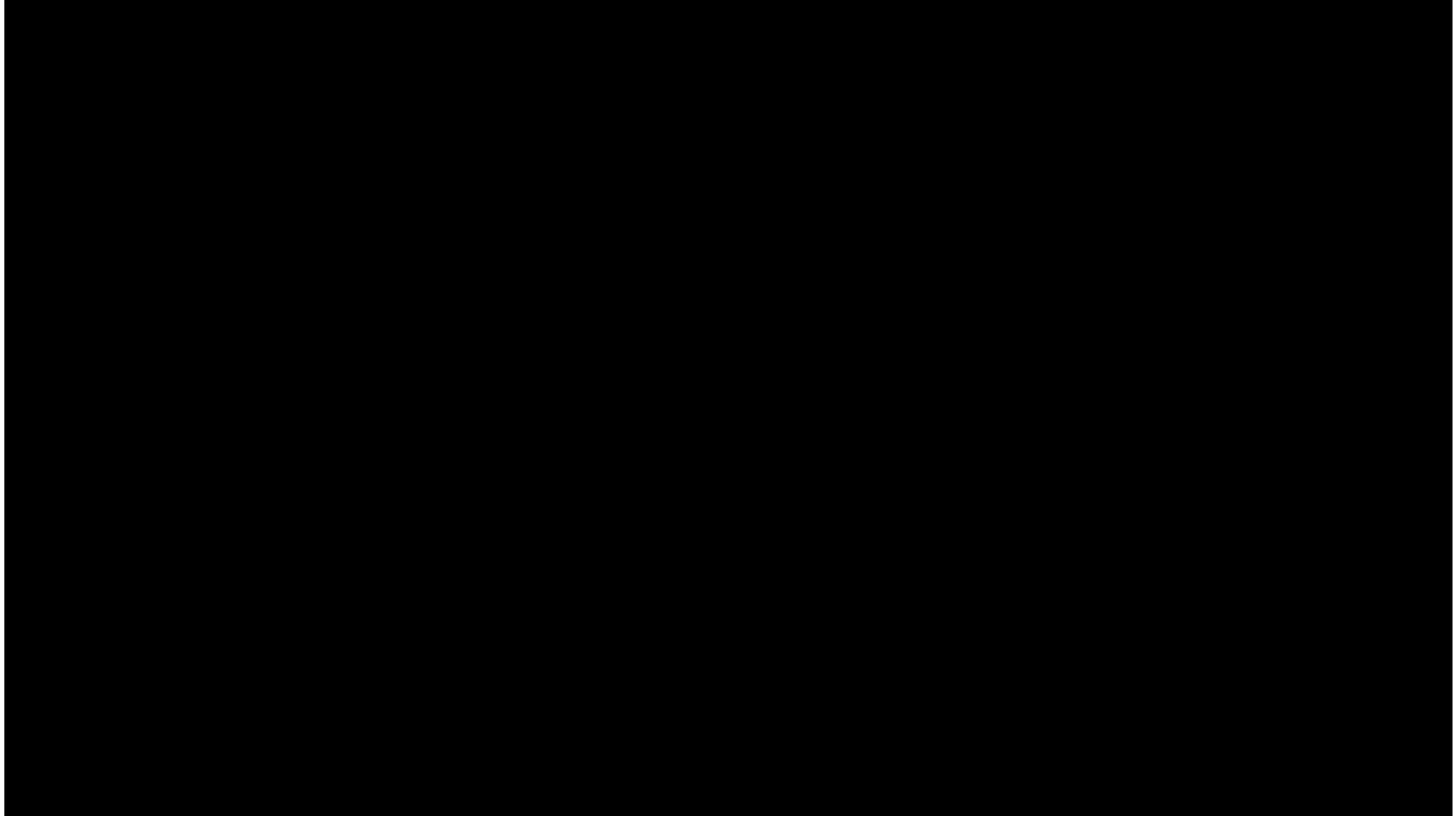






PROJECT MANAGEMENT
CENTER FOR EXCELLENCE

A.J. CLARK SCHOOL OF ENGINEERING
Civil & Environmental Engineering Department

UNIVERSITY OF MARYLAND
2026 PROJECT MANAGEMENT SYMPOSIUM

Adaptive Project Management

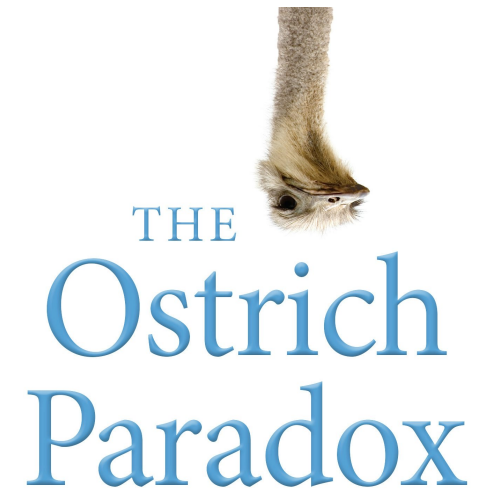
A Time Machine for Demanding Schedules
Project Management of the Post Katrina Assessment
and Response in New Orleans

Lewis E. Link, PhD

Senior Fellow, UMD Project Management Center for Excellence
Former Director, Interagency Performance Evaluation Task Force
Former Director of R&D and Chief Scientific Advisor, US Army Corps
of Engineers

WE HAVE A PROBLEM!

- **1980 – 2024: 403 Confirmed Weather/Climate \$B+ Disasters**
 - 67 tropical cyclones
- **Costliest Disasters**
 - **Katrina 2005 New Orleans**
 - Harvey **2017** Houston
 - Ian 2022 W. Florida
 - Maria **2017** Puerto Rico
 - Sandy 2012 NY/NJ
 - Ida 2021 Louisiana
 - Helene 2024 Florida/GA/NC/TN
 - Irma **2017** SW Florida
- **Pre Katrina: Betsy (1965), Camille(1969)**



Robert Meyer and Howard Kunreuther



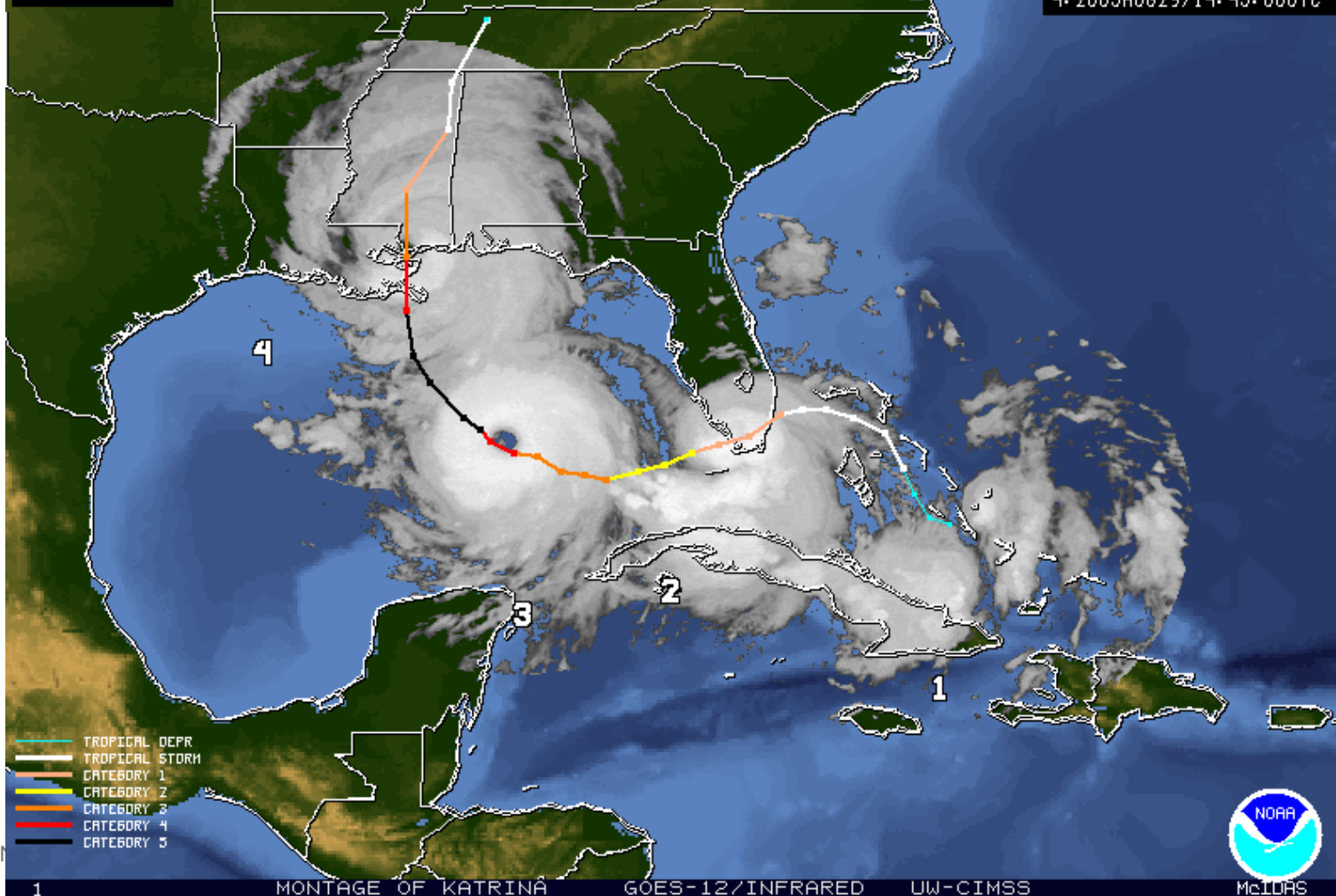
Outline

- Katrina - The Challenge
- Managing the Challenge
 - Forensics – Interagency Performance Evaluation Task Force
 - Short Term Recovery – Task Force Guardian
 - Long Term Recovery – Task Force Hope/HSDRRS
- Secret Sauce



Katrina 30 August 2005

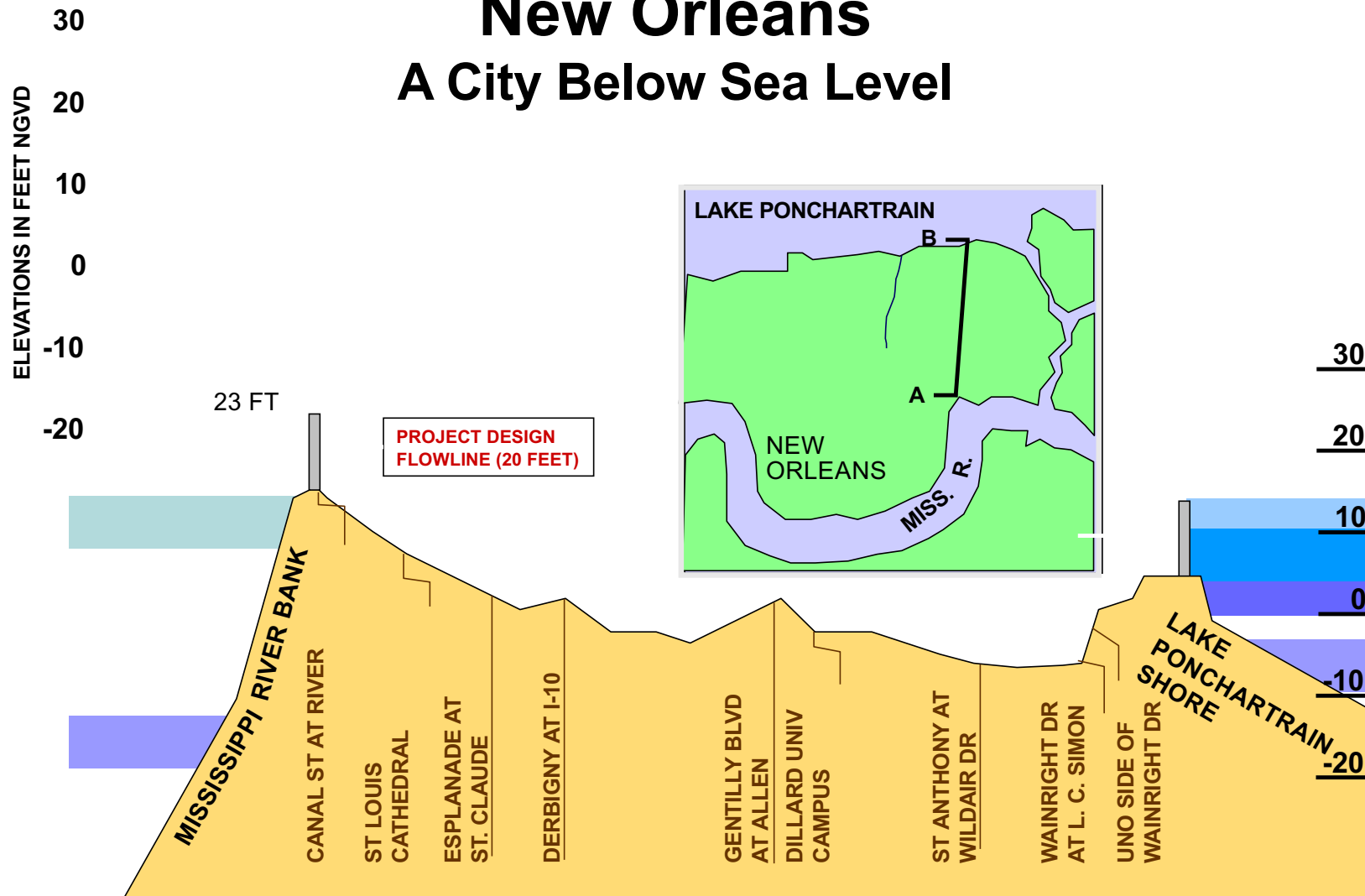
Image Index
1: 2005AUG23/21: 15: 00UTC
2: 2005AUG26/06: 15: 00UTC
3: 2005AUG28/07: 15: 00UTC
4: 2005AUG29/14: 45: 00UTC



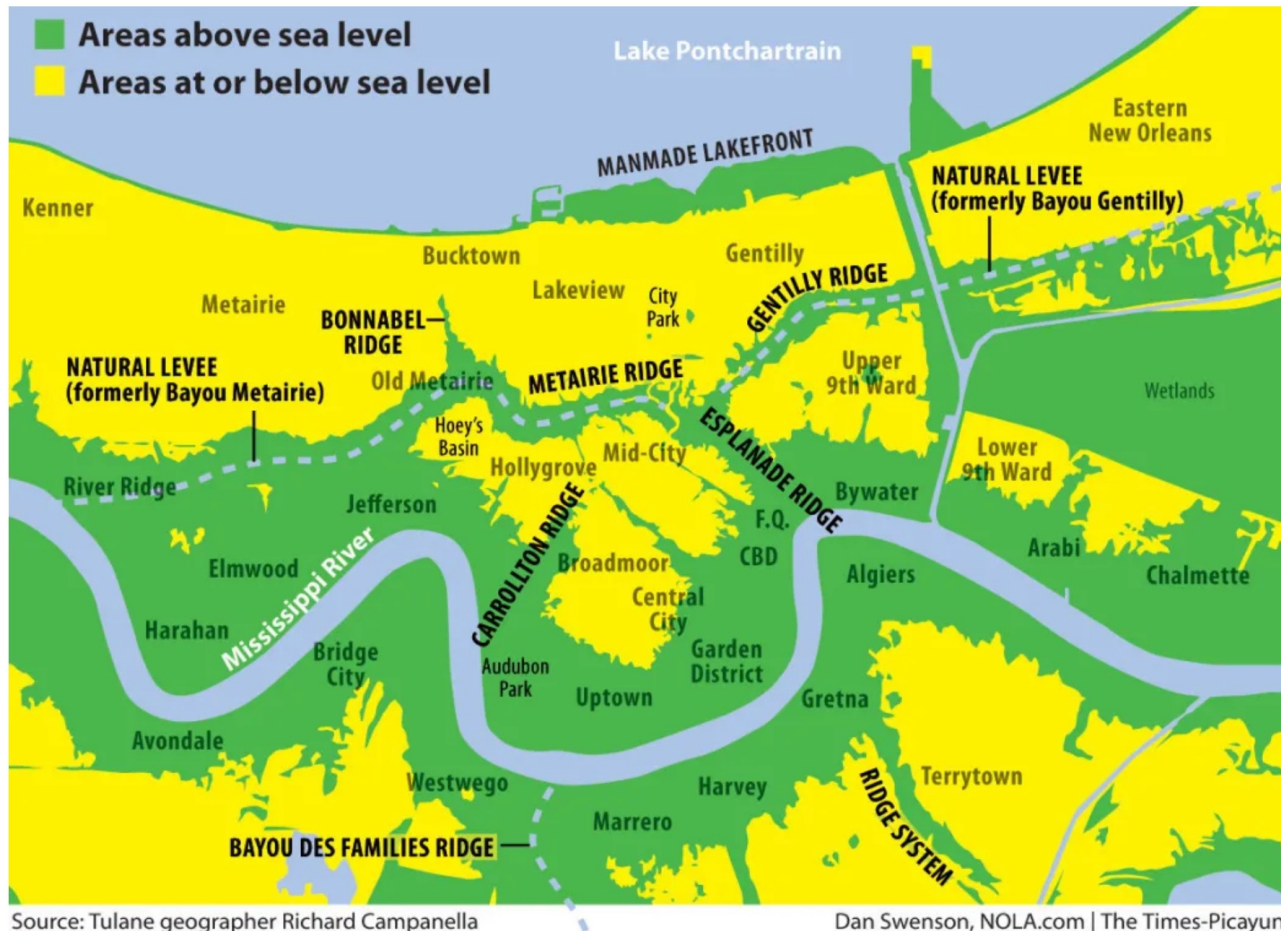
Surviving

New Orleans

A City Below Sea Level



Subsidence in New Orleans



Percent Below Sea Level

1895 - 5%

1930 - 30%

2020 - 50%

Estimated Rate 0.2 – 2 in/yr

This map shows the Gulf Coast of the United States, including parts of Louisiana and Mississippi. A red line indicates the 'Katrina Path' along the coast. A white arrow points to a section of the coast labeled 'This Section Not Completed for Katrina'. The map also shows major cities like Jefferson, Orleans, and St. Bernard, and bodies of water like Lake Borgne and the Gulf of Mexico.

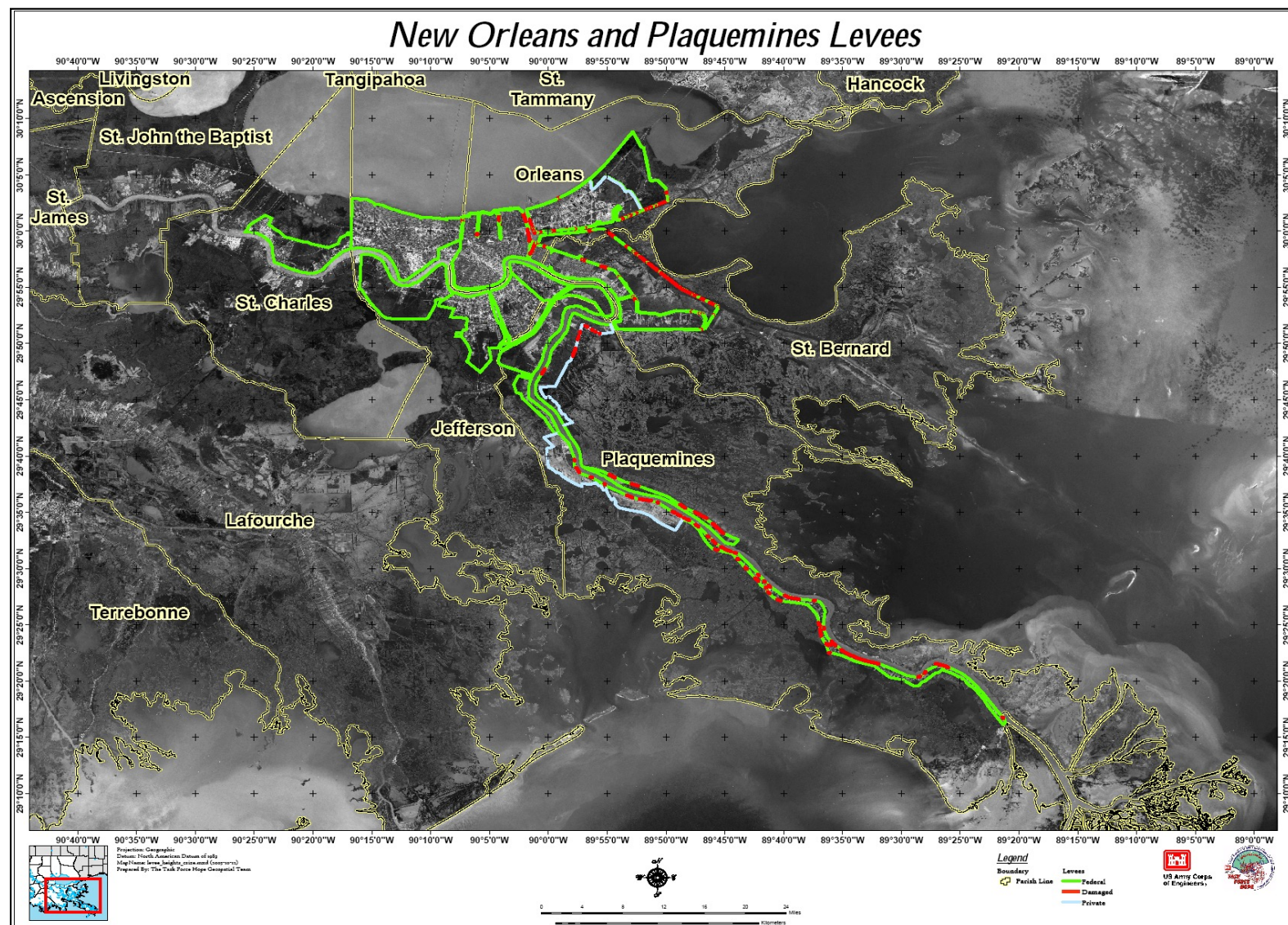
 192 mi Federal Levees
 34 mi non-Fed levees

73 Pumping Stations

590 Flood Gates

55 Major Breaches

**220 of 350 mi
perimeter
damaged**



MULTIPLE FAILURES

From poor design, to construction not matching plans, to levees not high enough to withstand the storms they were designed for, man-made weaknesses in the hurricane protection system failed metro New Orleans on August 29.

The map displays the city of New Orleans and surrounding areas, color-coded by maximum floodwater levels. A legend in the bottom left corner indicates the following ranges:

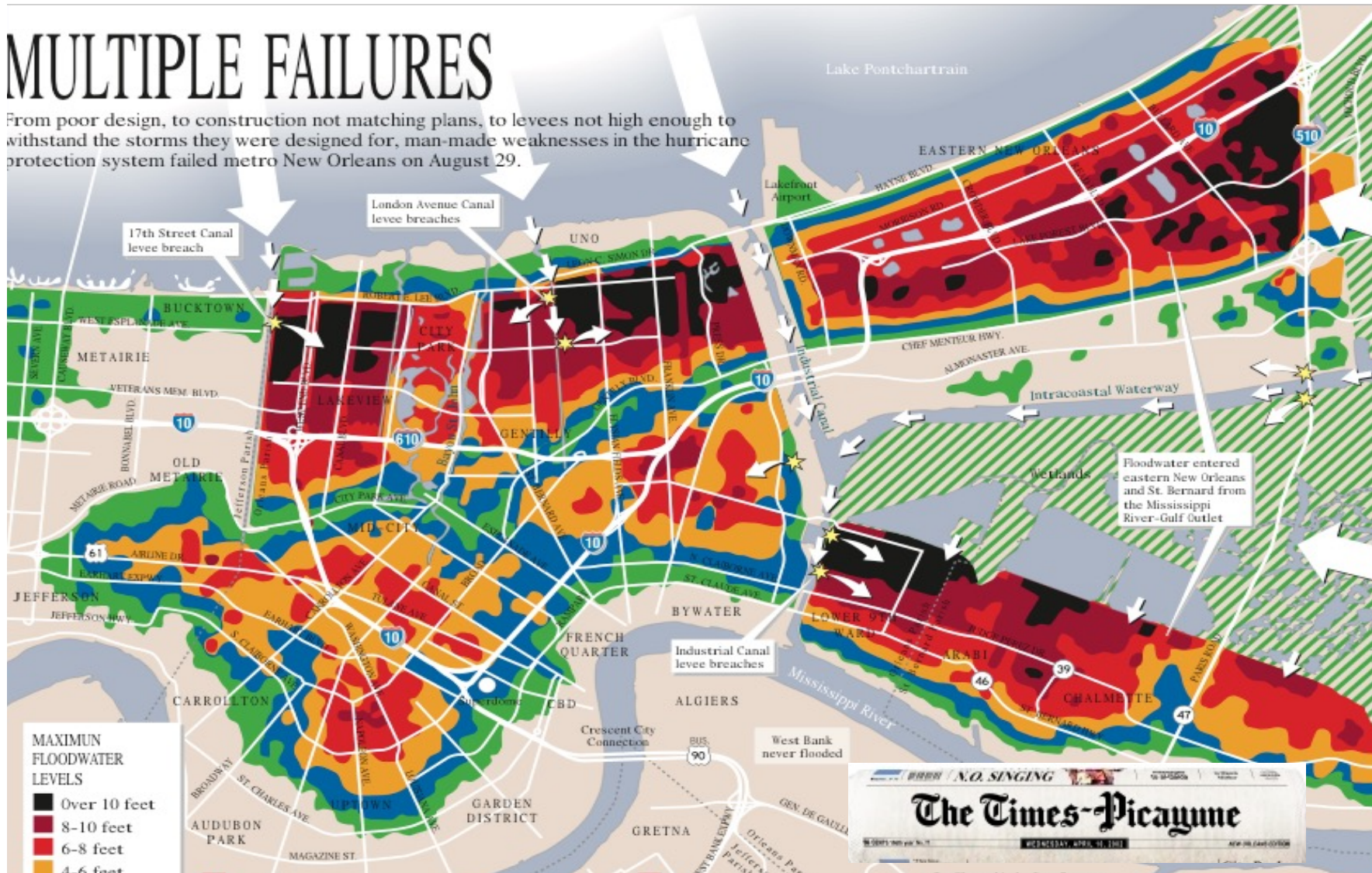
- Over 10 feet (Black)
- 8-10 feet (Dark Red)
- 6-8 feet (Red)
- 4-6 feet (Orange)
- 2-4 feet (Yellow)
- 0-2 feet (Green)

Key locations and features labeled on the map include:

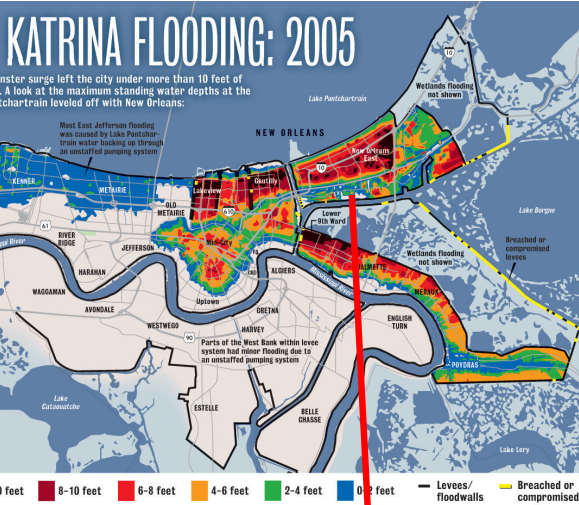
- Neighborhoods: BUCKTOWN, METAIRIE, OLD METAIRIE, JEFFERSON, CARROLLTON, UPTOWN, GARDEN DISTRICT, GRETN, ALGIERS, FRENCH QUARTER, BYWATER, GENTILLY, CLAY PARK, LAKEVIEW, UNO, EASTERN NEW ORLEANS, LOWER 9TH WARD, ARABI, CHALMETTE.
- Waterways: Lake Pontchartrain, Lakefront Airport, Intracoastal Waterway, Wetlands, Mississippi River, Lakeview Canal, Industrial Canal, West Bank.
- Highways: I-10, I-510, I-610, I-90, LA-61, LA-39, LA-46, LA-47.
- Other: Crescent City Connection, West Bank never flooded, Floodwater entered eastern New Orleans and St. Bernard from the Mississippi River-Gulf Outlet.

Arrows indicate the direction of floodwater flow and specific levee breaches, such as the 17th Street Canal levee breach and the London Avenue Canal levee breaches.

From poor design, to construction not matching plans, to levees not high enough to withstand the storms they were designed for, man-made weaknesses in the hurricane protection system failed metro New Orleans on August 29.



Hazard = Surge and Wave Environment





The Katrina Challenge

- 220 of 350 miles of structures and 34 of 73 pump plants damaged, 55 major breaches
- 80% of New Orleans Flooded
- 1800 fatalities, ~ \$200 B in Total Economic Losses
- 9 months – Next Hurricane Season
- Uncertain Future Hazard



Response

Emergency Response – Corps of Engineers; FEMA; NGOs

LA Field Recovery Office

MS Field Recovery Office

Task Force Un-Water, Debris Removal, Rock Island District

What/Why/Risk – Interagency Performance Evaluation Task Force

Independent Task Force (Univ of Maryland)

Immediate Recovery – Task Force Guardian - Restore to pre-K level

St Louis District, New Orleans District

Long-Term Recovery – Task Force Hope – Design and Build HSDRRS

Hurricane Protection Office – 6 Districts

Protection Restoration Office – New Orleans District plus

Major Infrastructure Disaster Forensic Studies

World Trade Center Collapse - NYC

- SEP 2001
- Fatalities: 2000
- Agency – NIST
- Lead – NIST
- Team (200, 85 NIST)
- Time Frame: 7 Yrs: 4 yrs (WTC),
3 Yrs (WTC 7)
- Content 10,000 pages, 43 Reports

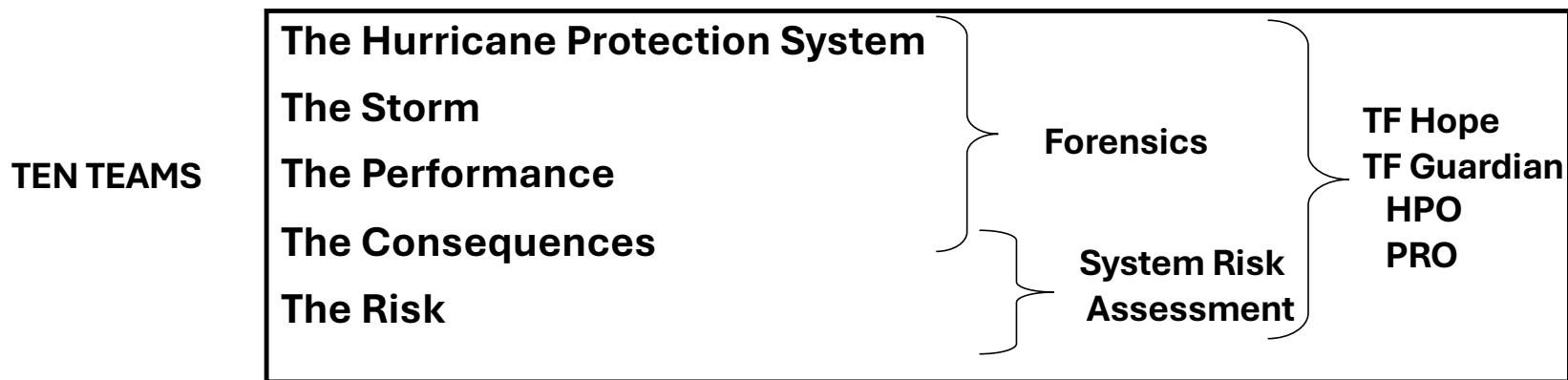
Hurricane Katrina – New Orleans

- AUG 2005
- Fatalities: 1800
- Agency - Corps of Engineers
- Lead – Independent, UMD
- Team – IPET (150 +)
- Time Frame: 9 Months (Initial),
3 yrs (Final)
- Content 7500 Pages, 9 Vol, plus
Supplemental Report, 4300
Reference Library

Interagency Performance Evaluation Task Force

...“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.”

LTG Carl Strock, Chief of Engineers



<http://biotech.law.lsu.edu/katrina/ipet/ipet.html>



Interagency Performance Evaluation Task Force (IPET)



Independent

**300 + Contributors, 150 full-time
\$30+ M funding (Congressional)
12 Government/25 Academic/
23 Private Sector Organizations
Virtual / Distributed Network**



Management Structure

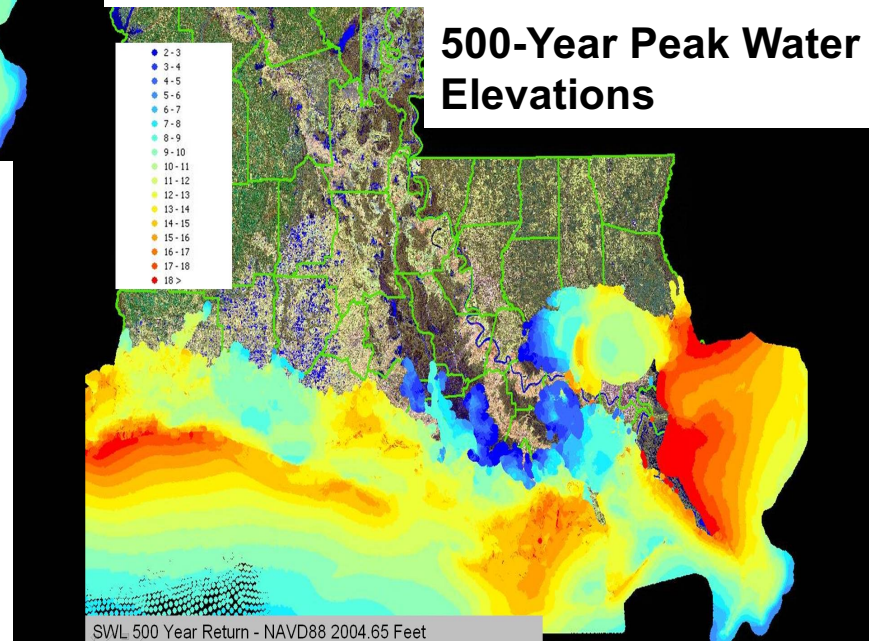
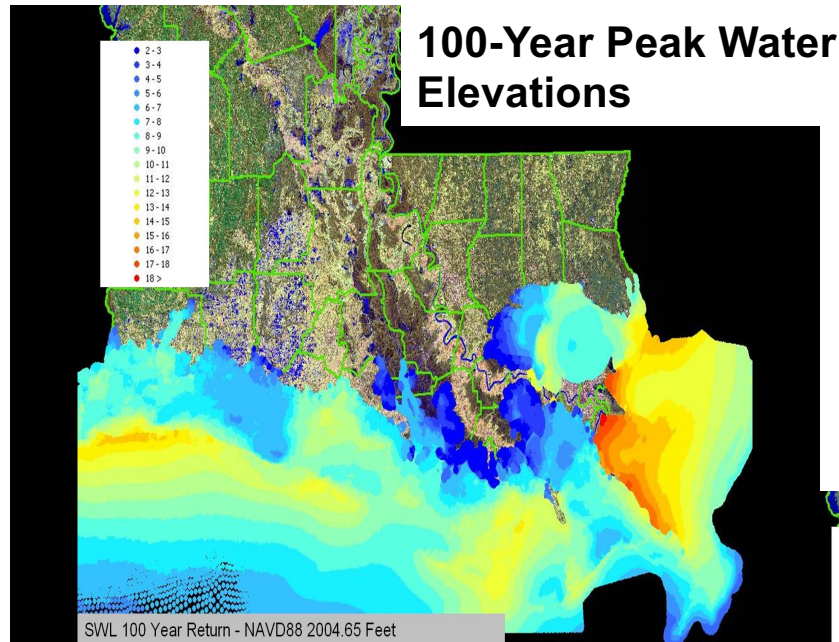
- **Leadership – Director (UMD), Deputy Director (Corps)**
- **Ten Inter-Related Teams, Each Having Dual Leadership**
- **Embedded Stake Holders in Teams**
- **Centralized Contract, Resource Management, Legal, and IT Support (ERDC, Corps Districts)**
- **PM Plan – Framework/Roadmap, Frequently Amended**
- **Continual Peer Review (Team Level, ASCE, NRC)**
- **Continual Transition of Findings (Public/Government)**

Assets

- **Experimental Infrastructure** (ERDC plus Partners)
- **IT and HPC** (ERDC)
- **Talent:** Universities (25), Agencies (12) and Companies (20)
- **Review:** Real-time external review (ASCE) and formal technical review (National Research Council)
- ***Critical Enablers:***
 - ***Funding*** (*Congressional Supplemental*)
 - ***Flexible Spending and Contracting Authorities***
 - ***Total Alignment*** (*Vertical and Horizontal*)
 - ***Admin and Contracting Support*** (*ERDC, UMD*)

DoD High Performance Computing Center, ERDC

Hazard Characterization JPM-OS

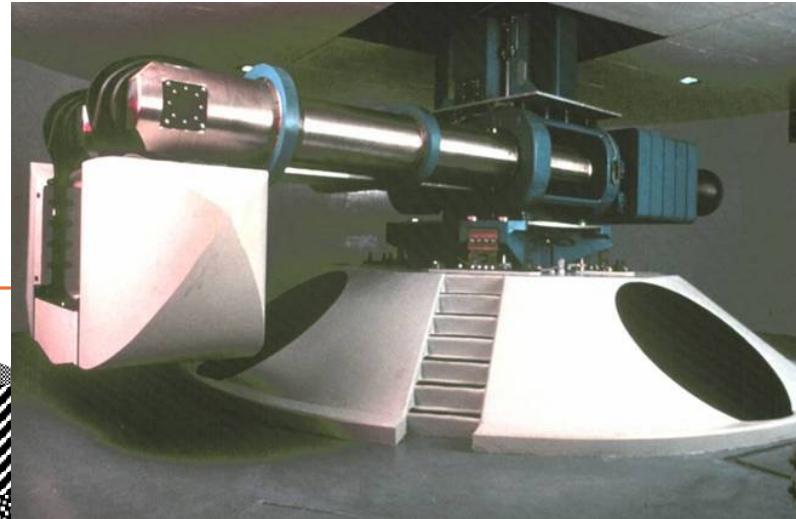
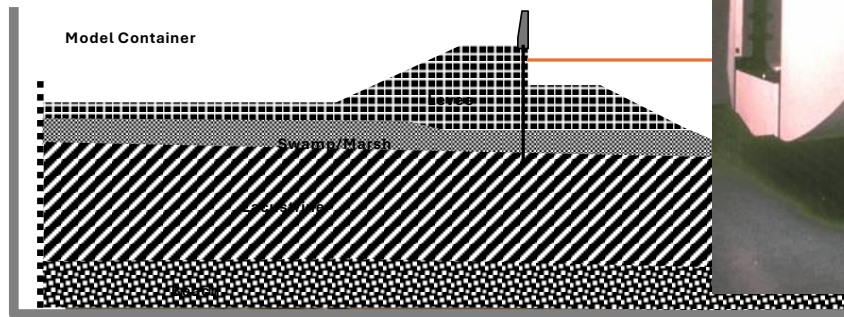


**152 hurricanes, varying
intensity, size, and track
Stage-frequency
relationships
63,000+ Hydrographs
Waves - Height/Period**



World's Largest Centrifuge Validation of Structure Failure Modes

1/50 scale model at 50 g



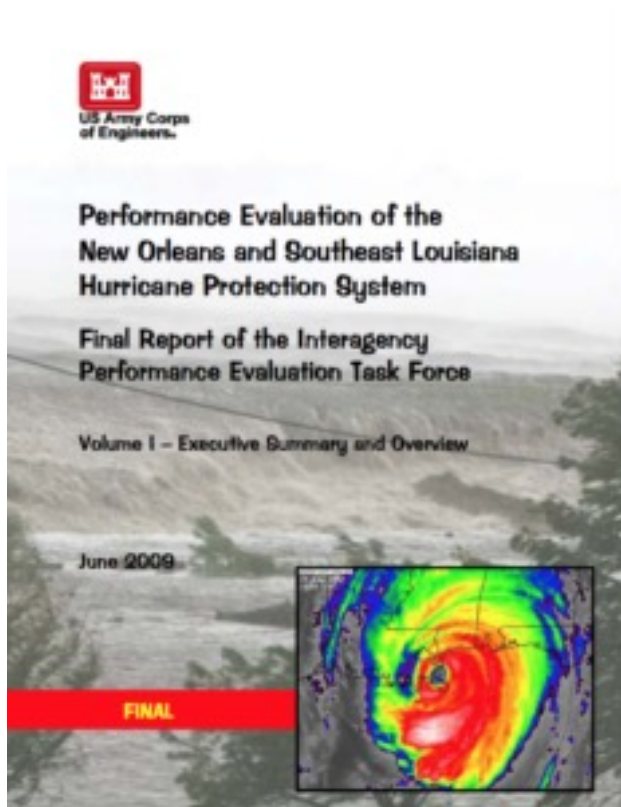
*With RPI
& Geo Delft*

Communications

- Weekly All-Hands Virtual Meeting
- Facilitated by “Groove” Virtual Office
- Task Force Guardian/Hope Embedded in IPET Teams
- Periodic (Public) Meetings with Peer Review Panels
- Public Web Site for all Information and Results
- Written and Broadcast Media (Daily)
- Public Meetings with Local Officials
- Testimony to Senate Committees, DOJ

“I think we have a shockingly accurate picture of what went wrong. IPET made that possible. 2006; 2009

Dr. David Daniel, President, Univ of Texas, Dallas and Chair, ASCE External Review Panel



9 Volume, 7500 Page Final Report

Supplemental Report on Future Risk

4300 Document Supporting Library

Prototype Risk and Reliability Analysis

**Direct Input to Design and Construction
of Immediate and Long-Term Response**

**Basis for Major Modifications to National
Technical Guidance and Policy for Flood Risk Reduction**

Response

Emergency Response – Corps of Engineers; FEMA; NGOs

LA Field Recovery Office

MS Field Recovery Office

Task Force Un-Water, Debris Removal - Rock Island District

What/Why – Interagency Performance Evaluation Task Force

Independent Task Force (Via Univ of Maryland)

Immediate Recovery – Task Force Guardian –

Restore to pre-K level by June 2006

St Louis District, New Orleans District.

\$14.7 B

Long-Term Recovery – Task Force Hope –

Design and Build HSDRRS by 2011, Add Resilience by 2018

Hurricane Protection Office – 6 Districts

Protection Restoration Office – New Orleans District plus

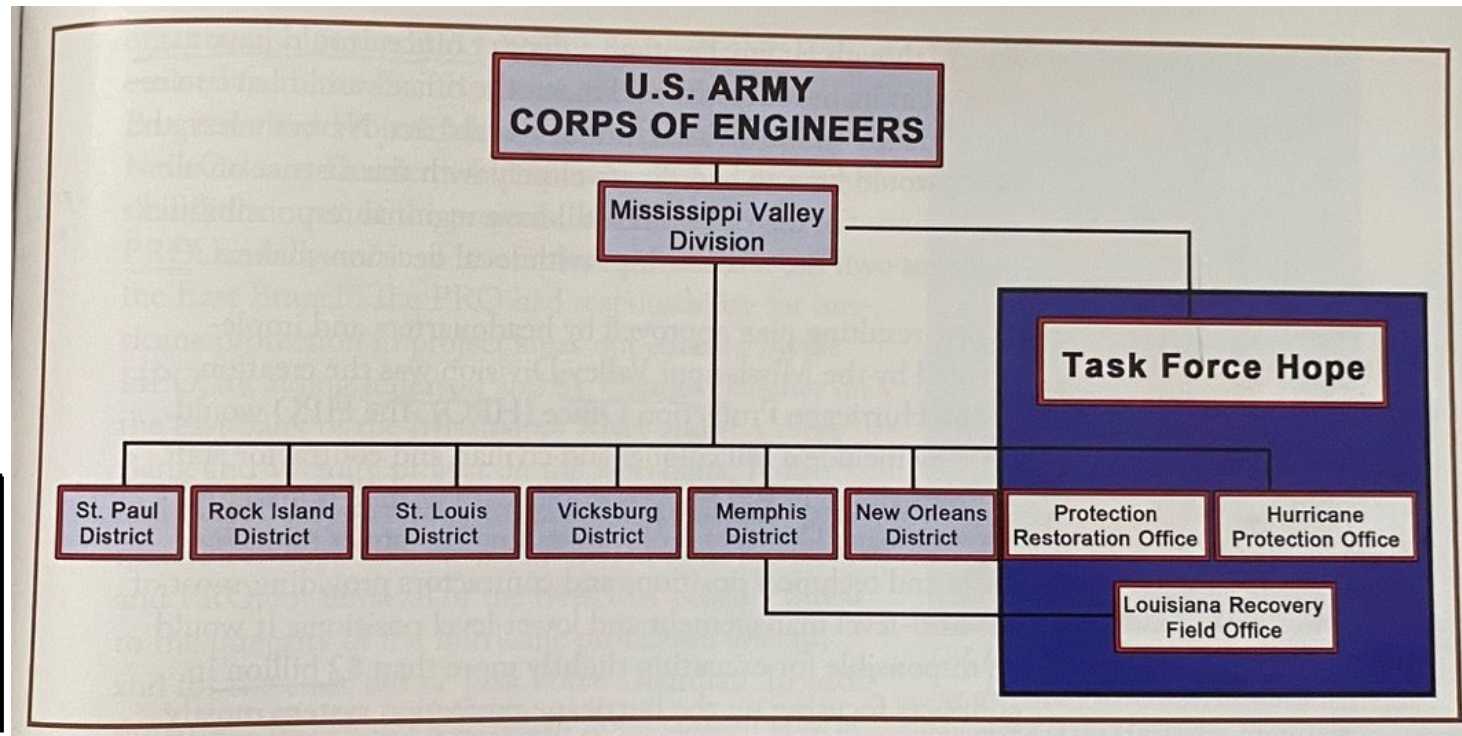
Organizational Structure for HSDRRS

T F Un-Watering

Rock Island District
Lead
New Orleans
District Support

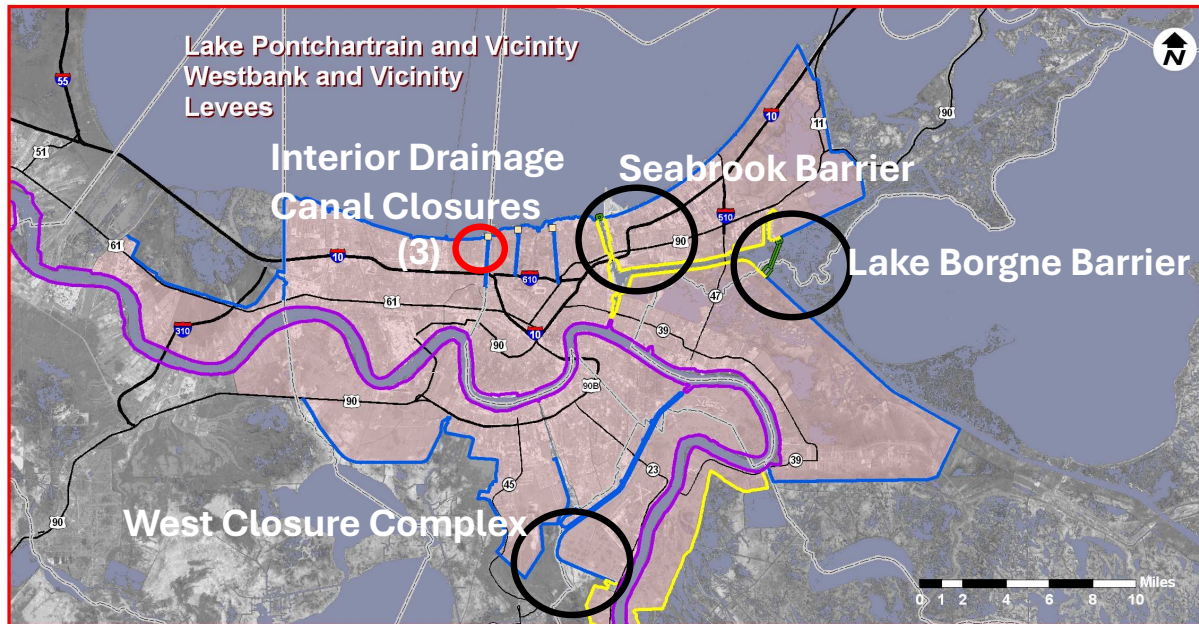
T F Guardian

St Louis District
lead
New Orleans
District - Support



1000-3500 Dedicated Personnel, \$14.6 B

Hurricane and Storm Damage Risk Reduction System



US Army
of Engineer

Southeast L
Hurricane Protec
and Major Evacu
100 Year

SCOPE OF EFFORT

350 mi of Structures

133 mi Perimeter Structures

70 mi Interior Structures

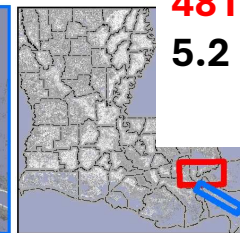
134 mi Plaquemines Structures

481 Transitions

590 Flood Gates

**Interior Drainage and Pump Station
Upgrades**

- Pump Static
- Mississippi F
- Authorized L
- IHNC Closures
- 100 Year Le
- Parish Bour
- Interstate
- Major Highw

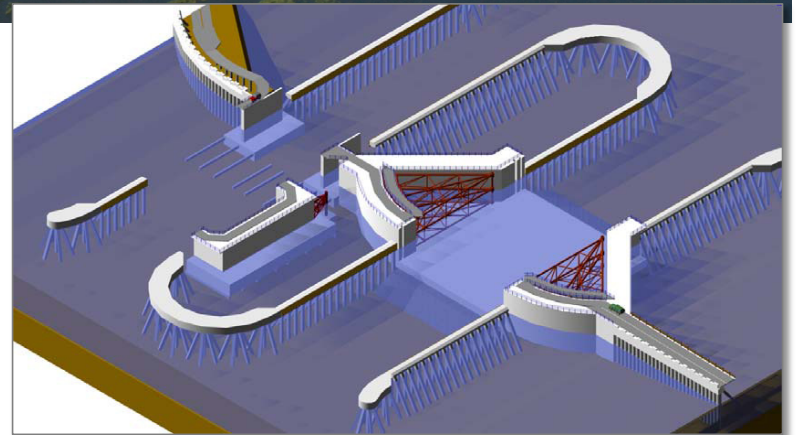


481 Construction Contracts

5.2 Million Cubic Yds Borrow

Lake Borgne Closure Complex

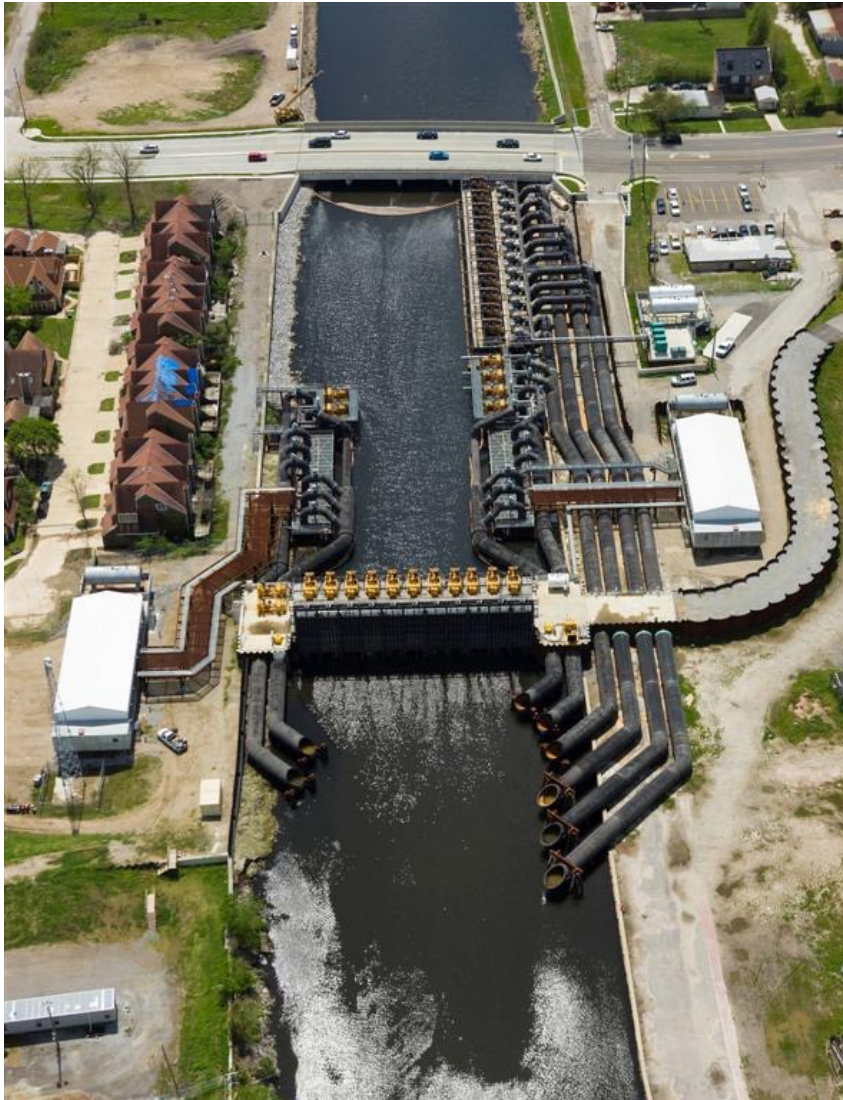
Largest Storm Surge Barrier in the World



West Closure Complex



Largest Drainage Pumping Station in World



Interior Drainage Canal Closure and Pump Stations (3)

Two Steps:

TFG: Temporary Closure and Pumps

TFH: Permanent Closure and Pumps

Scope of Work Challenges - HSDRRS

- Managing 481 Contracts
- New Design Criteria and Construction Methods*
 - Risk Informed Design
 - Uncertainty-Based Factor of Safety
 - Incorporating Resilience
- Coordinating the Massive Materials Requirements (e.g., 5.2 M Cubic Yards - Clay)
- Concurrently Managing Multiple (\$B+) Interdependent Projects

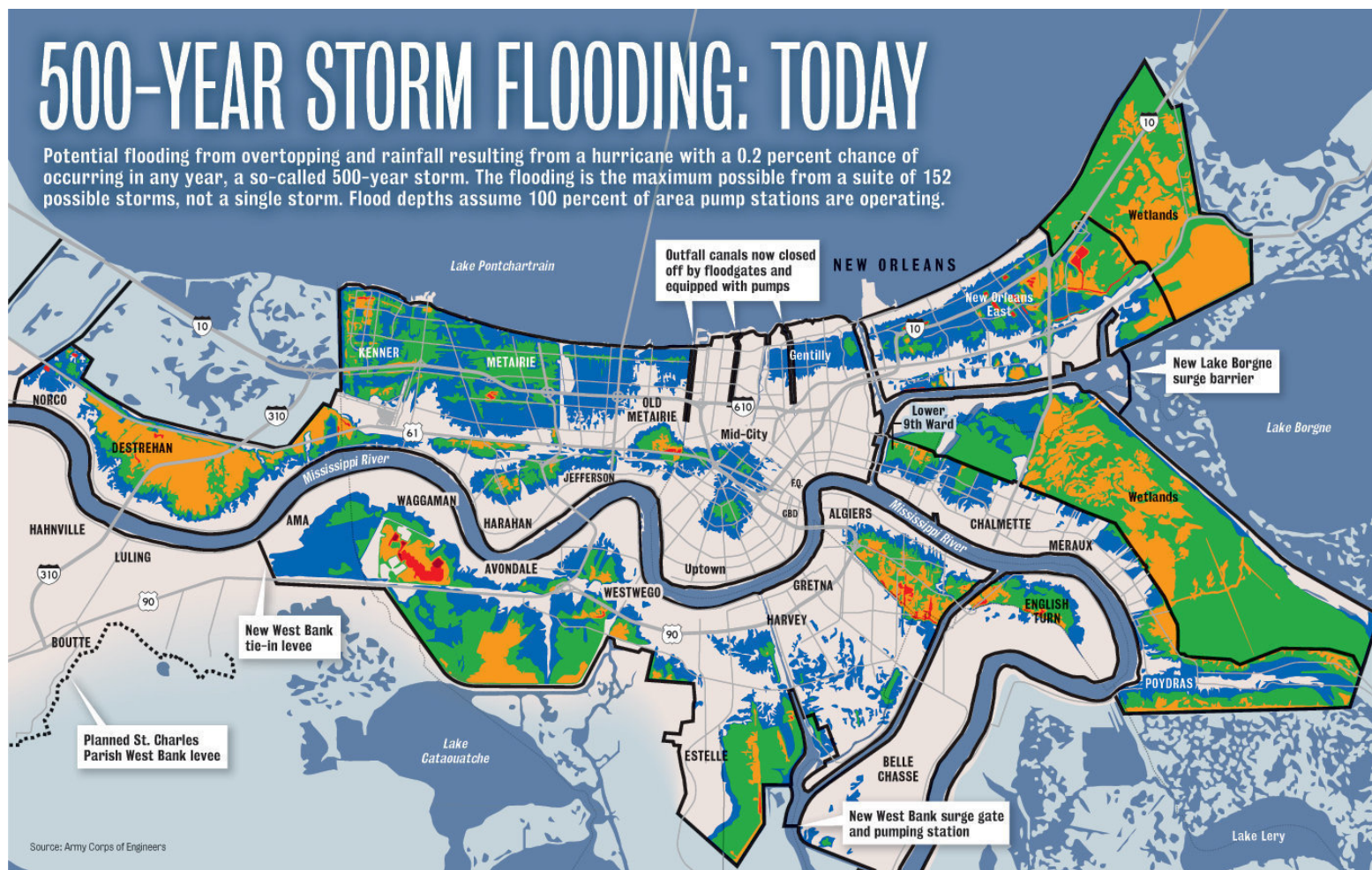
*IPET Analysis Support

HSDRRS Execution and Time Initiatives

- Adopt Existing Real Estate Footprint
- Early Partnering with providers and relevant agencies
- Executive Teaming for Resolving P M and Construction Issues
- Design-Build and Best Value Contracts
- Distributed Management of Contracts and Integration of Products (multiple Corps Districts and Task Force Hope)
- Integrated Project Environmental Assessments (NEPA)
- System Resilience Added as Second Phase, post 2011

500-YEAR STORM FLOODING: TODAY

Potential flooding from overtopping and rainfall resulting from a hurricane with a 0.2 percent chance of occurring in any year, a so-called 500-year storm. The flooding is the maximum possible from a suite of 152 possible storms, not a single storm. Flood depths assume 100 percent of area pump stations are operating.



APPROXIMATE STANDING FLOODWATER DEPTHS



Source: Times Picayune

HSDRRS IMPACT

86%
Reduction in
Economic Risk

98%
Reduction in
Life Loss Risk

Source: IPET
Supplemental
Report on
Future Risk

Secret Sauce

- **PURPOSE**
- **VERTICAL & HORIZONTAL ALIGNMENT/COMMITMENT**
- **TALENT/TEAMS**
- **ADAPTIVE PM** (Primitive Version of Agile, **Weekly Sprints**)
- **BEST AVAILABLE TOOLS and METHODS**
- **POLICY AND GUIDANCE FLEXIBILITY**
- **ADEQUATE FUNDING**
- **REAL-TIME PEER REVIEW**
- **TRANSPARENCY**



WHAT ABOUT THE FUTURE?

Natural Hazard Analysis and Mitigation Since Katrina: Are We Ready for the Future?

Lewis E. Link , Gregory B. Baecher and Gerald E. Galloway

Department of Civil and Environmental Engineering, University of Maryland

College Park, College Park, MD, USA

Water Policy Vol 27 No 6, 673 doi: 10.2166/wp.2025.324

What Will PM look Like for Large Infrastructure Projects?

Scenarios/Incremental Adaptation

Deep Uncertainty

Life Cycle Funding (Incremental vs project life)

Agile Policies, Guidance, Governance

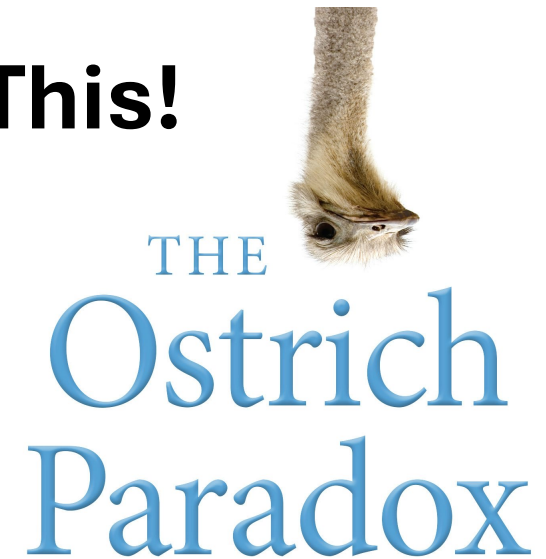
Major Coastal Risk Reduction Planning



We Have Got to Get Better At This!

Charles Darwin: “It is not the strongest of the species that survives, nor the most intelligent. It is the one that is **most adaptable to change**. Those that have learned to collaborate and improvise most effectively have prevailed.”

Eric Hoffer: “In a world of change, the **learners shall inherit the earth**, while the learned shall find themselves perfectly suited for a world that no longer exists.”



**WHY WE UNDERPREPARE
FOR DISASTERS**

Robert Meyer and Howard Kunreuther





PROJECT MANAGEMENT
CENTER FOR EXCELLENCE

A.J. CLARK SCHOOL OF ENGINEERING
Civil & Environmental Engineering Department

Questions & Evaluation

Evaluate Session:



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<https://cee.umd.edu/clark/faculty/276/Ed-Link>

