



Sixth Biennial Freshwater Spills Symposium, May 2006

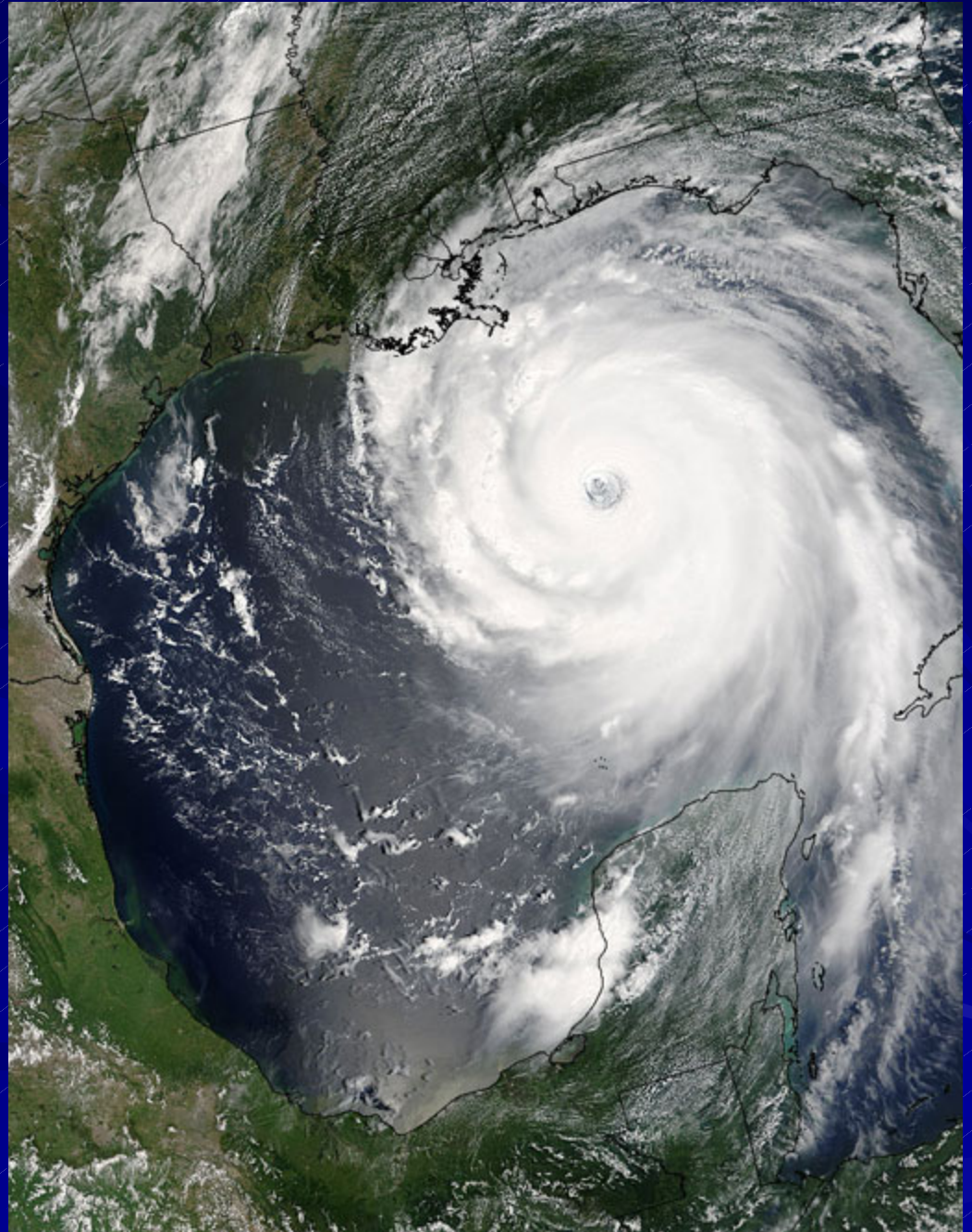
Water Quality Assessment and Monitoring in New Orleans Following Hurricane Katrina

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Kevin J. Weiss and James F. Wheeler
Office of Wastewater Management**

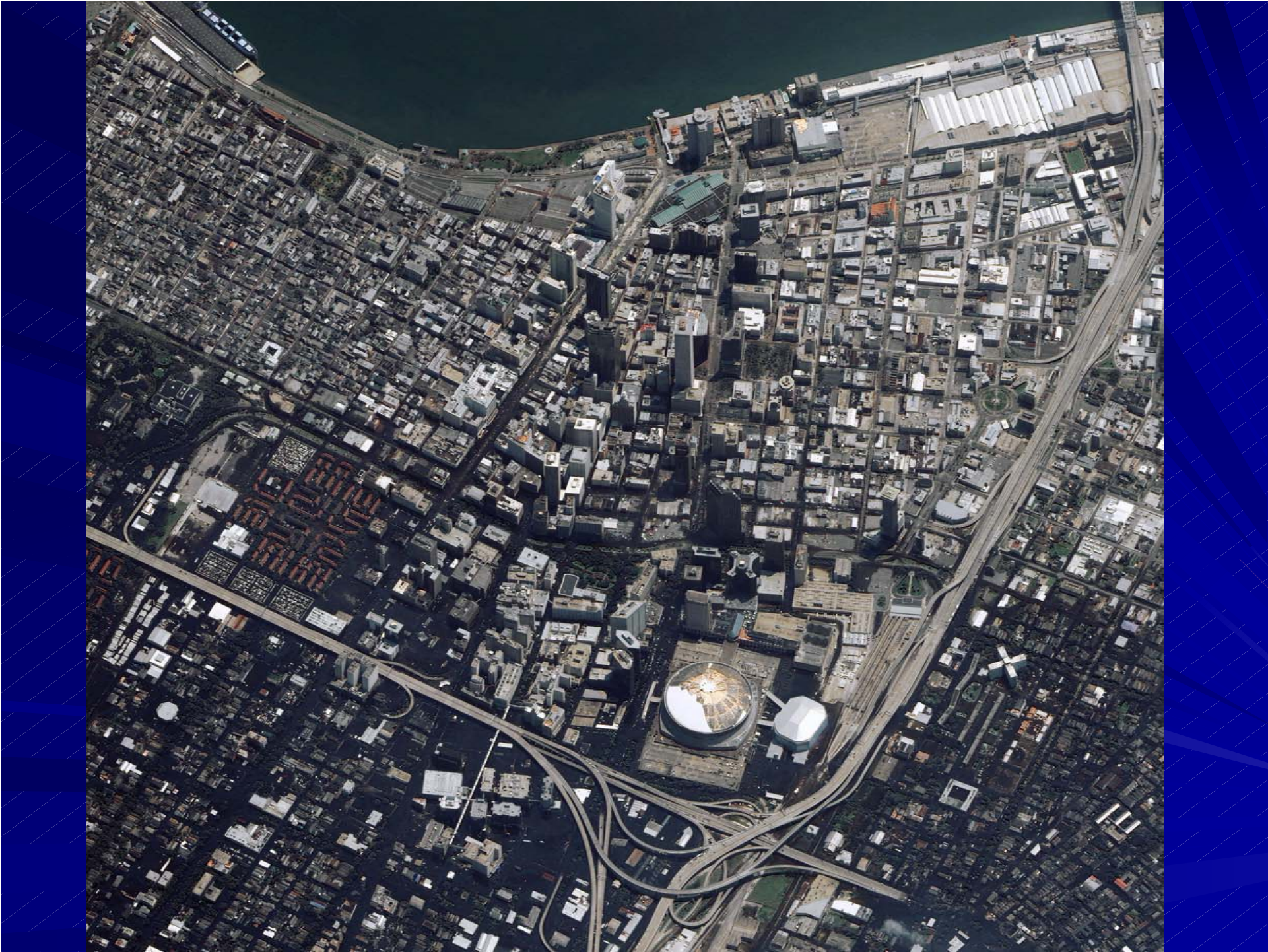
Project Collaborators

- Jane Moore: EPA Office of Wastewater Management
- Margaret Heber: Chair of Measurement Group, EPA, OWOW
- David Shepp HQ, US Army Corps of Engineers
- Federal Agency Joint Task Force and affiliated support organizations

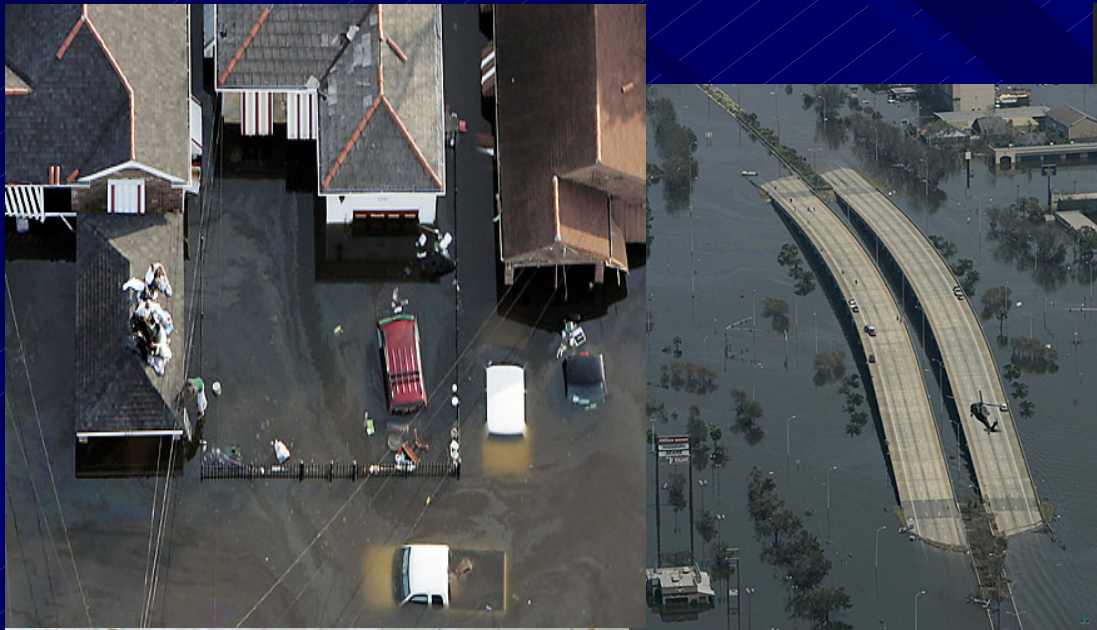
Satellite Image of Hurricane Katrina















Debris Issues (and Damaged Buildings)

[Emergency Hurricane Debris Burning Guidance](#)

[EPA resources on debris](#)

[Other federal resources on debris](#)



The U.S. Environmental Protection Agency and other federal, state and local officials are urging individuals to use caution when returning to hurricane-damaged homes and buildings. EPA today issued an advisory to the public that provides general guidance to help address potential hazards in structures damaged by hurricane Katrina.

EPA urges the public to be on the alert for leaking containers and reactive household chemicals, like caustic drain cleaners and chlorine bleach, and take the following necessary precautions to prevent injury or further damage:

- Keep children and pets away from leaking or spilled chemicals.
- Do not combine chemicals from leaking or damaged containers as this may produce dangerous or violent reactions.
- Do not dump chemicals down drains, storm sewers or toilets.
- Do not attempt to burn household chemicals.
- Clearly mark and set aside unbroken containers until they can be properly disposed of
- Leave damaged or unlabeled chemical containers undisturbed whenever possible.

Second Failure of 9th Street Levee



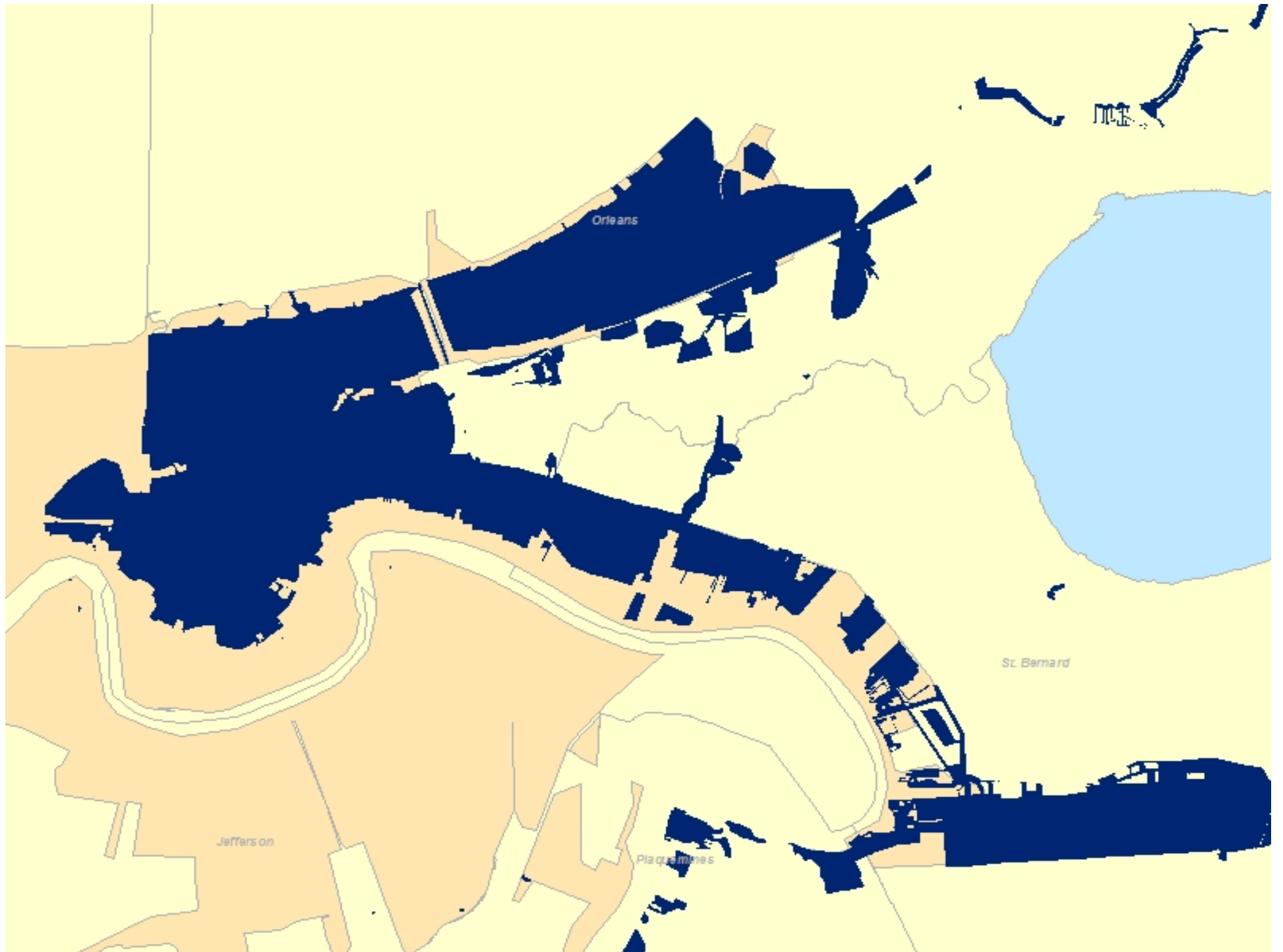




Katrina and Rita Affected area Roughly the size of the United Kingdom

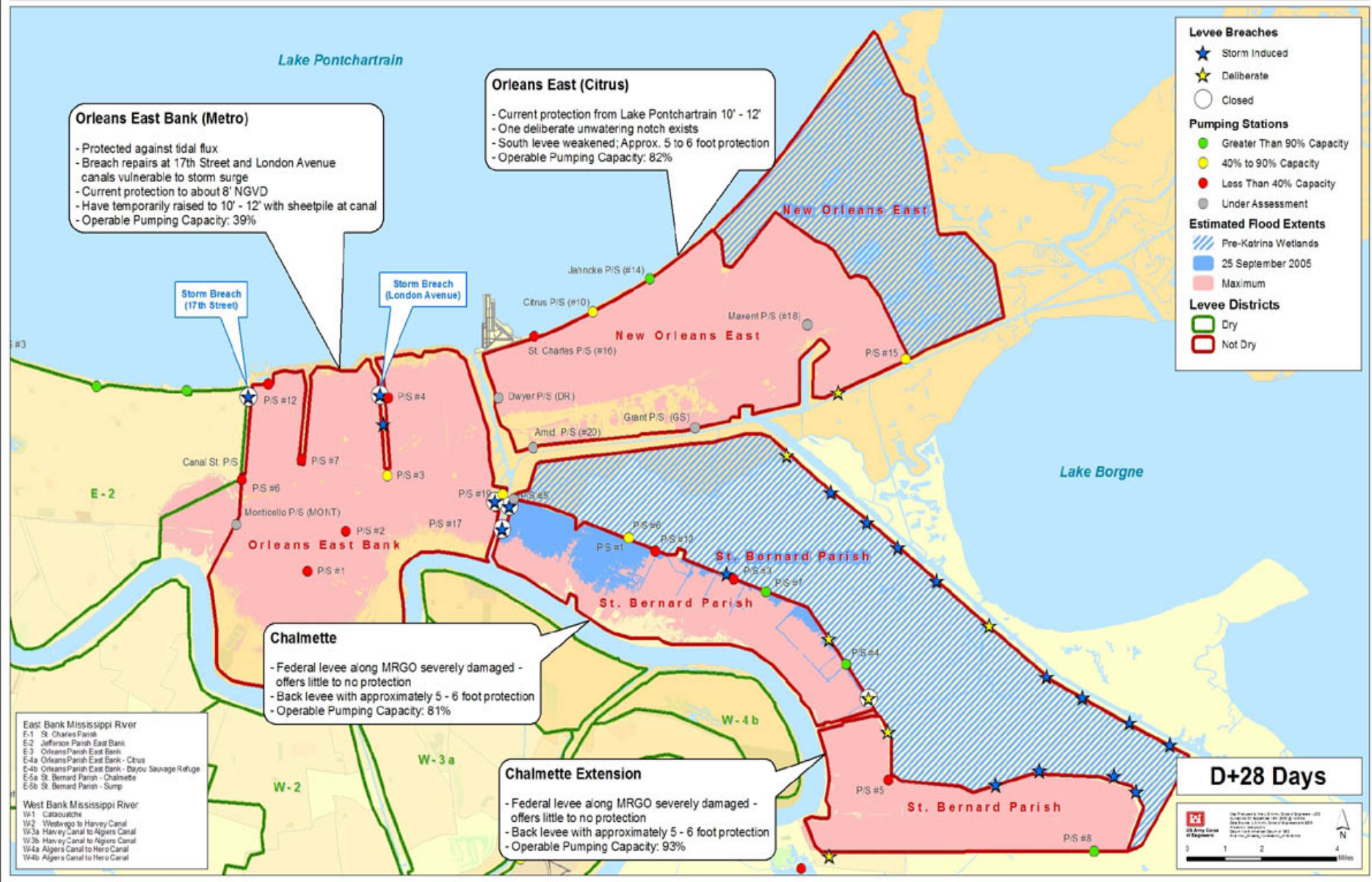
- 1.2 million households received \$3.5 billion in federal disaster assistance
- 43 million meals served by the American Red Cross and Salvation Army
- 285,000 cars damaged by floods
- Over 1,000 deaths in Louisiana
- Over \$200 billion in damages

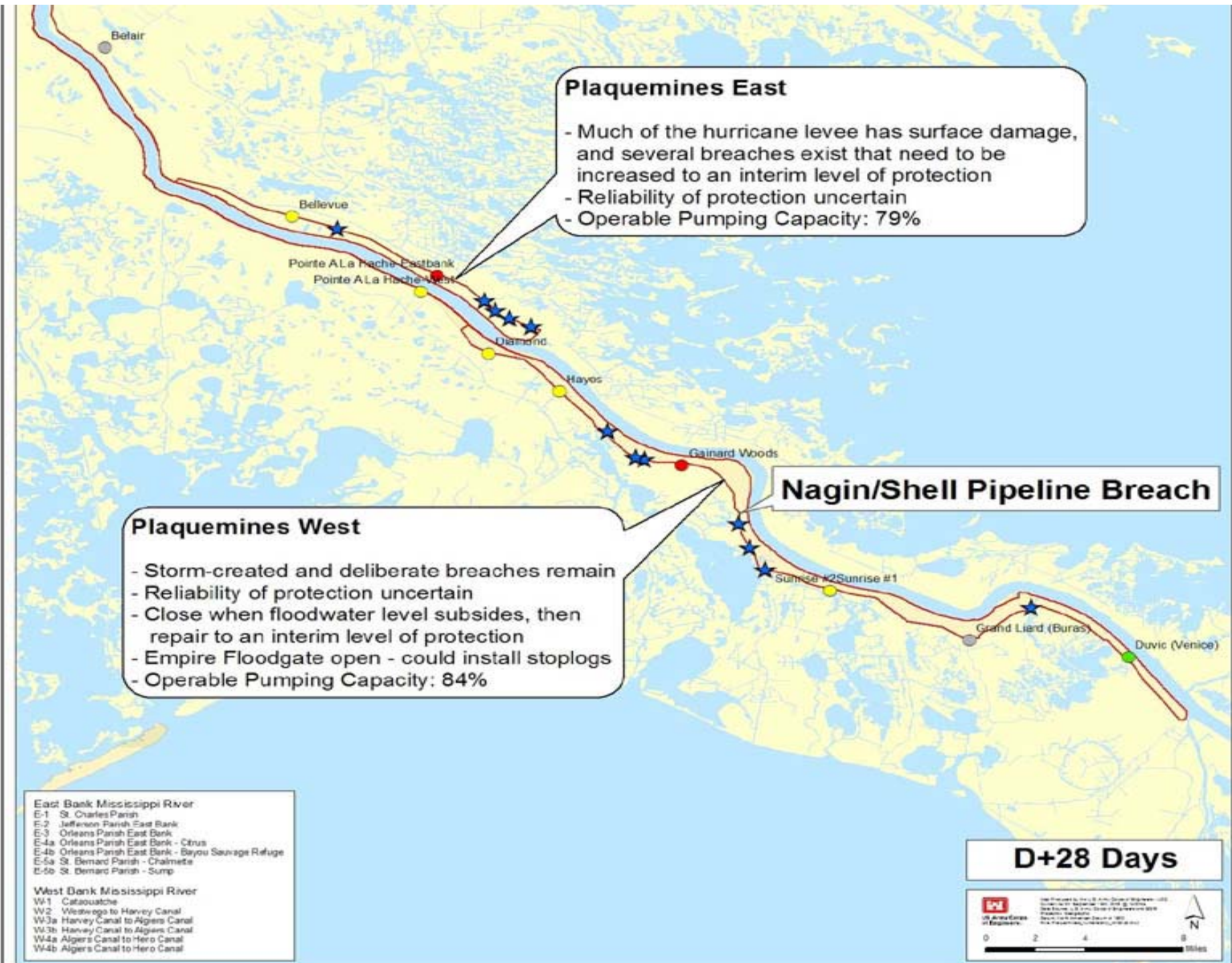




New Orleans Vulnerabilities

Current as of 25 Sep 05 - 1430hrs





Plaquemines East

- Much of the hurricane levee has surface damage, and several breaches exist that need to be increased to an interim level of protection
- Reliability of protection uncertain
- Operable Pumping Capacity: 79%

Plaquemines West

- Storm-created and deliberate breaches remain
- Reliability of protection uncertain
- Close when floodwater level subsides, then repair to an interim level of protection
- Empire Floodgate open - could install stoplogs
- Operable Pumping Capacity: 84%

Nagin/Shell Pipeline Breach

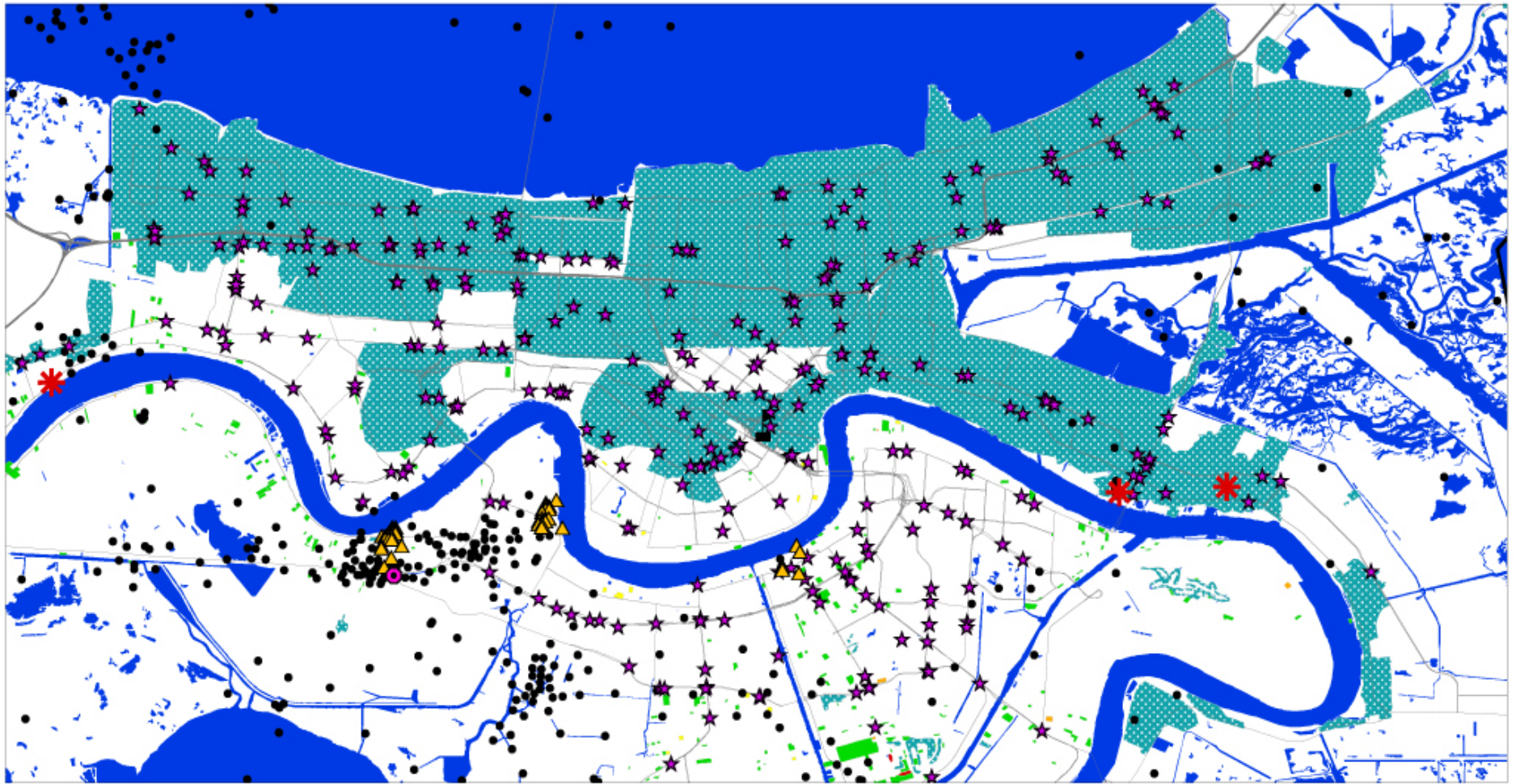
- East Bank Mississippi River**
- E-1 St. Charles Parish
 - E-2 Jefferson Parish East Bank
 - E-3 Orleans Parish East Bank
 - E-4a Orleans Parish East Bank - Citrus
 - E-4b Orleans Parish East Bank - Bayou Sauvage Refuge
 - E-5a St. Bernard Parish - Chalmette
 - E-5b St. Bernard Parish - Sump
- West Bank Mississippi River**
- W-1 Cataouatche
 - W-2 Westwego to Harvey Canal
 - W-3a Harvey Canal to Algiers Canal
 - W-3b Harvey Canal to Algiers Canal
 - W-4a Algiers Canal to Hero Canal
 - W-4b Algiers Canal to Hero Canal

D+28 Days






This Project is the U.S. Army Corps of Engineers' (USACE) Hurricane Preparedness and Response Program (HRRP).
 The HRRP is a multi-year program that provides for the repair and maintenance of levees and floodwalls.
 The HRRP is a critical component of the USACE's mission to protect the Nation's infrastructure and the lives and property of the people.
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0 2 4 8 Miles

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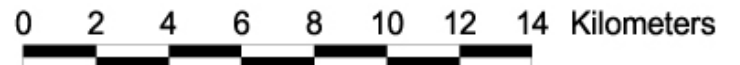
Damage as of August 30, 2005

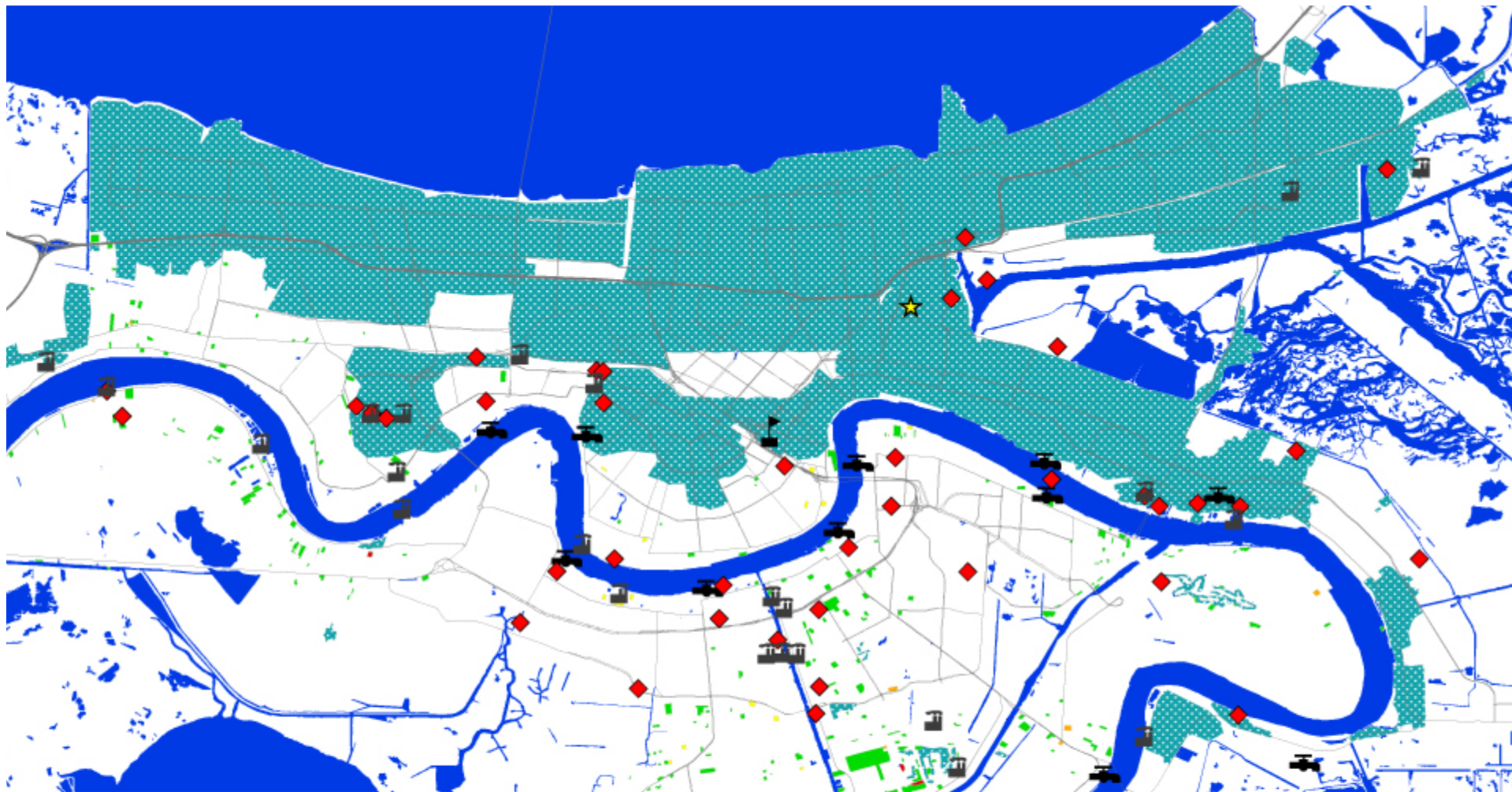
- | | |
|---|--|
|  Limited |  Catastrophic |
|  Moderate |  Flood |
|  Extensive | |

-  Superdome
-  Major Roads






Legend

-  Crude Petroleum and Natural Gas Production and Extraction Operations
-  Petroleum Product Storage Stations and Terminals
-  Refineries
-  Gas stations
-  Oil and gas wells



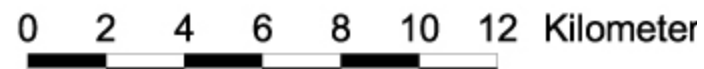


Damage as of August 30, 2005

- | | | | |
|---|-----------|---|--------------|
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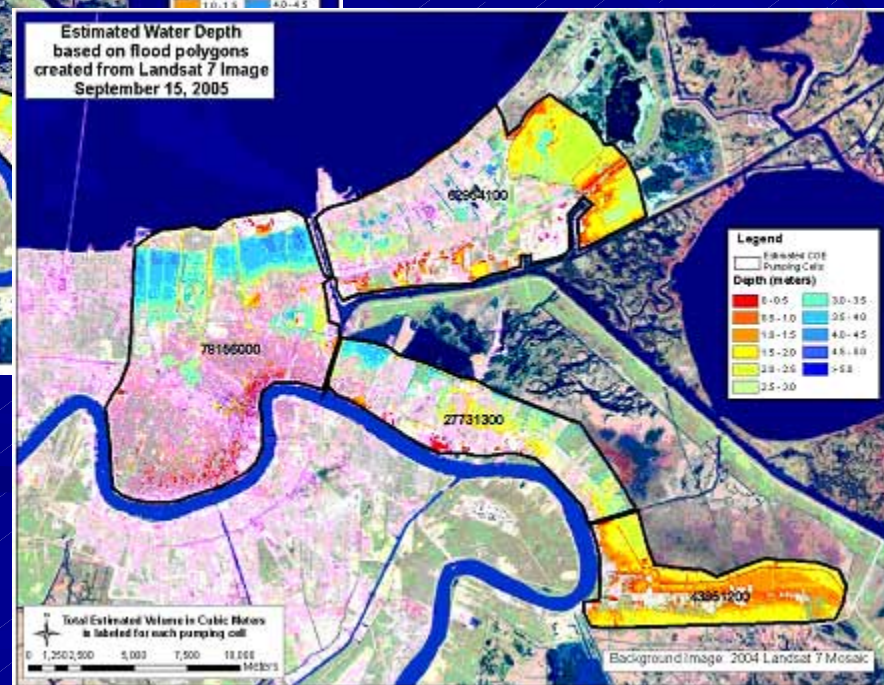
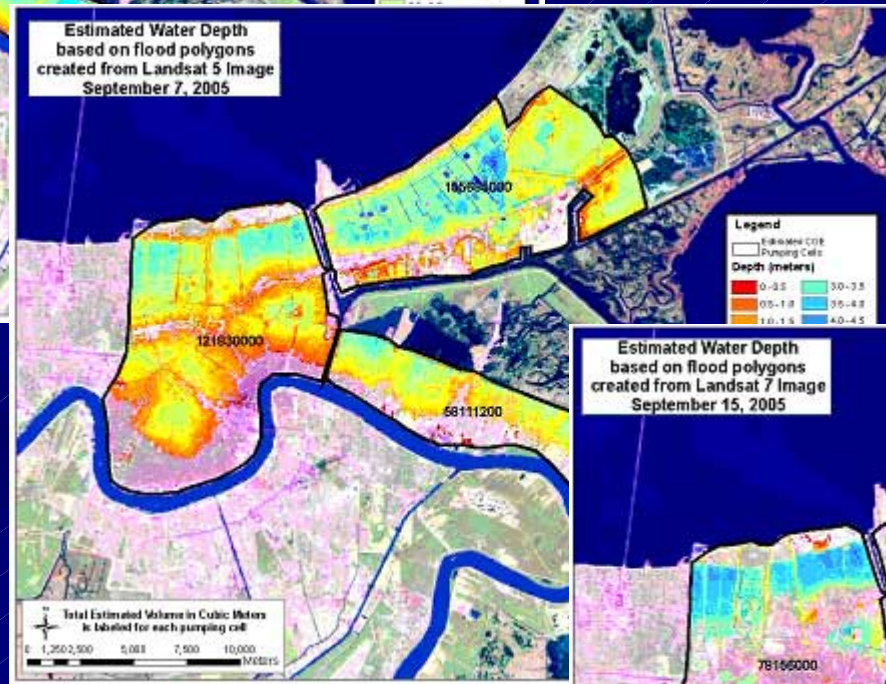
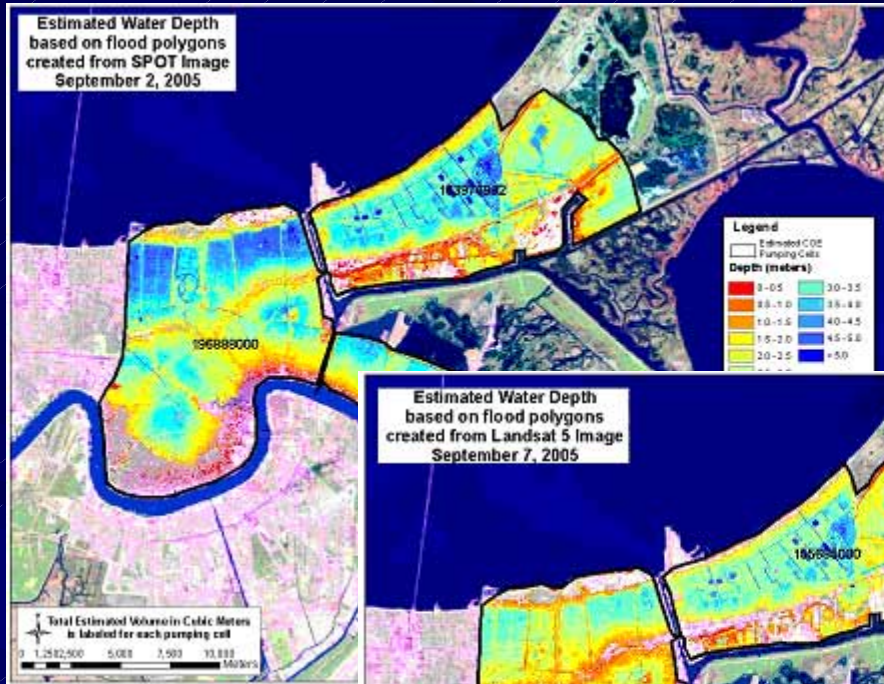
Legend

- | | | | |
|---|--------------------------------|---|-------------|
|  | National Priority List Sites |  | Superdome |
|  | TRI-Reporting Facilities 2003 | | Major Roads |
|  | Drinking water surface intakes | | |
|  | Hazmat locations | | |



New Orleans Dewatering Operation

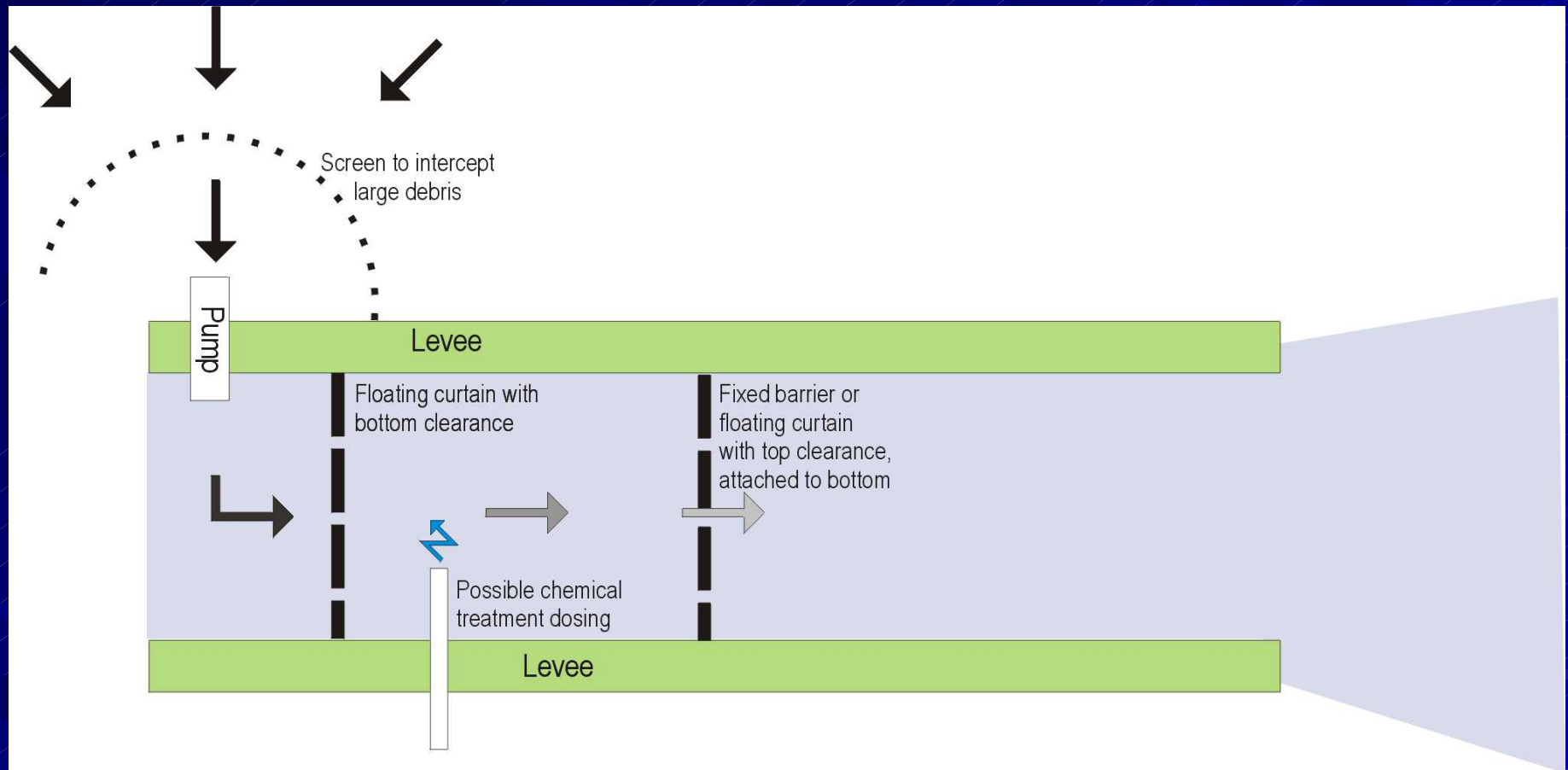
- Restoration of existing pump stations
- Establish and operate 34 temporary pump stations
- 24/7 operation to maximize dewatering
- Averaged 5 billion gals per day over 43 day dewatering operation
- Address water quality issues without slowing pumping operation
- Collect water borne deceased with dignity



Water Quality

- Establish floating debris diversion and collection systems
- Install absorbent booms before and after pump locations
- Operate floating aerators before and after pump locations
- Monitor water quality and sediments throughout the system

Illustration of in-canal expedient water treatment system



Flood Water Sampling Sites September 3-5, 2005



WATER QUALITY MONITORING UNWATER NEW ORLEANS (OCTOBER 9, 2005)



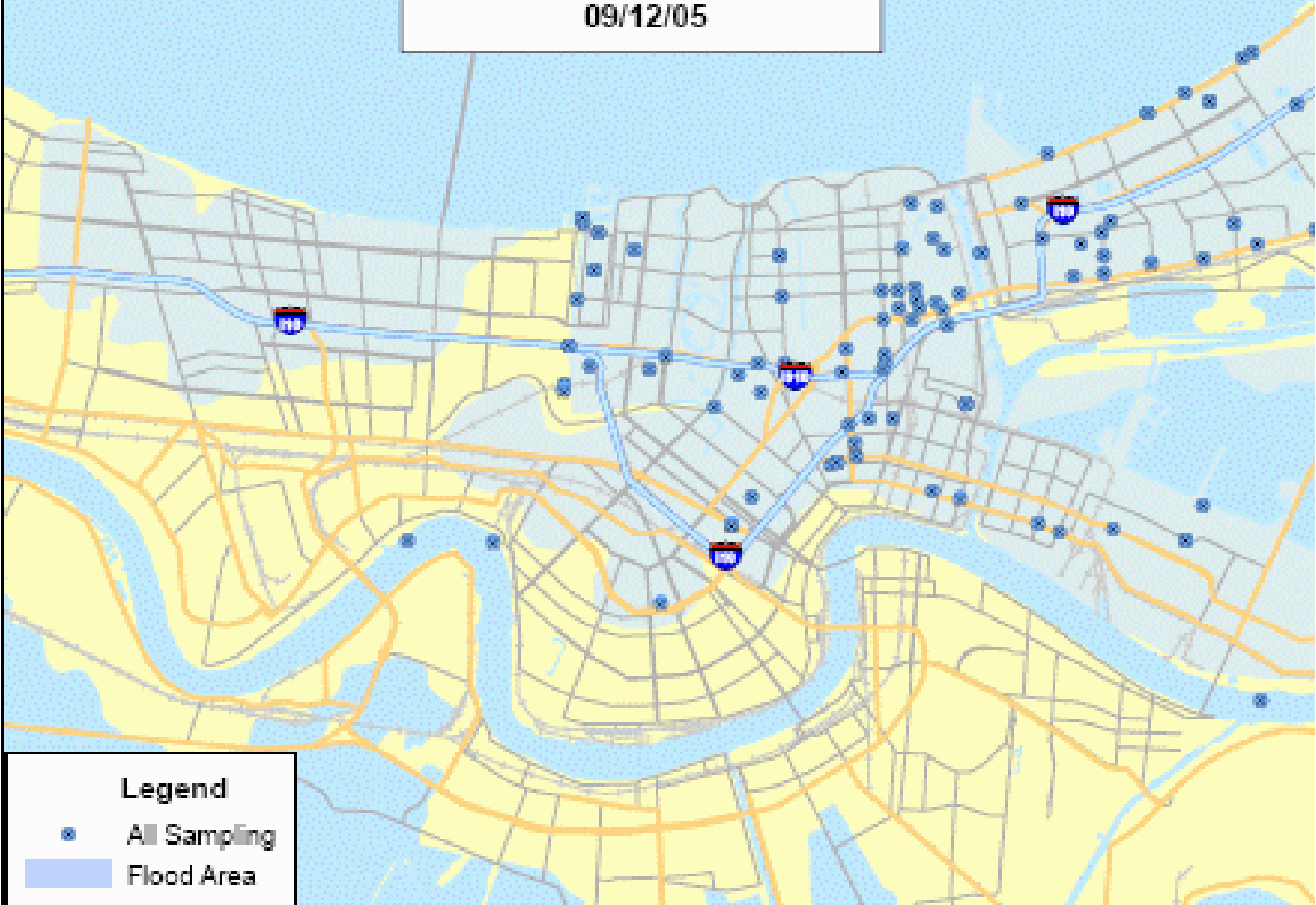
0 2,000 4,000 Feet

Legend

- Pump Stations
- Sample Locations
- ▲ Aerial Locations

NOTE:
Any encroachments are shown with the permission
name and result of the sample location.

Floodwater Sampling Sites 09/12/05

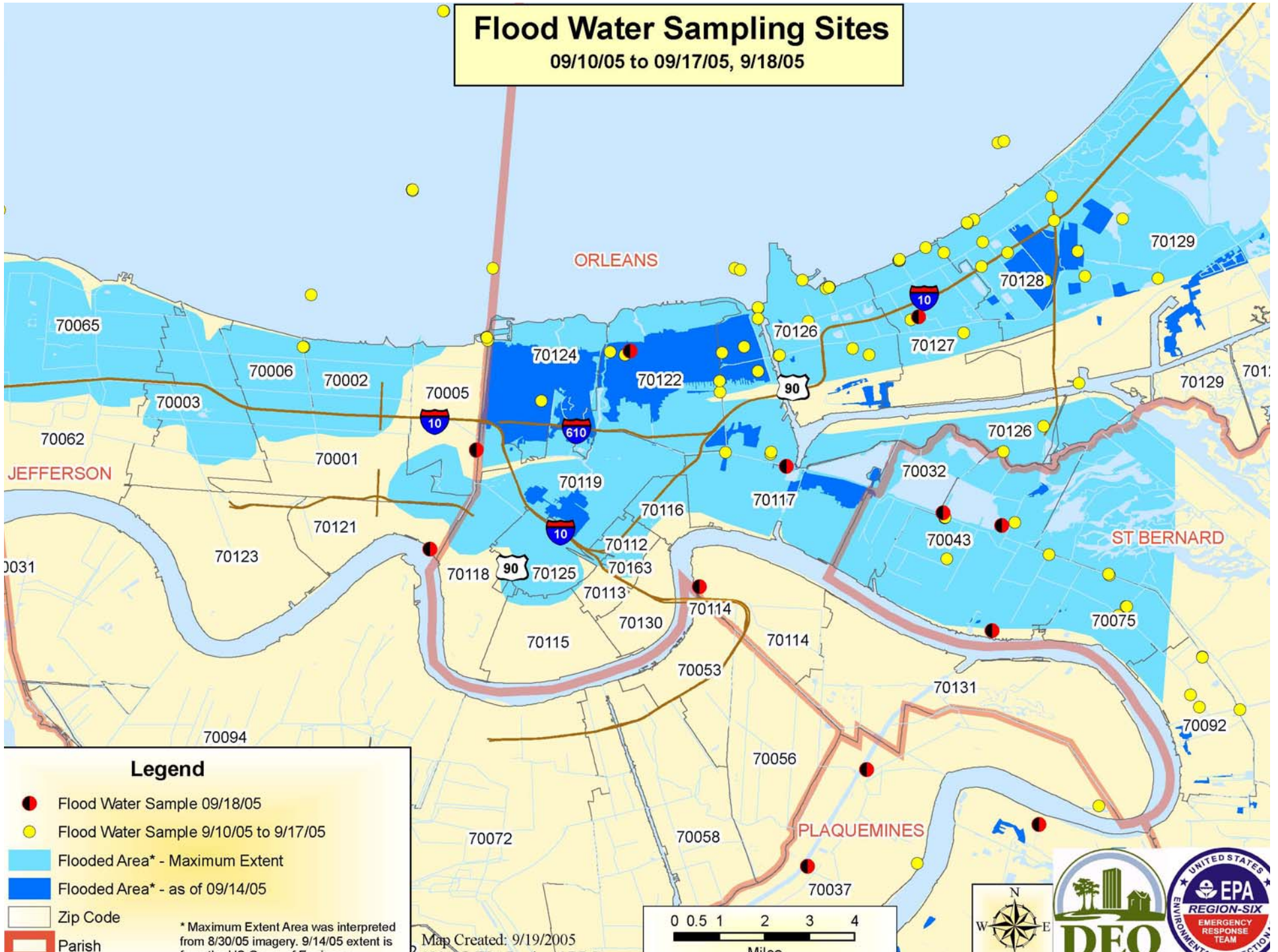


Legend

- All Sampling
- Flood Area

Flood Water Sampling Sites

09/10/05 to 09/17/05, 9/18/05



Legend

- Flood Water Sample 09/18/05
- Flood Water Sample 9/10/05 to 9/17/05

- Flooded Area* - Maximum Extent
- Flooded Area* - as of 09/14/05

- Zip Code
- Parish

* Maximum Extent Area was interpreted from 8/30/05 imagery. 9/14/05 extent is

Map Created: 9/19/2005

Sampled and Found Exceeds EPA Limits

CASNumber	Name	Measured Level ($\mu\text{g/L}$)	EPA Limit ($\mu\text{g/L}$)
7439-92-1	<u>Lead</u>	20	15

Table 1: Sampled, Found Exceeds EPA Limits

Sampled and Found meets EPA Limits

CASNumber	Name	Measured Level (µg/L)	EPA Limit (µg/L)
7440-39-3	<u>Barium</u>	210	2000
7440-50-8	<u>Copper</u>	62	1300
57-12-5	<u>Cyanide</u>	29.7	200

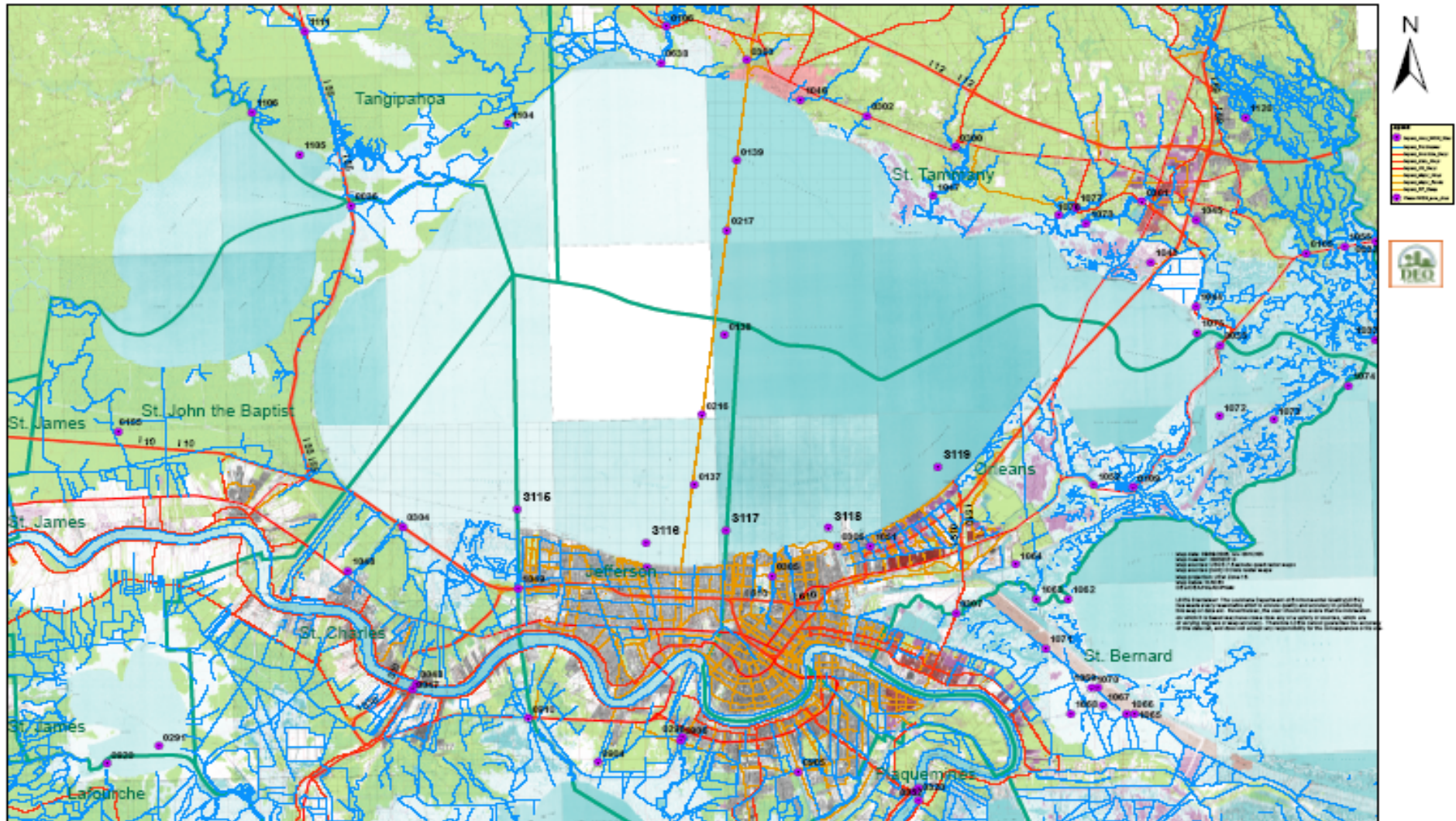
Sampled & Found but No EPA Limits Currently

CASNumber	Name	Measured Level (µg/L)
7429-90-5	<u>Aluminum</u>	1290
7440-70-2	<u>Calcium</u>	111000
7439-89-6	<u>Iron</u>	1930
7439-95-4	<u>Magnesium</u>	99200
7439-96-5	<u>Manganese</u>	669
7440-02-0	<u>Nickel</u>	22
7440-09-7	<u>Potassium</u>	52700
7440-22-4	<u>Silver</u>	12
7440-23-5	<u>Sodium</u>	724000
7440-66-6	<u>Zinc</u>	292

Example EPA Biological Water sample data

Sample Date	County	Location Description	Sample Number	Bacteria	Colonies/100 mL
9/8/2005	JEFFERSON	Bonneville Canal	15178	E. coli	5818
9/8/2005	JEFFERSON	Outfall	15561	E. coli	6260
9/8/2005	JEFFERSON	Outfall	15562	E. coli	7568
9/8/2005	ORLEANS	Louisa & Almonaster	15172	E. coli	462
9/8/2005	ORLEANS	Independence & Marais	15175	E. coli	7308
9/8/2005	ORLEANS	Independence & Marais	15176	E. coli	8212
9/8/2005	ORLEANS	Kenilworth Canal	15177	E. coli	5702

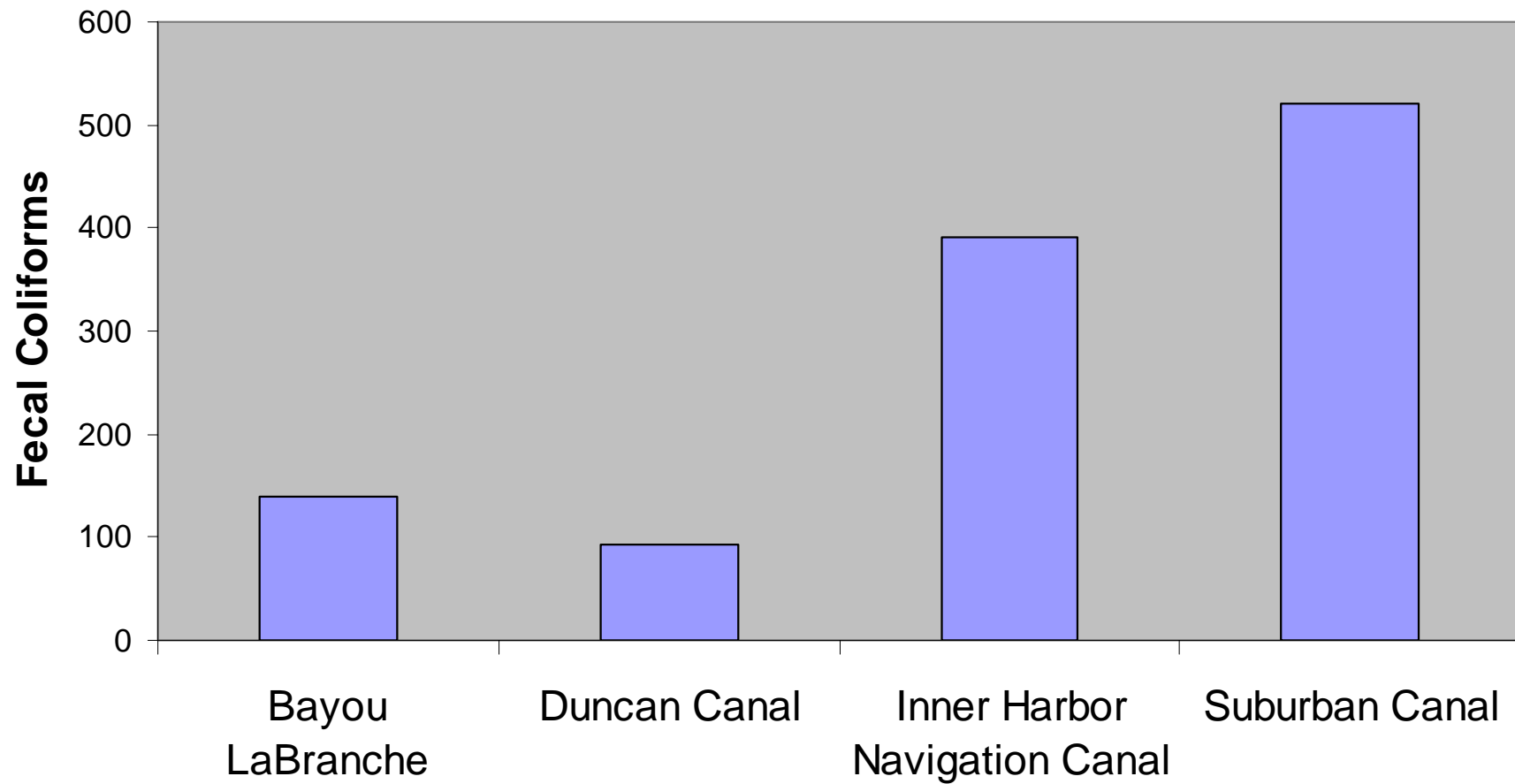
Lake Pontchartrain Water Impact Assessment



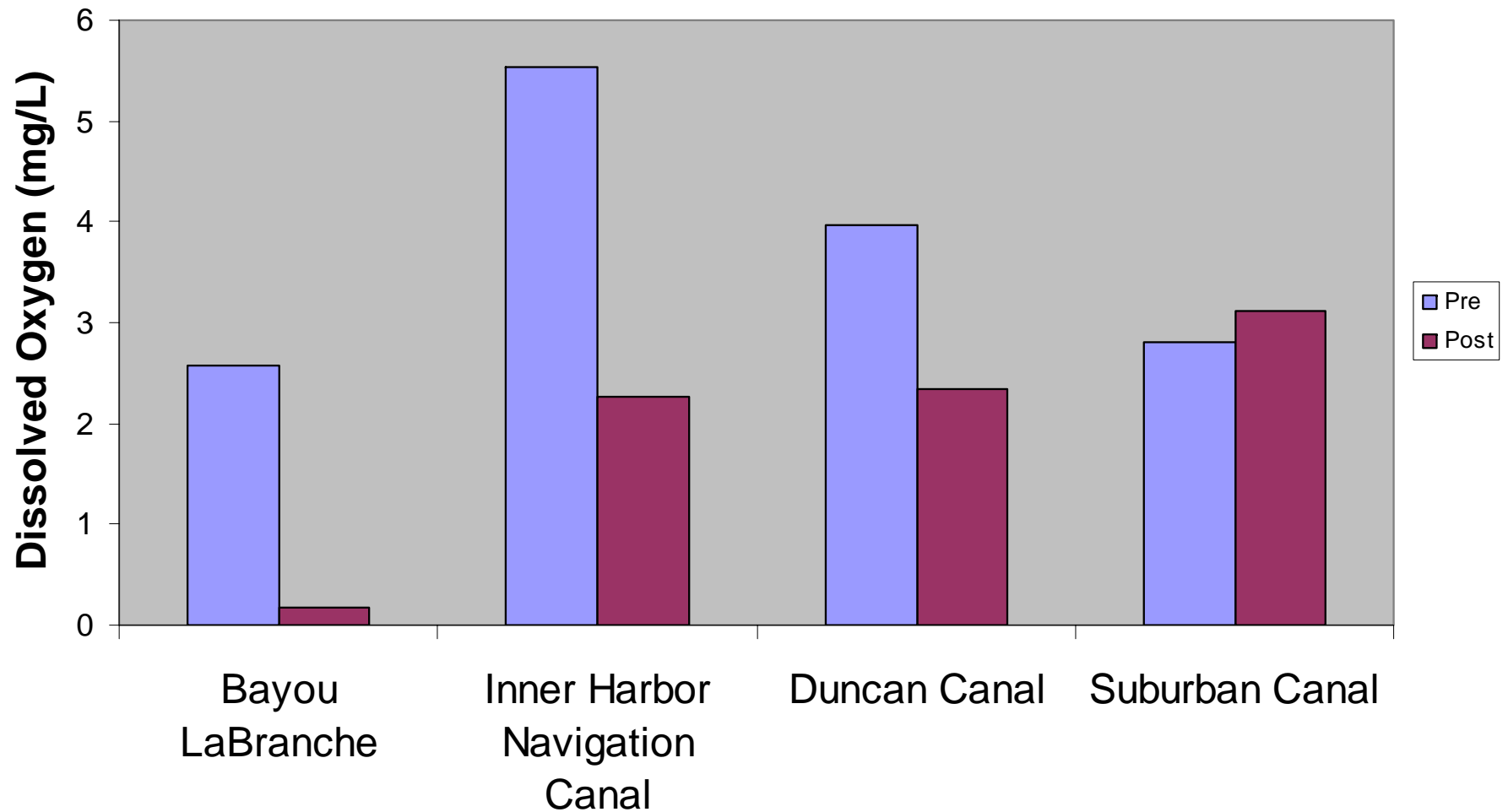
Planning Map for Water Quality Assessment Impacts of Katrina

Lake Pontchartrain Impact Area - Map 2 of 4

Fecal Coliform Density at Southshore Canal Sites

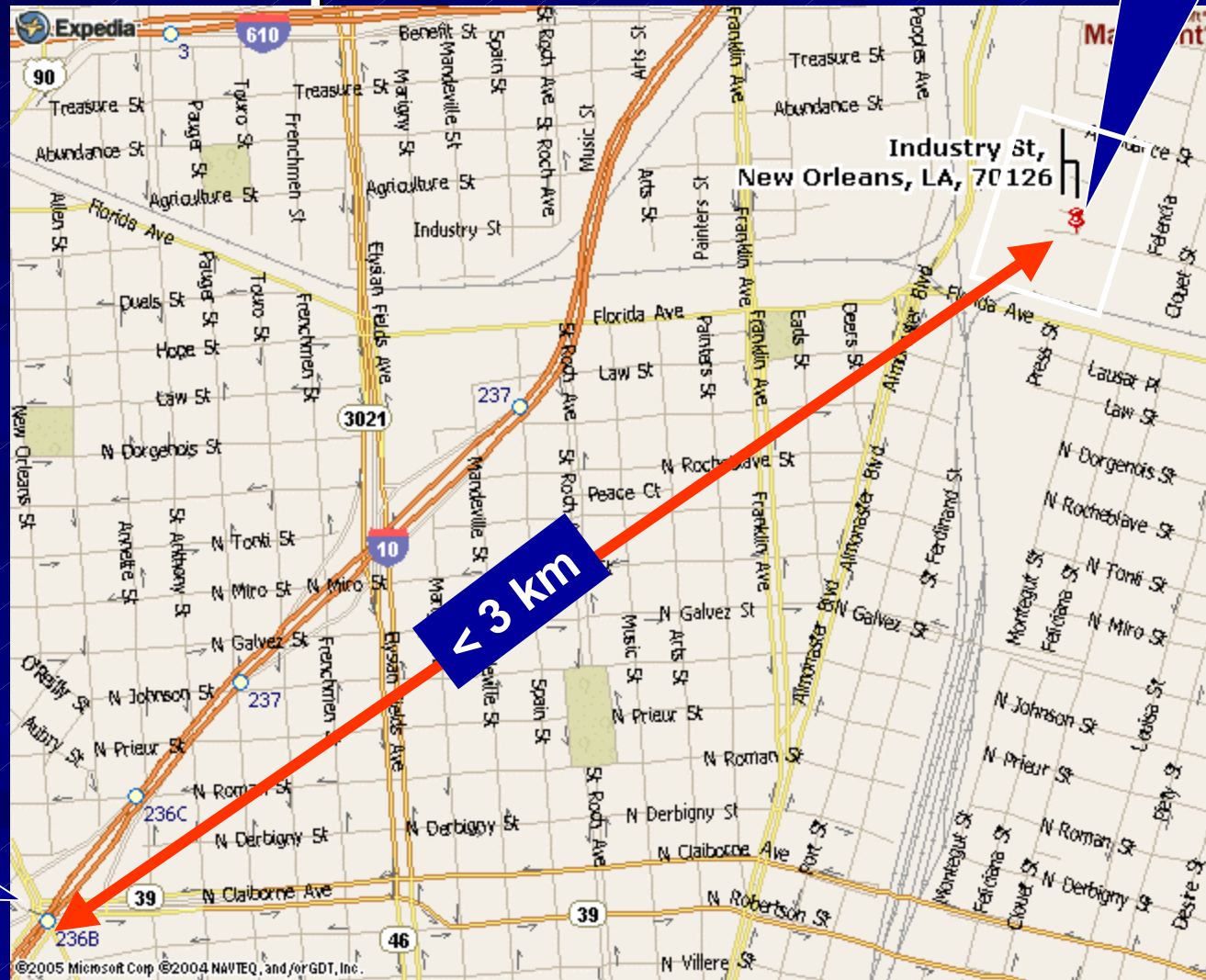


Average Dissolved Oxygen Concentrations at Southshore Canals



Agriculture Street Landfill Superfund Site

Ag. Street
Landfill Site



Lead = 846
ug/L

< 3 km

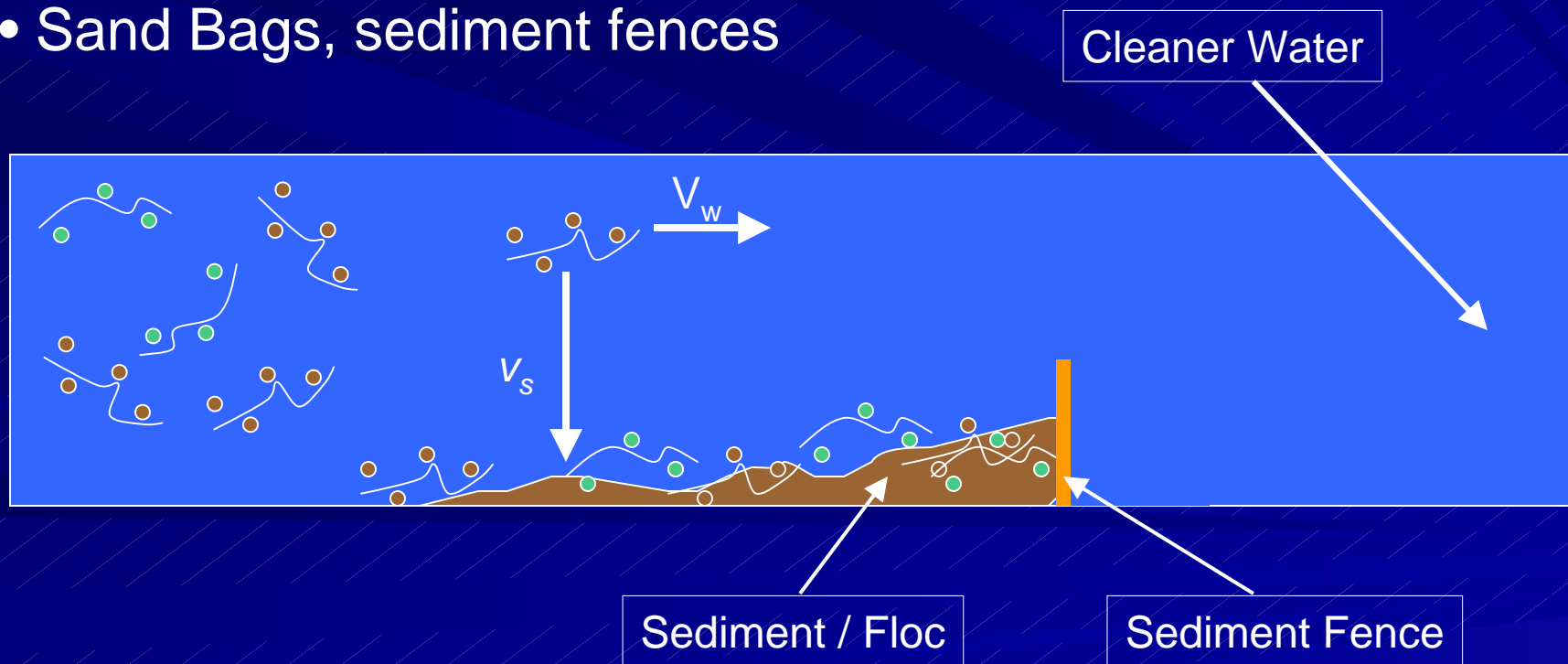
Contaminant Sorption / Flocculation

- Commonly used concept in Water Treatment
- Powdered Activated Carbon (PAC)
 - Sorbs contaminants (fuel...)
 - Reduces turbidity
- Polymer
 - Chain with positive and negative charges to bind to charged particles
 - Binds to colloidal particles creating a “floc”
 - Binds to PAC / contaminants into a “floc”
 - Increases particle size and “floc” settles out

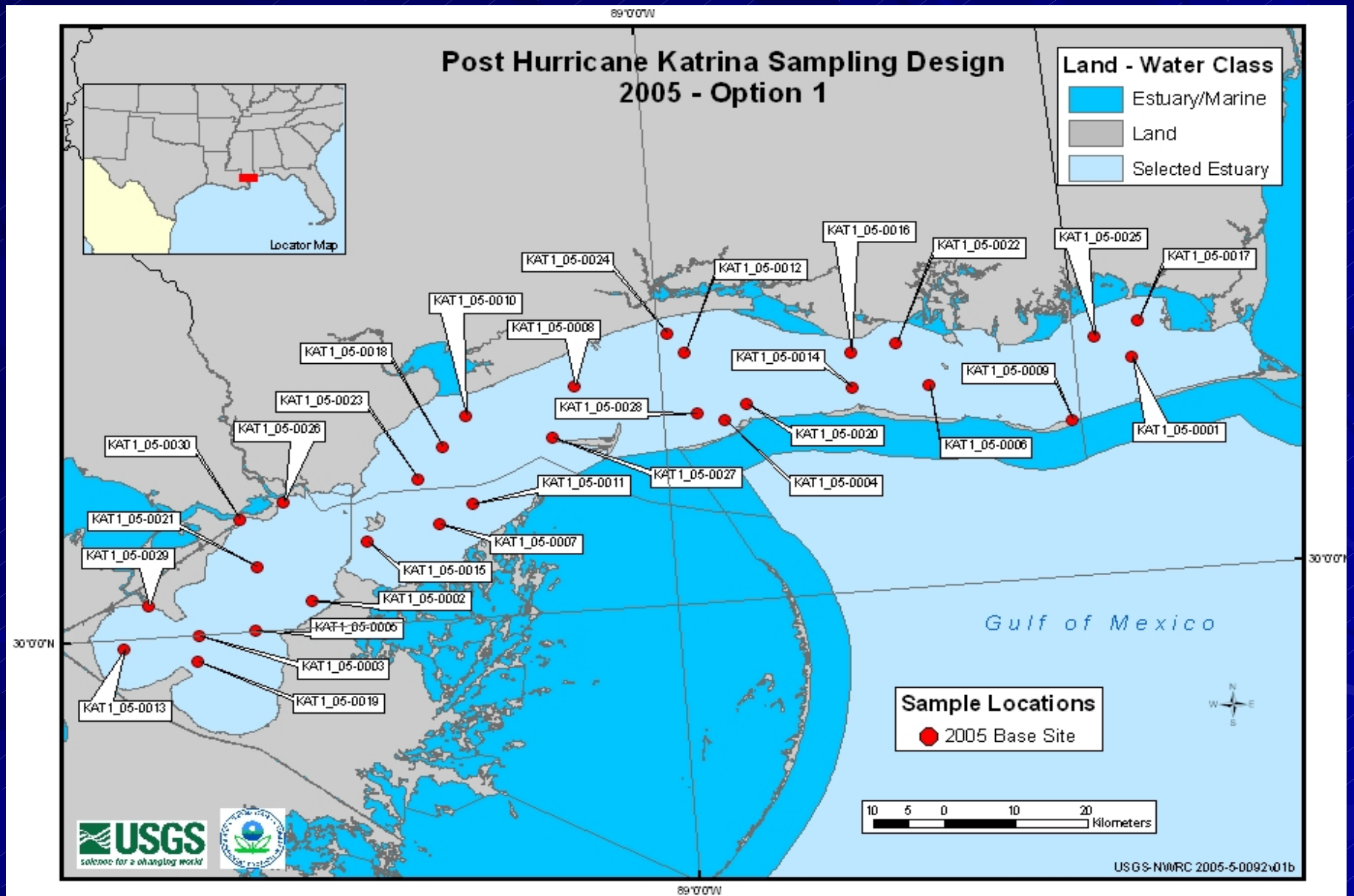
Contaminant Sorption / Flocculation

Use:

- In front of storm water drains
- Around suspect pools
- Sand Bags, sediment fences



Tissue Sampling Sites in the Gulf Coastal Area



Summary

- Fast Reaction Environment
- Many Agencies and Organization Involved
- Expedient water quality protection measures were integrated with dewatering
- GIS and remote sensing provided an important information management framework
- Initial water conditions were much better than expected largely due to enormous dilution
- Water quality continues to be monitored and longer term impacts will be evaluated



Managing Water Quality Issues During Hurricane Katrina Recovery Operations

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