

Slide 1 Intro

It's an honor to be invited back to speak about flood protection. This is my first opportunity to thank all of you since my service as a Commissioner has been recognized by the presentation of the Ed Picou Outstanding Service Award. All the more prestigious award because Ed's career as a geologist is one of outstanding technical accomplishment and altruistic service. For flood protection he has proved a strong supporter by co chairing all the Geological facts of life for flood protection Symposia. So has every NOGS President and executive committee member going back to Mike Fein's administration, thank you all. Here are some of the lessons I have learned.

Lesson 1.

Sometimes, large dynamic geologic processes are seen as an Earth Attack!, but large or small, dynamic geologic systems are always seeking a balance.

As geologists, we are used to working with a long and somewhat imprecise time line. About geological time James Hutton famously said: "We find no vestige of a beginning and no prospect of an end..." The exception that proves the rule is I have just been told this talk will definitely end in 30 minutes. As for the talk's beginning, it's just good, long time line, geological practice to begin today's talk about what's happened since 2005 at the beginning, in the middle of the 15th century as a great European geologist examined the geological balancing act of erosion and deposition in marshes.

Slide 2 I would like to share an excerpt from his geology field notebook entitled:

Changes of Earth and Sea

The destruction of marshes will be brought about when turbid rivers flow into them. This is proved by the fact that where the river flows swiftly it washes away the soil, and where it delays there it leaves its deposit... because the water flowing in the river is thicker and more laden with earth in the lower than in the upper part... So the conclusion is that the marsh will be destroyed because it is receiving turbid water below, while above, on the opposite side of the same marsh, only clear water is flowing out; and, consequently, the bed of the marsh will of necessity be raised by means of the soil which is being continually discharged into it.

It's a seldom quoted passage but I wanted you to hear the powerful clarity of this early report about a coastal geology fact of life. These dynamic and competitive geological processes are crucial to maintaining emergent coastal lands in Louisiana and are our first and best protection when Earth Attacks! A powerful thought comes from a powerful mind and this four hundred year old observation and deduction was made by one of the world's great geologists: Leonardo da Vinci.

Slide 3 Tsunami—PS

It was Christmas Day, 2004 6:58 pm in New Orleans when Earth Attacked! a small resort town in Thailand with a violently large Tsunami triggered by the Sumatra – Andaman Earthquake. This undersea mega thrust earthquake

occurred when the Indian Ocean crustal plate was subducted by the Burma crustal plate.

Slide 4 This did not go unnoticed by the editors of Popular Science, who published this issue in May, long before Katrina and Rita arrived in the Gulf. The magazine editors popularized an idea that became my theme for flood reform recommendations since being appointed a Commissioner in 2007:

using technology to "take on" these attacks.

Slide 5 Earthquake—Museum

Ten Months after the Tsunami, Earth attacked again, when another natural disaster, an earthquake, occurred in Oct 2005. Late sleepers were jolted awake about ten minutes before 9 am local time by oblique slip fault movement causing the Kashmir Earthquake in Pakistan. The International Seismological Centre measured the magnitude as 7.6. The USGS reported three aftershocks of about magnitude 6 during the day and also reported about 86,000 killed, about 75,000 injured and 2.8 million persons displaced as India, Afghanistan, Tajikistan and western China were also shaken.

Slide 6 Meanwhile, none of this went unnoticed at the science museum in Springfield. No, not Homer Simpson's home town, the real Springfield, in Massachusetts, where the Springfield Science Museum announced a new exhibit exploring nature's fury. Thanks and a tip of the hat to the Springfield Science Museum for granting me permission to use their original art work in this talk.

Lesson 2

Human carelessness and disregard for geological facts of life is not an Earth Attack!

Building carelessly, without using geology and geophysics methods to check for foundation stability, in one of the most dynamic deltas on the earth defies the geological facts of life on our coast and is not an example of an Earth Attack! But it is an example of a levee construction management method known as the DOH!

Slide 7 As you can see, between the Tsunami and the Earthquake "Earth Attacks!", I have skipped a chance to say the 2005 flooding was an earth attack!, because it wasn't.

Slide 8 Recently Mayor Mitch Landrieu told a national TV audience:

“...the first thing for the country to continue to remember is this was an infrastructure failure. This was not a natural disaster...we still believe that we need to get to 500-year protection, rather than 100.”

The Mayor is right. It was an infrastructure failure—we do need 500 year protection. Most of the City flooded because of things done on purpose by the Corps designers and contractors that built circumstances that resulted in an unnatural disaster. The collateral storm damage was manmade, a constructed catastrophe.

Slide 9 If you were on the NOGS Field Trip in 2006 you visited the Ford Mustang

Slide 10 crevasse splay outcrop and already knew the infrastructure failed. By the way, check your photos of the field trip.

Slide 11 Mine show what the USGS proved with results of water gauges they rushed to the field between Katrina and Rita to get new data showing inundation levels have been understated. DaVinci's "lower part" is marked by the deposition. Apparently, the most obvious stain line we usually see as the high water mark, isn't and we have not been able to recognize the height of water in DaVinci's "upper part" as well as we thought.

Slide 12 If you weren't with us on the field trip, you would have been reminded the infrastructure failed if you had visited the newsstand outcrop earlier this year and picked up the Times-Picayune.

Slide 13 As a point of national pride, by 1795, New Orleans was such a vital port for Americans it made the Louisiana Purchase necessary to secure it. Wharfs and other improvements followed apace during the golden age of steamboat commerce. As competing interests flourished, there were conflicting uses of, and along, the Mississippi River causing Congress to establish the Mississippi River Commission in 1879 to organize things. Congress overlooked one important thing when it focused only on development: it ignored the geological reality noted in the 15th Century. This meant continued development would continue to upset the sedimentary balancing act.

Slide 14 Writing in his book *Life on the Mississippi*, Mark Twain expressed his colorful doubts the Corps of Engineers would ever tame the Mississippi River he knew and respected. Mark Twain is right.

Slide 15 The resulting geological imbalance in the golden age of dam and levee building in the early years of the 20th Century provided an incident to emphasize Twain's point.

Slide 16 As a result of the great flood of 1927, an immense Federal commitment to flood protection began in 1928. A presenter at the October 23, 2015 SEG workshop on earthen dams and levees listed the number of U.S. dams and levees built each year in the 20th Century. There was a bell shaped distribution of construction projects proving the 1930's to 1980's was the golden age of flood control projects on the Mississippi River watershed.

Slide 17 The boom in construction of federal flood control projects starved the river of sediment tipping the dynamic geological processes further out of balance.

These locks and dams trapped and held in upstream channels most of the Mississippi's land building sediment needed at the coast to offset coastal subsidence. Enhancements of natural levees to prevent river flooding halted annual overbank floods delivering sediment to the marshes and instead, clay and silt was redirected offshore to the continental shelf wasting Da Vinci's "lower part" by withholding building material desperately needed to keep pace with a transgressive ocean.

As this USGS map, titled: : Land Area Change in South Louisiana (1932 to 2010 shows; it was a classic fight, an epic struggle and favorite classic movie plot of humans struggling against nature--and the land lost. As more federal projects were completed during the golden age of dam and levee building, vulnerable coastal marshes were placed at greater risk. In the 21st Century, the marshes were drowning setting the stage for a new drama, one that began with a robust hurricane season.

Slides 18, 19, 20, 21, 22

Lesson 3:

When it comes to the geological facts of life for flood protection, the Corps has been under advised about the physical geology of the levee rights of way.

Slide 23 Katrina , and Rita came and went. Instead of restaging the old 19th Century battle against nature to dominate it for development's sake, a new contest was at hand: to keep what we have built from being taken back as Mark Twain feared.

In the aftermath of the unnatural (man made) disaster, news reports catalogued how much shoddy work had been done.

We can win this bout hands down if we use state of the art geological methods, to safety check levees before or during building them, The State Coastal Protection and Restoration Authority (CPRA) must obtain base line seismic surveys on levees to find and fix unhealthy sections before this new generation of notable storms test them.

Slide 24

Lesson 4:

The State of Louisiana has made a model for the nation with our great improvements in governance of the impressive flood protection works provided by the nation. Louisiana has produced a prize system of flood control authorities and placed operations and maintenance in the hands of blue ribbon panels of experts.

Slide 25 Ten years ago, Louisiana made great reforms by improving governance of levees and public works flood protection projects.

As a result, East and West Flood Authority Boards were founded and Commissioners like Maclay and Julien were appointed by Governor Blanco to the West Authority.

Also, there was overwhelming, positive, statewide support for a constitutional amendment. The new Commissioners set to work sharing our expertise and informing other levee stakeholders about flood protection.

Slide 26

Lesson 5:

What I learned by giving an unflinching but controversial geological opinion about the debris filled Marrero to Westwego "Soft Pastry Levee".

I learned the Army freely uses initials of phrases as words, but the Corps intensely dislikes my nicknames for their things. Some examples:

Slide 27 I was part of the Corps inspection team, called a Tiger Team,

Slide 28 Four years ago today I was examining a west bank levee noted for being built with rubbish and soft clay. Here you can see the soft clay of the trench bottom taking footprints.

Slide 29 Although the outer part of the levee had dried hard, the inside of it was, in my opinion, too soft.

Slide 30 As I politely differed with army officials on the levee about the matter, I made them very angry when I noted the structure had a hard crunchy outer shell and a soft chewy inside. "You haven't built me a levee" I told them. "You have made a jelly donut". My voice tends to carry.

Slide 31 It got into the news. The Corps officials were displeased, and asked me not to say it any more. Today I am glad to assure the public, I won't say it any less either.

Second: It has been 6 years since last September 5 when I nicknamed the Army COE east bank headquarters office building after I walked across the parking lot and noticed the variety and number of expensive luxury, classic and sports cars Corps employees drove to come to work on the levees by urging Louisiana officials to cut corners or costs and leave two pumps out of the WCC pump house.

Slide 32 Since Army got so irritated about their levee being compared to a jelly donut, I thought it best not to tell them their headquarters is nicknamed

Slide 33 Fort Ferrari.

Lesson 6:

Slide 34

What the Tiger Team saw and reported--Mr. Mike takes a lot of heat.

Sharing geological know how a big accomplishment of the reform movement and this work was a challenge for me. This is the first opportunity since then, and I appreciate the chance, to explain my controversial, front page, findings and let my professional colleagues decide for themselves what they think of the situation.

Slide 35 Tiger Team contributions

One major task of the Tiger Team's detailed examination of the levee was to dig ten foot square more than four foot deep trenches in the levee to see if the amount of rubbish used as a building material exceeded COE standards. Chapter 3 of the Tiger Team's more than 400 page report was about the trenching. I hopped in the trenches to see for myself.

With President Susan Maclay's leadership and the united support of the other Commissioners my field effort was assisted by the Superintendent ordering the entire heavy equipment crew to go with me and help. As any of you would, I kept notes.

Slide 36 I took it as a professional compliment when the Tiger Team made me a co-author several chapters, including the Trenching Chapter and I also edited the entire report.

Slide 37 Not to be outdone by DaVinci's field notebook being quoted this excerpt, from my field notebook, described one of many trenches:

To produce Chapter 3 on trenching, the Tiger Team took my field notebook pages, changed the investigator's name from Mike Merritt to Tiger Team and published them.

Lesson 7:

I learned how important it is for geologists to share our "know how" with authorities in charge of operating and maintaining levees, and I have learned you can make a difference.

Slide 38 One contribution I made was as the author of a Times-Picayune guest editorial. In coming years some Commissioners will be term limited so it is vital all of you consider donating a few hours a month and apply each July for appointment as a Commissioner. Make your voice heard.

Slide 39 Fox 8 News aired this picture and my comment about November, 2011. The story was updated in March, 2012 on their website.

In 2012, there was great uncertainty, not only about this levee but about whether the narrow scope of work under which the Tiger Team was forced to labor could fully resolve all concerns.

Slide 40 In good conscience, I could not see what I saw and agree to some of the conclusions being reached on evidence I considered soft. Eventually, to end the wrangling over how to word the report, I issued a letter of non-concurrence.

Slide 41 The final Tiger Team report was modified after I laid down my editor's "red pencil" and before it was released to the public in July, 2012.

In July, 2012, President Maclay forcefully and publicly pointed out SLFPA-W's expert Commissioners were never given a chance to respond to the Tiger Team's surprise press release of the final report that had editorial changes neither I nor the agency knew anything about. Consequently, the second IEPR review was scheduled to resolve the controversy.

Shockingly, SLFPA-W was not informed of the new review and had no opportunity to make public comments to the 2nd review team for more than two years until the report was complete, the contract money all spent and the final report was a few weeks from ending.

Slide 42 Upon learning about it at the last minute, my staff submitted 20 pages of new comments and I submitted 43 pages of the selected highlights of many comments from my annotated 400 plus page copy of the first review team report which restored material edited out of the final Tiger Team Report after I could not concur with the first Team's conclusions. Here is the gist of the first of many charge questions CPRA set out.

General Charge Questions

Q1. Do the design assumptions made during the decision document phase (interpreted as the EAR, PDD, DDR, or similar appropriate design document for the specific project - to be provided to the Panel) for hazards remain valid

through the completion of design and construction as additional knowledge is gained and the state-of-the-art evolves?

Regretfully, the second review team rubber stamped the conclusions of the Corps employees on the Tiger Team. However, I believe my conclusions have been proven correct by the Chief of Engineers long delay in certifying this levee as required by Congress. Why the delay?

Slide 43 On the flood side at the Westminster P.S. for a surprise inspection.

On the morning of October 23, 2014, I pulled a surprise inspection of the soft pastry levee. This is what I saw. That afternoon I met with Col. Hansen at the New Orleans Corps office and began our discussion with a cautionary tale from our own industry.

Slide 44 I warned the Colonel about overlooking risk factors such as, for levee foundations, neglecting to do a thorough job with geology and geophysics methods, of identifying geo-hazards. I also stated concerns about projects with overwhelmed factors of safety

Slide 45 & 46 (like the bad examples we saw on the NOGS field Trip at the London Avenue Canal)

Slide 47 and failed construction project management, (like the West Bank's soft pastry levee where quality control processes failed and Corps construction project managers did nothing to correct the importation of rubbish as a building material.

All of these failures accumulate and lead to avoidable accidents. This is why Mayor Landrieu rightly says a preventable mistake is not a natural disaster, it is an infrastructure failure.

Slide 48 As of today, November 2, 2015, it has not been reported to me the Chief of Engineers has certified this levee yet. surprise: they are not watertight as my photos from the flood side show. Note the Westminster Pump Station in the background. East of this Pump Station a few score yards is the location of the Tiger Team Trench into a levee filled with the clay soft enough to be on Fox News.

In my opinion, he can't until this flood wall is watertight and in my opinion, he should not until basic physical geology and geophysics methods are used to examine the levee foundations using recent Army coring and boring results to measure the stability of this problem-child levee. I modestly think this vindicates my non-concurrence with the cheer leading done by the Corps of Engineers.

To sum up, sometimes just having an informed, expert earth science opinion in the board room has made an important difference so many times already, for example when Dr. George Losonsky of Baton Rouge served the East Authority. On the West I have had an opportunity to write a guest editorial in the Times-Picayune and testify or attend federal hearings,

Slide 49 state senate hearings, explain the geologic facts of life for flood protection to newspaper reporters, on radio and on television. I urge all of you to apply

as a Commissioner. Many of you have been beside me at the Symposia and

Slide 50 the recent Mississippi River Commission hearings.

Slide 51 I have been able to get motions and resolutions passed by simply asking the Flood Authority to help the State Geological Survey get Congressional funding for mapping the geology of the New Orleans area

Slide 52 or to support the NOGS surface fault atlas project. By simply knowing what geologists know, we can speak up to help the taxpayers.

But one thing above all: without flood protection, nothing else matters. My greatest opportunity to make a difference so far, was being a Commissioner speaking on the record to a State Senate Committee in June, 2007 about the desperate need on the west bank to repair several levee breaches below two feet of elevation in a four and a half foot high levee.

Slide 53 With no help or support from the Corps, and with no federal funds, only State money, we built interim defenses to protect the west bank at these crucial weak areas until the Corps projects were finished someday. We were ready

Slide 54 a year before Hurricane Gustav arrived in 2008 and delivered a 7 and a half foot storm surge. Nice try Gustav,

Slide 55 but we built 8 and a half feet and better

Slide 56 and hurled you back into the sea.

Now we have the opportunity to repeat this success by using our earth science know how, the skills our members have used to find every Gulf Coast salt dome, sulfur mine and oil or gas pay sand since 1941; and use our science to examine the foundation soils below the levee for weaknesses not obvious to the eye during drive by levee inspections, so we can find and fix them too.

On November 21, our West Bank Voters will go to the polls to consider a 5 mill bond issue. It will cost about as much each month as a burger and fries, and is needed for flood protection operations, maintenance and future lifts. Our voters are very smart and I believe they will invest in the future and approve it.

As a geologist, I believe we will hold the public's confidence if we use our know how to conduct the future work maintaining elevation by correcting any weak spots found by geophysical safety tests as we work our way along the levee beginning next year.

As a foot note, I may be an engineer's worst nightmare, a geologist carrying a badge, but I prefer to be remembered as one of the few, geologists chosen by fellow Commissioners to be allowed to help out during a time of transition. As Commissioners, we sit down with strangers and become friends working on these issues together. My Commissioners placed me in functional charge of the West Authority when they gave me the power to hire and fire during a portion of the 4th quarter of 2013 and first quarter of 2014. When the

temporary task was done, I stepped back to just being a Commissioner and they gave me a nice supper not paid for by any tax money.

Slide 57 For dessert we had this handsome cake. It was later reported to me that when Col. Fleming's duty at Fort Ferrari ended and he was transferred elsewhere, a military ceremony was held and refreshments served. Among the gifts of parting from his staff, Col. Fleming received a jelly donut.

I, on the other hand, have been given your highest award, the Ed Picou Outstanding Service Award. I am encouraged, I will go on in the future as I have in the past First: urging the Corps and CPRA to stop relying so heavily on single borings hundreds of yards apart, and use modern geological and geophysical techniques to verify how stable the levee foundations are every step between existing borings.

Slide 58 Thanks