HURRICANE KATRINA AND THE CRITICAL ROLE OF THE MEDIA IN SHAPING PUBIC POLICY

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THE GEOLOGICAL SOCIETY OF AMERICA

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The storm we all feared would arrive one day…

- It approached New Orleans as an unprecedented Category 5 hurricane, with storm surges of up to 53 feet
- We witnessed the biggest mass evacuation of New Orleans in its history and everyone hoped for the best….and waited.
- Many realized it would be a major test of our disaster relief capabilities; on par with anything that had collectively struck the United States in our lifetimes.

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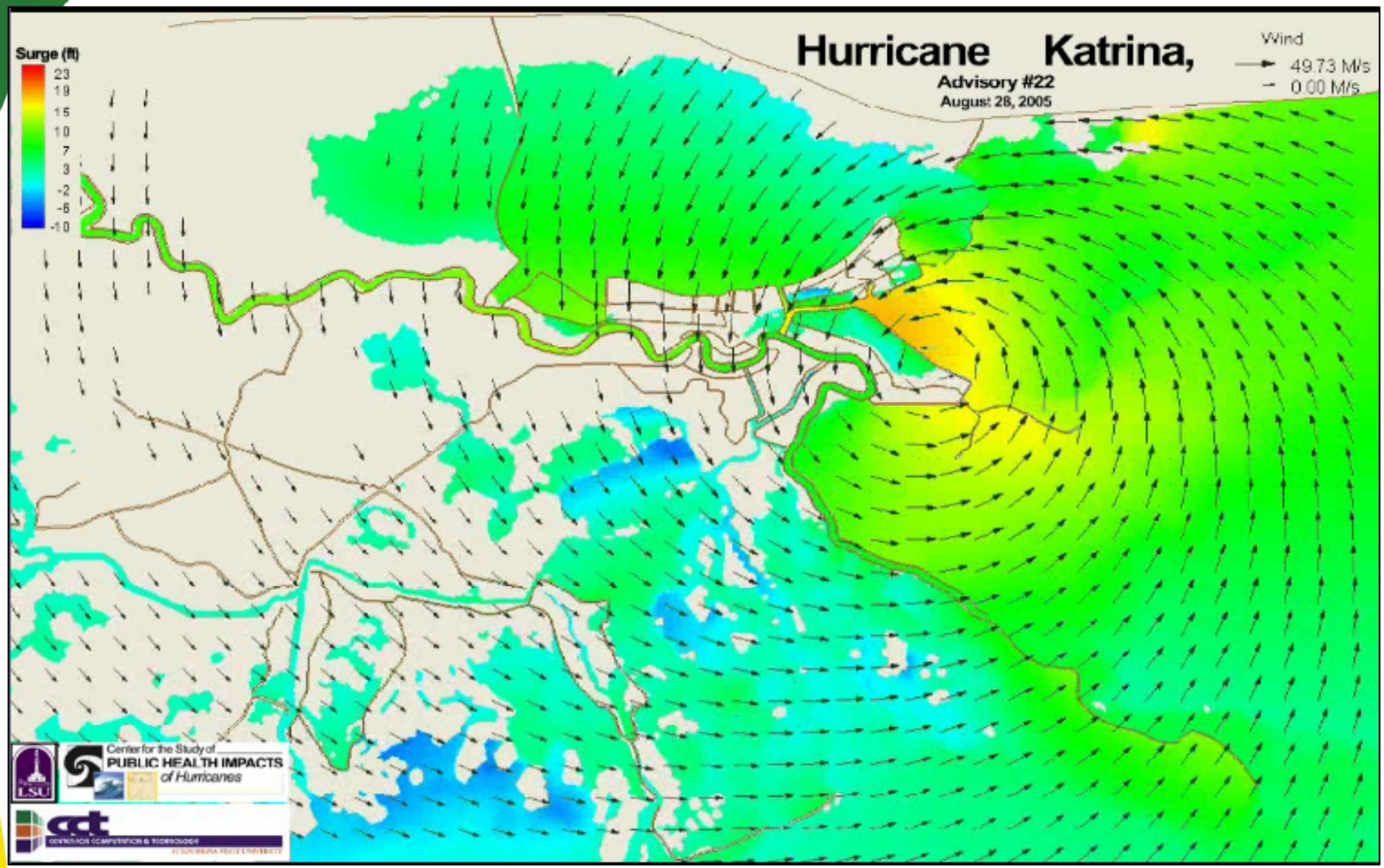

- **As the hurricane made landfall forecasters downgraded it to a Category 3 storm. Similar storms had struck the New Orleans area in 1915, 1947, and in 1965.**

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- **Around 6 AM on August 29th the 9 ft storm surge swept into the Inner Harbor Navigation Canal area, engulfing the Entergy Power Plant area with waves up to 17 ft high.**

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- **Miles of levees just disappeared: MRGO levee completely washed away about two miles southeast of Bayou Dupree.**

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17th Street Drainage Canal breach

- The 17th Street canal had walls supposedly built to 14 ft above MGL (actually 12.1 ft)
- The highest flow it had ever experienced was between 6 and 7 ft MGL
- It began failing when water got to 8.5 ft.

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The most recently constructed elements of the city's flood control infrastructure, built in the 1990s, performed miserably.

EPA, 2005

London Avenue (North) breach

Similar failure mechanism as 17th St Canal

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- **New Orleans neighborhoods were filled with as much as 12 feet of water, for up to 6 weeks**

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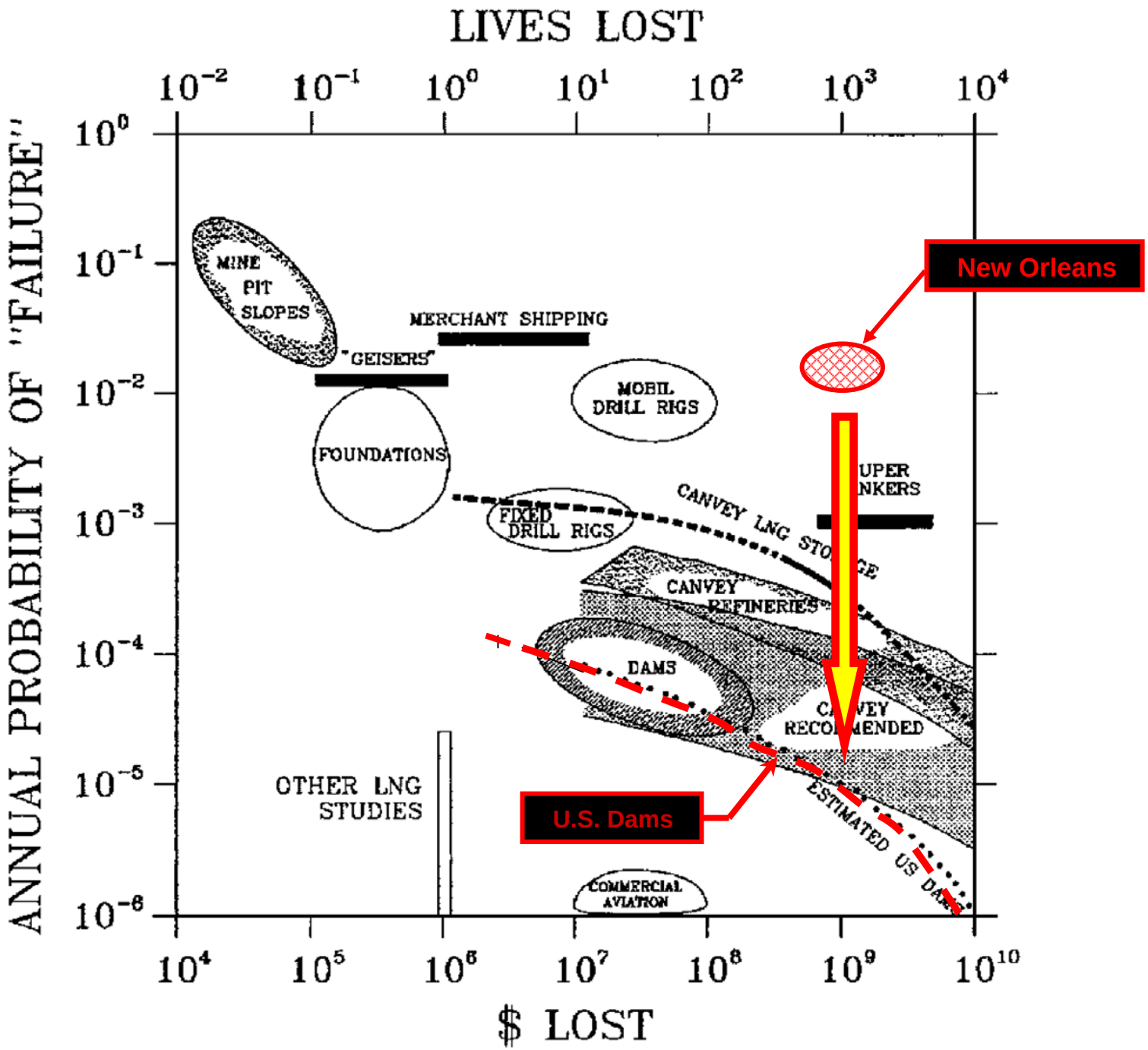
- Katrina left New Orleans under water, creating the worst flood in American history and the most expensive disaster, causing $24 billion in claims to the National Flood Insurance Program and $200 billion in overall damage.


LIVES LOST
10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4}
ANNUAL PROBABILITY OF "FAILURE"
10^{0} 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6}
MINE PIT SLOPES
MERCHANT SHIPPING
"GEISERS"
MOBIL DRILL RIGS
FOUNDATIONS
FIXED DRILL RIGS
CANVEY LNG STO GE
UPER NKERS
CANVEY REFINERIES
DAMS
CANVEY RECOMMENDED
OTHER LNG STUDIES
ESTIMATED US DAMS
COMMERCIAL AVIATION
New Orleans
U.S. Dams
10^{4} 10^{5} 10^{6} 10^{7} 10^{8} 10^{9} 10^{10}
$ LOST

MEDIA COVERAGE OF KATRINA

- The media swiftly deployed their best correspondents into harm's way to report on conditions. Live streaming via satellite and video phone has changed viewer's expectations of being able to witness historic events when they occur
- The media depends on cuing from: 1) government agencies and officials; 2) the public (via cell phones and e-mail); or, 3) from other media outlets (local affiliates, wire services, and esp. newspapers)

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MEDIA COVERAGE OF KATRINA

- **President Bush** was criticized for not leaving his Texas ranch soon enough to convene meetings with FEMA
- **Mayor Ray Nagin** was criticized for not using school busses to help in the evacuation; for an allegedly corrupt police department; and inability to maintain control when a few snipers allegedly took pot shots at emergency responders

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MEDIA IMPACTS

- **Like it or not, emergency planners, responders, and investigators are married to the commercial media**
- **We have to work with the media to educate people: to warn or alert them, and then to continually advise them in the wake of a disaster**
- **Media coverage controls the public's perception of the severity of any event; e.g. loss of 26% domestic oil supply and impact on sales of SUVs.**

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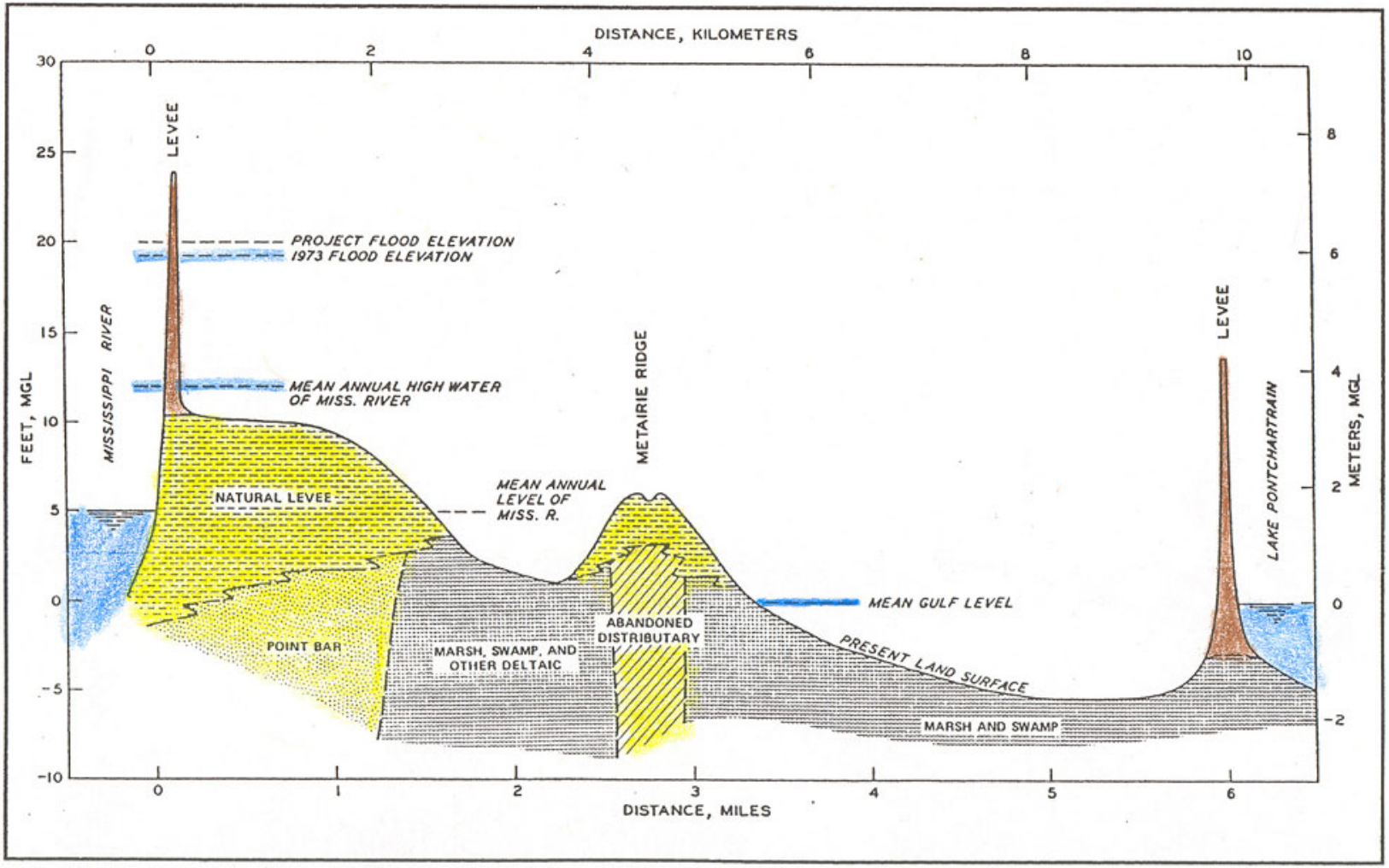

The media loves images that communicate technical information….like our description of New Orleans as "*the big pumper*" in lieu of "*the big easy*."

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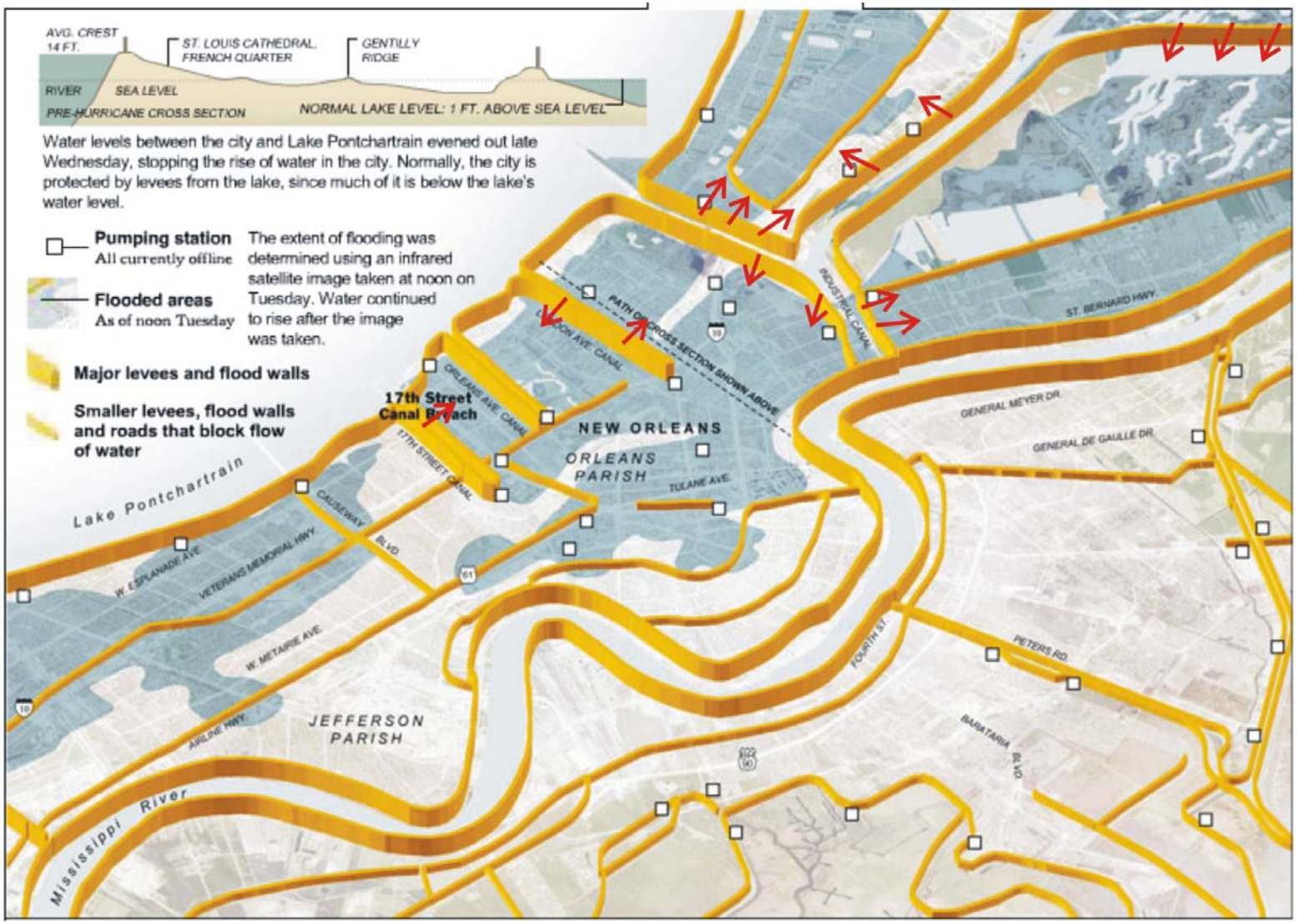
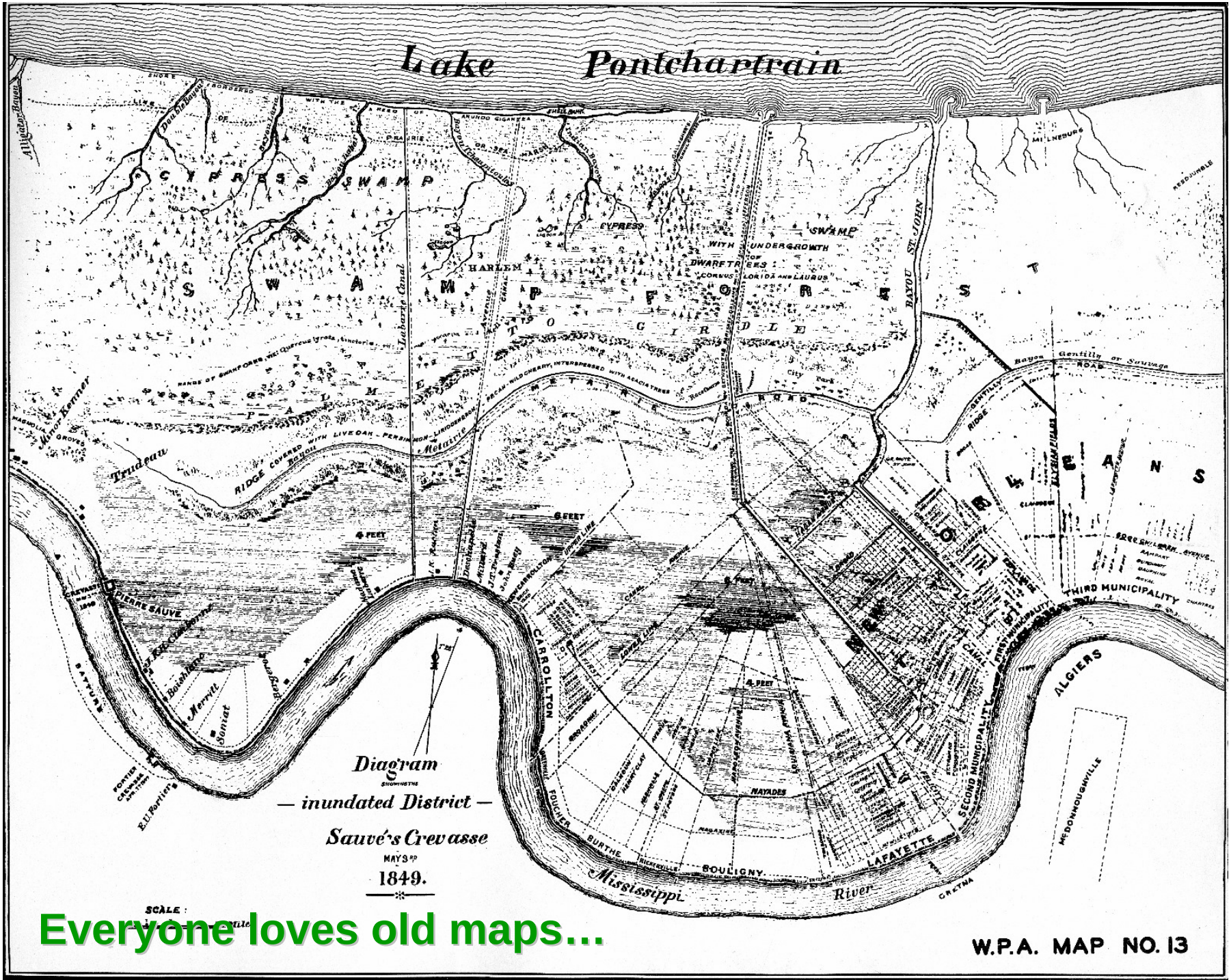
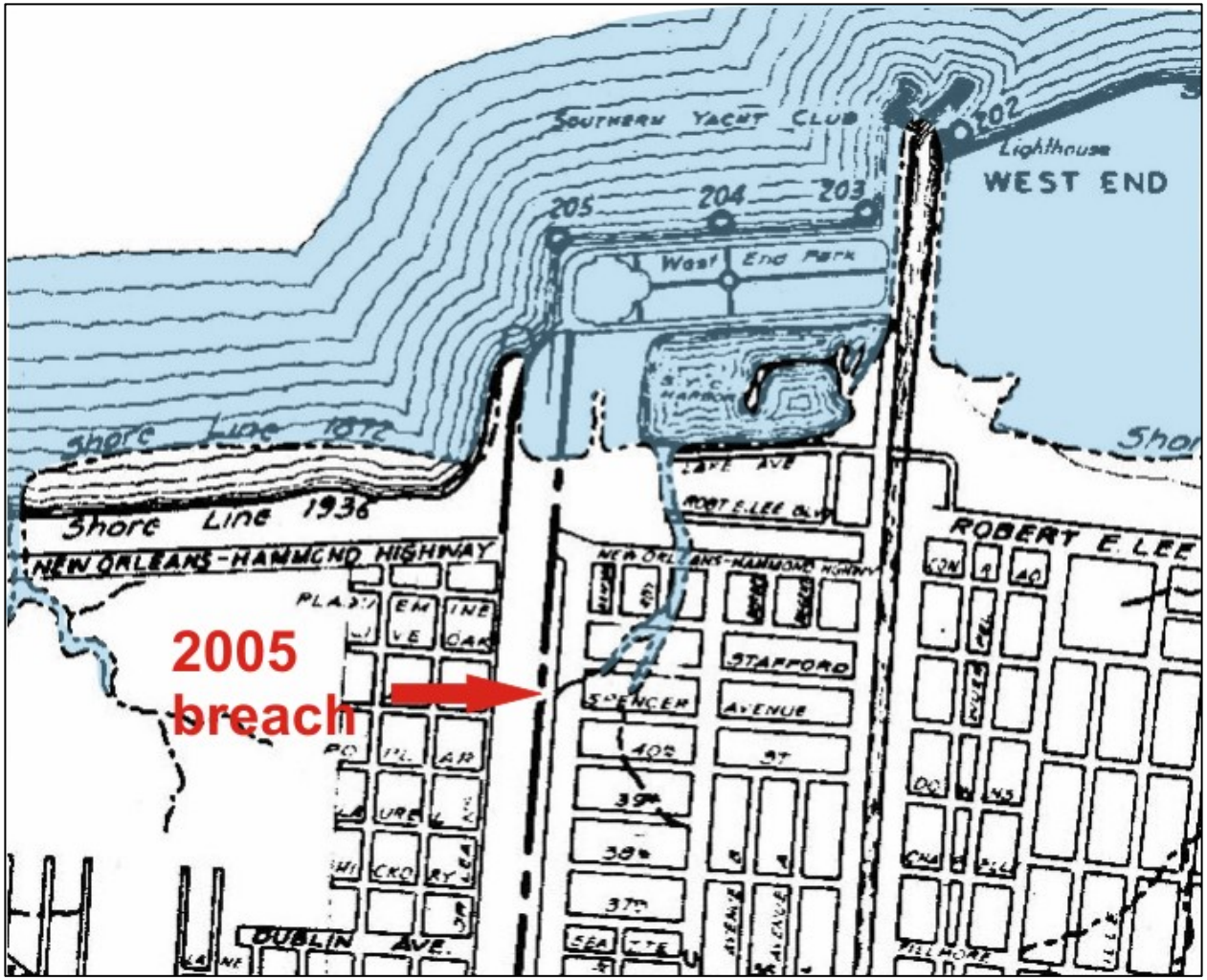


- **One picture is worth 1000 words…this graphic appeared in the *New York Times* shortly after we sketched it up for a reporter.**



Everyone loves old maps…



- **The 'smoking gun' graphic, discovered by Professor Joe Suyhada at LSU. Overlay of 1872 map by Valery Sulakowski on the 1937 WPA map, showing the 1872 shoreline and sloughs (in blue) along Lake Pontchartrain. The position of the 2005 breach along the east side of the 17th Street Canal is indicated by the red arrow.**

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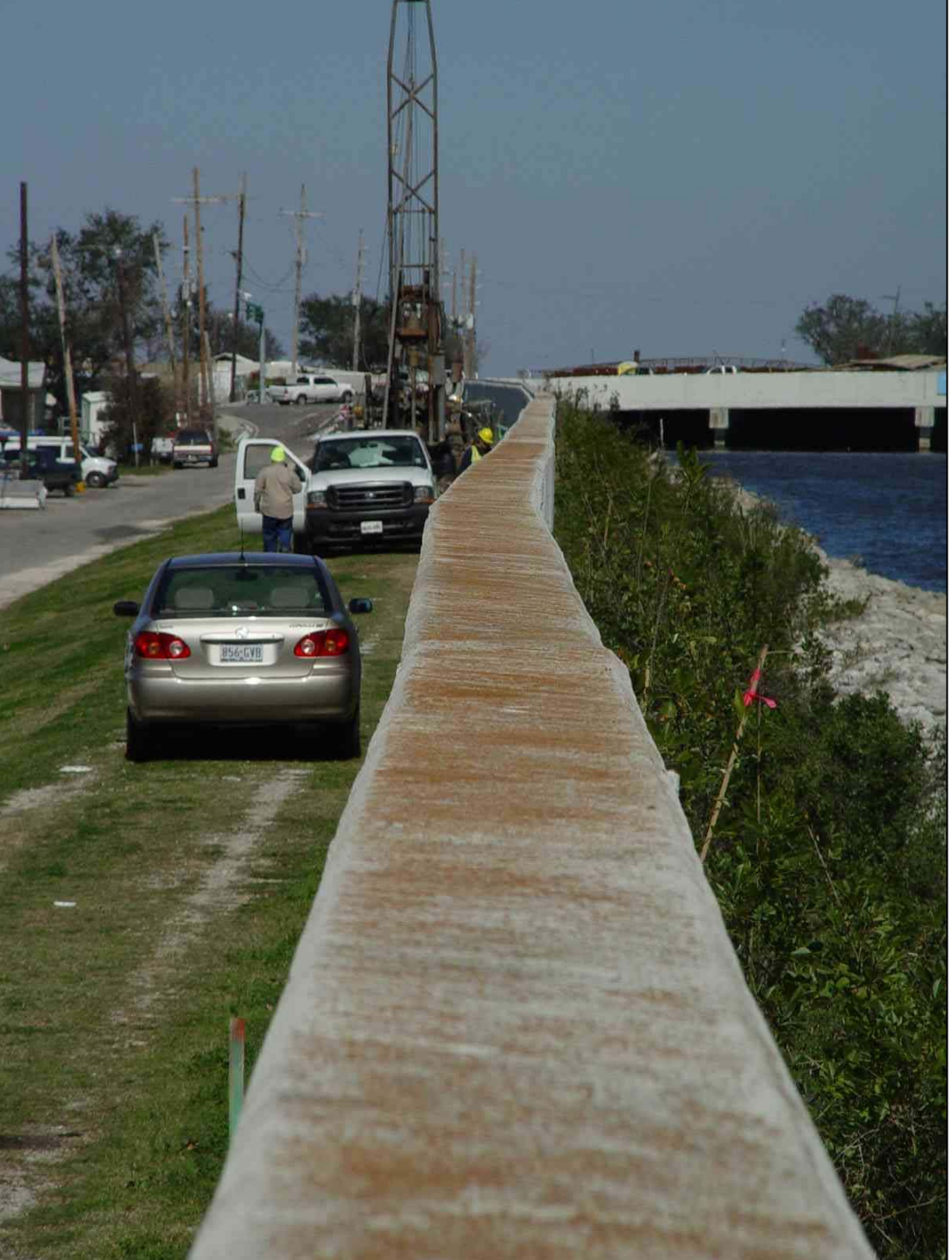
Incipient failure

- Tilted flood wall opposite the London Avenue North breach, at Robert E. Lee Blvd.
- Forensic scientists learn more from a partial failure than a complete one, because much of the critical evidence remains



The tilting wall controversy

- The NSF team assuaged that the bend in the flood wall on the west (unfailed) side of the 17th St Canal was evidence of an incipient failure
- The Corps didn't initially agree publicly

The New York Times

Investigators Gain Access to Levee for Soil Test

By JOHN SCHWARTZ
Published: February 1, 2006

NEW ORLEANS, Jan. 31 — It took a special agent of the Louisiana state attorney general's office and some bureaucratic sparring, but members of an independent team of engineering investigators won access on Tuesday to the site of a major levee breach from the Army Corps of Engineers.

The investigators, whose work is receiving federal funds through the National Science Foundation, say they have grown frustrated with the corps, which they say has also refused to release information needed to fully understand the levee failures that left so much of New Orleans shattered and soaked.

Cheryl Gerber for The New York Times

Members of an independent engineering investigation took notes as they began Tuesday to examine the soil's resistance near a breached levee at the 17th Street Canal in New Orleans.

Close Window

The Corps of Engineers closed doors and the media opened them…

When the Corps of Engineers denied site access to the NSF forensic team on a variety of technicalities, an article in the New York Times quickly broke the impasse and a more cooperative atmosphere ensued

Drilling at last, in February

- After months of waiting, we were thrilled to be drilling and sampling around the failed levees
- We soon learned that the foundation conditions beneath New Orleans were both unusual and treacherous
- Former Corps employees provided the technical expertise our team needed

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- **Drilling in a swamp environment.** **It took us three tries to get one successful sample of the basal slip surface at each place we drilled**

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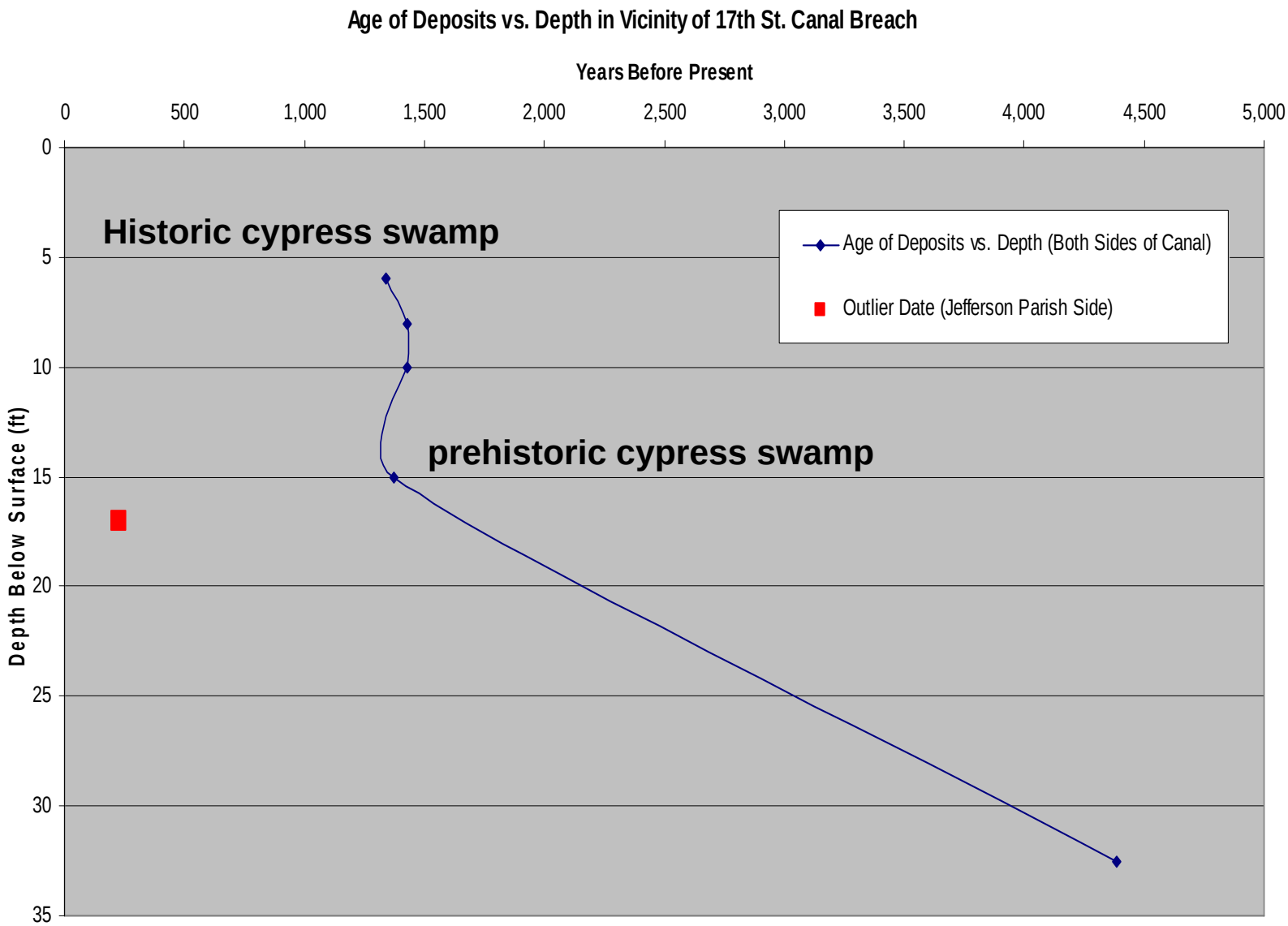


- **C14 dates and depths suggest a rapidly filling paludal environment during the late Holocene**

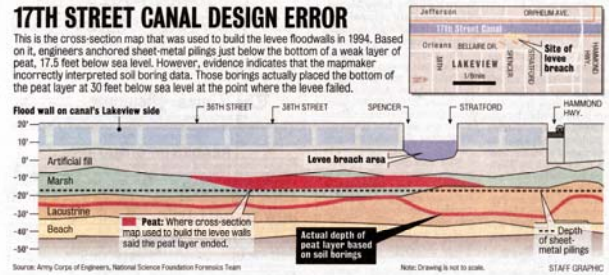
HUNDREDS DROWN AS EGYPTIAN FERRY SINKS SEE WORLD

The Times-Picayune

50 CENTS 170th year No. 14 SATURDAY, FEBRUARY 4, 2006 NEW ORLEANS EDITION

17TH STREET CANAL DESIGN ERROR

This is the cross-section map that was used to build the levee floodwalls in 1994. Based on it, engineers anchored sheet-metal pilings just below the bottom of a weak layer of peat, 17.5 feet below sea level. However, evidence indicates that the mapmaker incorrectly interpreted soil boring data. Those borings actually placed the bottom of the peat layer at 30 feet below sea level at the point where the levee failed.



Clerical error may have doomed levee

STAFF PHOTO BY TED JACKSON

Mapmaker confuses soil descriptions

By Bob Marshall
Staff writer

A difference in soil-boring data transferred from one chart to another may have played a key role in engineering decisions that led to the breach on the 17th Street Canal floodwall during Hurricane Katrina, National Science Foundation investigators say.

A cross-section drawing in the project design documents shows a weak layer of peaty soils between 11 feet and 16 feet below sea level in the area that failed during the storm. But information in the individual soil borings that were used to draw the cross section show the peaty layer extending as deep as 30 feet below sea level.

Investigators said their own borings taken at the site this week confirm the 30-foot depth, leading them to believe that designers used the flawed cross-section drawing to set the sheet pilings beneath the floodwalls at 17.5 feet below sea level — a choice

See LEVEE, A-12

J. David Rogers, left, a member of the National Science Foundation team, works with Diego Cobos-Roa, a graduate student at the University of California at Berkeley, at the site of the floodwall breach at the 17th Street Canal.

Tulane will reopen hospital on Feb. 14

Most other services also will be resumed

By Coleman Warner
Staff writer

Eager to restore part of New Orleans' medical infrastructure in time for Carnival, the Tulane University Hospital and Clinic announced Friday it will reopen its emergency room and resume most other services Feb. 14.

The revived operation at 1418 Tulane Ave. will come during the first week of Carnival parades and, with Charity and University hospitals still closed, will mark the first reopening of a downtown hospital since Hurricane Katrina.

Local residents and visitors desperately need the services, said John "Jack" Finn, president of the Metropolitan Hospital Council of New Orleans.

"Everybody in emergency services right now goes to bed and says a prayer for the re-opening of Tulane," he said. "Anyone who is aware of the health care status here in New Orleans will be relieved."

Jointly owned by Tulane and the Hospital Corporation of America, the medical complex initially will provide just 63 of its 235 pre-Katrina inpatient beds and operate with less than half its previous workforce. But there are plans for steadily increasing staff and service, and the center "will play a key role in the rebuilding of the city of New Orleans and the region," said James Montgomery, chief executive officer. Employment details for the complex, part of a network run by Tulane and HCA, weren't immediately available.

The hospital will offer 15

See TULANE, A-6

STAFF PHOTO BY ALEX BRANDON

The historic Coliseum Theater at Coliseum and Thalia streets was nearly destroyed in a Friday afternoon fire. Firefighters were hampered by low water pressure and had to call in a helicopter to haul buckets of water from the Mississippi River.

Blaze destroys 1915 landmark Coliseum Theater

Feds investigating tent city spending

Company got $5 million for job

Relief workers

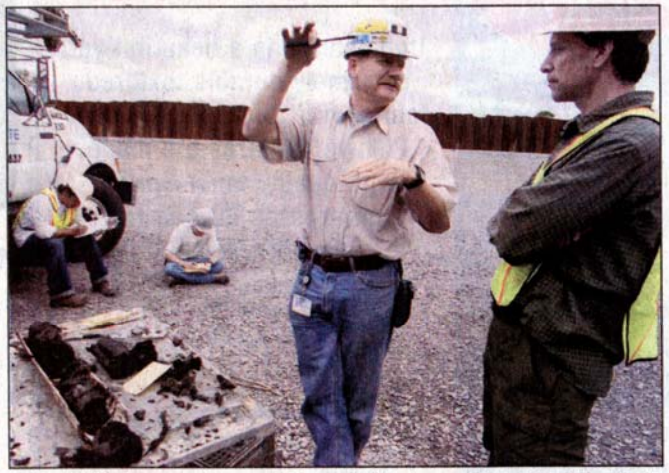
- **Headlines always tend to oversimplify complex situations.**

We had only been drilling three days when this headline hit the *Times-Picayune*; and the Corps' investigators were all over me wondering how I conclude so much from just one or two borings….when they had been drilling hundreds of holes.

HURRICANE AFTERMATH

STAFF PHOTOS BY TED JACKSON

This piece of clay was just above the peat area at the site of the 17th Street Canal floodwall breach.



J. David Rogers, center, and Joseph Wartman discuss soil borings at the 17th Street Canal floodwall.

the words "wood" or "shells" written between the lines, indicating a mixture, although the written description of the layers on the log indicates these layers were composed of mostly weak material.

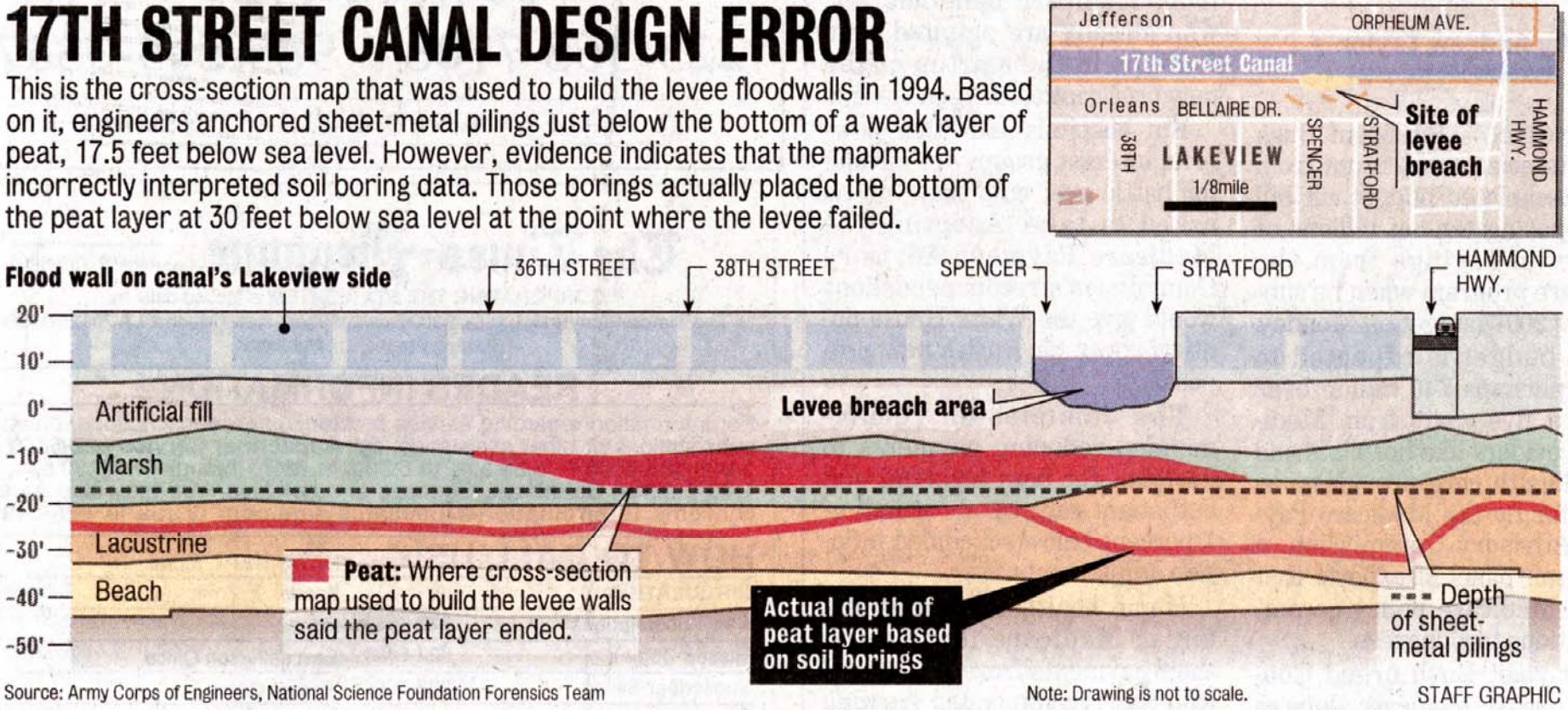
But on the project cross section, that same area shows the symbols for such soils ending at about 15 feet below sea level. Below that depth, the symbols show soils of "fat clay" or "lean clay" — sticky, impervious soils considered very good for resisting water, Rogers said.

'Significant finding'

After doing its own soil borings at the breach this week, the National Science Foundation

The slip surface

- Sampling the slip surface was only the first hurdle
- Shear testing of this toothpaste consistency paludal clay proved far more difficult
- The results eventually showed a peak shear strength of 50 psf, degrading to zero after a half inch of rotation



- **This fairly sophisticated geologic cross section through the 17th Street Canal breach was faithfully reproduced by the *Times-Picayune*. It illustrates the actual versus inferred depths of the pervious swamp deposits in vicinity of the failure.**

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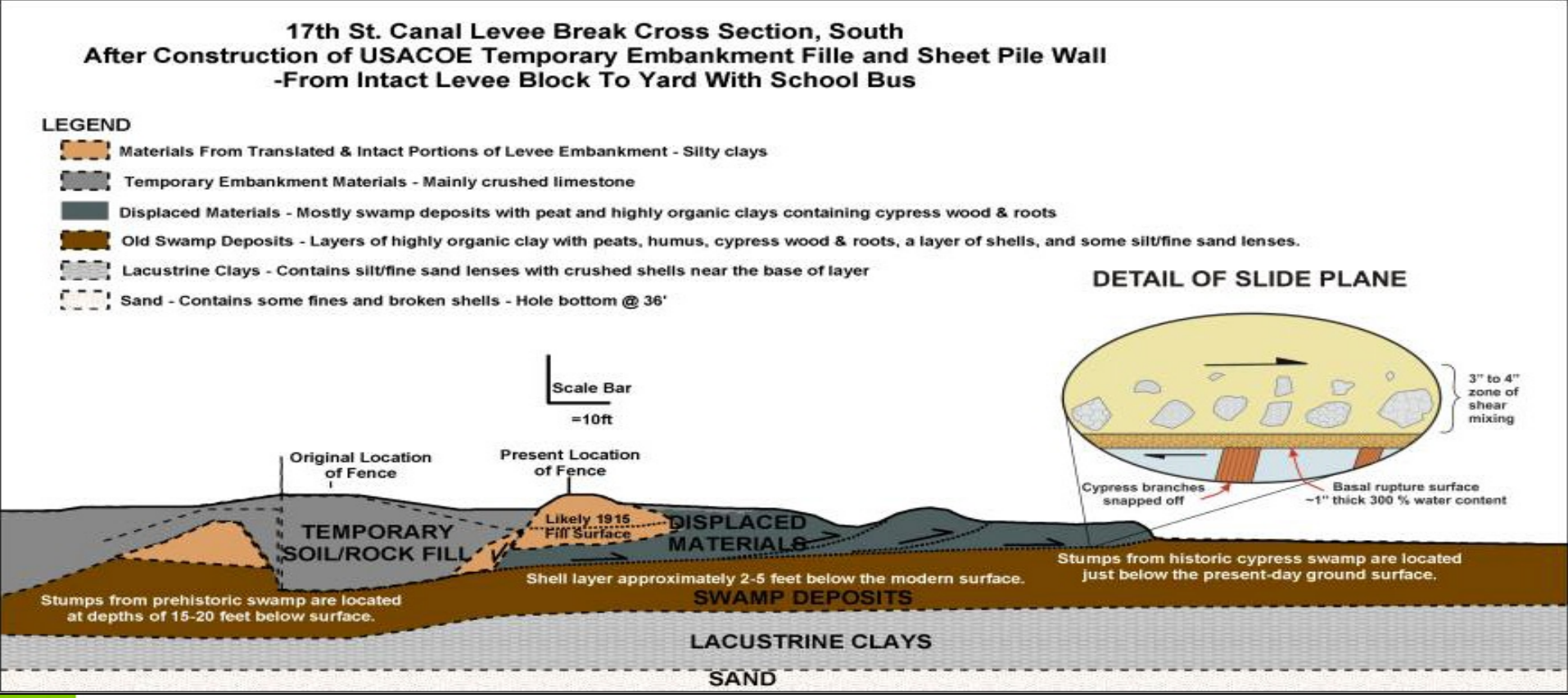

- West-to-east geologic cross section through the 17th Street Canal failure approximately 60 feet north of Spencer Avenue. A detailed sketch of the basal rupture surface is shown above right.
- The slip surface was about one inch thick with a high moisture content (watery ooze). A zone of mixing 3 to 4 inches thick lay above this. Numerous pieces of cypress wood, up to 2 inches diameter, were sheared off along the basal rupture surface.

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Resolving a technical dispute… You have to have the right phone number…

We weren't getting anywhere with the Corps dueling in the *New Orleans Times-Picayune* and NSF was getting heat from Capitol Hill…

Finally, a breakthrough. One of my former PhD students was a LCOL teaching at West Point. I asked him for a phone number contact for General Strock, and soon learned that one of his old classmates was the general's Chief of Staff in Washington, DC.

A few minutes later I was on my cell phone talking to him; engineer to engineer, explaining what our concerns were. We suggested a two day site visit without media escort, and the character of the relationship between the Corps and the NSF team changed permanently, for the better.

- **Poor performance**: Skeleton of **steel sheetpile cutoff walls** is all that remains of the **MRGO levee** between Bayou Bienvenue and Bayou Dupree

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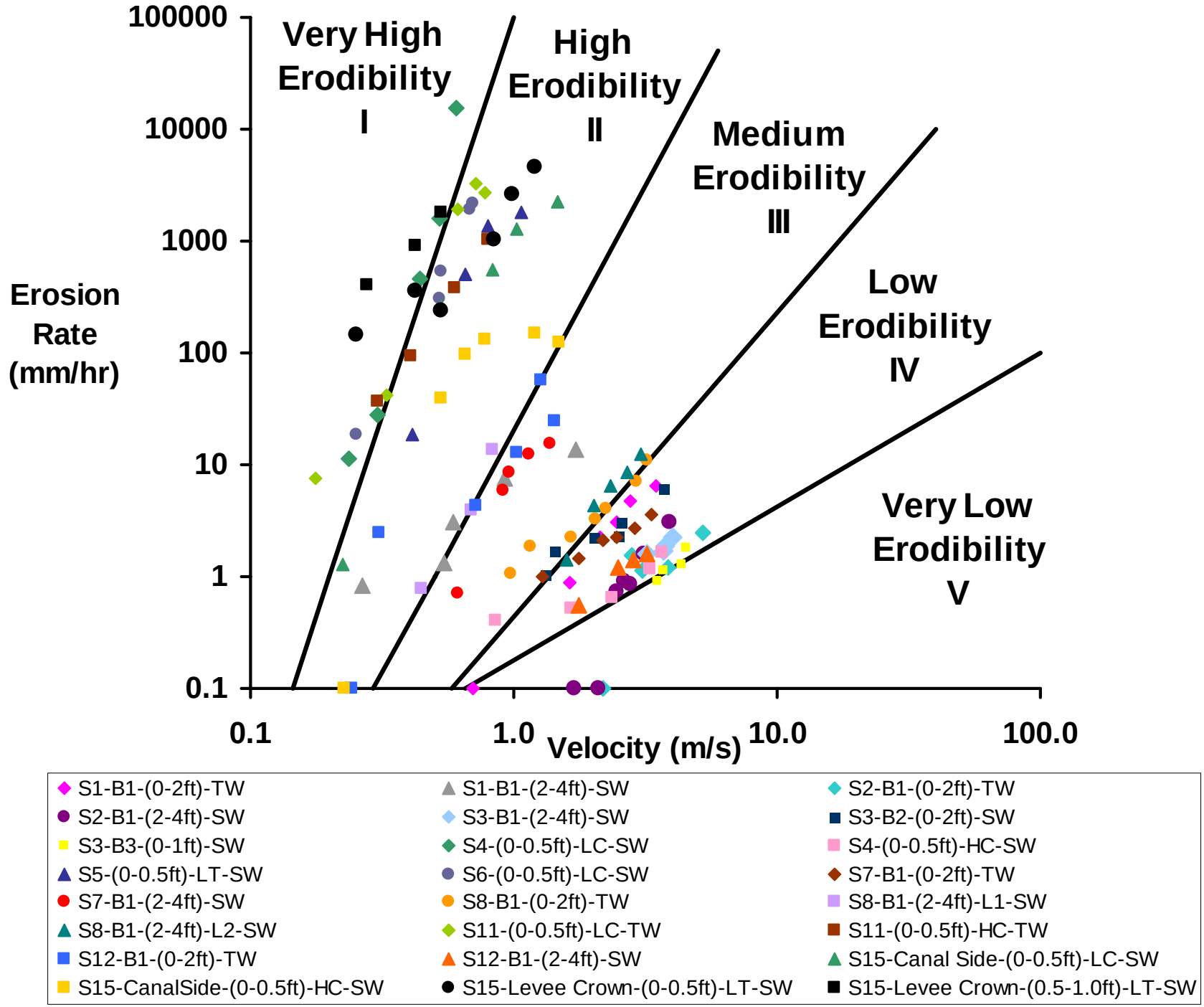
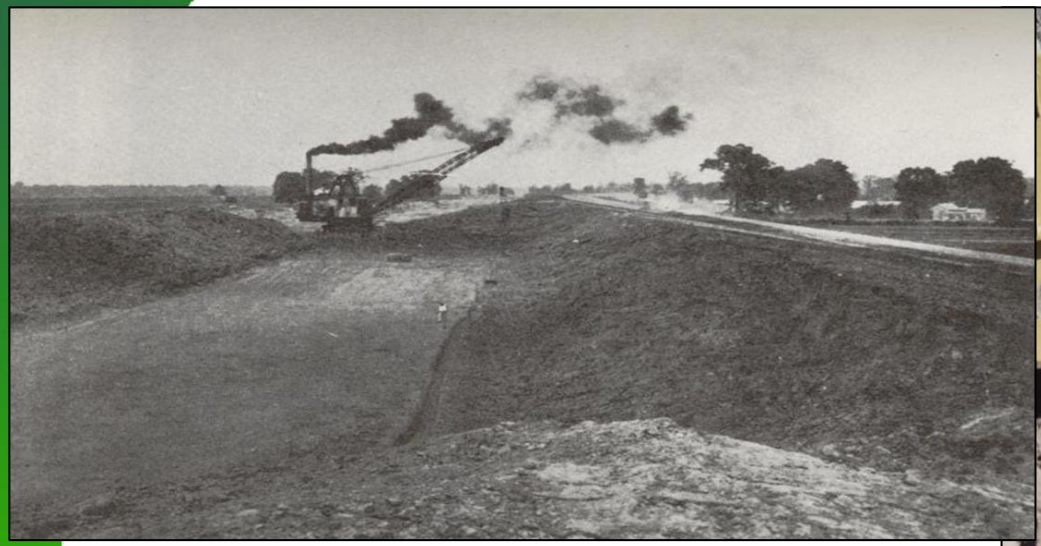
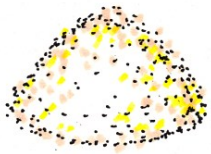
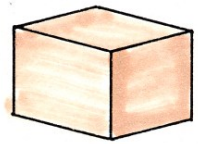

Very High Erodibility I
High Erodibility II
Medium Erodibility III
Low Erodibility IV
Very Low Erodibility V
Erosion Rate (mm/hr)
100000
10000
1000
100
10
1
0.1
0.1
1.0
10.0
100.0
Velocity (m/s)
S1-B1-(0-2ft)-TW
S1-B1-(2-4ft)-SW
S2-B1-(0-2ft)-TW
S2-B1-(2-4ft)-SW
S3-B1-(2-4ft)-SW
S3-B2-(0-2ft)-SW
S3-B3-(0-1ft)-SW
S4-(0-0.5ft)-LC-SW
S4-(0-0.5ft)-HC-SW
S5-(0-0.5ft)-LT-SW
S6-(0-0.5ft)-LC-SW
S7-B1-(0-2ft)-TW
S7-B1-(2-4ft)-SW
S8-B1-(0-2ft)-TW
S8-B1-(2-4ft)-L1-SW
S8-B1-(2-4ft)-L2-SW
S11-(0-0.5ft)-LC-TW
S11-(0-0.5ft)-HC-TW
S12-B1-(0-2ft)-TW
S12-B1-(2-4ft)-SW
S15-Canal Side-(0-0.5ft)-LC-SW
S15-CanalSide-(0-0.5ft)-HC-SW
S15-Levee Crown-(0-0.5ft)-LT-SW
S15-Levee Crown-(0.5-1.0ft)-LT-SW



COHESIONLESS vs COHESIVE



sand –
no glue
lots of friction



clay –
lots of glue
little friction

The key to levees surviving overtopping is the clay content. Much of the dredged material consisted of organic silt, which did not have substantive cohesion

The Corps ended up importing the appropriate clay from central Mississippi in barges at $85 a cubic yard.

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Press Conferences

- The NSF Team briefed the media formally on Mon May 22nd. We were told we could no longer use the term “NSF” to describe our team, and were to call ourselves the “Berkeley-led team.” Only one city councilman attended.
- We briefed the State legislature the next day. Only one representative stayed till the conclusion and spoke to us afterwards.
- Our report got front page stories in *LA Times* and *New Orleans Times-Picayune*, but page 5 in *New York Times*

ON THE RECORD

"Carbon dioxide. They call it pollution. We call it life."

Television adverts from the Competitive Enterprise Institute — a group that receives funds from the oil industry — imply that rising levels of CO_2 are nothing to be alarmed about.

"The ads are a deliberate attempt to confuse and mislead the public."

Curt Davis of the University of Missouri, Columbia, criticizes the Institute for misusing his findings on the East Antarctic ice sheet.

Sources: CEI, St. Louis Post-Dispatch

SCORECARD

Rampaging elephants Sri Lanka announces plans to tame, rather than kill, unruly wild elephants. It will then use the beasts as tourist attractions.

Race of the clones The first cloned equines — two mules called Idaho Gem and Idaho Star — are ready to run against each other, and others, in competitive mule races.

Rabbit romance Urologists develop prosthetic penises for male bunnies. The implants could have human applications, too.

Tracking whales University of Washington researchers are training failed drug-detecting dogs to sniff out the floating faeces of endangered killer whales.

OVERHYPED

A golf shot round the world

NASA mission planners have delayed a spacewalk to drive a gold-plated golf ball into low Earth orbit. The publicity stunt, sponsored by Canadian golfing firm Element 21, would have made International Space Station Commander Pavel Vinogradov a sporting celebrity. But engineers are worried that Vinogradov's hook could lodge the ball in a solar panel or other piece of vital equipment. NASA wouldn't comment on Vinogradov's handicap, saying only that the swing would be put off for a more thorough safety analysis.

SIDELINES

Q&A

Drilling for truth in New Orleans: a geologist's story

Since Hurricane Katrina hit, David Rogers has travelled to New Orleans 11 times. A geologist from the University of Missouri, Rolla, Rogers has been investigating the failure of the levee system — this collapsed in several places during the storm, flooding the city. On 22 May, Rogers and others in a team funded by the National Science Foundation released a final draft report on the disaster. The report goes beyond explaining the geology and blames penny-pinching for much of the chaos.

What was your role in the team?

I supervised characterization of the failure sites — drilling holes and recreating the foundation conditions. I also had responsibility for historical research on the background of the structures: how the New Orleans flood-protection system has evolved since 1718. Both overwhelming tasks, believe me.

What was it like working in New Orleans?

It was like pictures you see of Hiroshima and Nagasaki after the Second World War. Just complete devastation for mile after mile. No people, no bathrooms, no water. Choking dust; very fine dust on everything.

The drilling was very difficult. A drill rig took six hours to get out of Baton Rouge, through all the traffic. Just horrible.

There were lots of gawkers driving by. And constant media coverage. Sometimes I'd be talking to the grad students and I'd find my words on the front of New Orleans' *Times-Picayune* the next morning. I had so many people asking me to opine on things long before the analysis had even gotten going. They wanted to know, why? Who do I blame?

What went wrong with the levees?

We don't think that everything was due to overtopping. We feel a lot more of it was seepage related. When the storm hit, water was forced under the structures, eroding their bases and knocking them down.

What was really unusual about drilling down there is how permeable the swamp deposits are. I've drilled in the Dead Sea, I've been all over the world and I have never seen anything like the swamp mucks underneath New Orleans. I would be pushing a tube sampler down one hole and 30 feet away water comes squirting up my old bore-holes.

The flow of water through this permeable ground should be cut off by large metal sheets that extend deep into the ground underneath the levees. But a lot of the sheet piles did not extend far enough. Had those sheet piles been just 5 feet deeper, a lot of the failures wouldn't have happened — that's how close they were.

The thing is, you can't just use one average depth for the whole structure, you have to keep evaluating the foundation every foot. Bad assumptions were made in a few places, where the geology dipped down, and they didn't get the cut-off deep enough.

When we looked at the records we saw an increasing drive towards economy in the past 20 years. It would appear that they tried to do more for less, and they saved money, but they sacrificed a lot on safety.

I found the guy who drew the cross-section that was wrong on 17th Street, I actually tracked him down. He feels horrible. He was

Mammoth task: David Rogers says New Orleans is not ready for the hurricane season, which starts this month.

Article in Nature

- The article in Nature on June 1st carried an interview with me about my assignment as the geologist on the NSF team working down in New Orleans
- I offered a fairly pessimistic assessment, based on poor attendance and political response to the press conferences

Most everyone ended up agreeing on all the major points

Between late May and late October four additional forensic reports were released. All of these agreed with the basic failure mechanisms proposed in the May 22nd NSF panel report, after months of arguing and intrigue.

AMERICAN SOCIETY OF CIVIL ENGINEERS 1852

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LSU HURRICANE CENTER

Addressing Hurricanes and Other Hazards and Their Impacts on the Natural, Built, and Human Environments

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As scientists, we must court the media

- The television media covers the “breaking news” as never before
- Those stories can install public confidence or hinder it
- Most of the commercial media view themselves as purveyors of truthful information
- News networks are profit-oriented corporations operating in a highly competitive marketplace, but
- Courting positive media coverage has become an essential aspect of disaster response and mobilizing public opinion to foment change.

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CONCLUSIONS

- Media coverage is ESSENTIAL to the success or failure of society's emergency response
- The media tends to search out stories that elicit emotional responses or show graphic images to spike their viewing audience. Scientists need to provide meaningful graphics
- Media market consultants recognize that viewers tend to select one channel over all others during any important event; so they expend considerable effort covering these unusual events
- The media loves scientists who provide simplistic explanations of complex situations

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This lecture will be posted at

www.umr.edu/~rogersda/levees

in .pdf format for easy downloading

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