Appendix Y – Mr. Michael Merritt's Reserved Comments

The Honorable Mr. Michael Merritt, the SLFPA-W Tiger Team member, provided his written reserved comments on 15 issues related to the planning, design, execution, results, interpretation, conclusions, and recommendations of this WBV14C.2 Tiger Team investigation program. Mr. Merritt's opinions follow.

Synopsis of Reserved Comments

Executive Summary Opinion: Close examination of the 29 trenches opened in October-November, 2011 raise concerns about clay in the levee being overly: weak, wet, prone to seep, soft, laden with debris, prone to premature settling or difficult to maintain.

The Tiger Team was hampered by adverse circumstances and a lack of USACE resources including:

- no functional administrative guidance about the mission and function of a Tiger Team at the outset, (other than an appellate process when the Tiger Team was deadlocked),
- lack of clerical assistance to produce exhibits,
- poor choices (by non-Tiger Team members) of geophysical reconnaissance methods,
- shortness of time and pressure to proceed without a written plan,
- lack of functional field support from the contractor when working to find wood in the samples and
- serious, outside, interference.

Concerns now exist that improperly benched trenches refilled with newly supplied objectionable material have become new weak spots inviting additional concern about levee stability and performance.

Executive Summary Analysis: Most of the 29 trenches opened in October-November, 2011, raise concerns about clay being too soft or weak, too wet or prone to seep and containing an abundance of objectionable materials likely to increase the Non Federal Sponsors operating cost, maintenance cost or threaten the safety of workers providing maintenance. There are also serious concerns about premature settling of the levee increasing costs to taxpayers for maintaining the levee's height for certification because the levee was not built according to plans and specifications in the contract and also appears to be heavier than the approved design.
Presence of abundant, even if permissible, moisture content lowers shear strength of clay in the levee's core. When exposed while excavating, some of these clay layers easily accepted foot prints on the trench floor, but are said not to affect the theoretical "factor of safety" calculated by computer simulations. However, the levee's practical ability to withstand scouring, storm surge impacts or prolonged high water appears to be less robust than if clays within the levee were leaner, or drier, or both.

My technical impression is: serious concerns exist about soils in the levee having objectionable debris over more than 1632 yards along the levee, about seepage concerns over sections adding up to more than 884 yards along the levee and soft clay sections found from one end to the other.

(As previously stated to the Tiger Team, there is about 500 running feet of levee at the north end of the north-south reach having strong, (relatively debris free), clay.

Because the USACE clay specification allowance for debris is overly generous, objectionable material was found abundantly usually consisting of wood, concrete, metal, brick and broken glass or terra cotta in that order. A review of trenching observations and lab data about debris indicates:

(1) The construction project's managers failed to enforce the "spirit" of the USACE clay specification subjectively, during construction, by instructing workers to pick up and remove any debris they saw.
(2) The USACE clay specification, even if objectively enforced and followed to the "letter" (by measuring debris to see if it meets the definition of "objectionable debris"), utterly fails to withhold large volumes of trash and unworthy items from being incorporated in a levee.
(3) Although excavations of geophysical anomalies consistently found debris, this rubbish should already have been removed by picking or grubbing.
(4) The geophysical survey anomaly map of debris in places where it should not be, proves the construction process management failed, by incorporating this trash in the levee, thereby raising grave operations and management issues.

Trenching showed some clay presenting as dry, but far too much was found wet. Even when the levee incorporates abundant light weight (wood) debris, the levee is, apparently, still over the design weight and will presumably subside even more rapidly than planned under this extra, unanticipated, load.

This Tiger Team review, time and again, would have profited from better choices of geophysical tools, especially resistive or seismic shear wave methods to closely examine the integrity of trench data with other geological data to make a detailed study of sediments in the embankment or beneath the levee right of way. Soils beneath the levee are important because the underlying basement soils ultimately determine whether or not the levee stands, falls catastrophically or settles at an exaggerated rate. Soils placed in the levee embankment become the first and primary flood defense, so homogeneous, medium stiff, clay is preferred.

Any concerns the act of trenching compromised the original completed and compacted condition of the levee are now moot as the contractor's method of filling and re-compacting the open trenches to close them virtually assures concerns will be raised due to lack of benching, lack of proper re-compaction and importing dirty fill with as much or more objectionable material as was removed to open the trench.

Executive Summary Recommendation:

1. There is an urgent need for action to remediate these concerns, especially for new design specifications on the repairs to this levee and any future projects in the New Orleans Division. New design criteria are a step toward much needed revised or new, clearly worded, USACE specifications including but not limited to:

(1) minimum clay material strength greater than current, informal, protocol and
(2) new construction practice by requiring stiffer clay with higher unconfined compressive strength than traditional, pre-Katrina, design criteria;

(Pending the formal adoption of a new specification, it is said, by other Tigers, the initiative is with designers in New Orleans Division who may prescribe new construction methods with stronger materials to remediate the weak and wet sections of the levee.)

2. More rigorously detailed, levee right of way, geological mapping informed by seismic wave velocity analysis is recommended. The seismic survey will be useful together with electrical resistivity issues to identify wet clay layers or define seepage concerns. The seismic survey will, in effect, model clay strength between existing borings by detecting relatively unhealthy levee sections existing between borings to address settlement and other stability or performance issues.

Geophysical survey methods are less invasive, less expensive and afford closer scrutiny of the relative strength of clay layers than trenching.

Revised specification for clay in these repairs should include at a minimum, but not be limited to:

(1) defining key words;
(2) sharply reducing the permissible percentage of wood volume per cubic yard and
(3) alternatively, and without prejudicing the foregoing, requirements, mandating ***de minimis*** wood volumes in a particular lift or 6" thick, 500 foot long levee right of way section, whichever is smaller in areal extent.

Premature settling and anticipated operations and maintenance difficulties may be addressed with a more rigorously detailed, levee right of way, geological mapping effort informed by seismic wave velocity analysis detecting levee reaches likely prone to rapid settlement. Concerns about operating and maintenance difficulties may be addressed by using geology and geophysics to guide grubbing all debris located to date.

Geological data would also be used to map the presence of distributary deposits or note faunal markers of weak clay areas to provide a better understanding of hydraulic characteristics affecting seepage or strength issues pertaining to stability.

3. The Tiger Team spent a lot of time working out how to go about its work and, before disbanding, should write a standard operating procedure for a Tiger Team so the next group to attempt this will learn from this Team's experience and go farther, faster, on the next task.

4. Complete field check, repair and recompaction of all trench sites to assure proper benching and debris free fill to make sure there are no weaknesses remaining caused by trenching.

"Construction legacy" pollution concerns to be addressed by new USACE policy and practice of indemnifying Non Federal Sponsor for construction environmental pollution legacies continuing or discovered after the project is returned to Non Federal Sponsor.

Observations Informing the Foregoing Summary

- The lack of a written plan at the outset caused the Tiger Team to invent, change or reinvent work procedures throughout the project.
- Serious outside interference impaired the efforts of some Tiger Team members to fully participate in the trenching project.
- Haste made waste in the Tiger Team's rush to go to the field at the urging of the New Orleans District Command. Contractors had trouble keeping up due to impromptu planning and last minute instructions during field work.
- There are serious soft levee issues.
- There was a tendency for some on the team or presenting to the team to lobby for project outcomes or particular viewpoints.
- Sometimes advocacy for an idea or point of view appeared to be at the expense of objectivity.
- There are survey issues.
- There are serious seepage issues.
- Deficiencies in following plans and meeting specifications raise operations and maintenance concerns.
- A particular clam shell found during trenching is a marker of some significance identifying clays likely to have higher organic content and be weaker.
- There is need for additional geophysical reconnaissance.
- There are grave concerns about the objectionable material found or remaining in the levee.
- There has been careless and inconsistent administration of this construction project.
- There appears to be violation(s) of several USACE specifications, especially clay and grubbing.
- There is a serious settlement issue.

Reserved Comment #1

Lack of a Written Plan

Opinion: Lack of a written, finalized, plan at the outset introduced error and placed the Tiger Team in the field somewhat unprepared causing the Tiger Team to invent, change or reinvent work procedures during the project.

Summary Analysis: Not having a written plan agreed upon beforehand meant tasks and instructions (for evolving work methods) were given to vendors as more easily misunderstood verbal or impromptu communications. This introduced errors, for example, all trenches opened prior to October 26, 2011 were not refilled, re-compacted and restored as the Tiger Team intended and discussed aloud.

Not having a written plan, in advance, to inform thinking about outfitting with supplies for trenching meant the Tiger Team was somewhat under prepared in the field and lacked handy items (such as a trenching shovel, compass, photo props to show scale of features in a trench, ladders to provide access to trenches) were not conveniently available to most team members on the levee.

Work procedures were revised throughout the project. The trenching plan was a work in progress discussed as the days went along and only documented after the fact on one or two sets of field papers as it happened. Also up in the air was how to publish and release the final report.

In between efforts in the field, the team would conference to try to produce a written plan. Meetings were held on October 28 and 31, 2011. At one of these meetings, with a preponderance of trenching completed, the team was heard to be discussing backdating the plan whenever it was available to a date before trenching began and whether, when the document was complete, it should be written in the present or past tense. The implication was the Tiger Team should not use the past tense in a forward looking (plan) document about (how to do) an already completed project.

As trenching continued without a written plan, field instructions and procedures changed and changed back, as they did from October 25, 2011 to October 28, 2011 regarding size of wood to be collected.

Not having written guidance of an administrative nature about how to operate the project meant team members were discussing, on October 31, 2011, what mission statement and position descriptions are appropriate for the Tiger Team and the task.

Not having a written plan for field work meant team members were still revising trench locations throughout the project and final trench locations were planned at the Burger King on Lapalco and Ames on November 3, 2011. These new trench plans were implemented the same afternoon based on those discussions at Burger King together with a working lunch at Boudreaux's in order to keep pace with pressure from USACE New Orleans District to hurry up and complete the field work.

Recommendation: Facilitate the work of the next Tiger Team by writing an operating procedure and use this project's report and documentation as a template for trench location criteria, decision process and priority of tasks to organize such work.

Contemporaneous Observations Considered Before Reaching This Recommendation

First Day Summary 10/25/2011

1st trench 179+80: Contractor asks Army Corps of Engineers officials how to refill it, and was heard by Merritt to say: "Shall we put the dirt back in (10' x 10' x 4' deep hole) and tamp it down with bucket?"

NOTE: this is contrary to Tiger Team's discussion and oral statement: area should be reduced all around to permit machines to run across area to re-compact and refill local area around trenching hole.

Contractor then said: "But we did all the other trenches this way". This is how flood authority found out all prior trenches (shown as yellow circles or yellow wrenches on Power Point in T.O.M. Committee meeting) were not done as Tiger Team had intended.

As stated by open trench 1, USACE Tiger Team members are OK with not repairing improperly filled trenches on berms, but at least 7 prior "centerline" trenches must be exhumed and this first phase 1 trench, being #8, must be done, or redone, properly. Still no written plan.

Also Army has no compass, Merritt provides compass to orient engineering drawings.

On **October 26, 2011** after digging at 136 + 07 on geophysical anomaly 24: No explanation for geophysics anomaly. Told the Tiger Team having a written plan outlining steps, and reasons for taking steps, would also resolve many concerns.

Until a written plan is provided the only documentation of the guidance for picking these locations being trenched consists of Merritt's annotated copy of Mr. Conroy's copy of the geophysical target maps and Conroy's notes. For example, the trench at 179 +80 on the Center Line (CL) was picked based on a cross section view of thickness and type of clay material from various sources.

Friday, **October 28, 2011** Plans now are to convene a video teleconference to continue efforts to produce a written plan on Halloween Monday (2011) from 1:30 PM until 4:30 PM. E-mail notices to follow.

Day 5 Summary 10/31/2011

NOTE:Upon reflection of the events of the prior week, it seems the lack of a written plan to guide USACE action in the field is inefficient resulting in uncoordinated decisions or actions by USACE and contractor personnel that do not assist, or actively obstruct, participation in the Tiger Team. For example, regarding the "ompanion" sample, issue: SLFPA-W hoped to collect a statistically significant portion of an excavated layer and pick it clean.

By finding little more than the Tiger Team already collected in a hasty inspection, SLFPA-W would be confirming the USACE's assumption no wood was being left behind. Originally, small pieces of wood (kindling and wood chipper size) were collected by the Tiger Team along with "objectionable material" (firewood size) pieces. However, after the "practice pitch" trenches in September, 2011 the (unwritten) plan changed. After the first trench (on Tuesday), Tigers were told, before we "picked" the second trench, to only collect firewood sized pieces

The issue arises out of concern much objectionable material was battered by dirt moving equipment (to reduce the size of unpicked wood pieces) before allowing the wood to remain and be abandoned in place anyway. Such a practice exploits poorly chosen words in the USACE specification for clay that do not prohibit small material in virtually any quantity.

Last week, after the second trench on Tuesday and continuing through Thursday, the wood gleaning process emphasized firewood size pieces only. Last Friday, there was little, if any, large material but, significant quantities of small wood were bagged for removal to the USACE labs. I inquired why the change back and was told by an official there were no plans to study the small material.

It is obvious, and was pointed out, the "small" material should at least be weighed because simply "looting" the layer will only bias, by understating, any work to fully account for the total volume of wood in the clay.

Inspected contractor's efforts to properly refill trenches opened last week near Orleans Village.

At 179+80 the 10'x10' trench appeared to have been widened to 15'x15', not according to planned good intentions stated in Tiger Team meetings

At 180 PS 187.5, the second pit opened last October 25, 2011, even less effort has been made to open the trench further before rolling material back (in compacted layers) because upper trench dimensions appear to be about 12'x12' per USACE allowing contractor to fill and tamp trenches not on centerline. Apparently, a plastic bag of trash was left to be buried in hole. So far, this is not what the Tiger Team orally discussed would happen as there is no way a lamb's foot can cross this trench to repack each layer and burying construction site trash is not permitted.

Also on **Oct 31 2011:** At 1:15 PM, Tiger Team video conference, led by Mr. Conroy from St. Louis, convened to review Non-Federal Sponsor comments about the scope of work (SOW) with the object of producing a written plan. Discussion of the second of many comments received about the SOW, from Mr. David St. Marie, continued until 2:39 PM when discussion began about the third of Mr. St. Marie's comments.

There are many versions of the scope of work document, some more outdated than others and none of the recent discussions have been added to amend the SOW.

Merritt asks everyone who shows a document to the group or has a document before them, to share a copy because much was written and done before SLFPA-W was notified to send a representative to the September 12, 2011 meeting at Fort Ferrari. (Apparently the Tiger Team was active in August, 2011.)

The USACE has replied to some of the comments being discussed but the source documents are not available. Mr. Merritt asks for a copy of the Tiger Team Mission Statement and a position description statement outlining a team member's role. Tiger Team Project Leader, Mr. Conroy, said he "had the same questions as Mike, all I was told was in the jungle, not much stands in the way of a tiger."

Mr. Merritt stated the team needed the written response requested from Mr. Glen Gremillion to address the Plans & Specifications issue in the Tiger Team plan.

On **October 31, 2011:** Some Tiger Team members tell Mr. Merritt the levee crown trench cuts should be 1 to 1.5 but other voices are heard speculating this may have been reduced to 1 on 1. (By this is meant a 4' deep trench with a perimeter at bottom of ten feet square, should be enlarged gradually until at the top, the ten foot square perimeter is pushed out 1.5 times the depth (or six feet.)

Mr. Merritt notes this doesn't seem to be happening either and when one trench was benched slightly, two more pieces of firewood were found.

The Tiger Team began to discuss the distribution of the final report. USACE team members want to let Col. Fleming decide and want him to see the final report first. "Why" Mr. Merritt asks, "You're not going to change anything are you?"

The team may mark the final report to Col. Fleming as a draft. (If this occurs, Mr. Merritt worries a "for the record" version of the report (in the public domain) may be as slow to arrive later as the written plan is now.)

The Tiger Team discusses Mr. St. Marie's 18th comment about the draft of the scope of work. After Mr. Merritt said: "the team needs to determine general boundaries" no one spoke. Then, Mr. Conroy said, "It is a good point

Tuesday 11/1/2011

Pictures, at station 179+80, taken at 8:07 AM show bulldozer smoothed material filling trench. It doesn't look like the top layer is rolled in. The bulldozer is "walking on top" of what it pushes in the trench. In other words, the trench closure is not according to orally discussed intentions.

Since Mr. Merritt told the Tiger Team on Monday (about slack on no benching during trench refilling), the trench near station 66+90 closed quickly. The original plan was to enlarge the area around the trench by six feet but that voiced intention was abandoned and the talked about but unwritten plan was reduced (for all but crown cuts) to match the contractor's completed work

Thursday 11/3/2011

To make good use of time during light rain, Tiger Team will discuss where passed up trench sites (for instance, a previously targeted site on a haul road), can be relocated to good advantage. Discussion ensued at 10:15 AM at the Burger King. Mr. Conroy has the geophysics "inferred target" maps annotated with planned and complete trenches. Mr. Merritt brings the cross sections showing lift layers and a list of SLFPA-W areas of concern.

By 10:37 AM, using what has been seen and learned from trenching so far, it is apparent, and recommended by Mr. Merritt, that a "trend" be trenched on the flood side from 40 feet off the centerline, about one-third of the way up the levee slope from the levee toe and extending from station 0 (the New Westwego Pump Station) to station 5 (500 feet east) along the levee. Tiger Team chat continues to plan activity until 11:23 AM. Mr. David St. Marie, Mr. Jas Singh, Mr. Merritt and Mr. Conroy are leading the discussion and a consensus is obtained about relocating a trench to better address SLFPA-W areas of concern. About five locations may be shifted and two more planned locations will be moved elsewhere.

November 4, 2011

End of Tiger Team effort to trench 29 trenches including 19 of the 42 requested by SLFPA-W in heavy debris areas observed by inspectors. Early trench efforts were biased against finding objectionable material and were not as thoroughly performed or documented as work methods and process evolved throughout.

Reserved Comment #2

Serious Outside Interference with Tiger Team

Opinion: Serious outside interference impaired the ability of Tiger Team members to participate in the trenching project.

Summary Analysis: At first, resistance to SLFPA-W representatives on the Tiger Team was passive and consisted of exaggerated attention to enforcement of rules. This was a failure of command and control by the construction project's managers because the rules were enforced selectively, overzealously and inequitably, thereby destroying any notion of basic fairness.

Active resistance began with the next level of interference and consisted of monitoring the entire Tiger Team generally, dictating time lines for the Tiger Team's final report specifically, sending observers to listen or participate in Tiger Team discussions and sending minders with cameras to follow and photograph Team member(s) on the levee.

This active, and ongoing, interference escalated into exaggerated delays such as routinely detaining a Non Federal Sponsor Tiger Team member at the front gate, or denying access to a team member attempting to estimate unconfined compressive strengths in trenches less than 4 feet deep (by omitting to provide a ladder).

This serious, and active, interference culminated with destroying samples containing objectionable material.

The first samples destroyed were samples already collected and bagged by the Authority.

Next: The serious outside interference escalated again when access to continue collecting samples was denied by blocking the worksite for more than half a day with contractor equipment that was idle.

Next: The serious outside interference escalated again when access to samples was refused by delivering clay containing objectionable material and dumping the truck load on the samples excavated from the layers with objectionable material to remove any possibility of access to these samples of intrinsic interest.

Finally, (although SLFPA-W declined to interrupt the work of others and waited several hours for the contractor to move idle equipment before sampling either the trench cuttings or the objectionable material imported to re-fill the trenches), a bull dozer interrupted the sampling work by intervening on SLFPA-W worksites and destroying both the samples and the imported objectionable fill clay at multiple trench sites.

Recommendation: Since this interference originated outside the Tiger Team, in work groups under the authority of the USACE New Orleans Command, The Tiger Team recommends leaving this issue for local authority to address and resolve.

Contemporaneous Observations Considered Before Reaching This Recommendation

On **October 25, 2011,** at Station 180 off on the protected side 187.5 feet: Jeremy George halts the "companion" sampling effort after 3 sample bags were filled. It was reported to Mr. Merritt a blown fuse may have silenced a back-up alarm on a SLFPA-W Bobcat. Merritt provides boater's (aerosol) air horn so noise can be made when backing up by employee assigned to

watch. Merritt calls for mechanic. Mr. George continues to shut the crew down and now complains the machine is leaking oil. SLFPA-W foreman, Mr. Forrester, challenges this and demands to be shown the leak. When no active leak found Mr. George says repairs to back up alarm will be sufficient.

Friday October 28, 2011 Mr. Merritt continued to point out Mr. Wagner's constant pressure or "pushing" of the Tiger Team's trenching and picking process was pulling too much clay material too quickly and increasing the amount of material lost or never found as well as cutting trench study time in half. Mr. Merritt requested the heavy equipment operator (operator #2) be replaced with the operator who commenced the dig on Tuesday (day 1), and who knows how to keep the excavation neater, trim in thin cuts and not mix up the samples.

Friday October 28, 2011, arrived at Trench 15 on anomaly 25. Station marker 144+46 offset 118 feet on the protected side. Discussion ensued. Speaking in a "stage voice", Mr. Conroy tells the Tiger Team he will try to keep the team independent and will not tolerate interference from anyone with his handling of matters. While facing USACE team members he added: "And that goes for your Colonel…" before turning to face Mr. Merritt "…and that goes for your President". No one else on the Tiger Team replied.

Taking this to mean Mr. Conroy was telling Mr. Merritt not to make further remarks to fellow Commissioners or provide written reports to SLFPA-W, further discussion ensued. Speaking up to reply, Mr. Merritt told Mr. Conroy: "If I am asked a direct question, I will give a direct answer."

November 1, 2011

Superintendent inquires when SLFPA-W will get the back-up alarm fixed. This query is intentionally insulting because the alarm is sounding. This is the same superintendent who listens to a morning safety meeting where the 10mph speed limit is pointed out and then exceeds the speed limit throughout the day "dusting" SLFPA-W vehicles. In one instance today, he drove on the protected side levee slope between a USACE vehicle on the crown and a SLFPA-W vehicle on the haul road (levee toe).

All SLFPA-W equipment is inspected each morning (in the SLFPA-W yard) before going out so even though there was a reason to know the equipment was working properly, told superintendent I was not aware it had broken, but would go check at once. Did so and found both alarms were working, however one is slightly louder than the other. Observed crew operating machines until about 9:15 am and documented both horns were working. Even the less noisy alarm is clearly heard, above engine noise, as the machine backs up. Admittedly, it might be difficult for the Phylway superintendent to hear as he drives about at speed with windows rolled up and air conditioning on. To put an end to the cheap shots, called Mr. Spohrer and requested a SLFPA-W mechanic come out a second time to recheck equipment and install an even louder horn. Reissued air horns to employees until working alarms can be replaced with new alarms.

Mr. Merritt and Mr. Forrester turn back east leaving the crown and start riding back on the flood side stability berm and are photographed through a long camera lens by their USACE minder. Re-examined area inspected by Tiger Team near old Westwego Seaplane Airport at about station marker 52.

Working to sample at the trench near station 66 + 90 about 1:23 PM when an impromptu meeting with the construction superintendent took place as he stopped by. He was told the back-up alarms were working and could be heard by others.

Also, the SLFPA-W crew was deprived of a chance to sample a layer at trench 66 + 90 when the contractor destroyed two bags of samples.

Wednesday 11/2/2011

At conclusion of study at 39+90, Mr. Conroy convened a "Tiger Chat" lasting 17 minutes, until 10:12 AM. A non-Tiger, Mr. Woodward, joined the team. A discussion ensued: Tiger Team project leader, Mr. Conroy, told Mr. Woodward he (Conroy) just wanted to speak to the Tiger Team members. Mr. Woodward replied he had to hear this. Mr. Conroy again told Mr. Woodward this meeting was for Tiger Team only. Mr. Woodward said he had been instructed to listen to all Tiger Team conversations. Believing this to be another instance of the New Orleans Division putting pressure on the Tiger Team, limiting the ability of the Tiger Team to operate independently,

Mr. Merritt inquired: "By whose authority was this done?"

Mr. Woodward: "By Mr. Baumy."
Mr. Merritt: "Were these instructions written?"
Mr. Woodward: "It was an e-mail."
Mr. Merritt: "That is problematic, that e-mail needs to be sent to the Flood Authority President."

Prompted by Mr. Woodward's interruption, Mr. Conroy and Mr. Merritt began to discuss the unresolved issue of Tiger Team authority and autonomy. Mr. Conroy told the Tiger Team Mr. Merritt had tried to contact him previously over the weekend. This was their first opportunity to discuss matters face to face.

Mr. Merritt told Mr. Conroy he had telephoned last Saturday afternoon, when as a Commissioner, Mr. Merritt had become aware of some discussions (messages) in the government Mr. Conroy was not copied on. In Mr. Merritt's view, some of the statements by New Orleans District officials went too far by appearing to present a conclusive finding on plans and specs issues that had only been before the Tiger Team for a week.

Noticing some minutes had passed, and realizing Mr. Woodward was still listening to monitor Tiger Team conversations,

Mr. Merritt addressed a remark to Mr. Woodward: "Are you still here, you have an e-mail to send. Has it been sent to the President yet?"
Mr. Woodward: "I don't have e-mail here."
Mr. Merritt: "You can call someone and ask them to send the e-mail for you."
Mr. Woodward: "I don't have a phone."
Mr. Merritt: "We have a larger gallery following us than some pro-golfers. You can borrow a phone from someone."
Mr. Woodward: "I don't know anyone who has a phone."

At this point, Mr. Conroy presented his own cell phone to Mr. Woodward, and in an apologetic tone said: "It's just an ordinary cell phone, it won't send e-mail." Mr. Woodward withdrew from the Tiger chat.

At station 37+23 on the protected side SLFPA-W's sample crew has been waiting most of the morning (after finding two bags worth of material destroyed and loading a few bags here from "non-car parts" layers). SLFPA-W is waiting for access to gather samples from two (2) flood side trenches. It was reported to Mr. Merritt the construction crew had used heavy equipment to block access to these samples. Mr. Merritt waited one half hour for the vehicles to move and then spoke to Mr. Glen Gremillion. Although the remarks were addressed to Mr. Gremillion, the construction superintendent interrupted and replied to Mr. Merritt, saying he had people on the clock and they needed to work first. At 12:30 PM, Phylway crew went to lunch and left equipment in place denying SLFPA-W the chance to work while they were gone. In the afternoon contractor refused to give way to SLFPA-W or to work while the USACE lab techs took another bulk sample. Two (2) trench sites were surrounded by heavy equipment and blocked from about noon till after 4:30 PM (when Mr. Merritt last checked). The SLFPA-W crew was sent home at 3:00 PM to avoid paying overtime by continuing to wait on the contractor to do a 45 minute job.

At 2:20 to 2:45 PM there was a series of conversations and calls regarding the SLFPA-W bobcats. The construction superintendent complained a SLFPA-W back-up alarm wasn't working in front of everyone assembled to talk about the trench. In the construction superintendent's opinion it was "hot-wired" and he said there would be a safety audit tomorrow. Mr. Merritt calls for a mechanic to check machines, even though Mr. Merritt clearly heard the alarm working. At 3:11pm Mr. Merritt noticed, although SLFPA-W machines came out to the job with audible alarms all along, the contractor's all-terrain vehicle and vibrating roller both had newly installed back up alarms that could be heard for the first time.

Day 8 Summary Thursday 11/3/2011

SLFPA-W crew assembled at project field office. From about 7:00 AM to 7:35 AM is safety meeting time. Contractor construction superintendent now states his new opinion, the properly working back up alarms on SLFPA-W bobcats are insufficient because they sound to him like they are less than the 50 decibels which he claims is a sound level required by rule. In the safety meeting, Mr. Gremillion states his opinion that the SLFPA-W ladder (everyone used to get in and out of the trenches since the first day) is unsafe. Mr. Gremillion asks if the contractor has a ladder and receives no reply. Mr. Merritt tells Mr. Forrester not to carry the ladder today and it is returned to the yard. Some trenches go unexamined as no ladder is available. Mr. Merritt still wants pocket penetrometer readings and informs Mr. Conroy that a lack of accommodation, for persons with a limited capacity for standing and walking, raises issues about compliance with the Americans with Disabilities Act. Getting SLFPA-W equipment onto the levee takes longer every day – today grappled with equipment "safety" controversy until 8:23 AM.

Requested any notes from other team mates in case anything was missed while SLFPA-W was detained at the gate.

During trenching it was reported by Mr. Forrester to Mr. Merritt that Mr. Wagner wanted to talk. As Mr. Merritt approached Mr. Wagner a discussion ensued. Mr. Gremillion asked Mr. Merritt "what the issue is". Mr. Merritt suggested getting the Occupational Safety and Health Administration to check all back up alarms on all vehicles on location to be sure they were louder than 50 decibels. Mr. Gremillion stated that was not the issue. Mr. Merritt disagreed. Suddenly Mr. Gremillion said "You don't have the authority to shut this job down." Mr. Merritt replied, "I can get it." And stated he had come over to see Mr. Wagner and instructed Mr.

Gremillion to stay away from him (Merritt). The hoped for conversation with Mr. Wagner did not take place as the group separated and Mr. Merritt and Mr. Wagner made phone calls.

Mr. Merritt, after discussion with Mr. Forrester, decides to withdraw SLFPA-W heavy equipment and crew and instructs Mr. Forrester to make it so.

Mr. Merritt phones Mr. Miserendino to make sure the crew is withdrawn. SLFPA-W crew returns to yard. The approved Tiger Team activity of companion sampling is suspended while the issue of interference with Non-Federal Sponsor participation in Tiger Team Trenching is addressed.

Mr. Merritt informs Mr. Conroy there is serious outside interference with Tiger Team approved "companion" sampling activity. Mr. Conroy states he is interested in watching the next layer being scraped up from Trench 21+95.

Mr. Merritt approaches Mr. Wagner to discuss matters, explaining "There is serious outside interference with the sampling routine." Mr. Wagner replied that the contractor can set the time line and is the lead safety officer. USACE is secondary on safety. Mr. Wagner also stated a USACE safety officer was en route. Mr. Merritt suggested the Army safety team look into the contractor's diesel fuel spill on the levee and the overhead line downing. It is explained to Mr. Wagner that after having an accident with a SLFPA-W lawnmower, an employee would be drug tested before being allowed to mow the grass, but, this contractor will let an employee remain as the operator of heavy equipment after an overhead line is brought down. Next it is reported to Mr. Merritt that Mr. Miserendino may be coming out. Mr. Merritt phones Mr. Spohrer.

Army safety inspection team arrives about 9:08 AM. Mr. Miserendino and Mr. Merritt conference. Discussion ensued. Mr. Merritt stated yesterday, at the littered "vacant lot" site, Mr. Wagner had stated clean material was being brought in to fill trenches, but this contradicts the contractor's excuse for stopping SLFPA-W sampling (the excavated material needs to be returned to the trench.) The contractor's statement was in the presence of Messrs. Wagner and Gremillion yesterday. When Mr. Wagner stated new material would be used it was clear there was no reason to disturb the samples while filling the trench. Mr. Wagner gave assurances SLFPA-W/Tiger Team could sample later as samples would be kept intact.

Mr. Merritt informed Mr. Conroy the contractor was still out of compliance with Americans with Disabilities Act, as there is no ladder to assist going into trench for penetrometer data. Also, Mr. Merritt told Mr. Conroy, these circumstances do nothing to restore the Board's confidence.

Day 9 Summary Friday 11/4/2011

Again today SLFPA-W's access was blocked when detained at the front gate and SLFPA-W observers were unable to see early layers cut into the trench.

Each day when SLFPA-W's crew returns to the site, the contractor, who has a duty to check and enforce work site safety rules, has imposed stricter scrutiny on SLFPA-W equipment than on all other equipment at the site, including his own. For example, all SLFPA-W vehicles observe the 10 mph speed limit and don't raise any dust as they travel, but are frequently "dusted" by contractor and USACE vehicles traveling at speed. Working SLFPA-W equipment (from back-up alarms to a step ladder) has been criticized publicly until SLFPA-W withdraws it, while the contractor's bulldozer, rolling vibrator and other heavy equipment had no back-up alarm at all.

Today this tendency to generate more heat than light escalated again, as all SLFPA-W vehicles failed safety inspection. SLFPA-W has regular inspections and an annual certification of every fire extinguisher the agency owns, performed by a vendor. This is done at the direction of the Fire Marshall to comply with Louisiana Law requiring annual checks of fire extinguishers. By insisting upon documentation showing each vehicle's fire extinguisher had been checked and passed within the prior 30 days, the contractor determined SLFPA-W vehicles (outfitted for the year since June), did not meet his standards. Merritt advised SLFPA-W "all vehicles failed inspection." (Later, Mr. Forrester photographed a contractor owned "heavy" truck with no large fire extinguisher mounted in its external bracket.) SLFPA-W employees were very knowledgeable about rules affecting their equipment and workplace and one possessed a certification as an expert. Merritt was advised by staff, in detail, of how unfairly inspection rules were being applied. For instance, during this particular inspection, when employees had to show their driver's licenses to a non-law enforcement person, one SLFPA-W truck and trailer was inspected as though it were Class A (the highest commercial driving license is required.) However, it was believed by SLFPA-W to be Class C (in a weight class less than 13 tons).

The Tiger Team was more than an hour ahead of SLFPA-W completing work at 01 + 41 when USACE and construction officials again took about 1 ½ hours to inspect SLFPA-W vehicles. Mr. Merritt produced the original factory lists, warranties and other materials for the controversial bobcat back-up alarm. The inspection was a little longer today as Mr. Merritt reads aloud to the army and construction company inspectors, detailing compliance of the backup alarm with every relevant regulatory rule provided by, but not limited to, the Occupational Safety and Health Administration, and the U.S. Bureau of Mines. Merritt then continued reading documentation showing it was a genuine, original equipment manufacturer part.

By 8:34 AM, the SLFPA-W equipment was admitted and Merritt was able to reach a dig in progress at station marker 71 + 39, off the center line about 36-ft. on the protected side. This is the first of the four remaining trenches being moved to new locations to keep pace with developments in the field.

71 + 39 - 8:34 AM

On arrival at 71 + 39 CL 36, access to enter the trench was denied (no ladder as non-compliance with Americans with Disabilities Act continues). Although the other side of the trench is as little as 3-ft. deep, there was about 18-in. of the levee slope incline nibbled by one trench wall as equipment operator #2 faced the levee to dig the trench straddling both stability berm and levee slope. This extra "4 ½-ft." of digging was interpreted as depth in the ground of the trench wall and used as a pretext to begin enforcing the OSHA rule against entering a pit deeper than 4-ft. (as measured on the wall side only.) Consequently, with the other three sides of the trench less than 4 feet or only 3 feet deep, access to test and estimate clay strength was still denied SLFPA-W.

Mr. Merritt told team members this hole seemed noticeably different, but other team members denied this.

109 + 30 – 9:27 AM

Still no ADA compliance or access to measure unconfined compressive strengths. Conroy makes usual comments and, as usual, Mr. Merritt reserves comments. Upon hearing Mr. Merritt restate

ADA non-compliance is preventing access to test clay strengths in the trench, Mr. Conroy intervened with Mr. Gremilion.

154 + 50 – 2:23 PM

Team prepares to trench at station number 154 + 50 off the center line 12-ft. on the floodside at 2:23pm. Team is told to speed a report, as the Colonel does not want to read over the holidays.

The samples with objectionable material from the layer 9-in. to 12-in. deep in trench 154 + 50 FS 12 were destroyed after SLFPA-W was working the site to preserve them. Contractor destroyed material Mr. Wagner said would be preserved by using a bulldozer that did not have a working backup alarm.

SLFPA-W moved to 162 + 50 CL to complete companion sampling and discovered these samples had been bulldozed and destroyed by contractor enroute to confront SLFPA-W and destroy the evidence at 154 + 50 FS 12.

Reserved Comment #2 A

Tiger Team was lobbied for outcomes

Opinion: The Tiger Team was lobbied for project outcomes or to rush to judgment by advocates of various points of view.

Summary Analysis: At the outset, almost anyone with an opinion was involved in the Team's meetings and conferences. The Tiger Team matured in its process by restricting access to meetings and deliberations by calling in experts or resource persons to appear only for interview and meeting behind closed doors or limiting phone participation by ex officio members. In this way, the Team eventually created an environment where its working ideas were developed, in closed meetings, by the Tiger Team only until they were useful tools suitable for other forums.

Recommendation: Advise future Tiger Teams:

(1) Their Tiger Team will likely be receiving unsolicited input from interested parties, whose work the Tiger Team will examine.
(2) Their Tiger Team must quickly learn to control access to Team meetings and phone conferences in order to come together as a Team first.
(3) After the Tiger Team group dynamics are well established, begin to study enough data to get some traction on the issues before receiving input from resource persons, site visits and anyone who wants to make a presentation or to arm chair quarterback.

Contemporaneous Observations Considered Before Reaching This Recommendation

One final note about **Oct. 25, 2011:** there has been a perceived lobbying push to portray this project as acceptable by using performance criteria. It was never a plan, nor a specification, to have debris in any levee, regardless of whether the project could still perform, because debris makes settling and loss of elevation occur faster. Also, disregarding quality of material is not a sound practice. Otherwise, it would be possible to build a levee out of Lego blocks and silly putty, show it could work as a levee and force Non Federal sponsors to accept it.

In earlier inspections of trenching, notes for the record had a tag line, always worded the same way, placed (to vouch for the suitability and future performance of the levee) on each trench description. In prior Tiger Team meetings I called for such tag lines about performance issues to be omitted in favor of reporting only facts or written engineering opinions supported by seals with Professional Engineer registration number attached. The tag lines are being left in every paragraph written as an official Tiger Team excavation record over my objection.

Friday **October 28, 2011:** Mr. Merritt continued to point out, this time on behalf of the Authority, Mr. Wagner's constant pressure or "pushing" of the Tiger Team's trenching and picking process was pulling too much clay material too quickly and increasing the amount of objectionable wood material lost or never found as well as cutting trench study time in half. Mr. Merritt requested the heavy equipment operator (operator #2) be replaced with the operator who

commenced the dig on Tuesday (day 1), and who knows how to keep the excavation neater, trim in thin cuts and not mix up the samples.

October 31, 2011 Mr. Pinner spoke freely in the meeting. Mr. Merritt replied, discussing "wood counting" and his site visit this morning. In his reply, Mr. Merritt praised Col. Fleming's appearance at the July 25, 2011 SLFPA-W meeting and the decision to form a Tiger Team and expressed confidence in the skills of the experts who will provide lab results to the Tiger Team. However, Mr. Merritt criticized last Friday's action of resuming collection of small wood while intending to omit it from any study or discard it.

Reserved Comment #3

Haste Makes Waste

Opinion: Haste made waste in the Tiger Team's rush to go to the field at the urging of the representative of the USACE New Orleans District Command. Contractors had trouble keeping up with the Tiger Team due to contractors not having sufficient time in advance to organize activity and prepare a written plan before beginning work in the field. Consequently, mistakes and accidents ensued.

Summary Analysis: Little written guidance on work process was given the Tiger Team. One resource abundantly supplied to the Tiger Team was constant pressure from USACE New Orleans Command to hurry the Tiger Team in an evolving but originally ill-defined process.

Haste in conducting the project without a written plan introduced confusion and mistakes, for example, in the trenching process. For example, there were two types of error in locating the centerline trench at station marker 174. First, the geophysical contractor was rushed over a weekend to provide data for targets and misdirected a dig by more than 12 feet. Second, the surveyor either (1) missed the trench location by almost a foot, or (2) made a systematic error along the levee reach by placing other area survey markers, to guide construction, that were off by the almost a foot (10 inches). Inaccuracies in trench survey data will foul up calculations of wood volumes (as a percentage of trench volume) when verifying the USACE clay specification was followed.

Bringing in another operator and urging him to work faster than the first, more careful, heavy equipment operator resulted in samples being mixed up at the east end of the levee and an accident that brought down an overhead line at the west end of the levee.

The geophysical data interpretation was a moving target as it continued to evolve and some targets were withdrawn as "mistakes" as time went along.

In a work environment where greater speed and output was urged at every project task, USACE conducted a safety meeting due to "a rash of accidents on WBV projects" ***(sic).***

Recommendation:

Do a better job of finalizing a written plan before commencing work. This gives the Team a chance to work out time lines and critical path diagrams to eliminate bottlenecks allowing the Tiger Team to work thoughtfully, but at an optimum pace, when operations do commence. Omitting to finalize and write down this prior level of planning is a project management error.

Work with more patience, because, time lost can't be made up by urging field work to proceed at a faster pace. The inevitable result of such haste is to cause more problems by "forcing" the work to speed up instead of finding a sustainable, less accident prone, rhythm for working.

Contemporaneous Observations Considered Before Reaching This Recommendation

Moved to third trench at station marker 174 on the centerline of the levee on **October 25, 2011**. Location of trench was not surveyed in. Merritt uses survey marker 200' away (at station 172) and measuring wheel to locate dig site at 174 on the centerline. After proceeding 100', measuring wheel was "dead on" at Sta. 173 where the surveyor's flag remained in place. Merritt

rolls to 174 and places his own marker flag. Army surveyor arrives with survey transit and spots dig site more than 12 feet south east of Merritt location off on the floodside. Discussion ensued between Merritt and Tiger Team leader (Mr. Conroy) and CPRA officials (Mr. Jas). CPRA demanded dig be moved to Merritt location. Conroy concurred, because the Tiger Team talked about and wanted a centerline trench at station marker 174. Surveyor moved to survey station marker 174 and moved Merritt location 10" towards pump station implying or actually showing (by Merritt's on the ground measurement) surveyed marker stakes, placed at direction of Army contractor (at Sta. 173, 172 et al), were out of place during the construction project.

This shows haste made waste as The Tiger Team rushed geophysical contractor after 8 pm on Friday (over weekend) to provide coordinates of targets noted in geophysics survey for contractor to flag for digging at 8 AM Monday.

With no review by Tiger Team or any written plan of action, some well-intentioned but unknown person almost misdirected a dig and revealed another source of error or confusion of Tiger Team orally stated intentions.

The construction contractor's error placing the survey markers is also deeply troubling. Although being off on a survey by almost a foot may not matter on locating a one hundred square foot trench outline on a base map, it is an unacceptable level of contractor carelessness when using surveys to calculate trench volume to determine if the USACE specification for controlling the volume of wood in clay was followed, or not.

October 26, 2011, at about 10:50 AM: Tiger Team opened a new trench at station marker 166+90 on the centerline of the levee at elevation +13.5 where ground originally was +6.5. It quickly became apparent this was a different operator (operator #2 hereafter) who was less able to make small cuts to increase effectiveness in locating objectionable debris during digging. He worked faster but carelessly. Trying to be heard above the engine noise, Mr. Merritt complained when the samples were mixed up. Work halted as the issue was addressed.

Day 3 Summary 10/27/2011

There was great urging by N.O. District USACE officials for haste and more trenches per day. Today, the USACE began to arrive at 7 AM. This decision was made after a meeting in the field seeking ways to operate faster.

October 27, 2011 at 9:20 am at 120 + 39 off the protected side 63 feet: Here again, this operator, operator #2, is not working out. He seems to be working in haste in a way that reduces chances of finding material. The pit is being rushed by digging 6 inches at a time, not shaved 3 inches or less to show debris and provide an opportunity to collect it before digging further and losing the wood when the bucket is dumped. (It is almost impossible to dig through the stiffest wet slabs of thick clay after they are dropped by the machine to find material we have seen and know is in there. Also, with constant urging to move on and complete all the trenches quickly, the Tiger Team is now spending about half as much time examining the material from each trench.) After using a shovel to try to break large clay chunks apart to see if the firewood is within, one has to fight to get the shovel back. Still, by performing this task, another piece of firewood was found in these samples.

Friday October 28, 2011 Mr. Merritt continued to point out, this time on behalf of the Authority, Mr. Wagner's constant pressure or "pushing" of the Tiger Team's trenching and

picking process was pulling too much material too quickly and increasing the amount of material lost or never found as well as cutting trench study time in half. Mr. Merritt requested the heavy equipment operator (operator #2) be replaced with the operator who commenced the dig on Tuesday (day 1), and who knows how to keep the excavation neater, trim in thin cuts and not mix up the samples.

Friday, October 28, 2011: Arrived at Trench 15 on geophysical anomaly 25. Station marker 144+46 offset 118 feet on the protected side. Original elevation was 2.8 feet but new berm raises level to 5.5 feet. Began digging at 7:59 AM and trenched rapidly. Operator #2 could not keep the trench floor level (it was a foot hazard with rolling, closely spaced, undulations +/- 6 inches from maximum to minimum).

Apparently, the geophysics vendor was pushed to provide results more quickly than we had been told would be possible at the outset. On the way to this trench site, Mr. Conroy tells Mr. Merritt: this long and prominent geophysical contrast anomaly (the Tiger Team wanted to trench and investigate as it related to seepage), had just been said by the geophysics vendor to be "…a mistake". The gist of Mr. Merritt's extended comments was:

(1) the Tiger Team was told there was an interpretation with eight (8) classes of anomalies needing to be trenched to improve interpretations,
(2) "We were supposed to use geophysics to target where the trenches would go but it was not ready and Tigers dug with no geophysics or with raw data.
(3) Finally, "version 2.0" with six (6) classes of anomalies is ready
(4) so far, the Tiger Team has dug on an anomaly at the edge of the survey (where complete data recording was blocked by the Pump Station) resulting in discontinuous data and obviously meaningless or unreliable geophysical results and
(5) When we do trench here, the Tiger Team is told it will be an "empty act" because this (continuous) data is an error!
(6) How many other trench sites are staked in haste on preliminary interpretations or on "data errors" and will there be a version 3.0 geophysical interpretation?

On **October 31, 2011**, at 10:45 AM: Inspected trench 165+09 off the centerline 10 feet on the protected side. Taking a second look, when inspections were being rushed, is helpful especially since drying and different lighting conditions reveal subtle details of lift layers or wood and debris that can be photographed for comparison with initial data. (At the beginning, the team dug 3 inches at a time and examined about three trenches a day. Now, as little as half an hour is spent at a trench including digging time.)

Thursday11/3/2011 At 9:40 AM, everyone assembles for safety meeting with USACE Safety Specialist Mr. Larry Plaisance. The meeting was good, comprehensive and lasted thirty five minutes. Apparently USACE is concerned about the rash of accidents as projects draw to a close.

Nov 4, 2011 at trench 154 +50: Tiger Team is told to speed a report, as the Colonel does not want to read over the holidays.

Reserved Comment #4

Soft Levee Issues

Opinion: Shear strength of clay (unconfined compressive strength measured in pounds per square foot) varied vertically, horizontally, suddenly and unpredictably throughout the project. A tendency was noticed for shallow, or exterior, clay layers to be stronger than deeper, or interior, clay layers. Found clay with estimated shear strengths below original, planned, design strengths.

Summary Analysis: The limited thickness of clay through which rain can soak into a clay bed (or compaction water escape by evaporation) may be about 18 inches of clay more or less (depending on material type). The softer and weaker sections of the levee appear to be either pre-existing or consistent with using wetter clay, in haste, to finish by June 11, 2011 allowing the outer shell of the levee to dry and stiffen while deeper water in place cannot pass out causing wet and weaker clays to remain as soft spots of quickly varying strength.

It would be preferable for the entire levee to be constructed of more homogeneous, medium stiff, clay with unconfined compressive strength greater than typical material from Bonne Carre Spillway (400 psf). For example, a new, minimum standard, such as 1000 psf, would be better.

During trenching, pocket penetrometer estimates of clay strength showed several areas in the levee where clays below 1000 psf could be strengthened to good advantage. Moving forward, these weak areas, whether pre-existing or placed by current contractor, should be addressed as a priority for remediation and strengthening. Prefer USACE study and report on mitigating concern about unnecessary moisture trapped in clay, especially on design or construction countermeasures preventing loss of strength or addition of weight.

Some Non Federal Sponsor Tiger Team members would have preferred to avoid unnecessary additional weight of the embankment, especially any unanticipated and unplanned loading incurred by placing wetter, instead of drier clay. Placing wetter, heavier clay runs the risk of increasing loading, speeding compaction and making settling worse. Allowing the levee to become heavier than planned will require more expensive and earlier lifts to maintain levee certification by maintaining levee height. Also, wetter and weaker levees are thought to be more of a seismic risk by being more susceptible to being damaged in an earthquake.

Recommendation: Originate new Army specification and construction practice requiring medium stiff clay (as defined by new material strength requirements such as a minimum of 1000 psf) having higher unconfined compressive strengths than traditional 400 psf, pre-Katrina, design practice or construction criteria. Earlier and more robust use of objective measures of clay characteristics and parameters during construction including tracking any gain above planned density (as happened in this instance).

Contemporaneous Observations Considered Before Reaching This Recommendation

At trench 174 at the center line of the levee on **October 25, 2011**, Merritt climbed in 4.1 foot deep trench and while on hands and knees, examined base of cut before calling Tiger Team Leader Mr. Conroy's attention to a layer of clay so soft both men were able to stick their thumbs in it up to the first joint. Mr. Lannie, Barfield brought in a penetrometer and estimated the unconfined compressive strength of the soft clay layer was 750 lbs. At the top of the trench wall, clay strength was estimated as 2200 lbs. and, midway between, as 1300 lbs

By **October 26, 2011**, I am using my thumb so much and estimating clay strength so closely the Tiger Team is most interested. The Tiger Team suggests protecting such an important tool (as my thumb) with a thimble.

On **October 26, 2011** at 172 + 08 off the protected side 60 feet, Clay strength (pocket penetrometer) tests showed 500# at 4 feet deep on one side of the trench and 1400# on the other side. At 2.2 feet deep clay strength measured 1800 lbs.

On **October 26, 2011** at 166 + 90 on the centerline of the levee, Clay strengths, measured by pocket penetrometer, were:

Above Pit Floor	Reading
2 feet	3500lbs.
1.5 feet	1500lbs.
1.0 feet	1000lbs.
.5 feet	1000 lbs.

The tiger team seemed to be finding a pattern of stiffer or firmer clays at the surface that seemed to grow weaker and wetter with depth of digging. Color change from light gray above 3 feet deep and light tan below 3 feet noted in presumed lean clays of the sample.

It has been my experience and is my opinion, it is extremely unlikely water from rain can soak in (or compaction water escape by evaporation) by going through more than 18 inches of clay more or less. This "jelly donut" character of the levee appears to be consistent with using wet clay to finish by June 11, 2011 allowing the outer shell of the levee to dry and stiffen up on the levee's "hard crunchy outside", while deeper water in place cannot pass out and remains as a soft clay spot in the levee's "soft chewy inside".

October 27, 2011 at 121 + 46 off the protected side 15 feet: Mr. Merritt enters the trench to give the clay a "thumb penetrometer" test. For the first time, his thumb goes in until his hand is in contact with the pit wall. Mr. Lannie's penetrometer shows, 2 feet above pit floor, clay strength was 1300 lbs., 1 foot above, it was 1200 pounds. At thumb print depth, about 6 inches above the trench floor, it was 600 pounds per square foot (psf). Mr. Merritt was surprised, because earlier readings taken when his thumb went in up to the first joint had measured as much, but this felt softer. (It was later explained the pocket penetrometer readings can vary significantly depending on how they are taken.)

Apparently neither the contract nor the USACE specifications make any specific requirements for material strength for material in place. Tiger Team members estimate even the typical, pre-Katrina, 400 pound unconfined compressive strength would be sufficient to pass a computer simulated factor of safety analysis.

However, from a practical point of view, using very soft clays thought to be satisfactory before Katrina, now seems lacking for a primary protection urban flood control structure expected to withstand storm surge impacts and prolonged wetting. Dry, stiff, clays are strongest, safest and preferred for this purpose and should be the new USACE standard and required specification.

Discussion ensued about soft clay, with USACE experts opining most clays in this area have plastic limits of 15% to 22% moisture content and liquid limits (less predictable) varying from

50% to 70% (moisture content). Apparently, higher organic content allows the material to hold water like a sponge explaining why peat could have 400% to 600% Liquid Limit.

On **October 27, 2011** at 120 + 39 off the protected side 63 feet: In the trench, my thumb went all the way in. Told Mr. Conroy, I thought if I had a longer thumb it would have gone further in the very soft clay (shear) strength at bottom of the trench was 250 psf. Moving up the pit wall, 500 lbs. at 1 foot, 1000 lbs. at 1.5 feet, 1500 lbs. at 2 feet and 1100 lbs. at 3 feet.

Having now found a clay layer with an unconfined compressive strength less than the 400 pounds per square foot (psf) said to be typical of Bonne Carre spillway "sweepings", USACE employees continue to explain this very soft clay away by now saying this is a "local pocket" of soft clay.

The Tiger Team does bulk sample lab work here.

Mr. Conroy showed me clay with what appeared to be an iron stained, very fine, sand layer. Geophysics showed abundant "conductive" and "inferred metallic" targets in trench area.

On **October 27, 2011**: At 2:30 PM, began trench #12 on geophysical anomaly #18. Location is station marker 97+00 on the centerline at elevation +13.6 feet. Thumb goes into clay as far as 1st joint indicating Merritt's "calibrated thumb" estimate is 500 psf. Penetrometer shows 6 inches above trench floor unconfined compressive strength is 1500 psf.

On **October 31, 2011**, the Army trench for bulk sampling, near station 120 + 39 on the protected side, is still open. After drying all weekend, the clay still looks wet and is still plastic though shrinkage cracks are beginning to form.

<u>Wednesday 11/2/2011</u>

At 8:12 AM, operator #2 began digging a trench at 40+51 about 38' off of the flood side where big wood pieces were found. The trench was 67" deep. About 18" up from the trench floor a soft, light gray, "medium stiff" clay layer was noted on the sides of the trench and tested about 800# more or less. The trench was soft, un-compacted, gray clay throughout.

At about 10:15 AM, began trenching at station marker 39+90 about 120' off the crown on the flood side. Began digging in light gray clay and heard wood breaking from 12" to 18" deep. At 36"- 42" clay was so soft, Merritt's thumb went in up to the first joint, indicating an unconfined compressive strength of 500 pounds per square foot. The trench appeared to be in soft, uncompacted, gray clay throughout.

At station marker 27+25 at 80 feet off on flood side: Brad Arcement, Mike Wielputz and Mike Merritt have a discussion about USACE sampling protocol of using #4 sieve to separate wood from organic material by "grating" the sample and lab methods for trimming samples. They also discuss concerns about big wood pieces, in small samples, affecting test results of lower shear strengths.

Mr. Conroy tells the Tiger Team, this is the 6th trench dug today, and is on a flood side seepage berm where some wood was picked.

Again, shear strength measurements were taken at various heights above trench floor. Estimated unconfined compressive strengths, in pounds per square feet or psf, were:

3 ½’	1000p/sf	
3’	1200p/sf	
2’ above floor	750p/sf	

Recheck: measurement at various depths descending from surface:

6” from surface	1700p/sf	
12”	2300p/sf	
24”	1250p/sf	
36”	700p/sf	

Thursday 11/3/2011

About 3:13 pm at station marker 04+42 at 34 feet off the center line on the protected side: Unconfined compressive strengths were estimated with a pocket penetrometer at various places along the trench walls as follows:

East Trench wall

Measurement taken from bottom-up		Estimated unconfined compressive strength in pounds per square foot
wedge		750 pounds per square foot
3’		1500 pounds per square foot
2’		1500 pounds per square foot
1’		1500 pounds per square foot

West Trench wall

Measurement taken from bottom-up		Estimated unconfined compressive strength in pounds per square foot
wedge		700 pounds per square foot
3’		2000 pounds per square foot
2’		1600 pounds per square foot

12’		1600 pounds per square foot
3”		700 pounds per square foot

A musty “basement” type odor was noted in the trench and Mr. Merritt collected a double bagged sample and preserved it in an ice chest. Both of the other two contemporaneous samples were placed in open sun and remained on the levee as work continued.

Note: Subsequent testing found nothing out of the ordinary in the sample. Neither the contractor nor the USACE have admitted they also took samples nor has either one revealed any sample descriptions or test results. However the integrity of their samples in the field was destroyed as soon as they were collected because only SLFPA-W’s sample was immediately placed on ice and refrigerated until hand carried to the lab on ice.

Nov 4 109 + 30 – 9:27 AM

Merritt commented to the Tiger Team expressing concern about the seismic stability of the “soft spot”.

Nov 4, 2011 154 + 50 off the flood side 12 feet at 2:23pm: Pocket penetrometer shows estimate of 500-lbs/square foot for unconfined compressive strength.

Reserved Comment #5

Substituting Advocacy for Objectivity

Opinion: At the outset, some team members made up their minds more quickly than others. They issued statements to the contractor and interested parties about each trench as it was observed. Other team members were thoughtful and reserved any opinions until they obtained more information. They thought any bias or strongly held opinion of a contributor should be disclosed to be more objective. They hoped, by seeing the trenching details unfold they would have a more objective basis for drawing conclusions.

Summary Analysis: For example, an USACE engineer routinely stated, at every trench excavation, there were no through seepage, under-seepage, compaction or stability concerns. This seems to be a conclusive statement of findings advocating everything is OK instead of a statement of what was found that is waiting for objective, laboratory findings to incorporate in reaching a conclusion. As Mr. Merritt reserved his comments at a trench excavation, in order to make up his mind on carefully considered, objective, evidence, it has now been inferred his silence then, by not commenting either way, gave consent to these snap judgments of other Tiger Team members.

Some USACE Tiger Team members depended upon experiences elsewhere by importing previously held beliefs. For example, some members were of the opinion wood would not rot in the levee. Others expressed an optimistic view (in a dry season) that a levee section already hosting a protected side puddle would not seep and if it was, it was compaction water. There were also aggressive USACE estimates of clay strength.

Cumulatively, these behaviors began to create an appearance some members of the Tiger Team arrived at the levee with their minds made up and are pounding the data to fit and describing it to match snap judgments or preconceived notions. This makes the Tiger Team seem more like a cheerleader for what has been done, than an independent and objective observer being led to conclusions by the evidence in view.

Some Non Federal Sponsor (NSF) Tiger Team members made it a point to keep an open mind about each trench and adopted the view the trench evidence should lead the team to conclusions. For example, Mr. Merritt told the Tiger Team admitting biases is a way to become more objective.

Mr. Merritt continues to object to this “everything is OK” tag line on trench reports because it is a conclusion that should be withheld until fully advised by seeing all trenching and supporting lab data.

It is Mr. Merritt’s view, based on seeing the entire trenching program, reviewing his notes and hearing presentations from other Tigers, 24 of the 29 trenches raise concerns about clay being too weak, too prone to seep, too wet or too soft. There are concerns in other trenches about presence of objectionable materials that raise concerns about operation and maintenance costs and conditions that threaten safety of maintenance workers. There are also concerns about premature settling of the levee and increased costs to taxpayers because they levee was not built according to plans and specifications in the contract or according to the approved design or both.

All of these issues and ongoing concerns are inconsistent with the snap judgment "OK"s given as soon as a trench was opened.

Recommendation: Other than a cursory view of observable facts at a particular trench, (such as it is, or is not, currently seeping), any preliminary observations should be specifically detailed and be supported by data. Sweeping generalizations such as there is no under-seepage (at any time) are unwarranted at the outset and should be avoided to be objective throughout the levee examination.

For example, an Non Federal Sponsor team member believed strength estimates were being exaggerated, and did not say "estimates are exaggerated", without more. Instead, he made some additional observations and shared the data to explain and support the view as a fact. Gathering and sharing information the Tiger Team, or subsequent reviewers can consider provides a factual basis for conclusions and does not let any issue appear to be a blanket disclaimer or an unsupported opinion.

Contemporaneous Observations Considered Before Reaching This Recommendation

With comments made **October 25, 2011** over the open trench at Station 174 on the levee centerline, (and recorded by a construction company employee with a home movie camera), a clear pattern of departing from scientific observations only and making gratuitous speculations about future performance is continuing. Specifically, Army personnel spoke to Mr. Merritt and minimized the plan and specification issue by playing down the significance of 3 pieces of objectionable material. Merritt spoke up rebutting and rejecting this speculation noting they have not yet tested half of the Authority's areas of concern and were only providing half the effort requested now in all areas of concern. He also, and specifically, pointed out 10 of the 29 trenches planned in this Phase 1 were outside the of SLFPA-W areas of concern in presumably clean areas. Perhaps, Mr. Merritt said, it's best the other half of the trenching requested by SLFPA-W is reserved, until after the current 29 trenches "Phase 1" (or more scientific and better planned trenches) are complete and before "Phase 2" (the remaining 23 trenches requested, in known problem areas, by non-federal sponsors) when trenching could be guided by a new and more suitable and effective geophysics method selected by the Tiger Team.

October 31, 2011: During trenching, a Tiger Team member stated he hasn't seen any performance problems but, he and other USACE team members have said that from the beginning, before much evidence was taken.

Mr. Merritt replied expert engineers need to <u>show</u> failure won't happen. Even with a computer simulation, objective sample data from the lab would inform those calculations and those data have not been collected yet (so the conclusions seem premature).

<u>Wednesday 11/2/2011</u>

At station marker 27+25 at 80' off on flood side Mr. Conroy said he saw no evidence of through seepage, under seepage or compaction issues. However, Mr. Merritt was concerned the clay here was so soft. Also, the surveyor's satellite connection was lost apparently adding error by making estimates of trench volume, for lab calculations, less precise.

Thursday 11/3/2011

Another opinion imported to the levee was the belief wood pieces isolated in clay would not decay. About 3:13 pm at station marker 04+42 at 34' off the center line on the protected side, Mr. Merritt found important samples of wood, apparently placed before it rotted leaving its former imprint on the clay. This challenges the belief by some team members wood placed within the clay won't rot, create a void space, and raise concerns about seepage and settlement. The sample was given to Mr. Mike Wielputz to be taken to a USACE lab for testing.

November 4, 2011

162 + 50 – 11:56 AM

The Tiger Team reconvened at the east (Orleans Village) end of the levee reach. By noon, digging was underway at station marker 162 + 50 on the centerline.

When a USACE engineer appeared to be pressing the pocket penetrometer "too hard" while making measurements (to estimate unconfined compressive strength of the clay layers) Merritt and other non-federal sponsor observers became concerned. These USACE estimates of unconfined compressive strength were in error and are too high. Merritt entered the trench and resumed making clay strength estimates. Discussion ensued. Merritt showed his lower figures to USACE engineers and noted the USACE overestimated unconfined compressive strength aggressively. Merritt remarked: "the important thing, if one individual always pushed harder, was consistency, so comparison of relative differences would still be valid".

estimates show:

	Flood side		Protected Side	
	USACE	***MLM***	***USACE***	***MLM***
3-ft	3000 psf	2600 psf	2100 psf	2200 psf
2-ft	2700 psf	2000 psf	1500 psf	1300 psf
1-ft	1100 psf	1000 psf	1600 psf	1100 psf
3-in	1200 psf	800 psf	2700 psf	1900 psf

Before detailed measurements of complete wood pieces were obtained, Merritt noted encountering visual and audible wood "shows" from top to bottom in a trench deeper than five feet. Objectionable sized wood material was found seven times in several layers including 6" to 12", 24" to 30", 30" to 36", 36" to 42", 42" to 48" and 48" to 54". As excavation continued from 4.5 feet to 5.0-feet in dark gray, woody clay, (believed to be from River Birch pit) there was a noticeable change in the color to light gray (presumed Willow Bend clay pit product). Tiger Team Leader, Mr. Conroy, commented there were several objectionable size and smaller wood pieces in the 5-ft deep trench. Digging began, he opined, in the Willow Bend, passing into 4 ½-ft River Birch, and into Willow Bend again. "My professional opinion (is) no negative issues (such as) slope stability, through seepage, under seepage…" he added. Mr. Conroy leaves field to keep an appointment. Merritt reserves comments.

154 +50 off the flood side 12 feet

Mr. Arcement commented it seemed stable, no observed seepage and well compacted. Pocket penetrometer shows estimate of 500-lbs/square foot for unconfined compressive strength. From the outset, the contractor's employee has made a seemingly continuous video and insists upon recording Mr. Arcement's comments. He adds, "The Team looks forward to another bulk sample east of this location, to doing an "assessment," doing lab work to process the samples and collecting borings." Merritt stated he would like to attend lab testing and drilling.

Reserved Comment #6

Surveying Issues

Opinion: Efforts to use Global Positioning Satellite surveying transits were delayed or denied by circumstances in the field. This indicates a better alternative technology could have been used to improve productivity. Survey error must be defined to know the margin of error in trench volume calculations, (no accuracy of measurement was stated in the field but an error in placing the transit of 10 inches was noted and documented by measurement with a surveying wheel).

Summary Analysis: The delays of the field excavation and study, by waiting on global positioning satellite (GPS) surveys are the least troublesome aspect of the difficulty in operating global positioning satellite (GPS) survey equipment on this levee. It is far more serious to introduce errors when defining the boundaries and volume of a 10 foot square trench. Had more time been spent producing a written plan at the outset, a more appropriate technology for computing trench volume could have been planned.

Any computations of trench volume to purport to show the number of single pieces of wood exceeding the specification for a single cubic yard of clay should report the error of measurement of the trench volume surveys.

Recommendation: Since the relative position of the trench on the right of way is of less importance to this project than its interior volume for computing percentage of the trench occupied by wood or debris, it would have been simpler and faster to not index to the satellite for specific location with global positioning satellites.

Instead the team could have used archaeological methods and automated techniques by using a small, ground based LIDAR device to map the slightly irregular trench volumes in "3-D" with more attention for details and less concern for precise location in the survey grid. This should have been done at least as a backup when the primary surveyor was shut down.

In this way the team could avoid mixing assumptions (about variances in trench volume and bilateral symmetry) and various steel line measurements at the trench surface (after digging or when no GPS data could be obtained) together with 4 or 5 GPS transit measurements per 6 inch layer and other varying factors (depending on where a surveyor transit was placed inside a corner, the error of the measurement and how even, or level, the trench floor excavation was).

For example, there were two types of error in locating the centerline trench at station marker 174. First, the geophysical contractor was rushed over a weekend to provide data for targets and misdirected a dig by more than 12 feet. Second, the surveyor either (1) missed the trench location by almost a foot, or (2) made a systematic error along the levee reach by placing other area survey markers, to guide construction, that were off by the almost a foot (10 inches as checked by a surveying wheel that correctly placed adjacent survey stakes exactly 100 feet apart).

Contemporaneous Observations Considered Before Reaching This Recommendation

On **October 26, 2011**: On the east reach of the levee it was noted surveying delays are frequent due to difficulties linking to satellites for survey connections. Time is lost as excavation waits on the surveyor to use global positioning satellites to measure and describe a specific trench

corner. Contractor places a repeater on the levee to provide a sort of wireless cloud to improve communications.

Wednesday 11/2/2011

At station marker 27+25 at 80' off on flood side, and again at 29 + 50 at 13' off on the flood side, had difficulties with surveying due to poor GPS signal. Have had recurring issues all along, but now the signal is completely lost, (so no survey is available).

Moved to third trench at station marker 174 on the centerline of the levee on **October 25, 2011**. Location of trench was not surveyed in. Merritt uses survey marker 200' away (at station 172) and measuring wheel to locate dig site at 174 on the centerline. After proceeding 100', measuring wheel was "dead on" at Sta. 173 where the surveyor's flag remained in place. Merritt rolls to 174 and places his own marker flag. Army surveyor arrives with survey transit and spots dig site more than 12 feet south east of Merritt location off on the floodside. Discussion ensued between Merritt and Tiger Team leader (Mr. Conroy) and CPRA officials (Mr. Jas). CPRA demanded dig be moved to Merritt location. Conroy concurred, because the Tiger Team talked about and wanted a centerline trench at station marker 174. Surveyor moved to survey station marker 174 and moved Merritt location 10" towards pump station implying or actually showing (by Merritt's on the ground measurement) surveyed marker stakes, placed at direction of Army contractor (at Sta. 173, 172 et al), were out of place during the construction project.

This shows haste made waste as The Tiger Team rushed geophysical contractor after 8 pm on Friday (over weekend) to provide coordinates of targets noted in geophysics survey for contractor to flag for digging at 8 AM Monday.

With no review by Tiger Team or any written plan of action, some well-intentioned but unknown person almost misdirected a dig and revealed another source of error or confusion of Tiger Team orally stated intentions.

The construction contractor's error placing the survey markers is also deeply troubling. Although being off on a survey by almost a foot may not matter on locating a one hundred square foot trench outline on a base map, it is an unacceptable level of contractor carelessness when using surveys to calculate trench volume to determine if the USACE specification for controlling the volume of wood in clay was followed, or not.

Reserved Comment #7

Levee Seepage Issues

Opinion: Tiger Team models of hydraulic head and other characteristics of levee performance during computer simulated high water events have not yet replicated or explained prior seepage history or present day standing water on the protected side stability berm during drought. Not enough geological work has been done to understand the hydraulic characteristics and behavior of the levee or basement soils too know if the design is sufficient for the circumstances.

Summary Analysis: Comparisons of computer modeling of hydraulic situations for standing water scenario (9.5 feet of water standing on the flood side) and a fully involved scenario with 13.5 feet of water (the full levee height) have not yet simulated or defined the prolific seepage observed during dry seasons of the year.

Therefore, although water has been seeping for more than ten years before current construction loading, compaction water may now become an additional, minor, factor. New ideas about compaction dewatering explaining the wet spots observed on the otherwise dry and shrinkage cracked berm have not yet acquired any basis in computer modeled simulations to distinguish them from prior seepage, especially as to any porosity or permeability trends facilitating an avenue of approach for this observed water. Finally, new compaction water does not appear to be enough, without more, to account for the robust, long time, seepage occurring year round.

Omitting to use resistivity and seismic methods in tandem means current geophysics surveys are insufficient to understand any geophysical contrast between dry and wet lift layers due to dewatering or ongoing seeping.

Recommendation: Obtain over the entire project right of way, a locally detailed geologic interpretation to define the relationship of buried sand(s) under the levee and the behavior of the levee fill as a hydraulic system overlying indigenous inter-distributary deposits of the St. Bernard Delta Lobe of the Mississippi River.

Using electrical resistivity and seismic survey techniques as part of the geology mapping effort will bring the full power, of jointly using both surveys (to distinguish wet layers), to bear on this analysis.

Also, place automated instruments to provide continuous digital records of moisture levels. Use this data in computer simulation efforts to understand and define the physical process moving water to the protected side stability berm.

Finally, develop computer models simulating the conditions observed in the field and provide an explanation of what is going on hydraulically to explain how this seepage will affect levee operations, maintenance and safety. Analyze computer simulations to determine if design modifications will improve levee performance.

Contemporaneous Observations Considered Before Reaching This Recommendation

Note about Orleans Village levee reach trenches: This levee reach has a more than ten year history of seepage concerns so it may become problematic for a few members of the Tiger Team to have stated observations (during a dry season) there are no stability, under seepage, through

seepage and compaction concerns at each trench. (These comments were recorded by the contractor's sound and video recording equipment.)

On **October 26, 2011**, the team moved to investigate a dry, shrinkage cracked, site with a geophysical response in the vicinity of a seep and standing water. Under present dry conditions, a seep is currently active and was investigated by the Tiger Team at latitude North 29 degrees, 52 minutes, 16.8 seconds and longitude West 90 degrees, 07 minutes, 14.7 seconds as measured by Merritt.

Notwithstanding virtually identical Tiger Team comments at each pit (i.e. that there is no evidence of through seepage or under seepage), there is a more than ten year history of seepage noted by SLFPA-W, or predecessor agencies, on this levee reach.

The area is dry with prominent shrinkage cracks, but at the seep (on the protected side berm) the only green vegetation and standing puddles of water on the entire levee construction site can be seen. It must be obvious the water is not running uphill to the puddles on the stability berm from the canal to the North. Water must either come through the site from the swamp to the South or have been imported as overly wet material. This imported moisture may now be provided by compaction of levee material (placed while the clay was wet) between swamp and the seep.

After a few moments delay, Merritt returned (from explaining how samples were to be taken by SLFPA-W's crew) only to find the Tiger Team omitting to trench at the seeping stability berm and proceeding to another location. Mr. Eddy Templeton advises there is no relation of the geophysical measurements to the seep and that is the reason some members want to skip this site. It is 3:33 pm and the nearest surveyor stake shows station marker 144 as Tiger Team abandons location without even kicking a dirt clod.

The only basis for the view there is no relationship between the geophysical anomaly and the seep noted is they do not appear to coincide physically (they are a few yards apart). If this "puddling" is caused by seepage, it still makes sense to seek new more detailed data and test the relationship of the geophysical response detected to see if it is related to physical or geological circumstances explaining the presence of water, whatever the reason.

At about 3:45 PM began digging at station marker 136+07 on geophysical anomaly #24. Trench located 18 feet off centerline on flood side. One (1) piece of 1" diameter, and 30" long, objectionable material (was) seen during excavation. Here, it was thought, a six inch layer of River Birch material was upon 3 feet of old degraded levee material. Degraded and re-used levee material was anecdotally noted by some observers as having a powdered white coating on the clay, possibly, they speculated, either shells crushed to powder or salts, (or first to evaporate products, of an evaporite series). If the latter is the case, this is evidence moisture moved (at least by wicking moisture from a wetter area to a drier area). The iron stains on the fine sand found in the area may be another indicator, because hydraulic characteristics favoring movement of moisture (seeping) imply the presence of enough permeability and porosity to provide an avenue of approach for oxygen to permit the oxidation process to go on rotting wood or rusting iron in the sand.

Friday **October 28, 2011** Mr. Merritt approached Tiger Team Project Leader Mr. Conroy (who is from St. Louis). Discussion ensued. After a brief review of how the Cards forced game seven (7) of the World Series, Mr. Merritt discussed improving the excavation method with Mr.

Conroy. Also, Mr. Merritt made a point of noting deteriorating weather and the Army plan to stand down at noon today until either Nov. 2nd or Nov. 7th (2011).

From a geologic point of view, the seeping investigation site passed by for trenching must be completed before any rain occurs while standing down. At the present time, the entire surface of the levee right of way is very dry with shrinkage cracks about ½ inch wide and, possibly, 14 inches deep. This is an ideal time to examine a notorious section, from Orleans Village to the Westminister Pump Station, with a more than 10 year history of seeping. Any moisture would be easy to detect now, under dry conditions, and not go unnoticed in or after the rain.

Furthermore, yesterday (Thursday), several offers were made by SLFPA-W to simply bore 4 feet with a post-hole digger SLFPA-W brought along, in order to quickly see and study samples of the linearly aligned geophysical anomaly in the seepage area. However, no holes were drilled or samples taken.

Friday, **October 28, 2011** at Trench 15 on geophysical anomaly 25 at 144 + 46 offset on the protected side 118 feet. On the way to this trench site, Mr. Conroy tells Mr. Merritt: He believes there is no seepage problem here, only compaction water is being expelled as the levee settles under the weight of new construction.

Wednesday 11/2/2011

At 8:12 AM, operator #2 began digging a trench at 40+51 about 38' off of the flood side where big wood pieces were found. The trench was 67" deep. About 18" up from the trench floor a soft, light gray, "medium stiff" clay layer was noted on the sides of the trench and tested about 800# more or less. The trench was soft, un-compacted, gray clay throughout. From 2' to 3' deep, noted clay with iron stain. The Tiger Team should determine if this indicates seepage.

Reserved Comment #8

Operations and Maintenance Issues

Opinion: Poorly compacted or irregular levee slopes (due to omitting to follow Tiger Team trench refilling intention), together with an abundance of point source (conductive technique geophysical survey) anomalies and observed debris protruding from the levee (indicating the robust presence of debris in the embankment) raise great concerns about operations and maintenance costs of this levee being excessive and compromising safety of maintenance workers. Presence of debris will also make it more difficult to set anchors for turf armoring planned to complete the project because buried debris will block and refuse attempts to drive anchors to hold the turf mats in place.

Summary Analysis: The high correlation between geophysical survey anomalies and metal, concrete and wood debris found during trenching gives one pause when looking at the hundreds of anomalies identified within 5 feet of the construction surface. For example, debris was so prolific that attempts to complete one of a few bulk samples had to move to another location and begin digging anew when the sample attempt encountered large debris halting the effort.

All this debris poses a serious safety and operations and maintenance concerns due to the cyclical shrinking and swelling of alternately wet and dry clay, throughout the seasons of the year. These seasonal changes in moisture content will allow material to "work out" of the clay. This emerging debris process will become an ongoing mowing obstacle.

Also, the:

(1) poor job of rolling clay back in to fill the trenches (thereby creating irregular contours on the levee crown and levee slope) and
(2) use of debris filled "clean clay" ***(sic)***, (to refill the trenches)

have introduced even more difficulty, more potential obstacles to mowing and provided additional challenges to future efforts to maintain or armor the levees. (Having debris present in such abundance will make it difficult to set anchors for turf armoring planned at the conclusion of the project.)

Recommendation: Using the existing geophysical survey, every anomaly shown as a target, no matter how deeply buried now, should be located, or, if not found or recognized, sought by over-excavating by another 3 feet.

Excavation and interpretation should account for broad, non-point source anomalies to exclude seepage or contrast between wet and dry lift layers and compaction issues as a source of areal anomalies.

After all currently known debris is cleaned out, a new geophysical survey, using a resistive method, should be obtained to compare with the conductive geophysical method survey (howing all the anomalies representing incorporated debris) as a quality control check on the debris removal.

Also, New Orleans District should:

(1) evaluate and correct all trenches (none were properly benched in before October 26, 2011),
(2) check and correct all stability berm trenches (still waiting to be benched properly) and
(3) re-check all slope and crown trenches supplied with objectionable material in the new "clean clay" ***(sic)*** fill.

Follow up tests of compaction of trenches should be made and none left with less than 1700 psf unconfined compressive strength or equivalent to adjacent clays, whichever is higher.

Contemporaneous Observations Considered Before Reaching This Recommendation

On **October 27, 2011** at 7:40 am at 121 + 46 off the protected side 15 feet, we put the bucket to work. In the first passes (0-6" layer), found one piece of objectionable sized wood material and the metal hook off of a construction crane. Mr. Miserendino visited the site soon after and all of the SLFPA-W representatives on the trenching site agreed, striking this large and heavy metal equipment could have killed someone as mower blades disintegrated into flying shrapnel.

On **October 27, 2011**, moved to next position, Station 108+18 offset 60 feet on the protected side. The original elevation was +7.6 feet, but top of trench is +5.0 feet. Began trenching at 11:13 AM and encountered (heard) frequent shows of (hard to see) wood in the first 1.5 feet. Found objectionable material from 0-6 inches in west side of trench and more objectionable material protruding from the east trench wall.

Day 6 Summary Tuesday 11/1/2011

At 8:03 AM, visited trench at station 174 on the centerline of the levee and found it has been "rolled in", but it appears the surface to be planted to grass and mowed is irregular and too rough, especially on the flood side flank at the crown. Here, the appearance suggests clay material was pushed into the trench with a bulldozer and only the top layer was rolled in. As a result, it will be more susceptible to scouring and storm surge impacts and this will be a tough area to maintain safely and properly.

At 8:20 am saw the trench on the protected side flank near station 165 + 08. Again noted holes and an irregular surface, too rough to mow and maintain easily. Same safety and scour concerns.

Driving west on the crown at 10:15 AM, saw firewood in the way and photographed debris and near cobble sized rocks. Got out and looked around on the flood side near station 15+5. It is easy to find pieces of wood and debris that have never been picked and will be obstacles to mowing.

Near Westwego Pump Station at 10:22 AM, on another area declared a concern by SLFPA-W, Mr. Forrester notices the area has been cleared of some surface litter and is cleaner now. Still, unworthy materials (obstacles unwelcome in a mowing field) remain, such as two (2) foot square steel plate at station 0 on the protected side slope. The non-federal sponsor considers these large and hard items imminently dangerous to life and health since they could shatter mowing blades or the mowing deck and will hurl shrapnel off the levee right of way as they disintegrate.

At 12:57 PM at station 70, the samples are loaded and transported as SLFPA-W crew moves to new location. At this location there is a 12 yard long linear crack trend on the protected side berm at station 70+20 that is similar to a much longer and wider crack (5" wide, 38" deep and ¼ mile long) noticed downstream of Huey P. Long Bridge during a recent high water event). The appearance of this similar but much smaller crack is also greatly different from ordinary shrinkage cracks and seems to support one of the explanations for the Huey P. Long river levee cracks i.e. that they are an artifact of construction.

Whatever their origin, cracks of this type (in linearly aligned lineaments) on the levee are a serious concern during high water events because they have separated (no uniform soil cohesion locally) and will inject rain or overtopping waters deeper in the lift layers than would otherwise be possible. Injecting water deeply into lift layers further weakens the strength of the clay in the levee.

11-4-11

Continued inspection westward along levee before dark and found objectionable material in new, so called "clean clay" brought to refill trenches on the western part of the levee reach. While still on the levee Mr. Merritt phones Mr. Conroy to inform him the new trench fill looks worse than the excavated material it is brought in to replace. Each SLFPA-W crew member fills a sand bag with trash from the "clean clay" ***(sic)*** to prevent the new, imported, debris from being bulldozed into the levee when the trenches are re-filled.

Reserved Comment #9

Significance of Shells

Opinion: The presence of ***Rangia*** is a useful marker for organic clays most prone to excessive settlement when present as a basement soil or weak strength when placed as a building material.

Summary Analysis: The best specimen of the most common shells found by the Tiger Team is ***Rangia***. This animal is also known as the ***cocktail clam*** and has a triangular or wedge shaped shell adapted for burrowing in a muddy, near coastal substrate having fluctuating brackish water of salinities less than 10 parts per thousand.

Therefore, the presence of this animal is a ***defacto*** marker in native soils for organic clays deposited in deltaic deposits in coastal swamps or marshes between point bar trends of distributary channels proceeding southward, through the levee right of way area, to the coast of the Gulf of Mexico.

Recommendation: This fauna has a very specific environmental niche and its presence in underlying soil is likely to be a warning to provide design accommodations for excessive levee settlement rates. The presence of the shell in imported fill is equally diagnostic about soil types in the clay quarry. In existing levee material inferences may be made about soil chemistry processes and help explain sample characteristics (i.e. white coatings on clay related to seepage).

Contemporaneous Observations Considered Before Reaching This Recommendation

October 27, 2011: Moved to next position, Station 108+18 offset 60 feet on the protected side. The original elevation was +7.6 feet, but top of trench is +5.0 feet. Upper 1.5 feet, light gray changing to a deeper tan to light brown (and leaner) clay. Mr. Eddie Templeton found and showed me a prize mollusk shell (bivalve specimen) from the 18 inch to 27 inch deep layer.

Thursday 11/3/2011

At 5:05 pm began digging at station 01+41 at 21' off the centerline on the flood side of the levee. Mr. Eddie Templeton inquired again about shells, noting they were cupped and not flat wondering if they were re-deposited from the Oligocene. Mr. Merritt will endeavor to find out.

Summary of field experience and study of the shell provided by Mr. Templeton:

During the recent trenching of the levee filled with assorted debris near the Westminister Pump Station near the Westwego City Limits at Marrero, Louisiana, shells were frequently noticed in material thought to be old levee degrade material reused in this project to raise the tropical storm surge defenses to 100 year level protection.

In looking over the specimen, it is obviously a member of the animal kingdom. It is in the Mollusca phylum (a group of animals such as snails, squids and oysters) and the Bivalvia class.

I note no ribs seem apparent on the shell, but concentric growth rings are obvious. Also, the anterior adductor muscle scar is far more prominent than the Posterior adductor muscle scar. The wedge shaped shell suggests burrowing indicating the animal lived on a muddy substrate in

a coastal environment and the overall rounded white or cream colored shell suggests a local (Gulf of Mexico) species.

Any errors or misunderstandings about the shell are my own, but I have inquired of and been assisted by:

Dr. Chacko John, State Geologist of Lousiana and Director of the Louisiana Geological Survey,

Dr. Carol Wicks, Chair and Frank W. and Patricia Harrison Family Professor of the Department of Geology and Geophysics in the College of Science at Louisiana State University and

by one of the best experts in the world on this type of fossil, Dr. Laurie C. Anderson, Department Head and Professor in the Geology and Geological Engineering Department at the South Dakota School of Mines and Technology and Director of the Museum of Geology.

Dr. Anderson has determined this subject is of the genus ***Rangia***. I am deeply appreciative of everyone's assistance in responding to the Tiger Team with this helpful information.

With this authoritative identification, the Tiger Team can easily locate additional information about this fossil since it appears in the Audubon Society Field Guide to North American Fossils in a photograph on page 132 and a narrative printed on page 485. This authoritative reference describes ***Rangia*** as a post Miocene animal with a thick shell (having a triangular outline) that prefers estuarine environments with low, or fluctuating, salinities.

Also, there is information available on the internet, at the website of the University of California Museum of Paleontology, showing this animal is in a group of Mollusca characterized by a head, a foot and an exoskeleton. A further sub category according to the Museum, and as I noted at the outset, is Bivalvia (scallops, clams, mussels and other sediment burrowers).

Another good source of information is the Maryland Department of the Environment where a particular brackish clam they call ***Rangia Cuneata***, has been considered an invasive species since it was discovered in the Potomac River in 1960. Their information confirms my view it is a brackish water dweller and their figures show it prefers low salinities such as less than 10 parts per thousand. They also note it is a filter feeding animal that seeks fresh water.

This is the basis for my working idea it is far more likely these individuals, if present in situ, indicate backwater swamp organic clays in an environment of deposition inland from the salinity of waters at the coast in interior (but still tidally influenced) swamps between point bar trends of the deltaic distributary channels and point bar trends. Therefore, they mark the most organic clay soils likely to have an accelerated settlement rate beneath the levee. These individuals are also interesting as an indicator of provenance of some of the levee fill material that apparently had been used in the levee some time earlier and is still in place.

I am still working out which layer of source material this animal's shell was in and also considering the surface deposits recently mapped by the LGS in 2010. Significantly, the SLFPA-W and its predecessor in charge of this levee, the West Jefferson Levee District, have

never used shells for levee roads or related construction. The only explanation for a shell in or below the material placed by the contractor in this phase 2 project is that the animal originally lived here and was in place as part of local canal material used in the first attempt to raise a levee or was imported from a nearby clay pit in building material used subsequently. In brief, there appear to be only four possible sources to explain the presence of this bivalve:

(1) ***in situ*** material raised in place in the original "developer levee" or successor levee rebuild and obtained by degrading this levee and recycling clay;
(2) clay taken from the River Birch landfill clay quarry (of similar geological provenance),
(3) recycled material from reworking a nearby levee project in Orleans Village or
(4) clay mined at the Willow Bend clay quarry at Donaldsonville (also a similar environment of deposition).

All these possibilities appear to place the source of the levee fill material in the Saint Bernard Deltaic deposits mapped by the Louisiana Geological survey in 2010.

Reserved Comment #10

Geophysics

Opinion: Geophysical surveys provided to the Tiger Team were inadequate for the intended task of locating objectionable wood or the new task, arising during trenching, of locating unhealthy (weak) clay layers in or beneath the current contractor's work.

Much geophysical survey work remains to be done to advise efforts to repair this project. This future work should include using geophysical methods that complement each other, such as, electrical resistivity and seismic techniques. Seismic shear wave velocity analysis should also be analyzed to identify unhealthy levee sections as demonstrated by prior research on comparable levees in the area.

Summary Analysis: Of the two most widely used and advantageous geophysical methods used in construction projects (electrical resistivity and seismic refraction techniques), the two methods selected and used for this project are neither one.

The choices of geophysical methods provided to the Tiger Team appeared to be limited by a narrow view: wood should be directly detected, found, objectively measured and shown not to affect performance. This removed at the outset, the hoped for possibility of a geophysical method more likely to objectively evaluate levee viability issues.

The choice of ground penetrating radar (GPR), (useless in wet clay), is indefensible and the GPR survey was abandoned almost as soon as it began.

The conductive survey found plentiful debris targets. In hindsight, wood violating the clay specification was not readily found by either geophysics survey but was found by sinking a shovel where the inspectors saw wood during inspections. However, the conductivity method did identify inferred metallic targets and resistive material (suit case sized concrete blocks) when digging on these anomalies.

In addition to poor choices in the geophysics programs obtained and forwarded to the Tiger Team, there is also inconsistency in the Tiger Team's approach and method in using geophysics. For example, when subjective enforcement of the clay specification is obtained, initial perceptions wood may be of an objectionable size are criticized by saying subsequent lab analysis of wood volumes compared to trench volumes shows there was no violation of the specification. In other words, a subjective view too much debris was going in the levee was rebutted by an objective measure the debris was "within specifications".

Ironically, the opposite is true with the geophysics aspect of the trenching program because, objective debris targets or broad anomalies were passed over and dismissed subjectively by having the Tiger Team stroll across a geophysical anomaly on the levee, without even a metal detector. Later, the Tiger Team would write down and report, with no objective post-mortem analysis or inquiry at all, the anomalous geophysical response was "investigated" by the team when no one measured its electro-magnetic signature or ran an auger or even put a shovel in it to see what was providing the response measured in the geophysical survey.

Recommendation: Two new geophysical surveys should be scheduled. First, and at once, run a seismic shear wave velocity survey to continuously profile the levee right of way between design borings to detect unhealthy (weak) areas within the levee. Directly acquiring seismic data

and measuring transit times of shear waves in the levee and underlying mappable units can be used to make inferences or interpretations about:

(1) unhealthy (weak) spots in the levee,
(2) broad contrasts in geophysical data (for example, does a wet lift layer in a dry section present as an anomaly to inform work on seepage concerns) and
(3) the stability of the levee (including survivability in the event of an earthquake).

Next, both versions of the anomaly map at hand, the early version (distinguishing eight classes of targets) and the later version (noting six classes of geophysical targets) should be used to aggressively root out debris causing these responses before the resistive method is run to (1) complement the seismic program, (2) check for wet lift layers and (3) as a check on the effectiveness of the debris detection and removal.

Future geophysical interpretations must be informed beforehand by the source of clay in the lift charts and trench data to resolve whether or not non-point source responses are measuring conditions affecting stability or seepage (such as the contrast between a dry and wet clay layer in the levee).

Contemporaneous Observations Considered Before Reaching This Recommendation

On **October 25, 2011** at Trench 174 at the centerline of the levee: …pointed out 10 of the 29 trenches planned in this "Phase 1" were in presumably clean areas outside SLFPA-W areas of concern. Perhaps…it's best the remaining 23 trenches requested by SLFPA-W are reserved for Phase 2 trenching guided by a new, more suitable and effective geophysics method selected by the Tiger Team.

On **October 26, 2011** at 172 + 08 off the protected side 60 feet: Saw visual evidence of wood consisting of gouges in clay of pit floor caused by wood debris tangled and dragging as bucket moved and heard wood breaking from 2.5 feet deep to 3.2 feet deep when the bucket hit a shopping cart. The shopping cart was the only metal found that could account for the geophysical survey target. Discussion ensued. Merritt and Mr. Conroy discuss the metal target and discover no one recalls the geophysical anomaly. Merritt brings out a copy of the maps sent by the Tiger Team to SLFPA-W (and placed before the commissioners at the Monday, October 24, 2011 regular meeting). This map shows the target at this location was an ***"inferred conductive target below 2.5 feet"***—a scientific triumph to be shown to Commissioner Morgan who thinks geophysics is witchcraft. Another brick was exposed.

On **October 26, 2011**, between stations 130 and 145: The Tiger Team moved to investigate a site on a geophysical response in the vicinity of a seep with standing water when there are shrinkage cracks all about. Mr. Eddy Templeton advises there is no relation of the geophysical measurements to the seep and that is the reason some members want to skip this site. The only basis for the view there is no relationship between geophysical anomaly and the seep noted is they do not appear to coincide at the surface (they are a few yards apart). If this "puddling" is caused by seepage, it still makes sense to test the relationship of the geophysical response detected to see if it is related to the presence of subsurface water, or other reason.

At about 3:45 PM began digging at station marker 136+07 on geophysical anomaly #24. Trench is located 18 feet off centerline on flood side. Degraded and re-used levee material was anecdotally noted by some observers as having a powdered white coating on the clay. Possibly,

they speculated, caused either by shells crushed to powder or salts, (or first to evaporate products, of an evaporite series).

On **October 26, 2011** at 136 + 07 off the flood side 18 feet: No explanation is apparent for the geophysics anomaly. Mr. Merritt tells Tiger Team: "In the outfield (at station marker 180 off centerline on the protected side 187.5') records showed 4 ½ feet of clay present but we only found 3 feet. Here we can't find the boundary between layers, nor understand the geophysical response. Is the anomaly occurring for scientific reasons or is it due to lapses in record keeping on lift charts? Until a written plan is provided the only documentation of the guidance for picking these locations being trenched consists of Merritt's annotated copy of Mr. Conroy's copy of the geophysical target maps. For example, the trench at 179 +80 on the Center Line (CL) was picked based on a cross section view of thickness and type of clay material from various sources. It will be difficult to evaluate the geophysical data if variables in the scientific process cannot be controlled.

Summarizing field experiences of **October 26, 2011**

The trench at 180 off on the protected side about 187 feet from the center line, was intended to investigate a geophysical anomaly four feet deep in material from the River Birch quarry.

The trench at 174 on the center line (CL) was intended to investigate an area of concern to SLFPA-W by digging on a geophysical anomaly and give good coverage to support an evaluation of this levee reach.

The trench at 172 + 08 off on the PS about 55 feet was to target a geophysics anomaly.

On **October 27, 2011** at 7:40 am at 121 + 46 off the protected side 15 feet: We put the bucket to work and in the first passes (0-6" layer), found one piece of objectionable material and the metal hook off of a construction crane. This was believed to be the shallow, geophysics target shown on the geophysical survey.

At 9:20 AM, set up trench #9 to test geophysical anomaly #22 at station 120+39 offset 63 feet on the protected side. From 1 foot to 1.5 feet saw and heard wood and found brick. Between 2 and 2 ½ feet saw objectionable size wood and saw 2 firewood sized pieces at 3 feet. Saw clay with brick colored dust or iron stain and found dark gray cobble, possibly limestone. Pit bottomed at 4 feet with much crunching noise, probably shells.

On **October 27, 2011** at 120 + 39 off the protected side 63 feet: Mr. Conroy showed Mr. Merritt clay with what appeared to be an iron stained, very fine, sand layer. Geophysics survey showed abundant "conductive" and "inferred metallic" targets in trench area.

On **October 27, 2011** about 1:30 PM, set up on station marker 104+51 offset 149 feet on the protected side: Other Tiger Team members reported finding a metal plate smaller than a stenographer's note pad. This trench was dug on a shallow, zero to 2.5 foot deep geophysical anomaly, and after finding metal, the team decided to continue to a depth of 4 feet.

On **October 27, 2011** at 2:30 PM, began trench #12 on geophysical anomaly #18: Location is station marker 97+00 on the centerline at elevation +13.6 feet. Originally, ground elevation here had been 4.6 feet. Shells and slick clay were found in presumed River Birch source material. From 1 foot to 1.5 feet on the south or flood side of the trench, saw wood, heard debris noise and saw a brick and rock amid dry material with some small wood. Noted white dusting or "rind" on

some clay pieces. At 3 feet deep a stone was found, presumably in old levee material. Mr. Jas believes, dry, old levee material was probably providing the geophysical response.

On **October 27, 2011** Tiger Team moved to geophysical anomaly #16: This is an inferred resistive target 2.5 to 5 feet deep at station marker 70+00 on the centerline. This was to commence at 4:04 PM at elevation +13.5 feet (original ground elevation 5.0 feet).

On **October 27, 2011** at 4:55 PM on the centerline: Began a trench at station marker 66+88 and elevation 13.5. Original ground elevation here was 4.6 feet. Saw wood at 6 inches, saw concrete at 12 inches and heard noise of wood breaking at 1.5 feet before tracked excavator reared up a little on a "hard bite" in very dry material bringing up ½ inch diameter wooden material. At 2.5 to 3 feet saw wood and heard wood as clay was slick, dark brown and gray. Mr. Jas called it "CH material" meaning it was inorganic and highly plastic clay. The USACE called the material "near optimum high quality material, …like the Bonne Carre Spillway and looks like it too". It is very hard to make fingernail penetration in the clay found 10 inches above the trench bottom and the penetrometer reading showed 3800 pounds per square foot. This trench (#14) (aka 66 + 88 CL) was the last today (October 27, 2011) and was placed here to target geophysical anomaly #15.

Friday **October 28, 2011** arrived at Trench 15 on geophysical anomaly 25. Station marker 144+46 ***(sic)*** offset 118 feet on the protected side. Original elevation was 2.8 feet but new berm raises level to 5.5 feet. On the way to this trench site, Mr. Conroy tells Mr. Merritt:

(1) This geophysical anomaly, (the Tiger Team wanted to investigate as it related to seepage), had just been said by the geophysics vendor to be an error.
(2) Merritt went on to critique the USACE geophysical study methods and results, especially the geophysical expert's message delivered enroute to this trench that geophysical contractor now considers the long and prominent geophysical contrast about to be trenched: "…a mistake".
(3) Mr. Merritt continued by noting that at first, the Tiger Team was told there was an interpretation with eight (8) classes of anomalies that needed to have some of the anomalies trenched to reprocess the data and improve interpretation. However, this first generation data was only seen by Mr. Merritt during this Phase 1 trenching when someone in the gallery of four or five dozen people following the Tiger Team was seen referring to a copy. (Mr. Merritt requested a copy, and is still checking to see if it has come.) Mr. Merritt also said: "We were supposed to use geophysics to target where the trenches would go but many were dug either with no geophysics or with raw data. Finally, "version 2.0" is ready and was used to pick some of these 29 locations (Phase I)." The gist of Mr. Merritt's extended comments was, so far, the Tiger Team has dug on an anomaly at the edge of the survey (where complete data recording was blocked by the Pump Station) resulting in obviously meaningless or unreliable geophysical results while, on the contrary, when data was thought to be worth investigating, the USACE refused to even consent to the use of a post hole digger the non-federal sponsors brought along, let alone excavate a trench on a prominent geophysical response here! When we do trench here, the Tiger Team is told it will be an "empty act" because this data is an error! How many other trench sites are staked on "data errors" and will there be a version 3.0 geophysical interpretation?

Began digging at 7:59 AM and trenched rapidly. Clay seemed either lean or dry as it curled up when being scraped away. Excavating from 1.5 to 2 feet exposed drier more crumbly material. At 2 feet deep began to see slicker clay surfaces in trench. Below 3 feet, clay was very slick and this was said to be fill.

Friday, October 28, 2011

Rain lets up, Tiger Team returns to project field office parking lot and walks to investigate two (2) more "blue" geophysical anomaly sites (on either side of a road entering the grounds of the old Westwego Seaplane Airport). Rain begins to fall steadily at 9:40 AM.

Here, the geophysics survey anomaly map shows a "shotgun" pattern of responses on the old littered "vacant lot" levee. The SLFPA-W areas of concern on the last east west levee reach (ending at the New Westwego Pump Station) will be taken up when Tiger Team returns to the field.

November 1, 2011

…trench at station 141+46 off on the protected side 118 feet (out on the stability berm). This trench was dug on a broad geophysical anomaly, later called "a mistake." Originally this trench targeted an active seep providing standing puddles of water on an otherwise dry and shrinkage cracked clay berm together with a broad anomaly detected during the geophysical survey.

Wednesday 11/2/2011

Mr. Jas did not want too much importance attached to geophysical targeting. Mr. Merritt disagreed and noted the Tiger Team had used geophysics to select most of its targets. Mr. Merritt also suggests moving to flood side targets. Mr. Conroy calls this "a good suggestion."

Thursday 11/3/2011

Return to trench at station 21+95 centerline at 8:00 AM. Apparently the contractor has added from ½ foot to 2 feet of fill from the Willow Bend Clay Quarry in the area since the geophysical survey was taken in the station 0 to 5 area. Mr. Conroy suggests moving downslope to sample River Birch (source) material without having to dig in the extra fill. Mr. Merritt concurs. Flood side targets may be roots. Rather than dig more un-compacted material the Tiger Team moves east. Geophysical target measured at 5' now may be at 8' and was not reached, although an 8"x10" piece of concrete was found. Mr. Conroy suggests adjusting the location to seek the geophysical anomaly at less depth on the protected side slope.

About 3:13 pm at station marker 04+42 at 34' off the center line on the protected side: Uncovered an old settlement plate (probably the geophysical anomaly) at the base of the levee slope. At 6" to 12" found abundant, nearly objectionable size wood, together with sand and broken glass. Abundant shells were noted at 24" to 30" overlying a rotting mass of wood with objectionable size material.

Reserved Comment #11

Objectionable Material

Opinion: The Tiger Team was told this levee was built by implementing the USACE clay specification subjectively to follow the "spirit" of the specification (if you see debris, pick it up). Nevertheless, vast amounts of wood and other unworthy items were incorporated into the levee during construction.

Objectively implementing the USACE clay specification during this review meant the Tiger Team had to look among the clay during trenching and send this wood to a laboratory to precisely determine the wood volumes found, to see if the volume of wood violated the "letter" of the clay specification by exceeding 1% by volume. Although few instances of violating the 1% limit were documented, this finding should not be a basis for suggesting all the trashy material be allowed to remain in the levee since it "met USACE specifications for clay".

The presence of prolific amounts of debris proves the contractor failed at efforts to subjectively implement the USACE clay specification to improve the quality of clay in the levee. The proposition the debris may remain since it is within specification for suitable clay material shows the failure of the USACE clay specification to obtain meaningful outcomes when implemented objectively.

This double dereliction demonstrates the inadequacy of the USACE specification for clay as a means for defining proper building material for future construction. New specifications and substantial revision of current specifications are urgently necessary.

Summary Analysis: Previously, the Tiger Team has spent a lot of time discussing how to apply the specification for clay to evaluate the suitability of this levee. Since the levee is built one lift at a time and without lab critique about whether the 1% volume guideline is violated or not, the construction oversight is subjective (if you see debris, pick it up).

Presently, the Tiger Team is in the position of using objective, laboratory, methods to determine if wood pieces subjectively appearing out of compliance with the USACE clay specification (should have been removed already) remained in the levee and how many of these wood pieces can now be shown by objective lab means to be within USACE clay specification tolerances after all (they can stay).

Belatedly using objective lab tests now, (of the actual volume of a piece of wood that should not be there), to force the issue the levee will perform and the material meets specifications, (when a good and prudent contractor would have removed the debris as a point of professional pride and good workmanship), is inconsistent and allows the clay specification to provide different results when it is applied to the same circumstances at different times. There are two obvious conclusions to draw from this:

(1) The permissible volume of wood in the USACE specification for clay is so inordinately high as to render the USACE specification for clay completely unusable when judged by outcomes of this project compared to peer projects holding to a good and workmanlike standard and
(2) The discovery of even a single piece of wood (that by itself condemns a cubic yard of clay) indicts the entire plan, process and procedure for assuring the quality of material is suitable for the project. (Finding one cubic yard out of compliance means any

cubic yard of clay could be, and more than one cubic yard of clay in the project is, also out of compliance because of a break down in control of the construction process during building.)

Recommendation: Provide a new specification for clay, with drastically reduced wood volume percentage, based on sensitivity analysis of trench data to show what new, objective, standard wood percentage by volume would have removed a preponderance of the wood actually present in this levee.

Define key terms in clay specification, if they remain at all, so the USACE clay specification will no longer be vague. Provide these definitions in the language of the specification by parenthetically explaining each ambiguous term the first time it is used.

Mandatory use of debris screening equipment as part of the clay pit certification and conditioning approvals. For example, mandate the use of debris screening clay loading equipment when inspectors first note problems with debris in building materials or whenever a trench is opened without discarding shallow, or debris laden, layers of clay in the quarry.

Make clay source pit authorizations conditional with a duty and the power to revoke the permit and approval of an owner's clay pit when it is known, or there is a reason to know, out of spec material has been provided to a levee.

Better and obligatory documentation in the QA and QC protocols of USACE inspectors and contractors for any issue previously noted to provide closure by either tracking it as an unresolved suspense item or stating the resolution of the matter in a later report to create a paper trail proving concerns are being documented, tracked and resolved as the project goes along.

Provide a new, obstacle to mowing, specification:

(1) requiring a geophysical survey (the metal detector rule) and
(2) not allowing the project to be completed, and the contractor released, until all metal, concrete debris of any size and wood large enough to damage mowing equipment is not in ordinary view and all surveyed geophysical anomalies or targets are removed to a depth of 3 feet.

Contemporaneous Observations Considered Before Reaching This Recommendation

October 31, 2011 Visit trench 120+39 off protected side 63 feet and studied second attempt in excavation by USACE lab techs trying to retrieve bulk sample. Bulk sampling is a carefully measured removal of (2 cubic feet) of material, instead of the usual dainty portions of samples run through a soil lab. Bulk samples are being collected by the Tiger Team because there is concern here material of objectionable size (that did not meet USACE specification for clay) was battered with heavy equipment until wood debris broke into smaller pieces (about which the USACE specification was silent) and was abandoned in place. The bulk (larger than usual) lab samples are intended to quantify the amount of this small wood or organic material in the levee clay.

Here, efforts (to dig enough sample from a hole about 2 feet square to test the small wood content) were confounded by hitting firewood sized pieces, causing technicians to move over and start digging anew elsewhere in the trench to get a bulk sample of small wood only.

November 1, 2011

At 9:35 AM near the intersection of the power line right-of-way crossing Lapalco Boulevard and the levee, found a large rock on the levee crown. Continued west on the levee towards the New Westwego Pump Station and station 46. This is the area on the flood side where, in October, 2010, a bulldozer had forced SLFPA-W inspectors taking photographs and video recordings of debris, to repeatedly move aside (as the bulldozer came closer and covered up the debris and objectionable material being photographed). Photographed an unpicked rock on the levee's flood side berm. At approximately station 49, found an unpicked 1 inch diameter 10 inch long piece of white PVC pipe.

At 9:48 AM, on the flood side stability berm alongside station 40, photographed wood. Off the levee right of way, further south, the road to the now closed Westwego Dump is blocked by a fallen tree. We are unable to proceed away from the levee, southward, to investigate the dump site.

At about 10:03 AM along station 34+80, found two pieces of firewood on the levee berm and noted a USACE employee, (who has been following us all morning), is still tagging along. At station 26, Mr. Forrester calls Mr. Merritt's attention to an extra layer of about 6" of clay on the crown of the levee. Also found another piece of PVC pipe, twisted fabric protruding from the ground on the flood side levee slope and objectionable wood.

November 1, 2011

Thursday 11/3/2011 at 21 + 95 on the centerline of the levee, an 8"x10" piece of concrete was found on the surface.

November 4, 2011 1 + 39 - 8:34 AM

On arrival at 71 + 39 CL 36, Merritt noted objectionable material was found and retrieved from the 0-in to 6-in. layer. From 18-in. to 24-in. heard and felt a heavy hit, presumably concrete, and found a thick concrete piece 9-in. x 3-in. that may have been larger before it shattered into other pieces smaller than 1.25 in. X 1 in. X 4 in. together with wood (also seen and heard). A piece of objectionable wood 1 ½-in. diameter and 13-in. long was found, in sticky clay, at the bottom of the trench from 30-in. to 36-in. deep.

Mr. Merritt told team members this hole seemed noticeably different, but other team members denied this.

109 + 30 – 9:27 AM

In a Tiger chat, there was a technical discussion of clay moisture content vs. material strength. Merritt states a concern the Tiger Team should endeavor to learn if layers of objectionable debris can be correlated from trench to trench to estimate the size and scope of the problem.

162 + 50 – 11:56 AM

The Tiger Team reconvened at the east (Orleans Village) end of the levee reach. By noon, digging was underway at station marker 162 + 50 on the centerline and encountering visual and audible wood "shows" from top to bottom in a trench deeper than five feet. Objectionable sized wood material was found seven times in several layers including 6" to 12", 24" to 30", 30" to

36”, 36” to 42”, 42” to 48” and 48” to 54”. As excavation continued from 4.5 feet to 5.0-feet in dark gray, woody clay, (believed to be from River Birch pit) when there was a noticeable change in the color to light gray (presumed Willow Birch clay pit product). Digging ended 12:55 PM.

Tiger Team Leader, Mr. Conroy, commented there were several objectionable size and smaller wood pieces in the 5-ft deep trench. Digging began, he opined, in the Willow Bend, passing into 4 ½-ft River Birch, and into Willow Bend again.

Nov 4, 2011, at 154 + 50 off the flood side 12 feet at 2:23pm: The Tiger Team recognized this trench had all River Birch material with the same bad lift layer, with big wood pieces, from 2-ft. to 3-feet deep.

Continued inspection by moving westward along levee before dark. The Tiger Team has now decided upon the plan of discarding or wasting the clay excavated to open the trenches rather than refill the trench with the excavated, and debris laden, fill. This afternoon non-federal sponsor found objectionable material in new, so called “clean clay” brought to refill trenches on the western part of the levee reach. While still on the levee Mr. Merritt phones Mr. Conroy to inform him the new trench fill looks worse than the excavated material it is brought in to replace. Each SLFPA-W crew member quickly fills a sand bag with wood, broken glass, brick, terra cotta and other trash from the “clean clay” ***(sic)*** to prevent this imported debris from being bulldozed into the levee when trenches are re-filled and closed.

Reserved Comment #12

Careless and Inconsistent Construction Project Administration

Opinion: The inattention, carelessness and slack in the construction process (that placed so much debris in the levee) seem to have carried over to other areas as well, particularly project safety.

Summary Analysis: This contractor's vehicles were seen speeding more often than not. Some had missing equipment such as fire extinguishers (a large truck), oil caps (an oil tank trailer) or back up alarms (bull dozer, vibrating roller, etc.). During trenching, there was a near miss collision between a construction vehicle moving at speed and a parked non-federal sponsor pickup.

Although only on the levee a few days when the contractor was operating trenching equipment, Tiger Team members saw evidence of two fuel spills while contractor's construction equipment was being refueled on the levee. One spill may have been large enough to be reportable to environmental authorities. This level of sloppiness raises concerns about the cumulative impact of contractor's refueling habits over the more than one year of construction work and adverse impacts on getting grass to grow where fuel has been spilled. This is especially a problem giving the difficulty of using vegetation as armoring for the levee as the turf for armoring is difficult to establish without watering six times a day and fertilizing, even on unpolluted soil.

Contractor disposed of construction trash in Tiger Team trenches before refilling the trenches.

No signage was posted near two separate locations where high lines cross the levee and one line was downed in a preventable accident caused by carelessness operating the construction company's trenching equipment.

The Tiger Team attended a safety meeting conducted by USACE officials due to a rash of accidents during the final stages of construction projects.

Recommendation: Bond or other indemnification for dealing with environmental matters remediating "legacy" construction pollution discovered during the operating life of the project. Claimable expenses would be incrementally higher operating and maintenance costs (trying to get grass to grow in a spill area) or environmental cleanup processes restoring sites.

Alternatively, USACE would retain responsibility and ownership of discovered or undiscovered project legacy pollution and only return the levee (sans project generated pollution) to the Non Federal Sponsor for operation and maintenance.

Contemporaneous Observations Considered

Before Reaching This Recommendation

Nov 1 2011 3:00PM: Mr. Merritt documents his observation the contractor's (heavy equipment) vibrator has been working all day without a back-up alarm.

<u>Wednesday 11/2/2011</u>

Tiger Team begins movement from station 57+10 to 40+50. Mr. Ronnie and Mr. Merritt are riding SLFPA-W's mule, at modest speed, west along the protected side at 7:48 AM when they

hear and see a commotion. Mr. Ronnie realizes there's an emergency and sounds a loud horn to add to other warnings. Mr. Merritt looks southwest and see's most of the group on the crown of the levee, have turned to face the rising sun and are shouting and waving their arms over their heads to try to get operator #2's attention. Looking southwest from the haul road, Mr. Merritt sees the heavy equipment with bucket raised entangling and pushing an overhead line to the point where it might break. More members of the group on the protected side area are also shouting and waving as they are also trying to flag down operator #2. Realizing if the line broke, Mr. Ronnie would not be in a position to see the line would fall on SLFPA-W's vehicle. Mr. Merritt shouted to Mr. Ronnie to floor the accelerator and go as fast as possible. The line was tearing away from the cable holding it between two poles, when the SLFPA-W vehicle escaped into the clear and the heavy equipment eventually halted with the overhead line draped across it. Mr. Merritt notes the accident appeared to be preventable because the sun was at operator #2's back and the construction company had no warning barriers or signs on the ground, within ordinary view, to remind operator #2 to look up. Apparently, operator #2 was not drug tested as he continued to operate the machine all day.

One week after beginning the 29 phase 1 trenches, on November 2, 2011 . At 3:11 p.m. Mr. Merritt noticed although SLFPA-W machines came out to the job with audible alarms all along, the contractor's all-terrain vehicle and vibrating roller both had newly installed back up alarms that could be heard for the first time.

Thursday 11/3/2011

Mr. Merritt discusses active interference (under the pretext of safety inspections) that is restraining SLFPA-W participation in Tiger Team Activities. Mr. Wagner replied that the USACE contractor can set the time line and is the lead safety officer. USACE is secondary on safety. Mr. Wagner also stated a USACE safety officer was en route. Mr. Merritt suggested the Army safety team look into the contractor's diesel fuel spill on the levee and the overhead line downing. It is explained to Mr. Wagner that after having an accident with a SLFPA-W lawnmower, an employee would be drug tested before being allowed to mow the grass, but, this contractor will let an employee remain as the operator of heavy equipment after an overhead line is brought down.

Nov 4, 2011: Contractor's bulldozer backs up repeatedly to attack and destroy Tiger Team companion samples and hide the evidence of new, but debris laden, fill intended for use closing trenches. Non-federal sponsor notes contractor bull dozer does not have a working backup alarm when it works in the full view and presence of USACE employees.

Nov 4, 2011 154 + 50 off the flood side 12 feet at 2:23pm: Continued inspection westward along levee before dark and found objectionable material in new, so called "clean clay" brought to refill trenches on the western part of the levee reach. While still on the levee Mr. Merritt phones Mr. Conroy to inform him the new trench fill looks worse than the excavated material it is brought in to replace. Each SLFPA-W crew member fills a sand bag with trash from the "clean clay" ***(sic)*** to prevent it being bulldozed into the levee when trenches are filled.

Reserved Comment #13

Grubbing Issues

Opinion: It is a serious failure of construction project management to have left so much un-grubbed material to be encountered by this trenching examination.

Summary Analysis: From a 4 inch diameter metal pipe in place vertically at the existing surface of the ground when the first lift was laid, to the concrete blocks at the original surface the non-federal sponsor mowed around for years before they were covered by the new lift, an apparent, (even if unintentional), violation of the Army specification for grubbing (removing) such items was unchecked. (The concrete sections were too heavy for two people to move in a team lift, and were retrieved after being exhumed during trenching, by the non-federal sponsor using heavy equipment.)

Recommendation: Using the existing geophysical survey, every item, no matter how deeply buried now, should be located and removed. If not found where predicted or recognized, the known debris should be sought by over-excavating another 3 feet (deeper).

Also, every 10 foot square trench where metal or concrete of any size was found should be over excavated another 3 feet deep and benched in to a depth appropriate new perimeter or 30 square foot perimeter, whichever perimeter is larger.

Apparently, neither the clay loading at the quarry or the lift placement operations at the levee attempted to withhold either loading or placing debris from material handled for the project at either end (quarry or levee). As a result, the construction contractor has abundantly incorporated rubbish as a building material in this project. Therefore, all future operations at this project, (whether receiving clay from the two closest and nearby quarries or reusing degraded material on hand), shall utilize mechanical loaders capable of screening debris from the clay stream before it can be used in repair, reconstruction or future lifts.

Contemporaneous Observations Considered Before Reaching This Recommendation

Wednesday 11/2/2011

The Tiger Team moved to a protected side location at station 37+23. Here, Lapalco Boulevard (to the north of the east-west levee reach) parallels the levee right-of-way and both are met by Central Boulevard which dead ends to the south at the levee. Trenching began at 11:24 AM in slick, firm, gray clay. Below about 2.5 feet, the bucket hit a 4” diameter in situ (and upright) metal pipe, flush with the original, pre lift ground surface. This pipe should have been removed, and the surrounding area probed and excavated three feet deeper for any other unworthy items, per army spec on “grubbing.” Upon further excavation, a few feet below the original ground surface, the Tiger Team uncovered items (such as 14 inch tires and intact hubcaps) typical of a car recycling business. Mr. Merritt requested the samples with car parts be roped off as he did not want them. These items show the pipe was not missed when the area was grubbed. If the area had been grubbed, none of the subsequently discovered and deeper items would have been present when the trenching took place.

Reserved Comment #14

Settlement Issues

Opinion: It is a failure of construction project management to have placed heavier material than planned throughout the build without detecting it. Better monitoring of the construction process leading to discovery the levee was heavier than its design weight would have afforded a chance to adjust the design or compensate for increased settlement due to this greater, impromptu, loading. Also, trench refilling appears to have reduced the levee's original level of compaction or material strength raising concerns about the project's present condition to withstand storm surges.

Summary Analysis: This levee is settling at rates of inches per year, with actual declines varying with position on the levee right of way (from an estimated 6 inches per year on the already compacted levee "footprint" to about one inch per month on new, less compacted basement soils). In future, the heavier than designed levee is expected to have settlement rates higher than these prior observations would suggest.

In the field, levee fill was seen to be too weak to maintain a void occupied by objectionable size debris, so collapse features, from rotting wood for example, will occur.

Larger depressions in the levee slope contour are inevitable at trench sites less well compacted when re-filled after trenching than they were when digging began. This raises concerns about negative impacts at trench sites occasioned by reduced storm surge stamina, lessened scouring resistance and increased operations cost of routine maintenance and, moving forward, accelerated costs and quicker time schedules for lifting the levee to maintain heights required to keep the levee certified.

Recommendation: Locate and repack or otherwise strengthen known weak spots such as trenches or soft spots inferred by analysis of Tiger Team observations.

Commission and obtain <u>original</u>, detailed, geologic maps of the levee right of way to compare with previously mapped geology interpretations to better understand abrupt stratigraphic variations of the St. Bernard Delta Lobe inter-distributary environment of deposition.

Commission and obtain a (continuous profile) geophysical survey of seismic shear wave velocities as a proxy for material strength (as has already been done on other area levees). This data can inform basic physical geology mapping and better define specific areas at risk of accelerated settlement by showing areas of relative material strength and weakness in particular (deeper) levee lift layers or underlying alloformations to a depth of about 100 feet.

Use the geological and geophysical analyses as inputs for a 3-D model of weak sections in, or beneath, the levee. Use the model of weak areas to design and implement countermeasures to strengthen the project.

Commission and obtain new levee right of way cross sections and maps based on lift charts and Tiger Team trench data to better define the areal extent of particular lift layers found to have objectionable material. Review these findings with the Non Federal Sponsors in the context of negative impacts on levee safety and maintenance. Remove and replace debris laden lift layers.

Study and conclusively determine the basis for original estimate of levee fill material density and document why and how it was exceeded. From this analysis, develop options for countermeasures or design accommodations for this greater weight (loading) issue. Also prepare a plan so this issue will not go unnoticed and unchecked in future construction projects.

Since wet materials within the levee are heavier and weaker than drier levee clay within 18 inches of the levee surface, model the seismic response and stability of the levee to examine its durability and survivability of a 6.0 (Richter Scale) earthquake.

In examining settlement issues, account for, define and report in detail on prominent, aligned, crack lineaments in the levee without simply dismissing them as shrinkage cracks.

Contemporaneous Observations Considered Before Reaching This Recommendation

One final note about **Oct. 25, 2011:** There has seemed to be a perceived lobbying push by some to portray this project as acceptable by using performance criteria. It was never a plan or a specification to have more than a ***de minimis*** amount of debris in any levee because the presence of construction debris in earthen embankments makes settling and loss of elevation occur faster.

Also, disregarding quality of material is not a sound practice. Otherwise, it would be possible to build a levee out of Lego blocks and silly putty, show it could work as a levee and force Non Federal Sponsors to accept it regardless of settlement issues and especially settlement issues triggered by loading of underlying geological alloformations that are not mapped in detail. Without detailed geological mapping informed by geophysical methods that are proxies for material strength (none were run here) there is no hope of specific design compensations for geological weak spots that will reveal themselves with runaway operating and maintenance cost once the project is handed off to local, Non Federal, Sponsors.

October 26, 2011, at 136 + 07 off the flood side 18 feet: … this levee may have settled one foot per year while being built as it partly rests off the old (better compacted) footprint, due to a flood side shift of 40 feet. Could the shifted levee be settling faster in the former swamp than the portion of levee berm still on the old right of way (ROW) footprint?

On **October 27, 2011**, at 7:40 am at 121 + 46 off the protected side 15 feet: At a depth of about 2 feet a firewood sized piece of wood (objectionable material) was found, apparently at the contact of the overlying River Birch source material and the existing levee (existing levee material appearing as muddy, sticky, clay).

On **October 31, 2011**, at 10:45 AM: Inspected trench 165+09 off the centerline 10 feet on the protected side. A large void in the base of the west wall of the trench was created when two large concrete chunks were pulled out. The void can no longer be seen, as that side of the trench has completely collapsed.

Nov 1 2011, at 12:57 PM at station 70: The samples are loaded and transported as SLFPA-W crew moves to new location. At this location there is a 12 yard long linear crack trend on the protected side berm at station 70+20. This feature is similar to a much longer, deeper and wider crack noticed on a Mississippi River levee downstream of the Huey P. Long Bridge during a recent high water event. The "*different from an ordinary shrinkage crack*" appearance of this similar, but much smaller, crack seems to support one of the explanations for the Huey P. Long river levee cracks i.e. that they are an artifact of construction.

November 3, 2011, Thursday, at 09 + 80 off the flood side 49 feet: From 36" to 42" more wood was seen and heard and color changed at 48" to 54" when the clay from the River Birch source of supply appeared to be light gray with objectionable material. This clay is so wet it is very slick and pops noticeably. (Note: In later modeling underlying clay beds below -18 feet were estimated to have similar properties.)

November 4, 2011, at 109 + 30 – 9:27 AM: In a Tiger chat, there was a technical discussion of clay moisture content vs. material strength. Merritt states a concern the Tiger Team should endeavor to learn if layers of objectionable debris can be correlated from trench to trench to estimate the size and scope of the problem. Merritt also expresses concern about the seismic stability of the "soft spot".