DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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MAY 23 2012

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Brevard County, Florida Hurricane and Storm Damage Reduction Project, Mid Reach Segment – Final USACE Response to Independent External Peer Review

1. Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, EC 1165-2-209, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).

2. The IEPR was conducted by Battelle Memorial Institute. The IEPR panel consisted of 5 individuals with technical expertise geotechnical analysis, economic analysis, coastal engineering, biology/ecology and plan formulation.

3. The final written responses to the IEPR are hereby approved. The enclosed document contains the final written responses of the Director of Civil Works to the issues raised and the recommendations contained in the IEPR Report. The IEPR Report and USACE responses have been coordinated with the vertical team and will be posted on the internet, as required in EC 1165-2-209.

4. If you have any questions on this matter, please contact me or have a member of your staff contact Ms. Stacey Brown, Deputy Chief, South Atlantic Division Regional Integration Team, at (202) 761-4106.

Encl

STEVEN L. STOCKTON, P.E.
Director of Civil Works

Brevard County, Florida, Mid Reach Segment, Hurricane and Storm Damage Reduction Integrated General Reevaluation Report and Supplemental Environmental Impact Statement

FINAL
U.S. Army Corps of Engineers Response to Independent External Peer Review
January 2012

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of WRDA 2007, EC 1165-2-209, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review (2004).*

The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide the most scientifically sound, sustainable water resource solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people. Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to conduct the IEPR of Brevard County, Florida, Mid Reach Segment, () Hurricane and Storm Damage Reduction (HSDR) Draft Integrated General Reevaluation Report and Supplemental Environmental Impact Statement (GRR/SEIS).

The Battelle IEPR panel reviewed the GRR/SEIS, as well as supporting documentation. The Final IEPR Battelle Report was issued 9 December 2009. The Final GRR/SEIS review was completed on 10 November 2010. Overall, 22 comments were identified and documented. Of the 21 comments, 11 were identified by the panel as having high significance, 6 were identified as having medium significance, and 4 were identified as having low significance. The following discussion presents the USACE Final Response to the 21 IEPR comments.

1. Comment – *High Significance*: The design analysis is deficient in that it underestimates the amount of sand that will move offshore during equilibration of the profile, has been based on SBEACH analysis of the existing profile that was not representative of the beachface fill that is proposed, and underestimates the beachface fill erosion rates over the life of the project.

This comment includes two recommendations (erosion rate related to sea level rise and storm response) for resolution, both of which were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The design analysis was revisited and the estimated volumes of material that will move offshore during equilibration were updated. As stated in paragraph A-94 of Appendix A, one of the primary with-project erosion forces on the beach face fill will be cross shore transport seaward out of the dune and beach face fill area due to background erosion and profile equilibrium. This phenomenon has been accounted for throughout the design process. A theoretical equilibrated fill width can be computed using the concept of profile translation. The GRR was revised to increase design fill volumes for applicable reaches to produce the design profile width after equilibration. Table 6-2 and a description of the design analysis was added to section 6.1.2 to clarify the design quantities in the report. Alleviating erosion of the natural dune by providing man-made, sacrificial dune will enhance the storm damage benefits of the project. The dune portion of the fill template will naturally supplement the beach face fill as both are transported seaward during storms. A clarifying statement was added to section 6.1.2 to further explain the rationale behind the dune and beach face fill template design. Page 105 Figure 5-2 was modified to show that beach fill will equilibrate and extend out to depth of closure. Reviewers were directed to the discussion of the historical erosion during this time period presented in Appendix A, paragraphs A-46 through A-50. Section 2.2.2 of the report was revised to reflect the use of monitored and historical erosion rates in establishing the with-project erosion rate. Section 2.2.8 of the GRR was revised to incorporate the effect of sea level rise on future and without project erosion rates in compliance with ER-1165-2-211.

2. Comment – *High Significance:* The referenced SBEACH model report should be included in the GRR/SEIS to enable an evaluation of the cost to benefit ratios.

This comment includes three recommendations for resolution, two of which have been adopted (SBEACH model details and new SBEACH analysis) and one which was not adopted (updating benefits), as discussed below.

USACE Response: Adopted

Action Taken: Additional detail on SBEACH model setup and storm selection was added to pages 38-41 of Appendix A. Revisions included a comparison of the 1996 profile with the most recent beach profile survey to show that the study area profile has not changed since the SBEACH simulations were performed. Investigation found that the erosion predictions of SBEACH were not significantly influenced by the inclusion, or exclusion, of the rock substrate within the nearshore profile. The SBEACH results are conservative in overestimating the future erosion owing to the fact that the proposed beach fill sand is coarser than native.

USACE Response: Not Adopted

Per the discussion above, new SBEACH runs were not necessary due to insignificant changes to the model inputs. Therefore, benefits were not recalculated as no new data was developed.

3. Comment – *High Significance*: The tradeoffs between restoring the damaged sandy shore ecosystem and protecting the nearshore exposed rocks should be formally evaluated within the GRR/SEIS.

This comment includes seven recommendations (tradeoff of protection vs. restoration, description of sandy shore ecosystem to depth of closure, restoration in plan selection and mitigation details, amount of shady shore erosion, amount of nearshore rock exposure, likelihood of covering nearshore rock with sand, and list of dune plants) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: Information was added to the Executive Summary as well as Chapter 2 (Existing Conditions) which document why protection of nearshore rock is considered more important than restoring a complete sandy shore ecosystem. This includes why the Mid-Reach was dropped from the original 1996 project due to rock impacts and the opinions of the agencies at that time, such as the agencies establishing a need to minimize and avoid impacts to rock within the Mid-Reach. Also added were descriptions of relevant laws which protect hard bottom habitat.

Existing documentation in the GRR on the sandy shore ecosystem (Section 2.2.2) as well as the erosion of this ecosystem and the nearshore rock exposure (2.3.4) were referenced for the reviewer. Dune plants are further described in Comment 18.

4. Comment – *High Significance:* The reasons for protecting rock need to be compelling enough to justify the cost of failing to completely restore the sandy shore plus the expense of mitigation. Also, the agreed-upon limit of 3.0 acres of hardbottom burial needs a scientific justification.

This comment includes five recommendations (species of concern harmed by rock burial, classification for each species on the prior mentioned list, likelihood species listed are in Mid-Reach, application of literature justifying protection of nearshore rock, and justification limiting 3 acres of rock burial) for resolution which were adopted, as discussed below.

<u>USACE Response: Adopted</u>

The National Marine Fisheries Service has stressed the "ecological importance" and "uniqueness" of the nearshore coquina rock outcroppings in the Brevard County Mid-Reach study area, which had been designated as Essential Fish Habitat and a Habitat Area of Particular Concern and the need to avoid and then minimize impacts to the rock (Section 7.1). The US Fish and Wildlife Service stated that "since the Mid-Reach is a Resource Category 1 (highest value), the Service recommends no loss of habitat value/ecological function through avoidance, minimization and mitigation. Additional information was added in the Executive Summary and Chapter 2 (Existing Conditions) to justify protection of nearshore rock. The report addresses the value of the resources and the various species of concern (Section 7) that would be affected by the project. There is no agreed upon scientific means to identify the critical acreage or proportional amount of a unique habitat that must be preserved, or which may be allowed to be impacted, in order to preserve ecological function of the habitat. The critical acreage was identified following discussion with the agencies and regulatory action on the County permit.

5. Comment – *High Significance:* The justification to screen out certain structural management measures is not valid based on project assumptions.

This comment includes six recommendations (screening use of groins, screening use of submerged artificial reef, screening of breakwater measure, use of "discretionary" and "exclusionary" screening criteria, more detail on screening methodology and measure relationships, and consideration of two additional measures (feeder beach and overfill)) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: Section 5 of the GRR was updated to further clarify management measures and their ability to address the project objectives, this leads to better clarity and insight to the screening process. Discussion on the flexibility of the beach nourishment measure to provide fill of varying widths and lengths was added to Section 5.2.2, S-3. The screening methodology on page 100 was clarified to state "The first steps consider each reach separately; however they are not independent of each other." Step 2 was revised to state that only those costs not shared between Reaches were used in the initial screening. For the purposes of the plan formulation all the alternatives shown in Table 5-2 are mutually exclusive.

A feeder beach system measure was added, however it is not recommended for detailed analysis (Section 5.2.1, "S-9"). A feeder beach system is not likely to be implementable nor to produce much benefit. A feeder effect would add sand to the nearshore and berm but would not provide any material to the dune, limiting the protection from larger storms. Added sand would be limited by the longshore current available so would likely not add enough material to provide protection in

the berm volume for larger storms. Overfill of Reaches 1 and 2 would be substantially similar as constructing the S-3B alternative of conventional or hydraulic fill in those Reaches. The incremental analysis for Reaches 1 and 2 are shown in Table 5-6 and summarized in Table 5-7 and it shows that a hydraulic fill does not provide benefits in excess of the costs for those Reaches.

The following two measures were screened out. The groin measure includes some beach nourishment and would extend the entire 7.8 miles to avoid erosion effects to adjacent shorelines (pages 93-4). Thus while the impact to the hardbottom would be similar to the beach nourishment measure, it would not be possible to shorten the length of the groin measure to minimize the impact. While the groin measure can be combined with the beach nourishment measures, the inability to shorten the project length as needed for impacts does not make that a practical alternative.

The submerged artificial reef (Section 5.2.1, "S-5") would provide similar benefits to the beach nourishment measure and would have the ability to be built in smaller lengths to limit environmental impact. While this measure may provide greater longevity of the fill and save some cost on periodic nourishments, the construction cost of the rock structure plus fill would be nearly triple that of the beach nourishment by itself for the same relative benefit (based on preliminary cost estimates).

The discussion of the breakwater measure (S-7, page 95) was expanded to explain how limitations of a breakwater design, risk and uncertainty, and cost led to the screening of this measure.

6. Comment – *High Significance*: The assumption that all conventional fill would permanently cover all near shore hardbottom should be justified.

This comment includes four recommendations (describe smallest conventional fill impacts to hardbottoms, describe accurate hardbottom damages, conventional fill options that cannot be eliminated, and environmentally unacceptable hardbottom impacts) for resolution, all of which were adopted, as discussed below.

<u>USACE Response: Adopted</u>

Action Taken: Section 5.4 of the GRR was updated to provide more detail of the conventional fill management measure as it relates to nearshore hardbottom coverage. Appendix A of the GRR was revised to include an analysis of the smallest-scale of conventional fill, which is on the order of 30 to 40 cubic yards per alongshore foot. In general, the concerns about the wide fill templates overwhelming the low relief rock along with the concerns about how to quantify

construction impacts from equipment, pipe, and return-water dictated that all hydraulic alternatives would cause 100% impact.

In addition, the environmental regulatory agencies have documented their position that some levels of hardbottom impact would be unacceptable, regardless of mitigation. In Appendix K, Sub-Appendix K, a letter from the Corps of Engineers, Regulatory Division to Brevard County dated July 5, 2006 stated that the proposed project presented unacceptable impacts, and that a federal permit for the project would be denied unless the impacts to nearshore hardbottom are eliminated or significantly reduced.

7. Comment – *High significance:* Benefits of beachface fill appear to have been significantly overestimated. More inclusive methods of storm damage reduction should be used and the benefits all alternatives reevaluated.

This comment includes three recommendations (re-evaluate storm damage reduction benefits, include all parcels affected, account for damage reduction) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: Additional details on the calculation of benefits and storm damage reduction (specifically the movement and volumes of material) were included in the GRR (A-94 of Appendix A, and Section 6.1.2, Table 6-2 of the GRR), as well as analysis of the future effect of sea level rise with respect to economic benefits (Section 2.2.8 of the GRR). In addition, details on the structure and land value computations was included in the Economic Appendix, page B-4.

By addressing the design analysis questions in Comment 1, (the recommendations for resolution included revisiting the erosion rate, sea level rise and storm response), the storm damage reduction questions in this comment have also been addressed.

8. Comment – *High Significance:* The analysis of the availability of borrow material biases the economic analysis toward the preferred alternative by assuming only two borrow areas offshore near Cape Canaveral, but does not describe other potential offshore sands closer to the project, including those recently identified by the State in the vicinity of the Mid-Reach project.

This comment includes three recommendations for resolution, one of which was adopted (complete discussion of offshore sand resources,) and two of which were not adopted (economic evaluation of beach nourishment closer to project area and

further geotechnical investigation to eliminate all possible sand resources), as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: Revisions were made to Section 5.4.1.4 of the GRR to clarify the information provided regarding potential offshore borrow areas. The location of potential sand sources closer to the Mid-Reach than Canaveral Shoals would not result in significantly less project costs because hydraulic placement of the sand directly from the offshore source to the project is not a viable alternative. Hydraulic beach fill alternatives were eliminated from consideration during the plan formulation phase because they do not meet the requirement to avoid and minimize environmental impacts. With respect to truck-hauled alternatives, there is no justification for evaluating sources of sand closer to the project area since any such borrow area would be more distant from the Port Canaveral sand stockpile area (and thus more expensive) than the recommended borrow areas in the GRR. Section 5.4.1.4 of the GRR was updated to reflect this discussion.

USACE Response: Not Adopted

Per the discussion above, a detailed economic evaluation of beach nourishment locations closer to the project and further geotechnical investigations to eliminate sand resources were not conducted. As hydraulic placement was eliminated for environmental reasons, and as sites closer to the project will have a greater transit distance to Port Canaveral for offloading, such sites will be more expensive than the plan proposed.

9. Comment – *High Significance:* The justification for the beach nourishment design should include a description and evaluation of the alongshore sediment transport and a sediment budget for the system.

This comment includes three recommendations (presentation of a sediment budget, appropriate calibrated and validated model of alongshore sediment transport and shoreline change, and benefits associated with project longevity to be used as part of plan selection) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: Sections A-108 through A-114, of Appendix A, were updated to include a more detailed discussion of the alongshore sediment transport. The use of the longshore sediment model GENESIS was applied to solve for the with-project erosion rate on traditional beach nourishment designs such as this project, where the primary with-project erosion force is the longshore diffusion of sand out of the fill area. The background erosion rate was based on historical erosion rates in the

Mid-Reach. Additional information was gathered from recent monitoring data from the local dune fill project and used to calculate the with-project erosion rate.

10. Comment – *High Significance:* Due to the application of incorrect coastal processes analyses in plan formulation, and lack of consideration in the variability of exposed hardbottom, the risk and uncertainty analysis is inaccurate and needs to be revised based on appropriate input parameters.

This comment includes three recommendations (correct coastal process analyses, change risk classification, and rerun risk and uncertainty analysis) for resolution, all of which were not adopted, as discussed below.

<u>USACE Response:</u> Not Adopted

To clarify the project design and the associated risk, discussions on profile response to storms and quantification of with-project erosion rates were added to Sections 5 and 6 of the GRR and portions of Appendix A were updated (this is in line with the response to Comment 1). While several methods are available to define the coastal processes, the method presented in the GRR was modified to improve the predictive ability and robustness.

11. Comment – *High Significance*: The GRR/SEIS needs to address the potential that more than the estimated three acres of nearshore hardbottom could be covered by sand from the maintenance renourishment program.

This comment includes four recommendations (model run for post-renourishment and equilibration, rock exposure assessment, contingency plan for mitigation reef, estimate contingency reef need) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: All project-induced coverage of the nearshore hardbottom was computed based on translation of the native beach profile seaward to predict the with-project beachface/rock interface in the post-nourishment and equilibration state. The fill material is highly compatible with the native beach, thus the fill should obtain the same average profile shape as the existing beach. The toe of fill and rock impact analyses assume that the entire profile will translate seaward relative to the fixed, emergent rock. Appendix K, Sub-Appendix J (Mitigation and Monitoring Plan, Performance Standards and Evaluations) page 25 was revised to include discussion on how the potential for additional impacts to rock will be addressed through a comprehensive monitoring to assess actual impact and

contingency plan that will be negotiated in connection with the Florida Department of Environmental Protection regulatory permits.

12. Comment – *Medium Significance*: The justification for using 2004 as a baseline year for hardbottom coverage or as part of the basis for beachface fill plan selection does not address concerns regarding a reduction in the area of exposed hardbottom.

This comment includes two recommendations (monitoring data analysis and methodology to discern hardbottom impacts) for resolution, both of which were adopted, as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: The 2004 hardbottom survey was the newest available during the analysis phase. Additionally, the 2004 hardbottom survey of nearshore rock exposure has been accepted by the FDEP as a baseline for assessment of hardbottom impacts associated with the project for beachface and dune-fill proposed by, and permitted for, Brevard County along the Mid-Reach. The GRR was amended to indicate that pre-construction surveys of nearshore rock will be conducted (Appendix K, Sub-Appendix J of the EIS; Mitigation and Monitoring Plan).

13. Comment- Medium Significance: The Economic Conditions section (Section 2.4) of the GRR/SEIS needs to be expanded to include recreational benefits.

This comment includes two recommendations (additional recreational language and clarify user-value days) for resolution, both of which were adopted as discussed below.

<u>USACE Response:</u> Adopted

Action Taken: The economic conditions section (Section 2.4) was updated to mention recreational benefits and Paragraphs 47 and 48 of the Economics Appendix was expanded to include more in-depth discussion on recreational benefits. The limitations imposed by available parking were explained and descriptions of user-day values were added to Paragraph 48 of the Economics Appendix.

14. Comment – *Medium Significance*: The accuracy of the sea level rise calculations is outdated and the current policy (EC-1165-211) should be used.

This comment includes three recommendations (sea level rise analysis, change in recommended plan based on sea level rise analysis, and revise report with sea level rise analysis implications) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> **Adopted**

Action Taken: Pages 10-16 were updated in the Engineering Appendix. Sea level rise calculations were updated in accordance with EC-1165-2-211. A discussion of the future implications of sea level rise on erosion rates (an increase in the erosion rate) was added. The analysis based on this comment did not change the plan selection.

15. Comment – *Medium Significance*: Further justification is required for using articulated concrete mats, sine their performance in similar environment is not known, and the placement of the mats above the depth of closure (17-20 ft) may subject low profile units to burial.

This comment includes three recommendations (structural analysis of cables and unreinforced units, other installations in similar environments, and test section) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> **Adopted**

Action Taken: The native reef/rock in the Mid-Reach is exposed above the existing bottom on a consistent basis. The mitigation reef is of similar vertical relief and will be placed further seaward than the native rock, closer to the depth of closure of the beach profile where there is less energetic sediment transport occurring. Based on this, it is expected that the mitigation reef will remain exposed similar to the native rock. Location of mat installation has been selected to be as close to shore (in as shallow of water as practicable) to better emulate environmental conditions of the impact site, but immediately seaward of the zone of greatest seabed fluctuation (~ minus13 feet MLLW). This analysis is presented in Appendix K, Sub-Appendix F (Section 7.0, Seabed Profile Stability), pages 13-18.

16. Comment – *Medium Significance*: More clarification on the description of cost estimation is necessary, including defining terminology such as Average Annual Equivalent (AAEQ).

This comment includes three recommendations (details on resource use, accounting of non-market costs and clarification of terminology and methods) for resolution, all of which were adopted, as discussed below.

<u>USACE Response:</u> **Adopted**

Action Taken: The MCACES cost estimate, found in Appendix A-2 Cost Risk Appendix, details the assumptions used in the cost estimate. The MCACES estimate includes such things as quantities, cost per unit, and description of the construction process. Additional documentation was added Section 5.3.2 to explain how the non-market costs, e.g. interest during construction, are computed.

17. Comment – *Medium Significance*: More details on the 2008 profile data and template design should be included to enable verification of quantities as part of justifying the engineering design.

This comment includes two recommendations for resolution, one of which was adopted (include representative 2008 profiles/design templates) and the second that was not adopted (revised construction quantities to account for erosion), as discussed below.

USACE Response: Adopted

Action Taken: Additional beach profiles were included in the Engineering Appendix to indicate design and advanced fill (Figures A-22, A-23, and A-24).

USACE Response: Not Adopted

Further design is expected during the plans and specifications phase to account for any changes in fill volume due to the intervening time between report preparation and construction, however the fill volumes were not changed in the GRR.

18. Comment – *Low Significance*: The report includes errors regarding species identification and scientific names which brings into question the credibility of species listings.

This comment includes four recommendations (confirm American beach grass, accurate spelling of scientific names, complete list of plant species in Mid-Reach, and complete list of plant species in dunes and swales) for resolution, two of which were adopted as described below.

USACE Response: Adopted

Action Taken: Section 2.1.1 of the GRR was revised to eliminate spelling errors of the scientific names that were referenced. This same section was reviewed for an accurate list of plant species currently found within the dune system of the Mid-Reach.

USACE Response: Not Adopted

The GRR was not edited to include a complete list of plant species found on fully developed dunes and dune swales in Brevard County as the project is intended to provide and/or restore shore protection and not a restoration of the full suite of dune vegetation species.

19. Comment – *Low Significance*: The specific Environmental Operating Principles (EOPs) that are referenced need to be identified and described in greater detail.

This comment includes one recommendation (list EOPS and discuss plan formulation influence) for resolution, all of which were adopted as described below.

USACE Response: Adopted

Action Taken: Section 5.5.2 was expanded to include a listing of the USACE EOPs as well as a summary discussion on how each of the principles was considered.

20. Comment – *Low Significance*: The use of a discount rate and two-year duration to maximum habitat equivalency is not adequately justified and may affect the Habitat Equivalency Analysis (HEA) process.

This comment includes five recommendations (justify discount rate in HEA assessment, justify two year lag in HEA assessment, justify HEA and UMAM time lags or differences, sensitivity analysis of time lag in HEA, and evaluation of HEA and UMAM) for resolution, all of which were adopted as described below.

USACE Response: Adopted

Action Taken: The HEA analysis (Appendix K, Sub-Appendix SEIS-H) has been revised to reflect the recommendations of the panel, specifically including the use of input data and assumptions in the HEA that are consistent with, and detailed within, the UMAM analysis (Appendix K, Sub-Appendix SEIS-G). The revised HEA utilizes a one-year lag and net mitigation reef productivity level of 64%, including risk allowance (same as UMAM); and it includes a sensitivity analysis of the time lag factor, as recommended.

21. Comment – *Low Significance*: The GRR/SEIS needs to clarify that as the shoreline migrates landward the hardbottom will attenuate a greater percentage of the wave energy.

This comment includes one recommendation (assessment of impacts to wave climate) for resolution, and it was adopted as described below.

<u>USACE Response:</u> Adopted
Action Taken: The referenced statement in Section 3.5.2 was removed and clarification was added concerning the wave energy attenuation.