Performance Evaluation of New Orleans and Southeast Louisiana Hurricane Protection System

Report 1
Performance Evaluation Plan and Interim Status

Interagency Performance Evaluation Task Force (IPET)

Products, Schedule, and Milestones

- **Authorization of Study by Chief of Engineers – 10 Oct 05**
- SECDEF Announcement of NRC Panel and IPET – 19 Oct 05
- Establish External Review Panel – 27 Oct 05
- Public Web Site and first data release - 29 Oct 05
- IPET/ERP Kickoff, New Orleans, 7-8 Nov 05
- **ASCE ERP 30% Review – 9-10 Jan 06, Wash DC**
- **NRC Committee kickoff / 30 % Review, New Orleans 17-18 Jan 06**
- ASCE ERP 60% Review – 8-9 Mar 06, Vicksburg, MS
- NRC Committee Meeting / 60 % Review – 16-17 Mar 06, Vicksburg, MS
- **Structural Performance Report to NRC – 1 May 06**
- 90 Percent ASCE Review – 8-9 May, New Orleans, LA
- **Final IPET Report – 1 Jun 06**
- **Final ASCE Report - 1 Jul 06**
- **Final NRC Report – Sep 06**

IPET Report 1: Performance Evaluation Plan and Interim Status

What it IS:

- Strategic Overview and Scopes of Work for IPET activities
  - Incorporates ASCE/ERP and other Views
- Status report on IPET activities for Corps, ERP, Public
- Input to NRC New Orleans Regional Hurricane Protection Committee
- Summary of remaining work to be accomplished, including significant changes or issues based on ERP review or lessons learned.

What it is NOT

- Presentation of findings
- Detailed technical analysis
- Repository of data or analytical products

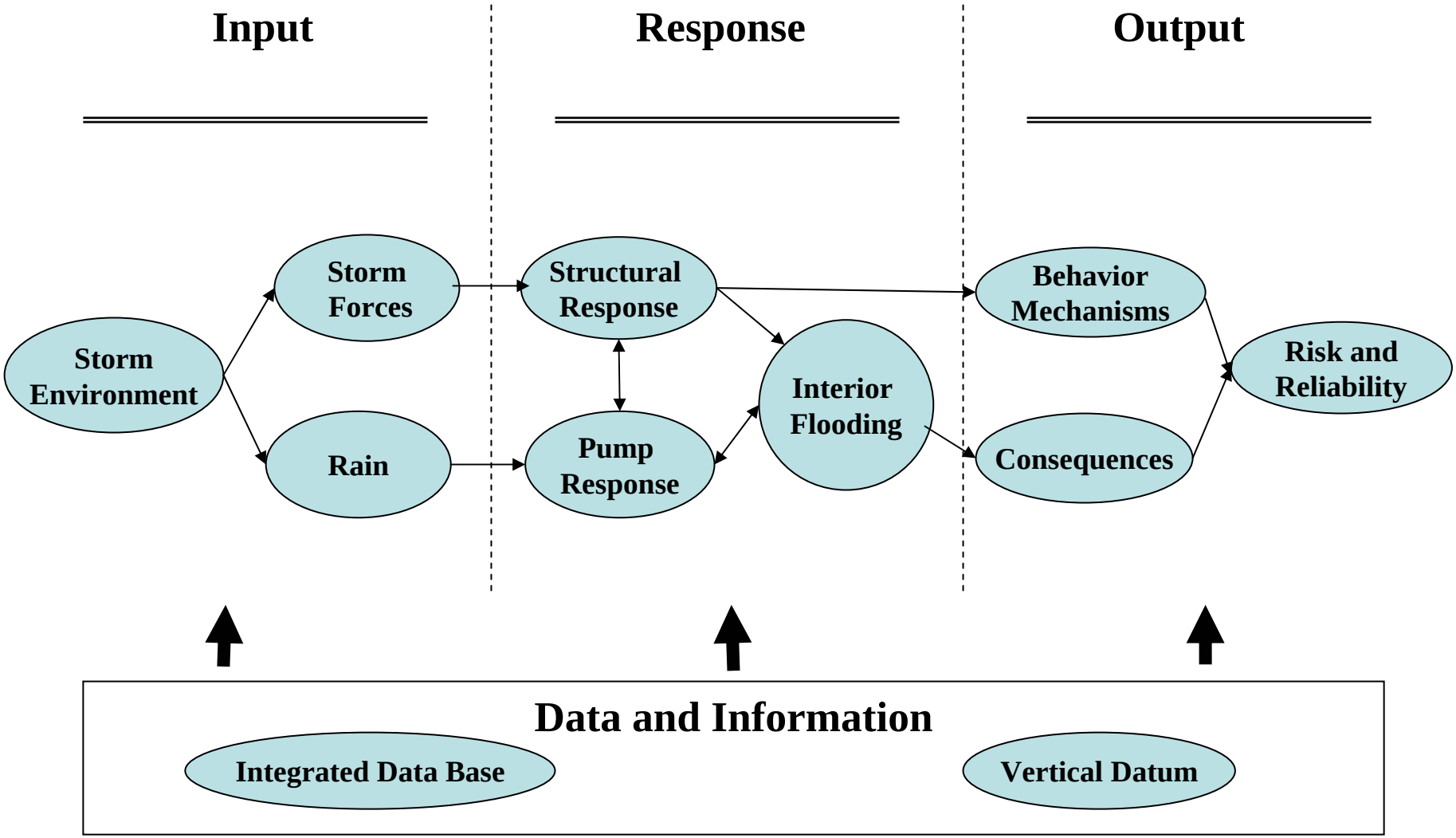
…"to provide credible and objective scientific and engineering answers to fundamental questions about the performance of the hurricane protection and flood damage reduction system in the New Orleans metropolitan area."

Participants: Corps + 40 Organizations

- **Federal Agencies**
  - Corps of Engineers (Lead agency)
    - MVD/MVN/MVK/MVS
    - Task Force Guardian
    - Huntington District (Task Force Co-Lead)
    - Louisville District
    - Tulsa District
    - Jacksonville District
    - Portland District, Hydropower Design Center
    - Engineer Research and Development Center
    - Institute for Water Resources / HEC
  - FEMA (Team member)
  - NOAA
    - NGS (Team Co-lead)
    - CO-OP (Team Co-Lead)
    - NWS
    - HRD
  - USBR (Team co-lead)
  - USDA Economic Research Service (Team Co-lead)
  - USGS (Team member)
  - NIST
- **State and Local Agencies**
  - Louisiana DOT
  - New Orleans Levee and Drainage Districts
  - South Florida Water Management District (Team Co-Lead)
  - Harris County Flood Control District, TX (Team Co-Lead)
- **International**
  - Japan
  - Netherlands
- **Academia**
  - University of Maryland (Task Force Lead)
  - Louisiana State University
  - Jackson State University
  - Utah State University
  - Penn State University
  - University of Florida (Team co-lead)
  - University of Delaware
  - University of North Carolina
  - University of South Carolina
  - University of Norte Dame (Team Co-Lead)
  - University of Texas
  - Stanford University
  - Texas A&M U
  - University of Wyoming
  - Georgia Institute of Technology
  - MIT
  - Oklahoma State University
  - Virginia Tech University (Team Co-lead)
  - Villanova University
  - Geo-Delft
- **Industry**
  - Steedman, Ltd., UK (Team co-lead)
  - Ocean Weather, Inc
  - ARA, INC
  - CH2M Hill
  - URS
  - RAC Engineering

Tremendous spectrum of talent and experience

IPET Systems Approach



The Questions

Corps

What were the storm surges and waves generated by Hurricane Katrina?

How did the floodwalls, levees and drainage canals, acting as an integral system, perform during and after Hurricane Katrina?

How did the pumping stations, canal gates and road closures, acting as an integral system, operate in preventing and evacuating the flooding due to Hurricane Katrina?

What was and what is the condition of the hurricane protection system before and after Hurricane Katrina and, as a result, is the New Orleans protection system more susceptible to flooding from future hurricanes and tropical storms?

Army

What was the design capacity (surges, waves, water levels, winds, category storm, etc.) of the hurricane protection system for New Orleans and vicinity?

What forces were exerted against the hurricane protection system (storm surges and waves generated by Hurricane Katrina) and how did the system respond in the face of these forces?

What levees and/or floodwalls were overtopped, breached, or failed during Hurricane Katrina, and what caused these results?

Examples of ERP Issues

- Extremely ambitious plan, question feasibility to complete
- Re-state & expand the “Questions” for clarity
- Details of reconstruction plans and activities
- Institutional & jurisdictional issues / impacts in protection performance
- Models used to couple waves and surge processes
- Misgivings about value of centrifuge
- Number of scenarios used to examine flooding & associated consequences
  - Too little study of alternative solutions to flooding
- Complexity and scope of risk model
  - Difficulty in assessing pre-Katrina risk
  - Great value in developing risk assessment capability

Focus of Discussions During IPET/ERP 9-10 JAN Meeting at ASCE

The Questions Synthesized

1. The Flood Protection System: What were the design criteria for the pre-Katrina hurricane protection system, and did the design, as-built construction, and maintained condition meet these criteria?

- What were the deign assumptions and as built characteristics of the primary components of the flood protection system?
- What records of inspection and maintenance of original construction and post Katrina repairs are available that document their conditions?
- What subsurface exploration and geotechnical laboratory testing information were available as the basis of design, and were these conditions verified during construction?
- Were the subsurface conditions at the locations of levee failures unique, or are these same conditions found elsewhere?

2. The Storm: What were the storm surges and waves used as the basis of design, and how do these compare to the storm surges and waves generated by Hurricane Katrina?

- What forces, as a function of location and time, were exerted against the hurricane protection system by Katrina?

3. The Performance: How did the floodwalls, levees, pumping stations, and drainage canals, individually and acting as an integrated system, perform in response to Hurricane Katrina, and why?

- What were the primary failure mechanisms and factors leading to failure for those structures suffering catastrophic failure during the storm?
- What characteristics allowed components of the system to perform well under exceptional loads and forces?
- What was the contribution of the pumping stations and drainage system in the unwatering of flooded areas?
- What areas or components of the flood protection system have sustained damages that reduce their protection capacity and may need some reconstitution of capacity?

4. The Consequences: What have been the societal-related consequences of the Katrina-related damage?

- How are local consequences related to the performance of individual components of the flood protection system?
- What would the consequences have been if the system would not have suffered catastrophic failure?
- What are the consequences of Katrina that extend beyond New Orleans and vicinity?

5. The Risk: Following the immediate repairs, what will be the quantifiable risk to New Orleans and vicinity from future hurricanes and tropical storms?

- What was the risk to New Orleans and vicinity from hurricanes prior to Katrina?
- On June 1, 2006, what will be the condition and engineering integrity of the New Orleans hurricane protection system, including structural repairs?

Examples of support to Corps activities in New Orleans

- Coordination of perishable field data collection
- Data Repository
- Public Web Site (tied to TFG e-bid Site)
- Groove Workspace
- Assessment of ASCE/NSF Observations for immediate application in rebuild
- Life cycle documentation of the hurricane protection system (on-going)
- Summary report on Katrina surge and wave elevations
- Summary report on multiple storms/paths surge and wave elevations
- Review of planned repair/rebuild designs
- Evaluation of existing and as-built conditions along canals
- Verification of existing elevations of current and reconstructed protection structures
- Densification of control benchmarks (75 established to date)
  - Interim time dependent vertical geodetic datum