- directed that any work performed by the non-Federal interests subsequent to the reports and determined to be a compatible and integral part of the projects shall be creditable
Study Reports

- Schneider Canal, Slidell, Louisiana Hurricane Protection Reconnaissance Report (May 1990)
- The Tangipahoa, Tchefuncte and Tickfaw Rivers Reconnaissance Report (June 1991)
- St. Tammany Parish, Louisiana Reconnaissance Report (July 1996)
St. Tammany Parish Work Authorized in Tangipahoa, Tchefuncte, and Tickfaw Rivers
Reconnaissance Report

• Mandeville Hurricane Protection
  • No support for this plan
  • Corps not currently pursuing implementation

• Mile Branch Channel Improvements
  • Corps unable to develop plan supported by City of Covington
St. Tammany—Mile Branch Channel Improvements
St. Tammany Parish Work Authorized in Schneider Canal, Slidell Reconnaissance Report

- Schneider Canal Hurricane Protection
  - Working with St. Tammany Parish and City of Slidell to develop project management plan for Section 533(d) study
  - Parish has proposed a new alignment east of original study area
  - Project management plan in development
St. Tammany Parish Work Authorized in St. Tammany Parish, La. Reconnaissance Report

• Bayou Chinchuba
  Channel Improvement Plan or Structure Raising
  • no implementable plan has been developed
  • Abita Springs and Lacombe Structure Raising (raise homes & businesses)
    • no non-federal sponsor

• Slidell Area Plan
  W-13 Canal Basin Channel Improvements
  W-14 Canal Basin Detention Ponds and Channel Improvements
  W-15 Canal Basin Drainage Improvements
St. Tammany—Bayou Chinchuba
Channel Improvements or Structure Raising
St. Tammany—Abita Springs and Lacombe Structure Raising
St. Tammany - Slidell Area Plan (W13, W14 & W15)

- I-10
- I-12
- US 190
- Bayou Bonfouca
- Bayou Vincent
- W-13
- Robert Road
- W-14
- W-15 Lateral
- Gause Blvd.
- Military Road
- W-15 French Branch
- W-15

- Waterways
- Channel Improvements
- One-Way Gate

- Poor Boy Canal Diversion
- Gum Bayou
- To Pearl River
- Bayou Liberty Rd.
- Hwy 11
- Old Spanish Rd.
- I-10

Slidell

To Pearl River

To Pearl River
St. Tammany—Slidell W-14 Canal

Scope of original plan reduced at request of St. Tammany Parish

- channel improvements
- bridge replacements
- detention ponds
- pump station

Section 533(d) report in preparation, scheduled for submission in July 2009