

**LOCKHEED MARTIN CORP**

**Moderator: Courtney Chambers**  
**July 24, 2012**  
**12:25 pm CT**

Courtney Chambers: Okay. At this time I would like to give you today's speakers on Adaptive Management Lessons Learned. Dr. Craig Fischenich is a Principal Investigator in the field of Environmental Engineering and Water Resources at the Engineer Research and Development Center's Environmental Laboratory. He participated in a national project delivery team for adaptive management. He has published over 300 journal papers, reports and conference papers related to ecosystem restoration, river engineering, geomorphology, ecohydrology, aquatic habitat enhancement and environmental benefits analysis. Craig also worked for seven years for the Corps of Engineers in the Omaha District where he served as the Chief of Special Studies Unit. Before working for the Corps, Craig worked as a design engineer for the South Dakota Game, Fish and Parks. He has worked in all fifty states and several countries and his projects have garnered considerable national and international recognition and awards.

Dr. Tomma Barnes is a Lead Planner for the U.S. Army Corps of Engineers Wilmington District with a background in oceanography and coastal ecology. Her current and past projects focus on coastal ecosystem restoration in North Carolina and Southern Louisiana. Tomma has been a USACE lead on adaptive management for Coastal Louisiana ecosystem restoration projects. She also participated in the National U.S. Army Corps of Engineers project delivery team for adaptive management. Her other duties include the Account Manager for the Northwest Division for Ecosystem Restoration Planning Center of Expertise and a team member on multiple ERDC projects. Prior to working for the U.S. Army Corps of Engineers, Tomma was employed by South Florida Water Management District where she worked on both

restoration projects and program adaptive management for the Comprehensive Everglades Ecosystem Restoration Project.

And then finally, Dr. Bill Klein is a biologist with the Regional Planning Division South, Environmental Planning Branch at the New Orleans District in Louisiana. His current work includes coordinating adaptive management and monitoring for the Louisiana Coastal Area Ecosystem Restoration Program and other ecosystem restoration and mitigation projects. Bill was the Environmental Manager for the programmatic EIS for the 2004 Louisiana Coastal Area Ecosystem Restoration Study and is currently the Environmental Manager for the several of the near-term Louisiana Coastal Area Ecosystem Restoration Projects. Bill has worked with the Corps since 1994 and has included not only ecosystem restoration, but also navigation, hurricane and flood risk reduction studies and projects. Bill is a Certified Professional Wildlife Biologist, and prior to his work at the Corps, Bill was a lecturer and head of the Wildlife Management Program at Sul Ross State University in Alpine, Texas.

Okay, more information about these speakers can be found in their bios posted on the Learning Exchange with the rest of today's meeting documents. And we're very thankful for their willingness to share with us today.

All right, at this time Tomma, I'm going to give you the presenter rights and we can begin our presentation.

Dr. Tomma Barnes: Okay, thanks Courtney. Can everybody hear me okay?

Courtney Chambers: Yes ma'am, I hear you.

Dr. Tomma Barnes: Okay, okay. Good afternoon. I am going to start off this presentation and then I will be handing it over to Craig somewhere about a third of the way in.

Okay, just to go through just going to briefly introduce the concept of adaptive management for those of you that might not be familiar, we're going to start with the National Research Council's definition of adaptive management. The National Research Council says that adaptive management is a decision process which promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.

The figure that we have here is a revision of the typical adaptive management cycle that you might see. We've modified it slightly to better reflect Corps process. So if it looks a little off to you, that's why. We've added a few boxes so that it fits with our Corps process.

Okay, today we're going to focus on - Craig and Bill and I are going to focus on the processes that we've applied for adaptive management for the Louisiana coastal areas projects, and provide some of the lessons that we've learned along the way as we've moved forward.

Some background - adaptive management is not really a new concept. It has some early work that dates back into the 70's with (Hollings) and then (Walters) is another big adaptive management guy, and his work is in the 80's. The Everglades Program has been working on adaptive management since 2000 when they received programmatic authority for the Everglades Restoration Program which included some adaptive management guidance. Okay and then with WRDA of 2007, the requirement for all Corps ecosystem restoration projects came about, and that was with Section 2039. And that section states that an adaptive management plan, or it's also called a

contingency plan, will be developed for all ecosystem restoration projects. This same section, 2039, also provides guidance for the requirement for monitoring for ecosystem restoration projects.

Additionally, Section 2036 of WRDA 2007 discusses adaptive management requirements for mitigation projects in case you're not familiar with those authorities. Some of the language in that authority also discusses that adaptive management plan should be scoped to the appropriate project scale and that they should address the rationale for adaptive management monitoring. They should describe metrics for success, performance standards, nature of planned adaptive management measures, cost estimation, how the information will be provided, and also responsible parties for implementation of adaptive management.

Further, specifically for LCA or Louisiana Coastal Areas, 2007 WRDA directed the secretary to carry out the LCA program in accordance with the Report of Chief of Engineers for that study dated 2005. The language from the Chief Report calls for the feasibility studies to identify specific sites, scales, and adaptive management measures and to optimize features and outputs necessary to achieve the restoration objectives in identifying, monitoring and adaptive management as critical components of the LCA projects. And there's some specific language from that Chief Report.

Okay, so we have this - we started off on LCA with these authorities to go in and do adaptive management on these studies. But we really didn't have a lot of how to do it. So in order to do that, we went through a process, and I'm going to walk through that process with you all before we go into some of the lessons that we learned as we went through the process.

So the first thing that we did was set up an adaptive management team to come up with how we were going to do this. You know, we had a series of projects that were under a very expedited timeframe to get done and we really had no “how do you do this” just to follow. So we had to come up with that ourselves.

So I put together - I started off and it was my assignment to basically move forward. And the first thing I did was put together a team to help me figure out how to do that. And the team consisted of a few folks from the State of Louisiana from their different agencies; we had several Corps folks from multi districts who had some background in adaptive management including ERDC and the Science Office for LCA. And we also invited some folks from USGS to be involved because USGS really has that expertise on the monitoring aspect of what we needed to look at.

So when I pulled in some of the folks from the Corps, I pulled some of the ones that I had worked with on the National adaptive management team. You know, these were the experts on adaptive management in the Corps of Engineers. So I pulled in some of the folks on that team and we sat down in a room and we brainstormed on how to move forward with this. And we set up a process for adaptive management planning or the setup phase and also how would you implement it later. So we came up with a process for that and we worked with the project delivery teams to help determine their project specific monitoring and adaptive management needs, and those varied depending on the project. We helped them to pull out some of the key uncertainties in their projects, and to establish criteria for project success, and also triggers for adaptive management. So if A happened, we would implement adaptive management by doing B. So we helped them identify those things.

And we also - we didn't have the information we received from the teams and we drafted what we called, "Feasibility level of detail adaptive management plans." This team basically decided on what we thought these plans should look like based on our guidance, and the level of details that they should contain.

Okay, so this diagram shows kind of the two tiered approach that we utilized or the two phase approach. The first one being the setup phase and the setup phase is what you do during planning. So this is what we really focused on as far as producing a product.

So we had the setup phase and then we came up with this process for how do you implement adaptive management. And implementation phase starts when planning is over as you move into PED you would start collecting your baseline data and you would through this implementation phase.

Okay. One of the key steps that we determined should occur upfront is the creation of a conceptual ecological model. These models should be very simple, non-quantitative models that are represented by a diagram, it should represent the system by showing relationships between anthropogenic and natural stressors, and biological indicators and target conditions for those indicators.

This diagram shows the components of a conceptual model. These conceptual models can take different forms, but we decided for Louisiana to follow a very similar format that they used in the Everglades. We did many conceptual models in the Everglades when I was working there, so these were pretty straight-forward, they identified your drivers both natural and anthropogenic, your stressors on the system, the effects of the stressors on attributes and then identified performance measures or what should be measured to show whether

or not things were working or your project was successful or not. So this kind of lays out the components of the model that we used.

This diagram actually shows some of the linkages between some of your conceptual ecological models and the adaptive management activities. Your conceptual models can help projects define and refine their goals and objectives. So your model can help you establish those goals and objectives and as your model changes, your goals and objectives may also change based on new information.

The conceptual models can help the project delivery team identify uncertainties and when you identify those uncertainties then you can also help define the research needs necessary to reduce those uncertainties. You have kind of a feedback loop there when once those uncertainties are reduced, you have a better understanding in the system and then you can also go back and re-refine your conceptual model accordingly.

The models can help identify indicators for both monitoring project success and for adaptive management. And those results of the monitoring can be then be used to again, refine the conceptual model. So it's kind of this reiterative process, you're always updating it as new information becomes available and your adaptive management monitoring process provides that additional information or that updated information so that you can refine your conceptual model.

Okay. So for Coastal Louisiana, we started off with challenges. It's a very unique system; there are lots of uncertainties, there were lots of project challenges. This just shows some of them, you know, we have subsidence, we have sea level rise, we have the sediment reduction of the system, we have the levies, we have oil and gas development, and canals, and salt water intrusion,

and hurricanes and storms and excessive barrier island degradation. So we had all kinds of problems. And the projects - because of this work were straightforward. These challenges or uncertainties that we had, often made it very difficult for us to predict project outcomes. Thus the increase need in this area for a good adaptive management strategy.

Okay, so we move forward with what the team called, “feasibility level of detail.” Again, incorporating information from the guidance to try to figure out how much information needed to be put in these plans. The plans we put together describe and justify adaptive management was needed, and I think Craig will talk a little bit more about that stuff in detail. The plans also identified how adaptive management would be conducted for each one of the projects. They identified who would be responsible for implementation of adaptive management and making the adaptive management decisions, so kind of that governance component.

They described what should be monitored, they described monitoring details of how often things would be monitored, what the cost for monitoring would be, they outlined how the results of monitoring would be used to adaptively manage the project. They identified what defines project success for each one of the projects, and they came up with cost estimates for both monitoring and adaptive management.

This slide just shows a sample or one of the Table of Contents from one of the projects; this one specifically for the Medium Diversion at White Ditch. So you can see some of the information that we included in the plans.

So we created these plans, but we were calling these plans “feasibility level of detail.” And as moved forward we had some uncertainties that we couldn’t really put into the plan at the current time. One of these big uncertainties went



back to the exact project features or the design. Basically what components if the project failed to meet its objective, what project features were the adaptive management features that we were proposing. You know, what would we need to do to change this project to be able to achieve project success. So that was a big uncertainty and in some cases we weren't able to address that at the current time. Also, if you don't know what project features exactly you would need, it's very hard to come up with the cost, you know, to come up with a cost estimate for adaptive management. So those were two things that we had a difficult time addressing. You know, it was a lot easier to come up with who's going to do it and how you're going to do it, but actually how actual adaptive management features was difficult.

Also another difficulty or uncertainty we had was in the monitoring elements. You know, we had to ask the question, "Did we identify the best monitoring components and frequency of monitoring, have we chosen the most appropriate components to evaluate short and long term responses, are the monitoring elements that we chose able to pick up the differences between natural variability and actual project response?"

So, you know, we produced these plans but are some uncertainty in the plans. And one of the ways that we addressed that was we are going to and have started working on more detailed adaptive management plans as we move into PED on these projects. And as the details of the plans become more refined, then we can also refine our monitoring and adaptive management plans and response, and hopefully be able to come up with a more detailed cost breakdown.

So I'm going to move this over to Craig now. Craig, can you take control?

Courtney Chambers: I'm giving him the presenter rights right now.

Dr. Tomma Barnes: Okay and Craig will be able to go into more detail on some of these things that I've just touched on.

Dr. Craig Fischenich: Okay, so as Tomma mentioned, we have this advisory team and our role was to assist PDTs and...

Woman: We can't hear you.

Courtney Chambers: We can hear you Craig; it's just a little bit distant. You might speak into the handset for more clear.

Dr. Craig Fischenich: Okay, is this better?

Courtney Chambers: Yes that's better, thank you.

Dr. Craig Fischenich: All right. So as Tomma mentioned, the advisory team was put together to assist the PDTs in developing these feasibility level monitoring and adaptive management plans. And so in the process of doing that, we posed a number of questions. The background graphics are not showing up on my screen, I don't know if it is on yours.

Courtney Chambers: It's not Craig. The yellow is a little faded, but we can see it.

Dr. Craig Fischenich: Yes okay, well I'll go ahead and read it off so you all know what we're speaking to. So in essence in formulating these plans, we really wanted to try to address four basic questions. First is whether or not adaptive management is warranted for a particular project, and it turns out it that it wasn't in all cases.

Secondly, we needed to determine what we would have to monitor in order to both determine project success and evaluate whether or not adaptive management actions be necessary. And then we wanted to identify what those actions may be in cases where it's possible to develop contingency plans. And then finally, we were interested in what the costs associated with that was. The background showed up there.

So to this first question of whether or not adaptive management is needed - and the way we moved forward on LCA with this was to, we set aside roughly half day on meetings with the PDT and this advisory team would sit down with them. And the PDT would give an overview of the project and then we would ask them a series of questions. And the questions in ensuing discussion really helped inform us about the project, but it also helped inform them about the adaptive management process. And ultimately we took the information that we got from them, compiled that into these draft plans and circulated it back. So a lot of what I'm showing you relates to the types of questions that we were posing, because these are the things that we would ask ourselves on our projects in order to help develop these plans.

So in regards to this notion of whether or not adaptive management is needed or not, this graphic points out that that there were - essentially we developed three criteria that would be necessary in order to actually move forward with an adaptive management of well - that it would be possible to have an adaptive management plan.

They basically boil down to whether or not there are uncertain outcomes, whether or not you can reasonably expect to measure a project performance and determine whether that performance is suboptimal or adverse. And finally, whether or not there are actions available if it is going in a bad direction.

So this graphic shows that that last point is in essence kind of an entry point, if there is sufficient flexibility to allow you to go in and make adjustments if things aren't going the way you'd hope. If not, then there is really no opportunity for adaptive management.

Anyway, as I said in a couple of cases - well in one case for LCA, we determined that there wasn't really any opportunity for adaptive management for that particular reason.

We - once we established that adaptive management might be warranted for a particular project, then we've got to determine what it is we're going to measure, how we're going to interpret that information and how we're going to make decisions. And so the linkages there really all begin with the project objectives and constraints. And in fact, this whole discovery process, really involved a lot of detailed discussion about the project objectives and how they'd been established and whether they were clear enough or articulate enough to associate particular metrics too. And so in that regards, it's a very useful planning tool because it really helps you refine your project objectives.

So in this case we were interested in establishing success criteria, performance measures that might be applied to evaluate project success and action criteria that would be potentially related to taking some adaptive management measure at some point down the road. And those fed into both monitoring and adaptive management plans which we rolled together on these projects.

So this slide just gives you kind of an overview of how we relate some of those different terminologies. And so performance measures for example are, you know, they refer to kind of the desired outcome of the project. And so we're interested in identifying metrics for those in such that they're

measurable, they have some degree of predictability, that they're going to change somehow in response to your project and, you know, they allow to kind of verify progress in terms of project performance.

So a couple of examples here are, you know, wetland hydrology as a performance measure. Well the metric for that might be the number of days that a particular site is inundated. Then we may establish an action criteria for that. So in this particular case if we've got more than 30 days in inundation during the period from July to September, that suggests that we might need to take some action and we might need to modify the project.

We also identified to what we refer to as risk endpoints, which you can think of in terms of adverse impacts or constraints that might be violated by the project. And so they're negative outcomes that might also have some action criteria associated with it. So if these things happen we may need to take some action.

So this slide lists, you know some of the questions that most frequently came up, or that we found maybe most illuminating or helpful in helping the (PDT)s develop these plans. So a couple of them on here that I think maybe I'll point out, you can read the rest, the first one of course as I mentioned deals with the issue of what the project goals and objectives are.

One of the first questions that we would ask was when will you know or how will you know if your project has been successful. It's very interesting that a lot of people haven't really thought about that, you know so and it's something we should on every one of our projects, how are we going to determine whether or not it's successful, at what point in time, how would we measure that, you know and so clearly that's something we need to do now.

A couple others that were maybe quite helpful are having some discussion about the primary sources of uncertainty and the maybe how we would address that, measure that, account for it.

And then in terms of defining potential adaptive management actions we had some discussion about what some of the unintended consequences might be, and it turns out for a lot of ecosystem restoration projects you know in advance some of the things that go wrong. A lot of them deal with weather or conditions that might occur post construction and if certain things happen it's going to be particularly stressful on project performance, and so in so far as you can identify those ahead of time, then you can take some contingency planning efforts into account and identify actions ahead of time that you might want to take.

And then this last one here you know we asked a lot, you know what would you do if this happened, or what would you do if that happened or if this was the outcome because that helped us get at this issue of whether or not there were particular actions that could be taken.

So in terms of how we operated, after having these kinds of discussions with the PDTs, the advisory team, mainly (Tomma) quite honestly along with one other colleague, shouldered the burden of kind of rolling this together into a draft plan.

And so for each objective that had been identified we would list one or more metrics associated with that and then for each of those metrics we developed a sampling design and what type for what, you know what we're going to measure with what frequency using what methods and so on.

And then we would identify whether or not there were particular performance standards or success criteria associated with each of those metrics, same with risk end points, and then if there were contingency plans that could be identified, should one of those risk end point or performance criteria not be met.

And then we would identify the you know baseline data requirements, a lot of discussion about the administration of the adaptive management plan in terms of how information would be gathered, evaluated, who would do the evaluation, who would do the decision-making and how and so that overall governance structure and operation was an important part of this, but in the case of LCA that was. you know, once that was established it was essentially the same for each of the individual projects.

And then there was the bit of estimating the costs. Now I've got another slide here in just a moment that I'll get to that.

One interesting development in the course of the LCA effort that came to light and I expect will probably be the case on several other of our larger ecosystem restoration initiatives, the ones that involve multiple projects is that you have, there's a difference between your viewpoint, if you're looking at a single project or thinking in terms of a single project versus looking at the system or how all of those individual projects that are part of a program might work together.

And it turns out that the objectives are different in some cases. The types of, and the sources of uncertainty are different because of those different scales and so too then are both the performance measures and the management actions that you might take.

And so this was kind of an interesting point of discussion for LCA because they had in that case at least at the time both a project and a programmatic focus and they had a science and technology program set up that could really serve that programmatic view and so you know we had to entertain both of those viewpoints.

So then we also spent some time discussing how we're going to manage data and report it and so this slide just kind of gives an overview of one of the reporting mechanisms that we were going to rely on, this report card that would allow you to do fairly quick overviews.

And then my final slide and then I'll hand it off to (Bill), (Courtney) if you want to go ahead and start the hand off - relates to the cost estimating effort, and so for the LCA projects at the feasibility level we were able to establish cost estimates for all the monitoring activities, and these are very detailed cost estimates actually, in this case we happen to have a good source of data in that the CWPPRA program had already established a lot of monitoring in the region and so it was, we had some experience in terms of collecting data on a number of these different parameters.

We also make cost estimates for the administrative components of it, how data's going to be managed, decision-making and all of that, and we actually were able to even, we added in a little bit of money for refinement of the feasibility level adaptive management plans during the PED stage. But the one thing that we didn't do at the feasibility stage was develop cost estimates for the adaptive actions should they be necessary. And so that was something that in a few cases just really wasn't possible because maybe we didn't have a preferred alternative yet or the details of the design for that particular restoration action were such that they would significantly affect potential management actions.



And so (Bill)'s going to talk a little bit more about that and the consequences of that, but I was just, we'll point out one other thing real quickly and that's that we're trying to develop some tools now that will help us better assess the cost side of it in terms of the potential benefits of implementing adaptive management so that we can kind of look at not just, is adaptive management feasible? but is there a return on investment in adaptive management. So (Bill)?

Bill: Good afternoon. Thanks for tuning into us and I hope you can see the map that we've got up there?

Courtney: We can.

Bill: Okay because I've been having some problems here with our network. This is what (Tomma) inherited, all those different projects for LCA.

If you take a look at the very top four those projects LCA MRGO (Mississippi River Gulf Outlet), the Hope Canal, BBBS (Barataria Basin Barrier Shoreline), and Bayou Lafourche. We have not prepared a adaptive management or monitoring plan for those four LCA projects, however with the LCA MRGO there was a spin off that was done, the MRGO Ecosystem Study, it's draft EIS and Feasibility Study has already gone out.

We were, and I will present later in here, able to do an adaptive management and monitoring plan and that was one of the good points of a lessons learned.

Next slide. As you heard (Craig) talk about, one of the challenges was that the adaptive management plans for the LCA 6 were prepared but unfortunately

during the feasibility phase cost estimates for the AM measures were deferred until PED phase.

One of the other problems with the feasibility level adaptive management plans is that it required revision, substantial revision on PED to address details not known or available during feasibility. Some of the lessons we learned is that at the feasibility level you should determine whether the adaptive management is applicable, and you saw some of the slides that (Tomma) and (Craig) and the other ones in the early adaptive management team came up with helped to identify the metrics and the performance measures and to develop some preliminary adaptive management measures.

You're going to be prepared to revise them in TD however it's very important if that project has a great deal of uncertainty that you developed some preliminary adaptive management measures and also the costs associated with them.

One of the problems that (Tomma) was limited by was the WRDA 2007 authorization for the LCA projects. Each of those projects had a cost cap on them and she had to work within that.

The next slide is the Barataria Basin Barrier Shoreline Restoration. It initially started back in the year 2000. It went from that big circle on your left all the way over past the little circle on your right. Following the 2004 report it was converted into a different type of project just focusing on the Caminada Headland area that's to your West, left, the big circle and the Shell Island project area.

I'm going to compare and contrast that to the next slide, which is the Terrabonne Basin Barrier Island. If you take a look at the map that headland

that you see to your right on the slide is the headland under the BBBS. All these islands you see listed right here are under the Terrabonne Barrier, I'm sorry Terrabonne Basin Barrier Shoreline Restoration.

Let me do a quick comparison on these two. The Terrabonne Basin Barrier Shoreline Restoration would increase the islands to about 5,840 acres, it is fully funded, cost about 647 million. The good points were adaptive management and monitoring. There was coordination, (Tomma) and her team coordinated with the PDT and the entire adaptive management team participated in this. There was a CEM, Conceptual Ecological Model for the project.

Estimated cost for the monitoring program over ten years was about five million. Estimated cost for the adaptive management plan, that's program setup, management, assessment was about 1.6 million.

Compare and contrast that to the previous slide with Barataria the NER plan for that was restoration of the Cominada Headland Shell Island at about 2,849 acres, fully funded cost was about 448 million. Coordination, one individual prepared the adaptive management plan, did not involve the adaptive management team, didn't involve anybody else. There was no CEM prepared. If you take a look between these two slides the estimated costs for adaptive management and monitoring was estimated at about 1.3 million.

One of the problems, one of the additional problems with the Barataria is that this project would, will be adaptively managed by altering the required operations and maintenance. That's not quite how the adaptive management team would have helped to approach this but as you can see that's one of the challenges that we have.

The next one was the (Historis), this is a good one. I'm happy to report that the folks that did this involved us early on. You can see several different mitigation areas, Milton Island, up in the top right, I'm sorry top left (Pritchie) Island, that's your next one over to your right and then down through Bayou Sauvage flood side protected side. And then they also considered mitigation banks.

The challenges with this were that there were several separate mitigation projects. This is for all the work that was done following Hurricane Katrina.

One of the real challenges from an ecological and adaptive management standpoint is that swamp habitat mitigation is very difficult down here because of the low lying area managing the hydrologic conditions can become extremely difficult.

Lessons learned: PDT and the adaptive management team worked together to enable the PDT to include sufficient funding for mitigation actions and include that they would continue to do monitoring and mitigation until ecological success is realized.

One of the other challenges for the (Historis) mitigation is a misunderstanding of implementation guidance. You heard (Tomma) talk to you about Section 2036 of the WRDA regarding project turnover and how you're going to do that. There's some confusion all up and down the chain of command about this particular aspect. As soon as the project is completed it's turned over to the local cost sponsor but what happens to the monitoring and what happens to adaptive management?

The lesson learned is working real closely with our guys in Office of Council. The project's turned over to the local sponsor upon completion, however the

monitoring, it's going to continue to be cost shared at whatever that cost share is until the mitigation has met ecological success, that'll be documented by the district engineer and go up through the division commander and all the other stuff according to the guidelines on how to do that.

Comite River -- this was an exercise of one week due to some commitments that we had to follow through with. The team had a very, very short period of time of coming up with the mitigation for the Comite River Diversion. The adaptive management team had a nice challenge of one week for analysis and preparation of the adaptive management plan before the EA went out.

One of the other challenges was that as we, the adaptive management team, were preparing the adaptive management monitoring plans, the PDT was also concurrently preparing the mitigation plan, so we worked hand in glove trying to make sure that whatever we learned they learned, whatever they learned we learned.

If you take a look over to the right you'll see a little aerial of Profit Island, it's an island in the middle of the Mississippi River. As you can imagine it's subjected to repeated flooding, completely covering the island. This is one of the mitigation areas that they had. One of the other challenges is that due to the time constraints, the guidance that we received was that we would not provide any costs for the mitigation plan or for the adaptive management plan.

Lessons learned from this is that the adaptive management team and the PDT work hand in glove trying to determine the mitigation measures and how to make sure that it is incorporated into the mitigation plan that mitigation, monitoring and if needed any necessary adaptive management would continue until ecological success is realized.

Cap 206 -- usually Cap studies are quite small however in the Delta and especially along the Mississippi River itself these areas can be very difficult to work with, this is Bayou Grosse Tete. The objectives were to reestablish water levels and flows, reestablish important fish habitat and populations, and reduce point source pollution.

This project is no longer funded; however, we did come up with - and go to next slide. We did come up with an ecological model. This is not the type of ecological model you would typically do for a 206 project. You saw the schematic that (Tomma) had presented early on, this shows a lot of the relationships and helps the team come up with further refinement of their goals and objectives although with dealing with the problems and potential solutions for their particular project.

If you keep this slide in mind along with the next slide this is another way of doing a conceptual ecological model. (Craig) came up with this for the MRGO ecosystem restoration project. We thought it was so good that we stole it from him for other projects and if you take a look it's very difficult to see in the heading, not only can this act as a conceptual ecological model but it can also act as a report card.

As you go down through you have the different drivers on your left hand column, fresh water nutrients, wetland losses, etc., as you go along the top most row MRGO before closure, future without project, MRGO closure, river diversion, hydrologic restoration and then what you do is you put in the different designations for these different drivers whether they're applicable, not applicable, and so on.

That's the good segway into the MRGO project itself. This is a very large project. If you think back to just a few slides ago when (Craig) was talking

about programmatic versus project scales, MRGO is a big project but you could almost look at this from a programmatic perspective. In this particular project we have marsh restoration, shoreline protection, ridge restoration and perhaps even more importantly from an adaptive management monitoring perspective is a diversion.

The lessons learned from the MRGO is phase construction because of the uncertainty and can't overemphasize that the adaptive management monitoring is really geared towards the uncertainty and those risks associated with those uncertainty.

We initially came up with a cost for the adaptive management monitoring plan of about 400 million. After re-looking at that and coming up with this phased construction and sequencing we were able to bring that down substantially. I mentioned the sequencing, that's the second point in this lessons learned and then the adaptive design.

The team was very, very good not only the environmental people, the planners, but the engineers and folks that all worked as a team under extremely difficult circumstances worked with us to be able to incorporate the adaptive management and monitoring so that we could take the problems and challenges that we had and change those into good positive things.

That brings us to the next slide and this I believe goes over to (Tomma).

(Tomma): Yeah. I know we're running a little bit behind on this but I just wanted to, I know as you listen to this you might, and you know we have the whole new smart planning thing going on, you might be asking yourself how do these two fit together and I just wanted to just briefly just touch on this a little bit just to assure you guys that they're not separate and they don't go against each other.

The conceptual ecological models I know in talking to the ecosystem PCX regarding some of the charettes that they've been participating in that for ecosystems they recommend that a conceptual ecological model is produced as a product to help with your, you know establish your goals and objectives and some of your uncertainties and as you move forward with your project planning.

The risk registers that are part of the charettes are used to identify both study risks and project risks and again those project risks are things that you may choose to address as part of your adaptive management plan and you know having an adaptive management process in place can help you reduce all of those risks.

And also you know having an adaptive management approach can also provide a means to address the uncertainties that you might not be able to resolve during an expedited planning process, so it's actually a good thing, you know, if anybody's questioning whether or not like I said they said hand-in-hand adaptive management can support this smart planning paradigm.

So I just wanted to briefly touch on that since this is kind of a big thing, big point of discussion these days, so anyway I wanted to hit that and then we can, you can move on to the next slide. There you go.

(Bill): Okay. I think I get that one.

(Tomma): Yeah I think it's back to you (Bill).

(Bill): In the interest of time the next two slides are very similar. The biggest take home message is to integrate the adaptive management into project life cycle.



This slide shows how in the planning formulation and the design and construction and O&M how adaptive management fits in. Skip to the next slide please.

For the planners and for the environmental folks out there on the left hand side the P&G six step planning process you can see the adaptive management starts kind of up at step one and then really kicks in at step three.

On the right hand side cumulative impacts analysis framework, that's from the CEQ guidance, conceptual ecological model really kicks in at the beginning to help identify the significant resource as your goals and objectives, that sort of stuff, and then it's used throughout.

Those are something for folks in their respective, whether they're planners or whether they're environmental, to utilize and see how the adaptive management and monitoring and the conceptual ecological model part of that fits in.

With that I'll turn it over to (Craig).

(Craig): Yeah. Well I think in the interest of time to leave a minute or two for comments and questions we can just leave this slide up and you know these lessons that are summarized here are certainly applicable to the LCA and other coastal Louisiana projects but not just to them and they're the same kinds of things that we have noted on other projects.

And the only one that I'll make a point of bringing up is really the first one and that's that you know adaptive management I think in many cases in the past by not just what the Corps or others or think of it, as something you kind of, can you kick down the road a little bit you're going to worry about it after

the project's built, but really it's just something that's integral to the planning process and it's so consistent with the types of things that we do when we plan and so you just making the thought process that goes into developing these adaptive management plans a part of your planning efforts from the very beginning I think is probably the key lesson learned.

So I, unless (Tomma) or (Bill) if you wanted to you know any other major closing comments otherwise I think we could open it up to some questions.

(Tomma): We can take questions. I'm okay with that.

Courtney: All right. We do have a few in the chat feature over here. Jacksonville they had a question about a slide that (Craig) was presenting, and you all may need to speak up and let us know which figure you were asking that question about, they were wondering what the Y axis numbers were indicating.

(Andy Lachivo): Yeah (Tomma) this is (Andy Lachivo) how are you doing? Good presentation by the way all three of you.

And I guess the, there are a couple questions we have, one was referring to a slide if we go backwards that has sort of like the return on investment...the Y axis I understood the one on the left that was benefits but the one on the right I was a little confused about the numbers because I think it's a good graphic I just want to understand it more.

Craig: Yeah. (Andy) the Y axis dealt with benefits, what looked like an axis on the other side was actually a probability associated with each of those alternative outcomes.

So the idea here is a particular project might have in this case eight potential outcomes, you know depending on how things worked out, and each has an associated probability and so you could look at a probability distribution of different benefit streams associated with it.

But if we're going to adaptively manage we're not going to let those three bad ones happen, we're going to make adjustments so then you got a different probability of outcomes and your overall likelihood of achieving benefits is going to be higher, and that's sort of that you know in a simplified way I guess kind of a part of this return on investment type calculator that we're looking at.

(Andy Lachivo): Okay. I have a few others but I'll wait because other people have comments too.

Courtney: Okay. From the Philadelphia District we had the question who does the adaptive management? and do you recommend keeping the construction contract open or using a service contractor?

Craig: Well (Bill) or (Tomma) do you want to speak to the Coastal Louisiana case?

(Tomma): Sure. Well who does adaptive management? For a program as large as Coastal Louisiana where you're talking about multiple projects they have actually identified kind of an adaptive management lead person who is kind of in charge of some of the coordination and he works with the project delivery teams, specifically you know the planner to make sure that for the set up of adaptive management that that stuff is in place.

You know we had these adaptive management planning teams that have been established who have kind of taken the lead in this, for projects that are much

smaller and not part of you know, really large programs where you have the ability to do that it would probably be the lead planner who would take the lead and work with the PDT to come up with these products.

Craig: (Tomma) I think maybe the question might also get at the adaptive actions themselves. So if an adjustment needs to be made to diversion operation or if we need to go back in and replant a barrier island or something.

(Tomma): Okay well according to our guidance adaptive management should be included as part of a first cost, which means yes, it's part of the first project cost, it's not considered (O&M) in that your construction would stay open for the ten years that were allowed to do the monitoring and adaptive management on these projects.

I've never received official guidance on that telling me that was right or that was wrong, but like I said from the way that our team has been able to interpret the authority and the implementation guidance that's what we pull from it, that it was kind of you have this ten years of monitoring that you can, that you're required to do or if you can achieve project success prior to that then you can stop before ten years.

But ten years is your max cost shared monitoring and as a result it's also kind of your max that the Corps stays involved for adaptive management tasks. After that you know it's usually handed over to the local sponsor for operation and maintenance and if that once handed over then it would be the sponsor's responsibility to continue monitoring you know if that's needed or to implement adaptive management.

So that's why I think they, the sponsors kind of want that to happen up front, you know in the first ten years so that it's a cost shared thing but it should be

part of first cost for the project. Does that, I hope that answered it? (Craig)  
you may have something to add there.

(Craig): Well no, I mean I could speak to how it's handled by a couple of other agencies but I don't think that's relevant.

Courtney: Okay then from Fort Worth they wanted to ask if it would be acceptable for purposes of feasibility documents to provide an ROM estimate on a per-action basis.

(Bill): This is (Bill), you want a rough order of magnitude estimate?

Tomma: Yes.

(Bill): Any estimate that you can do during feasibility I would make it as robust as possible so that whenever you move into PED phase when you will have changes to these things you'll have some wiggle room so that you're not locked into something that's less than what is really desirable to make sure that the ecological success is being met.

Woman: So err on the side of caution.

(Bill): Yes.

Woman: Okay.

Courtney: All right if there's any other questions just feel free to type them in or take your phone off of mute and ask verbally. Thank you.

(Jim Viril): Yeah. This is (Jim Viril) in Jacksonville, once again hey (Tomma) and compliment you on a good presentation.

(Tomma): Hey (Jim).

(Jim Viril): Hey I really had a question on you all's last slide talking about governance. I agree with you, I think it's crucial, I also think at least from our experience in the Everglades we're struggling with how to do it in adaptives management I also sense that from papers, like reading (Lance Gunderson)'s papers that it's looking a lot of programs around the country I think for story with governance.

So maybe you don't, you all don't have answers today but just curious kind of thoughts, how can we do this better or what's some approaches we could use, you know how, you know on the governance issue or do you think you guys, do you think it is a problematic or do you have, feel like you've got solutions you just got to work through them?

(Tomma): We've proposed a governance plan for Coastal Louisiana but I think you're dead on there. Nobody really wants to take responsibility and to step up and say hey I'll make that decision or hey you make that decision. So it is a problem and I think my biggest recommendation would be is to get that stuff straight up front, you know that should be one of the first things that you decide on is who is responsible for making these decisions or how these decisions are going to be made as you move forward.

So that when you, you know you have, so you have a process laid out when you know you're monitoring results come back and they're not on track of where they should be or where you think your project should be that you have a process in place to say okay boom we have to do this and you, you know

this decision needs to be made and this is how it's implemented and you know this is how we move forward so to me that's something that needs to be defined way up front and agreed upon, getting people to agree upon on that might be a different story.

(Mark Mebleson): Hi. This is (Mark Mebleson) calling from the Baltimore District, I don't know if you can hear me but...

Woman: We can.

(Mark Mebleson): ...we do have that set up for Poplar Island and we've been operating under an adaptive management plan for many years and we've set up a habitat group, a margin work group and a regular work group but we also have the project delivery team and they make the decisions based upon the annual monitoring that's done or any extraordinary circumstances what we would do as far a remedial actions or any quick changes that we would have to make.

So we do have that structure in place. Am I, can you hear me?

Man: Yep we got you.

(Mark Mebleson): Okay thanks.

Man: Yeah.

(Mark Mebleson): I'll put myself back on mute. Bye.

(Andy Lachivo): (Tomma) and (Craig) and (Bill) this is (Andy L), Jacksonville District. I had another question on the costs. You mentioned that there, you know the

estimates are complicated by uncertainties during the feasibility phase and that they may need to be updated during the PED phase.

However if you look at the guidance that you referenced in there, the 2009 guidance on interpreting the WRDA 2007, Section 2039 it says you want to have this in that, really that feasibility phase document worked out. How do you envision things would get updated within the confines of that guidance during the PED phase? Referring to cost.

(Tomma): If, I'll just speak to that just for a second. (Andy) it was, you know it's for some of these big complex ecosystems it's really hard to say okay if this doesn't work then we have to stick another pump in or we have to cut another hole in the levy or we have to, you know it's really hard to on a lot of these projects to determine what the fix would be.

We know that we have uncertainties but we're not really sure exactly what the solutions would be at the present time so it's hard to come up with the cost estimates if you're not really sure what components you would be implementing.

On some ecosystem projects that I've seen in other places there's, some of them are smaller and they're more straight-forward, you know you don't have so many of the uncertainties that Coastal Louisiana has, and actually the Everglades probably have a lot of the same uncertainties you know being these huge complex systems so it's hard to do that.

How we address that, how we're going to move into PED hate to say it but we've got a way with these feasibility level plans just because, and explained why we had to present them this way and we've received buy offs so far, you



know and we'll continue to refine them. Like I said that's how we're getting away with it.

I think you just have to tell your story and explain you know I think it's understandable that these big systems have so much uncertainty that it's really hard to pin down solutions if you can't hardly anticipate what the problems could be or when you have, you can anticipate so many problems that could happen because of the array of uncertainties. And (Craig) you might be able to add to that and (Bill).

(Craig): Yeah well I was just going to note that (Andy) one thing that they did on LCA, which was interesting, was they actually identified in the feasibility adaptive management plans, a cost item to update those plans in PED phase so they had a cost associated with the logistics of making that update, just trying to be as complete as possible so we and the project sponsor kind of know what they're signing on for.

And then the same kind of flexibility just kind of getting back to the governance issue was built into the governance plan in terms of opportunities for adjusting performance measures and making other changes and I think that's maybe an important feature as well. That's something I'm sure (Tomma) and (Bill) would be happy to share with others, but this you know there's uncertainty that you kind of know about and then there's this you know the things you don't know you don't know.

And it's that latter category is the tough one to get your arms around in terms of the whole costing effort but I'm not sure where we're going to end up as we move forward on this in terms of improvements to that process but ultimately there's got to be some accounting for or opportunity for addressing unanticipated outcomes.

(Courtney): Okay. Thank you all very much for your questions. And I'm sure if you have further questions that (Tomma), (Craig) or (Bill) would be happy to help you with, and each of them are in the Corps' outlook address book if you wanted to get in touch with them through e-mail.

But at this time we do need to begin wrapping up. (Craig), (Bill) and (Tomma) thank you all very much for sharing with us today, we had a very good presentation and we appreciate your time.

END