EXPERT PANEL ON DIVERSION PLANNING AND IMPLEMENTATION

Report #6

January 2016

Submitted to:
Coastal Protection and Restoration Authority

EXECUTIVE SUMMARY

The sixth meeting of the *Expert Panel on Diversion Planning and Implementation* was focused on results of simulations that were conducted to determine the effects of sediment diversions on receiving basins. Presentations and discussions were for the purpose of (1) updating the Panel on CPRA activities and providing a response to the recommendations in the Panel's fifth report, (2) informing the Panel of the outcome and rationale for CPRA staff recommendations regarding the *Fall 2015 Decision Point*, and (3) providing the Panel with results of simulations in the areas of land building and landscape change, vegetation and fate of nutrients, fish and shellfish communities, and socio-economics. The sixth report summarizes our findings and offers four recommendations for more effectively advancing the diversion planning process as it moves beyond the *Fall 2015 Decision Point*. Specific recommendations include (1) exploring through model interactions ways to more aggressively enhance sediment retention and maximize the process of land building, (2) reconciling inconsistencies in fisheries modeling through rigorous assessment of model performance following a process similar to that used for the land-building models, (3) expressing socio-economic outcomes relative to future without project, using all available time steps up to year 50, and (4) ensuring that assumptions used in the socio-economic analysis are fully stated and that inconsistencies with biomass results are reconciled. In addition to the above formal recommendations, the report offers numerous suggestions for clarifying predictions on land building, habitat diversity, water quality, fisheries populations, and for addressing point-by-point concerns in the socio-economic outcomes.

1.0 INTRODUCTION AND BACKGROUND

The *Expert Panel on Diversion Planning and Implementation* (the Panel) held its sixth public meeting at the Crowne Plaza Hotel on October 27 with follow-up discussions on October 28, 2015 at the Water Institute of the Gulf. The Panel was established to provide expert advice and guidance on key issues that pertain to river diversions in recognition that diversions are an essential restoration tool in coastal Louisiana. As noted in previous Panel reports, Louisiana's 2012 Comprehensive Master Plan states (p. 106) that "…sustainable restoration of our coast without sediment diversions is not possible". The Panel's official charge was thus to *provide technical input, review and guidance as plans are refined on diverting freshwater and sediment from the Mississippi and Atchafalaya rivers into adjacent estuarine basins to build, maintain and sustain coastal wetlands.*

The Panel, convened by The Water Institute of the Gulf (the Institute), is comprised of 12 members with backgrounds in a broad range of physical and biological sciences, social science, economics, and engineering. The extensive experience of Panel members in other restoration programs, together with the particular blend of Panel expertise, was considered important for advancing our understanding of river diversions. The Panel recognizes that there is an expectation that they remain independent and objective, and that their role is advisory in nature. As such, the Panel is not in a position to make policy or implementation decisions. More information on the Panel, including the list of members and their professional expertise, is given in Appendix 1.

The Panel was established to consider a number of issues including: (1) evaluation of critical scientific and technical uncertainties; (2) identification of research that will be needed to reduce uncertainties; and, (3) review and comment on program design and implementation, technical reports, model outputs, and other aspects of project development identified by the Panel or by the Coastal Restoration and

Protection Authority (CPRA). The Panel anticipates that topics for consideration will continue to vary from meeting to meeting and that Panel members will remain engaged periodically through webinars between the formal meetings. The agenda for the public part of the meeting is given in Appendix 2. The Panel also met privately to discuss findings and recommendations, which are summarized below in Section 3 and Section 4 of this report.

2.0 FOCUS OF MEETING #6

Meeting #6 occurred near the end of the second year of the three-year period over which the Panel was originally convened. This was an especially important meeting for two reasons. First, it provided for the first time an opportunity for the Panel to see results of the modeling work that had been the focus of intense activity leading up to the *Fall 2015 Decision Point*. Although the Panel had been informed of progress in monitoring and modeling through previous meetings and webinars between the meetings, there had not been a comprehensive presentation of the simulation results and a comparative analysis of model performance. Second, the meeting offered the Panel an opportunity to hear about and more fully understand the CPRA staff recommendation made just prior to the Panel meeting for moving forward the mid-Barataria and mid-Breton diversion projects to full engineering and design.

The primary focus of presentations to the Panel during the sixth meeting was to (1) update the Panel on CPRA activities and provide a response to recommendations from the Panel's fifth report, (2) inform the Panel of the outcome and rationale for the staff recommendation regarding the *Fall 2015 Decision Point*, and (3) provide the Panel with results of modeling simulations for a) land building and landscape change, b) changes in vegetation and the fate of nutrients, c) changes in fish and shellfish communities, and d) impacts of the above on basin-wide socio-economics. The above topics have been the subject of Panel recommendations in previous reports and will continue to be essential topics as CPRA moves beyond the *2015 Decision Point* towards the *2016 Decision to Implement*.

The Panel, during the second day of the meeting, discussed specific charge questions that were framed in advance of the meeting (Appendix 3), and discussed at length how best to furnish advice and guidance to CPRA that would inform in a meaningful way the next steps beyond the *Fall 2015 Decision Point*. The findings and recommendations in this report, as in previous reports, have their origin in the discussions of uncertainty, monitoring, modeling and conceptual approach from earlier Panel meetings. Given the complexity of the science and engineering associated with the design and operation of major freshwater and sediment diversions, it became clear that uncertainty and prediction from modeling were highly relevant and pressing topics that would form the underpinnings of virtually every future decision. Earlier findings and our 42 previous recommendations spread among our five previous reports are still relevant.

3.0 RESPONSE TO THE CHARGE

The Charge that had been provided to the Panel in advance of the meeting was centered around the four groups of analyses that dealt with the different aspects of system change that were most relevant to the *Fall 2015 Decision Point*: (1) land building and landscape change; (2) vegetation and the fate of nutrients; (3) fish and shellfish communities; and, (4) socio-economics. For each of the above areas of supporting information, the Panel was asked to respond to two sets of questions.

(1) *Patterns of change.* Given the assumptions regarding controlling factors, e.g. subsidence, sea-level rise, river flow, and sediment availability, does the Panel see any inconsistencies or counterintuitive patterns of change in the results of the 50-year simulations of the future without project (FWOP), individual diversions, collective diversion operation, or changing operational regime?
(2) *Use of results.* Is CPRA's interpretation of the effects of diversions in terms of a) the patterns of changes across the study area, b) the magnitude of effect vs FWOP, and c) the differences among diversions, reasonable given the uncertainty involved in the analyses? Are the differences among projects and against the FWOP on which the decision is based supported by the analysis given uncertainties in input data, model parameterization, etc.?

In light of model results that were presented, the Panel was then asked to offer recommendations beyond those made in previous Panel reports that would refine the analytical approach as the selected sediment diversions move into the next phase of engineering and design. The responses to charge questions #1 and #2 are given below, including suggestions for decreasing the level of uncertainty, and a short list of high-level recommendations is given in section 4.0.

3.1 Land Building and Landscape Change

The models for predicting changes in land building and landscape were used appropriately for the *Fall 2015 Decision Point*, recognizing that there was considerable uncertainty in their results. Patterns of change are largely consistent between the models, which is encouraging given that individual models are structured differently and rely on different sets of assumptions. For example, land building was more extensive in mid-basin than in lower-basin locations regardless of which model was used, and results showed that land building was substantial relative to the FWOP. Efforts towards calibration and validation were strong and models were able to recreate land building associated with the existing West Bay and Caernarvon diversions. The written summaries that discussed model results and comparisons between models were particularly effective in understanding the processes that underlie simulations of land building.

As the design advances toward specific diversions, the Panel would welcome sensitivity analyses on uncertain model parameters, and more effort to reconcile differences in model inputs, assumptions, and results (e.g., sediment loads from the river, bulk density of fine-grained sediments, better representation of initial land acreages, and interactions among vegetation-land building-inundation). Given the uncertainty within the scientific community regarding the impacts of inundation on vegetation, the two different modeling approaches provide a useful bracket of potential outcomes. Organizing a workshop focused on that issue may be helpful in reconciling differences in approach to vegetation modeling and thus model outcomes. However, a more consistent approach to determining the conditions (e.g. maximum depth) conducive for plant establishment on emerging land and plant mortality in submerging areas represents a more critical and tractable issue. Reconciling this difference between model approaches may lead to convergence in model behavior, while maintaining other differences in vegetation treatment that reflect scientific uncertainty, and maintain some degree of model independence.

Several model results were unexpected or counterintuitive. For example, significant sediment deposition within the diversion structure predicted by the AdH model warrants further investigation and consideration in both models. Similarly, the apparent inability for fine sediment to sustain far-field marshes may require additional modeling efforts or a different data presentation such as regional maps for net deposition. Finally, more significant land building with less aggressive operation strategy (PR6) than continuous operation (PR7) was an important and surprising result, though it was well explained.

3.2 Vegetation and Fate of Nutrients

The Panel applauds The Water Institute and University of Louisiana modeling team for their innovative modeling of vegetation dynamics within Delft 3D. It appears to be a powerful multi-species approach to forecasting changes in coastal vegetation and comparing vegetation dynamics with and without diversions. Integration of the LAVegMod.DM, VEGMOD, and LAVegMod.RootShoot model components provides critical linkages between the physical processes and the responses of key species. Changes in water depth, salinity, and nutrient availability generate projected shifts in spatial distributions, total biomass, and biomass allocation of these species. Coupling of nutrient modeling to vegetation and food web modeling appears to be an appropriate conceptual approach.

Overall, the picture provided by vegetation and nutrient model subcomponents at this time is sufficient to support selection of the individual sediment diversion projects based on relative estimates of new land that will be built. However, the underlying model setup, calibration and application to scenario analyses have not been sufficiently explained to allow estimates of environmental impacts of these diversions. Remarks here are therefore targeted at recommending areas in which better information or justification is needed in order to aptly interpret model output. These remarks should not be taken as criticisms per se, given that we understand the complexity of synthesizing and utilizing modeling outputs to inform management actions, and appreciate the accelerated timeframe for these decisions.

With respect to the vegetation model, one caveat concerns the use of model output to predict diversion effects on habitat diversity. The group of seven taxa selected for use in the vegetation models is a subset of the species present in the salt, brackish, intermediate, and fresh marsh groups. The panel cautions that conclusions about diversion impacts on future trends in species richness and dominance (see McCune and Grace, 2002; Gotelli and Colwell, 2011) are not supported by the current model outputs because estimates of these two parameters cannot be calculated using seven taxa selected from the broader species pool. The CRMS data could be used to conduct a supplementary empirical analysis for projecting occurrence trends for a broader suite of species, along with community richness and dominance measures, with salinity and water level changes (Visser *et al.,* 2013).

Extrapolation from these species-specific responses to predict spatial change in coverage of broader vegetation types in the landscape is the logical next step. The taxa selections for modeling salt marsh and brackish marsh dynamics are clear given that these groups are largely dominated by these species. However, the intermediate and fresh marsh groups have much higher diversity assemblages (Visser *et al*., 2013). It is unclear whether the taxa were selected because they are considered to be indicator species (*sensu* Dufrêne and Legendre, 1997) of the broader vegetation groups or whether the choices were based on other considerations. However, based on Meselhe *et al.* (2015a) the selected taxa would in fact represent taxa with highest current cover or that were most likely to respond to freshwater conditions produced by sediment diversions. Further, the issue of computational tractability played a role and these considerations should be highlighted in future modeling activities.

With respect to the nutrient modeling, we question the use of the model output to describe impacts on water quality without further detailed information on model calibration and a more structured interpretation of results. Two specific examples can be given along these lines. First, it would be highly instructive for the model to be used to summarize the mass balance of nutrients through key ecosystem compartments (vegetation, chlorophyll-a, nitrification and denitrification, burial and coastal export). This information should be synthesized vis-à-vis available data on the key state variables (chlorophyll-a, sediment nutrients, vegetation, etc.) and measured rates of transformation. Second, the results should be interpreted in the context of water quality impacts documented here and in other systems associated with model-predicted parameters such as chlorophyll-a and associated harmful algal bloom events, dissolved oxygen, and total nitrogen and phosphorus concentrations (e.g. Bricker *et al*., 2003, Zaldivar *et al*., 2008).

3.3 Fish and Shellfish Communities

The ensemble modeling approach that includes both EwE and CASM was designed to provide a robust analysis of the relationships between ecological drivers (e.g., temperature, salinity, vegetation) and the trophic interactions of fish and shellfish populations in the estuarine systems near the Mississippi River. While the models improve our understanding of these interactions, their ability to predict the size of future populations is limited and certainly dependent on the quality of data available for model development and the validation of model performance. The modeling teams have made substantial progress in the last year, but EwE/CASM outputs should still be treated more as an exploration of plausible futures than as a means to obtain definitive predictions of future fish biomass or fishery yields.

While both models seem to be able to mimic some of the expected spatial differences in species distributions with salinity patterns, there are some distinct inconsistencies between the model outputs that should be resolved. Projected species biomass outputs (either in aggregate or by species/locations) often differ between the two models, and the reasons for these differences need to be understood. For example, CASM shows an increase in biomass of many trophic groups over the next 50 years in FWOP model runs, and this trend is not apparent in EwE. We recognize that these two models are still in early stages of development, but some specific steps can strengthen their use and application.

Successful models depend on identifying the appropriate drivers, state variables, and other parameters (e.g., species biomass, diet matrices, bioenergetics). The intrinsic and measurement variability in these model components along with error propagation from hydrodynamic model output all contribute to uncertainty in ecosystem model results. Different interpretations and treatment of these model inputs can affect ecosystem model outputs. In developing model input and relationships, it is important to be transparent in identifying the necessary assumptions and simplifications. Uncertainty analysis, combined with thoughtful calibration and validation of the models, is thus critical. Meselhe *et al.* (2015b) have done an excellent job outlining approaches to assess model performance. We recognize that the Panel has not seen all of the details of ecosystem model development, but a rigorous assessment of model performance is needed for the EwE and CASM models following these guidelines.

The AdH and Delft 3D land building models are currently undergoing a synthesis analysis to determine why model results vary, and a similar analysis is needed for the EwE and CASM models. Development of the two ecosystem models is at an appropriate stage for the modeling teams to explore reasons why the models produce similar or different results and what drives the differences. Model formulations should be as parallel as possible. The biotic response curves are generally similar (e.g., brown shrimp to salinity), although there still may be some small differences that can affect model performance. Where possible, such differences should be reconciled. For example, there appears to be a difference in how the models treat primary production. This is the critical condition upon which the remainder of the simulations and conclusions necessarily depend. Relationships between chlorophyll a, phytoplankton, and periphyton need to be examined. It also was unclear whether submerged aquatic vegetation and emergent aquatic vegetation were incorporated into the two models as sources of primary production.

A discussion is needed of limitations in the initial data used to parameterize the models and how those limitations might affect model outputs. A basic statement of why these models are being used, how they are calibrated and validated, and what is reasonable to expect of the outputs should accompany the model output. Even when thoroughly calibrated to existing conditions, there will continue to be concerns about population responses to drastic environmental changes in the future (e.g., salinity reductions) that may not currently exist throughout the estuary. If a species is physiologically unable to tolerate certain conditions, this needs to be reflected in the model output. In this regard, sensitivity analyses in relation to these drivers would seem to be essential, and a clear articulation is needed of how important different drivers are in determining population size. For example, it is currently difficult to determine the relative importance of salinity (which determines total habitat available) or algal production (which drives the food web) in determining species productivity. This is an important conceptual difference that can change our assessment of impacts on fisheries.

The fisheries and yield module of the EwE needs to be clearly explained, including how it relates to the underlying population biomass of target species, because this is an important input into the socio-economic analysis. We suggest conducting some runs of EwE without the fisheries component so that biomass data between the two models can be directly compared.

And finally, framing of the biotic model outputs needs to be consistent with framing of land-building model output. The ecosystem and fisheries model output seems to focus on the larger model domain or area and the 50-year time frame and glosses over sub-basin changes and changes over the near term. This affects the interpretation of the effects of diversions and is not the same approach as used for land building where the focus is on near field effects. Stakeholders in affected sub-basins will likely view this approach as a lack of transparency in the presentation of results.

3.4 Socio-Economics

The Panel recognizes that analysis of socio-economic impacts of the proposed sediment diversions was initiated later than the other groups of analyses to assess diversion impacts and that it necessarily relies on outputs of those studies. Panel members agree that the socio-economic analysis is ambitious and that significant and appropriate effort has been devoted to refining methodology and to linking its analysis to environmental outcomes derived from biophysical models. The study team should be commended for making significant progress in a short period of time. However, the Panel has limited ability to respond to the charge questions because of the limited amount of information that is currently available.

A progress report that details methods, assumptions, results, and interpretation of the results has not yet been written. Accordingly, the following comments and recommendations are based solely on the content presented during the sixth meeting and the accompanying PowerPoint slides. Based on the PowerPoint slides, we understand that the socio-economic analysis has completed the literature review, nearly completed the framing of socio-economic methods, and produced preliminary results for three (commercial fisheries, ecosystem valuation and storm protection) of the six impact categories. The panel was not provided information on the three remaining impact categories (water supply, navigation, and recreation).

Model results of biomass and socio-economic results appear to be inconsistent. For example, considering fish harvest, a PowerPoint slide (#13) in the EwE model presentation shows a decline in brown shrimp biomass for both mid-Breton and mid-Barataria whereas slides in the SEA presentation show increases in harvests/landings (#11,#12,#14,#15). In general, we recommend coordination and communication between the fisheries modeling and the SEA team to explore the mapping of species-by-species temporal and spatial biomass outcomes into the harvest and landing outcomes in order to detect any inconsistencies.

Related to the above, it is unclear how biomass outcomes are translated into harvest outcomes and landing outcomes. What assumptions and methods are being used to relate those (presumably linked) outcomes? What behavioral or other factors (e.g., fishing "effort", prices, capital stocks) lead to differences between spatially-depicted biomass availability and spatially-depicted harvests, and between harvests and landings? What, if anything, would lead a biomass trend to differ from a trend in harvests? What assumptions are being used to incorporate (if at all) fishing pressures on biomass?

Other specific concerns include:

(1) Social interpretation. The overview of methodology (SEA slide #8) indicates that this will be conducted. More information should be provided about the data, methods and potential types of results. It could also cover quantitative information like social vulnerability assessment to coastal storm hazards.
(2) Harvests, landing and employment. The information presented on harvests and landings by parish (SEA slides #14 and #15) shows significant increases in employment in year 50 (85% in aggregate) which appears to be a very large increase in jobs, particularly given the more modest increases reported in harvests and landings. What explains the large number of jobs being created?
(3) Ecosystem Service Valuation. Information on this and storm protection avoided cost (SEA slide #21 and slide #23) should not be presented without more detailed explanation and interpretation of methodology and results.
(4) Storm protection. The information on storm protection avoided cost (SEA slide #23) has a curious feature associated with avoided costs in year 10. Three of the diversions (mid and lower Breton, and lower Barataria) analyzed alone show roughly zero benefits in year 10, while the other (mid-Barataria) shows negative benefits. Yet the benefits of all 4 combined in year 10 are significantly positive. We understand that the individual project outcomes cannot simply be "added up," but there still seems to be a contradiction. Can the contradiction be explained?
(5) The storm protection avoided costs analysis (which we understand to be driven primarily by the extent and location of land protection/building) should include visualization of not only the temporal path of the benefits, but also the spatial location of the benefits. Such visualizations would also help communicate to audiences the assumptions that drive the avoided cost estimates.

3.5 Model Linkages

Because the CPRA modeling efforts address a variety of processes including land building/landscape change, vegetation and nutrients, fish and shellfish, and socio-economics, the use of several individual models is required. The result is a super model, a family of models, or a connected series of models, each accepting input from and providing output to other models in the ensemble. In reporting to the public, decision makers, and reviewers, CPRA should describe these internally-generated flows of inputs and outputs as a way of showing how the models being used are connected to each other. If the exchanges are well known and defined, model users can more easily track errors, define confidence levels, and build explanations of multiple systems operating with each other. Such a description might take the form of a simple listing of the connections. The expansion of the lower portions of the conceptual model may also offer an opportunity to show how the resulting connections allow individual models to interact with each other.

4.0 RECOMMENDATIONS: BEYOND 2015 DECISION POINT.

The Panel recognizes the challenge that CPRA staff would face in trying to address explicitly all of the recommendations in our previous five reports. Given budget constraints and limitations in human capacity, it would be unrealistic to expect that all 42 recommendations could be addressed during the 20-month period over which they were made. We acknowledge that much progress has been made: many of our recommendations have in fact been followed and there has been considerable progress in moving forward with technical studies and other analyses to support sediment diversion planning. As noted previously, we think that the general conceptual model of the diversion planning process has been a very useful tool to communicate with public and CPRA partners, and that each of the four groups of analyses and models has reached a more advanced state in a relatively short period of time.

As CPRA now moves rapidly towards reaching a formal outcome of the *Fall 2015 Decision Point* with the potential for funding the mid-Barataria and mid-Breton diversion projects, we offer the following recommendations.

Recommendation 1:
Explore through model interactions between diversions and other potential restoration tools (e.g., outflow management, dredge spoil, terracing, and channel realignment) ways to more aggressively enhance sediment retention and maximize the process of land building.

Recommendation 2:
Reconcile inconsistencies in fisheries modeling through rigorous assessment of model performance following a process similar to that used for the land-building models, ensuring that model formulations are parallel and that model differences are understood and explained.

Recommendation 3:
Express socio-economic outcomes as changes relative to FWOP (in addition to changes relative to initial condition), and depict outcomes for all available time steps as opposed to outcomes in year 50 only.

Recommendation 4:
Ensure that assumptions used in socio-economic analyses are fully stated and that inconsistencies between biomass and socio-economic results are reconciled using outputs from both EwE and CASM models.

These recommendations are highly relevant beyond 2015 and, if implemented, will enhance project clarity, technical rigor, stakeholder communications, and planning continuity.

5.0 REFERENCES

Bricker, S. B., Ferreira, J. G., and Simas, T., 2003. An integrated methodology for assessment of estuarine trophic status. Ecological Modelling 169, 39-60.

Dufrêne M., and Legendre P., 1997. Species assemblages and indicator species: the need for a flexible asymmetric approach. Ecological Monographs 67, 345–366.

Gotelli, N. J., and Colwell, R. K., 2011. Estimating species richness. In: Frontiers in Measuring Diversity (Oxford University Press), pp. 39-54.

McCune, B., Grace, J. B., and Urban, D. L., 2002. Analysis of Ecological Communities. MjM Software (Gleneden Beach, Oregon), 304 pp.

Meselhe, E., Baustian, M.M., Khadka, A., Jung, H., Allison, M., Duke-Sylvester, S.M., Visser, J.M., Smits, J., van Maren, B., Harezlak, V., Jeuken, M., 2015a. Basinwide Model Development for the LCA Mississippi River Hydrodynamic and Delta Management Study. Draft Report 1: Delft3D Model Setup and Development, 29 pp.

Meselhe, E., Costanza, K., Ainsworth, C.H., Chagaris, D., Addis, D., Simpson, E., Rodrigue, M., June, H., and Smits, J., 2015b. Models Performance Assessment Metrics for the LCA Mississippi River

Hydrodynamic and Delta Management Study. Unpublished report, The Water Institute of the Gulf, 46 pp.

Visser, J. M., Duke-Sylvester, S.M., Carter, J., and Broussard, W. P., III. 2013. A computer model to Forecast wetland vegetation changes resulting from restoration and protection in coastal Louisiana. Journal of Coastal Research, SI 67, 51-59.

Zaldivar, J. M., Viaroli, P., Newton, A., De Wit., R., Ibanez, C., Reizopoulou, S., Somma, F., Razinkovas, A., Basset, A., Holmer, M., and Murray, N., 2008. Eutrophication in transitional waters: an overview, Transactional Waters Monographs, 1, 1-78.

Appendix 1

ABOUT THE EXPERT PANEL ON DIVERSION PLANNING AND IMPLEMENTATION

The Expert Panel on Diversion Planning and Implementation was established to provide independent advice as plans for implementing sediment diversion projects along the Mississippi and Atchafalaya rivers that support coastal restoration are refined.

This independent panel is expected to meet approximately three times per year. It will identify critical scientific and technical uncertainties, suggest specific research to reduce uncertainty, and review and comment on technical reports, model outputs, and other aspects of project development. Given the issues surrounding the complexity of the design and operation of a major sediment diversion, the panel's recommendations will be in an adaptive management context. Meetings of the panel will be structured to ensure key input is received from a variety of local experts, stakeholders, and citizens. Panel reports will be presented at meetings of the CPRA Board.

The Expert Panel was formed at the request of CPRA, which is also funding the effort. The Water Institute of the Gulf provides staff and logistical support to the panel.

MEMBERS

Member	Affiliation	Expertise
Dr. John T. Wells	Virginia Institute of Marine Science (Panel Chair)	Deltaic Processes
Dr. Loretta Battaglia	Southern Illinois University	Restoration Ecology and Climate Change
Dr. Philip Berke	Texas A&M University	Urban Land Use and Environmental Planning
Dr. James Boyd	Resources for the Future	Economics and Environmental Policy
Dr. Linda Deegan	Marine Biological Laboratory	Fish Ecology, Biogeochemical Cycling and Nutrient Delivery
Dr. William Espey Jr	Espey Consultants Inc	Civil/Coastal Engineering and Water Resources
Dr. Liviu Giosan	Woods Hole Oceanographic Institution	Morphodynamics and Sedimentation
Dr. William Graf	University of South Carolina (Emeritus)	Rivers and Water Resources Management
Dr. Matt Kirwan	Virginia Institute of Marine Science	Coastal Landscapes and Sea Level Change
Dr. Tom Minello	NOAA Southeast Fisheries Science Center	Fisheries Ecology
Dr. Martha Sutula	Southern California Coastal Water Research Project Authority	Water Quality Management, Systems Ecology
Dr. John Teal	Woods Hole Oceanographic Institution (Emeritus)	Coastal Wetlands Ecology

Appendix 2

MEETING #6 AGENDA

October 27, 2015
Crowne Plaza Hotel
Baton Rouge, LA

8:30	Welcome and Panel Introductions	Dr. John Wells (Panel Chair) *Virginia Institute of Marine Science*
8:45	Overview	Mr. Kyle Graham *Coastal Protection and Restoration Authority*
9:00	Diversions Update and Fall 2015 Decision	Mr. Bren Haase *Coastal Protection and Restoration Authority*
9:45	Perspective on Sediment Diversions	Capt. George Ricks, *Save Louisiana Coalition* Capt. Ryan Lambert, *Cajun Fishing Adventures*
10:15	Break	
10:30	Supporting Information: Land Building and Landscape Change	Delft 3D Results Dr. Ehab Meselhe, *The Water Institute of the Gulf* AdH Update Mr. Gary Brown, *US Army Corps of Engineers*
11:45	Lunch	
1:00	Supporting Information: Vegetation Changes and the Fate of Nutrients	Dr. Scott Duke-Sylvester, *University of Louisiana* Dr. Melissa Baustian, *The Water Institute of the Gulf*
2:00	Supporting Information: Changes in Fish and Shellfish Communities	Dr. Shaye Sable, *Dynamic Solutions* Dr. Kim de Mutsert, *George Mason University*
3:00	Break	
3:15	Supporting Information: Basin-Wide Socio-Economic Analysis	Mr. Mitch Andrus, *Royal Engineering*
4:00	Public Comment	
4:30	Adjourn	

Appendix 3

CHARGE FOR MEETING #6

CHARGE QUESTIONS

(1) The Fall 2015 decision relies on various analyses to demonstrate the effects of different sediment diversions, individually and in combination, on the receiving basins. There are four groups of analyses dealing with different aspects of system change:

- Land building and landscape change
- Vegetation and the fate of nutrients
- Fish and shellfish communities
- Socio-economics

For each of these types of supporting information, the Panel is asked to respond to the following questions:

Patterns of Change. Given the assumptions regarding controlling factors, e.g., subsidence, sea-level rise, river flow, and sediment availability, does the Panel see any inconsistencies or counterintuitive patterns of change in the results of the 50-year simulations of the future without project condition, individual diversions, collective diversion operation, or changing operational regime?

Use of the Results. Is CPRA's interpretation of the effects of diversions in terms of a) the patterns of change across the study area, b) the magnitude of effect vs. future without project, and c) the differences among diversions, reasonable given the uncertainty involved in the analyses? Are the differences among projects and against the future without project on which the decision is based supported by the analysis given uncertainties in input data, model parameterization, etc.?

(2) In light of the model results presented, what recommendations does the Panel have, beyond those made in previous Panel reports, to refine the analytical approach as the selected sediment diversions move into the next phase of engineering and design?