Flood control, risk reduction and preparedness 10 years after Katrina

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• Conducted early environmental sampling of Katrina floodwaters/sediments
• Air sampling adjacent to debris piles
• Analysis of debris handling procedures and techniques
• Analysis and prediction of bulk chemical storage problems during flooding events
Where are we?

- Flood control and surge attenuation
  - Structural elements (Greater New Orleans Hurricane and Storm Damage Risk Reduction System)
  - Non-structural elements (Louisiana Coastal Master Plan 2012)
- Environmental Risk
  - Debris removal, landfills and contaminated soil
Total cost: 14.6 billion
The criteria for commencing IHNC gate closure operations are:

- Water elevations of 3 ft or greater in Lake Borgne
- A storm is predicted to make landfall in the ‘area’ within three days

The general procedure is as follows:
- Closure of the Seabrook Gate by USACE, approximately 20 min;
- Closure of the Bayou Bienvenue Gate by USACE, approximately 20 min
- Closure of the GIWW Sector Gate by USACE, approximately 2 hours for sector gate and 7 hours for barge gate.
- Closure of the IHNC Navigation Lock by USACE.

Storm occurs
- GIWW Sector gate opened first (when maximum water elevation differential is ~3 ft) by USACE, approximately 2 hrs.
- Bayou Bienvenue Gate is opened by USACE, approximately 2 hrs.
- Once Lake Pontchartrain has drained, Seabrook Gate opened by USACEG, approximately 2 hrs.
Total cost: 14.6 billion
17th Street Canal Interim Closure Structure

7,600 cfs
How do you build a system in 5 years?

- NEPA (allowed USACE to break up comprehensive Environmental Impact Statements (EISs) into smaller units of assessment)
- Contracts (Design-build; early contractor involvement)
- Non-traditional techniques (deep soil mixing, wick drains)
NEPA

- National Environmental Policy Act
  - Establishes environmental review processes that apply to governmental actions
  - Seek reasonable alternatives to actions that harm the environment
  - An Environmental Impact Statement is prepared, public comment and review, followed by review by the Environmental Protection Agency
  - Very long process
NEPA (alternative arrangement)

- In an emergency, an alternative arrangement is possible for compliance with NEPA
  - Implemented in consultation with the Council on Environmental Quality, state and federal resource agencies
  - Breaks impact studies up into smaller pieces directed at each individual action
  - Still substantial alternatives discussed and mitigation efforts, still a significant public comment period
2. 17th Street Canal Proposed Action, Layout Alternative A
Coastal Land Loss

Over 2300 square miles lost since 1930
Terrebonne Land/Water Change 1988-2005

- Chauvin
- Point Barre
- Dulac
- Cocodrie
Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Overview

- **2005 Land**
- **2005 Water**
- **Fastlands:** Agricultural, developed, and upland areas surrounded by levees that are generally considered non-wetlands (LDSR, 2002) and that are excluded from calculations of net land area change.
- **2004 to 2005 New Water Areas (Decreased Land Areas):** Includes flooded marsh, sheared marsh, eroded marsh, and scouring marsh.
- **2004 to 2005 New Land Areas:** Includes wrack, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
- **2005 Flooded Burned Marsh Areas:** Based on imagery review of areas classified as burned marsh within a month to a few weeks of Hurricane Rita's landfall.
- **2005 Flooded Agricultural and Developed Areas:** Based on imagery review of new water areas occurring within the "other land" class of Chabreck and Linscombe's marsh community types (unpub. data, 2001).
- **Basin Boundary:** These boundaries include the shared area between the hydrologic basins defined by CWPPRA (1993) and the boundary of the LCA study (Barra and others, 2003).
- **Hurricane Track**

Data were filtered to depict areas of loss and gain greater than 2.3 acres (1.1 ha) in size to remove background noise and to increase confidence in the depicted trends.
50 million dollar—estimated costs of all projects
Caminada Headland Beach
(Fourchon Beach and Elmer’s Island)
5.1 million cubic yards for the beach/dune
5.36 million cubic yards for the marsh
Data and knowledge gaps

- How do structural and non-structural flood control/surge attenuation work together as a system to minimize damage?
- How do non-structural elements of the system mitigate surge?
- How resilient are the non-structural elements after storm impacts?
Depth-dependent roughness

- Cypress-tupelo and bottomland hardwood forest dominated by vegetation that is on the scale of relevant surges, marshes by vegetation much shorter than relevant storm surges
> 100 million cubic yards of debris
Debris Handling System

- Housing contents to curbside by resident
- Environmental and disposal teams circulate through neighborhoods and remove visible wastes targeted for segregation
- Remaining debris to C&D landfill
- Disposal

Staging area followed by proper disposal:
- 14.3 M lbs HHW
- 794,891 White goods
- 5 M orphan containers
- 940,000 e-waste

Inspection at tower and by spotters assigned to landfill face
Analysis and critique of Katrina debris-handling system

- No diversion of arsenic-treated lumber
  - Potential impacts: arsenic contamination of groundwater
  - LWRRI White Paper “Anticipating environmental problems in landfills in New Orleans East”
  - Quantities of Arsenic-Treated Wood in Demolition Debris Generated by Hurricane Katrina; B. Dubey, H. M. Solo-Gabriele, and Timothy G. Townsend; Environ. Sci. Technol.; 2007; 41(5) pp 1533 – 1536

- No diversion of wallboard
  - Potential impacts: generation of $\text{H}_2\text{S}$ in landfill
  - SWANA analysis of Katrina debris plan (2005)
  - LWRRI White Paper
Analysis and critique of Katrina debris handling system

- Inefficient household hazardous waste diversion
  - Potential impacts: contamination of groundwater by HHW
  - LWRRI White Paper “Anticipating environmental problems in landfills in New Orleans East”
  - LSU pile sampling and air sampling

- Utilization of C&D landfills for disposal
  - Potential impacts: groundwater contamination
  - NISTAC (FEMA) Draft Report, 2006
  - Criticized by a very wide range of constituencies
Old Gentilly Monitoring Well Data

Maximum metal concentrations:

As: 1.4 mg/L
Zn: 6,850 mg/L
Ni: 0.97 mg/L
“Old Gentilly Landfill Not the Disaster Once Feared” 2012

- Limited sampling for limited set of analytes
- No air sampling for H$_2$S (of primary concern due to deposition of very large volumes of gypsum wallboard)
- Nearly zero information to inform future events (Joplin tornado using very similar debris handling methodology)
Soil contamination issues continue

- Lead, PAH contamination remain extremely common
- Katrina dropped blood lead levels in children (Mielke, ES&T) presumably due to a fresh layer of soil covering
- Very large soil removal action underway at B.F. Cooper housing development
Questions??