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Final Independent External Peer Review Report

Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

Contract No. W911NF-07-D-0001
Task Control Number: 09207
Delivery Order: 0809

April 16, 2010

SHORT-TERM ANALYSIS SERVICE (STAS)

on

Final Independent External Peer Review Report for the Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

by

Battelle
505 King Avenue
Columbus, OH 43201

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Scientific Services Program

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FINAL
INDEPENDENT EXTERNAL PEER REVIEW REPORT
for the

Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

EXECUTIVE SUMMARY

The Surf City and North Topsail Beach Integrated Feasibility Report and Environmental Impact Statement (Surf City FR/EIS) is being prepared in response to the following two resolutions, adopted February 16, 2000 for Surf City, and April 11, 2000 for North Topsail Beach:

- Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on West Onslow Beach and New River Inlet, North Carolina, published as House Document 393, 102nd Congress, 2nd Session, dated September 23, 1992, and other pertinent reports, to determine whether any modifications of the recommendations contained therein are advisable at the present time in the interest of shore protection and related purposes for Surf City, North Carolina.
- Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on West Onslow Beach and New River Inlet, North Carolina, published as House Document 393, 102nd Congress, 2nd Session, dated September 23, 1992, and other pertinent reports, to determine whether any modifications of the recommendations contained therein are advisable at the present time in the interest of shore protection and related purposes for North Topsail Beach, North Carolina.

The principal study area includes the towns of Surf City and North Topsail Beach, both of which are located on Topsail Island. Topsail Island is a 22-mile long and 0.5-mile wide barrier island approximately 40 miles northeast of Wilmington, North Carolina. Due to the northeast-southwest orientation of the coastline, the island faces the Atlantic Ocean on the southeast. Other waterbodies in the vicinity include New River Inlet immediately to the northeast, Banks Channel and the Atlantic Intracoastal Waterway (AIWW) to the northwest, and New Topsail Inlet at the far southwestern end of the island.

The sponsors' interest is in developing a plan of protection against storm damage for 17 miles of shoreline extending from the Topsail Beach/Surf City town limits to the northern end of Topsail Island. The study is also documenting incidental recreation benefits. Being located between Cape Lookout and Cape Fear, Topsail Island is a frequent target for hurricanes and tropical storms tracking along the mid-Atlantic coast. In addition to these direct landfalling storms, many storms that have passed offshore without making landfall have also impacted the study area. Local impacts to the study area have varied depending on the location and strength of the storm. However, Bertha and Fran in 1996 and Floyd in 1999 were among the most damaging and costly storms ever to hit North Carolina.

USACE is conducting an independent external peer review (IEPR) of the Surf City FR/EIS. Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the Surf City FR/EIS. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007a) and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR panel.

Five panel members were selected for the IEPR panel from more than 22 identified candidates. Corresponding to the technical content of the Surf City FR/EIS, the areas of technical expertise of the five selected panel members included geotechnical engineering, economics, coastal engineering, environment/biology, recreation, and plan formulation.

The IEPR panel was provided with electronic versions of the Surf City FR/EIS documents, along with a charge that solicited their comments on specific sections of the documents that were to be reviewed. The IEPR panel and Battelle were briefed by the Surf City FR/EIS Project Delivery Team during a kick-off meeting held via teleconference prior to the start of the review. Other than this teleconference, there was no direct communication between the IEPR panel and the USACE during the peer review process. More than 400 individual comments were received from the IEPR panel in response to the 124 charge questions.

Following the individual reviews of the Surf City FR/EIS documents by the IEPR panel, a teleconference was conducted to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. The Final Panel Comments were documented according to a four-part format that included description of: (1) comment statement; (2) the basis for the comment; (3) significance of the comment (high, medium, and low); and (4) recommendations on how to resolve the comment. Overall, 16 Final Panel Comments were identified and documented. Of the 16 Final Panel Comments, 8 were identified as having high significance, 5 were identified as having medium significance, and 3 were identified as having low significance.

Table ES-1 summarizes the Final Panel Comments by level of significance. Detailed information on each comment is contained in Appendix A of this report.

Table ES-1. Overview of 16 Final Comments Identified by the Surf City FR/EIS IEPR Panel

Significance – High	
1	Based on the information provided in Appendix D (Coastal Engineering) and the Main Report, the study documentation does not adequately describe the development and application of the coastal engineering models, including model calibration, input data, and explanation of results.
2	To justify the scale of the recommended project, additional explanation is needed regarding the formulation of the project's initial and periodic renourishment volume requirements, the predicted response of the project to discrete storm events, and the comparative size and response of corollary projects along this coastline.

Significance – High (continued)	
3	The Selected Plan may not be implementable based on the engineering, construction, and fiscal resources information provided in the FR/EIS.
4	Estimates of property values are potentially incorrect for measuring the economic value of coastal locations.
5	The benefits associated with the non-structural alternative may have been underestimated or not fully evaluated, and the spatial distribution of benefits is unclear.
6	The presented geotechnical data are either incomplete or indicate that the proposed borrow sites are not well-suited to meet the requirements and predicted performance of the Selected Plan from engineering, economic, and environmental standpoints.
7	The justification for developing and applying the historical shoreline erosion rate, as presented in the FR/EIS, needs more detail.
8	The proposed geometry of the berm and dune appears inconsistent with natural beach profiles.
Significance – Medium	
9	The recreation benefits analysis omits overnight users, lacks an explanation for selecting the contingent valuation benefit estimate over the travel cost benefit estimate, and omits a discussion of congestion, all three of which can be addressed with existing project data or literature.
10	The cost estimates need more detailed explanation, including the rationale for calculating interest during construction.
11	The study documentation should indicate the degree to which anthropogenic replenishment and prior storm impacts have influenced the representative beach profiles applied in the SBEACH and GRANDUC models.
12	Local data sets and prior analyses on longshore sediment transport, wave height, and background erosion rate have not been fully discussed.
13	Additional risk and uncertainty analysis is necessary to address the assumptions and inherent variability in project costs, property values, climate change, and recreation.
Significance – Low	
14	The fishery resources discussion should be expanded to include nearshore shellfish species and relationships between Essential Fish Habitat (EFH) and commercial/recreational fishery values.
15	The FR/EIS should be expanded to address the relevant Federal and State protected species statutes and should be updated to clarify the present status of several species.
16	Historical conditions, including storm impacts and dredge disposal activities at and near the project area, need to be described more thoroughly due to their influence on future erosion rates and renourishment requirements.

The IEPR panel generally agreed that were several solid areas of analysis, and that acceptable models were used in the economic, engineering, and environmental analyses in the Surf City FR/EIS. The following statements provide a summary of the panel's findings, which are described in the Final Panel Comments presented in Table ES-1 and discussed in more detail in Appendix A.

Plan Formulation Rationale: The general approach used to develop and select the recommended plan was rational and clearly explained. However, the panel members expressed concern that the initial screening of plan alternatives may not have adequately accounted for project size, specifically as constrained by the availability of sand resources and the cost of multiple mobilizations for initial construction, and that the plan may not be constructible or

economically justified as described. The panel also noted that the dune and berm geometries of the plan alternatives differ from naturally occurring beach profiles, and that other profile geometries may more optimally meet the project objectives, relative to the recommended plan.

Engineering: Overall, the panel members felt that the engineering methods and models used were appropriate. However, there was a lack of necessary detail provided on model input data and calibration, historical shoreline changes and sediment transport, volumetric loss rates and renourishment requirements, and beach response to discrete storm events, making it difficult to evaluate the model outputs and the appropriateness of the project's scale. The dune and berm geometry of the project, relative to naturally occurring beach profiles and the ability of other profiles to meet the project objectives, was additionally identified by the panel as an issue requiring further examination. The panel also had concerns about the borrow area being potentially incapable of providing a reliable, long-term source of sand, and whether the project could be physically constructed in accordance with the assumed schedules and costs. Based on the information provided, the panel felt that the project may not be justified from size and cost standpoints.

Environmental: The discussion of the environmental and biological aspects of the Surf City project was very well done overall, particularly the description of hardbottom and benthic communities. The Biological Assessment was also very good. However, the information in the Main Report was presented in fragments, resulting in readability challenges. The panel thought that the Main Report would benefit from more discussion of endangered species and Essential Fish Habitat.

Economic: While the valuation of recreational benefits utilized state-of-the-art methods and good visitor survey data, these benefits were not included in the evaluation of the structural versus non-structural alternatives even though recreational benefits represent approximately one-half of the total project benefits. The panel was also concerned with the accuracy of the property valuation methods and the apparent distribution of the predicted storm damages and benefits between the oceanfront and non-oceanfront properties. They also found the cost estimation and recreation benefits information appeared to lack any formal risk analysis.

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LIST OF ACRONYMS

ATR	Agency Technical Review
AIWW	Atlantic Intracoastal Waterway
COI	Conflict of Interest
EC	Engineering Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	Feasibility Report
IEPR	Independent External Peer Review
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PDT	Project Delivery Team
P.E.	Professional Engineer
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WRDA	Water Resources Development Act

1. INTRODUCTION

The Surf City and North Topsail Beach Integrated Feasibility Report and Environmental Impact Statement (Surf City FR/EIS) is being prepared in response to the following two resolutions adopted February 16, 2000 for Surf City, and April 11, 2000 for North Topsail Beach:

- Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on West Onslow Beach and New River Inlet, North Carolina, published as House Document 393, 102nd Congress, 2nd Session, dated September 23, 1992, and other pertinent reports, to determine whether any modifications of the recommendations contained therein are advisable at the present time in the interest of shore protection and related purposes for Surf City, North Carolina.
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The principal study area includes the towns of Surf City and North Topsail Beach, both of which are located on Topsail Island. Topsail Island is a 22-mile long and 0.5-mile wide barrier island approximately 40 miles northeast of Wilmington, North Carolina. Due to the northeast-southwest orientation of the coastline, the island faces the Atlantic Ocean on the southeast. Other waterbodies in the vicinity include New River Inlet immediately to the northeast, Banks Channel and the Atlantic Intracoastal Waterway (AIWW) to the northwest, and New Topsail Inlet at the far southwestern end of the island.

The sponsors' interest is in developing a plan of protection against storm damage for 17 miles of shoreline extending from the Topsail Beach/Surf City town limits to the northern end of Topsail Island. The study is also documenting incidental recreation benefits. Being located between Cape Lookout and Cape Fear, Topsail Island is a frequent target for hurricanes and tropical storms tracking along the mid-Atlantic coast. In addition to these direct landfalling storms, many storms that have passed offshore without making landfall have also impacted the study area. Local impacts to the study area have varied depending on the location and strength of the storm. However, Bertha and Fran in 1996 and Floyd in 1999 were among the most damaging and costly storms ever to hit North Carolina.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Surf City FR/EIS in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers Engineer Circular (EC) No. 1165-2-209, *Civil Works Review Policy*, dated January 31, 2010 (USACE, 2010) and the Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* released December 16, 2004 (OMB, 2004). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to

coordinate the IEPR of the Surf City FR/EIS. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR panel on the existing environmental, economic, and hydrologic and hydraulic engineering analyses contained in the Surf City FR/EIS. Detailed information on the Final Panel Comments is provided in Appendix A.

2. PURPOSE OF INDEPENDENT EXTERNAL PEER REVIEW

To ensure that USACE documents are supported by the best scientific and technical information, a peer review process has been implemented by USACE that utilizes IEPR to complement the Agency Technical Review (ATR), as described in USACE (2010) and USACE CECW-CP Memorandum dated March 30, 2007 (USACE, 2007a).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the report's assumptions, methods, analyses, and calculations; and the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Surf City FR/EIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) eligible under section 501(c)(3) of the U.S. Internal Revenue Code. Battelle is an independent objective science and technology organization with experience conducting IEPRs.

3. METHODS

This section describes the methodology followed in selecting the IEPR panel members and in planning and conducting the IEPR. The IEPR was conducted following procedures described in USACE's guidance cited above (Section 2 of this report) and in accordance with OMB (2004). Supplemental guidance on evaluation for conflicts of interest (COI) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

3.1 Planning and Schedule

In terms of planning, one of the first actions Battelle conducted after receiving the notice to proceed (NTP) was to hold a kick-off meeting between the USACE and Battelle. The purpose of the meeting was to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. Due dates for milestones and deliverables in the table below are based on the NTP date of September 10, 2009. Table 1 defines the schedule followed in execution of the IEPR.

Table 1. Surf City FR/EIS IEPR Schedule

TASK	ACTION	DUE DATE
1	NTP	September 10, 2009
	Draft Review documents available	November 19, 2009
	Final Review documents available	December 28, 2009
	Submit Draft Work Plan[a]	October 14, 2009
	USACE provides comments on Draft Work Plan	October 19, 2009
	Conference Call, if necessary	October 20, 2009
	Submit Final Work Plan[a]	October 26, 2009
	USACE approves Final Work Plan	October 28, 2009
2	Battelle requests input from USACE for the COI for recruiting panel members	October 7, 2009
	Recruit and screen up to 6 potential panel members; prepare summary information	January 11, 2010
	Submit list of selected panel members[a]	January 11, 2010
	USACE comments on panel members' COI	January 18, 2010
	Complete subcontracts for panel members	February 1, 2010
3	Submit Draft Charge[a]	December 3, 2009
	USACE provides comments on Draft Charge	December 8, 2009
	Submit Final Charge[a]	December 15, 2009
	USACE approves Final Charge	December 17, 2009
4	USACE/Battelle Kick-off Meeting	September 17, 2009
	Battelle/panel Kick-off Meeting	February 8, 2010
	USACE/Battelle/panel Kick-off Meeting	February 8, 2010
5	Review documents sent to panel members	February 8, 2010
	External panel members complete their review	March 10, 2010
	Collate comments from panel members	March 16, 2010
	Convene panel review conference call	March 23, 2010
6	Submit Final IEPR Report[a]	April 16, 2010
7[b]	Input Final Panel Comments to DrChecks	April 19, 2010
	USACE provides draft Evaluator responses and clarifying questions to Battelle	April 23, 2010
	Teleconference between Battelle, panel members, and USACE to discuss Final Panel Comments, draft responses & clarifying questions	May 4, 2010
	USACE inputs final Evaluator responses in DrChecks	May 13, 2010
	Battelle inputs BackCheck responses in DrChecks (i.e. BackCheck)	May 24, 2010
	Battelle submits pdf printout of DrChecks project file[a]	May 25, 2010
	Project Closeout	July 23, 2010

[a] Deliverable

[b] Task occurs after the submission of this report.

Note that the work items listed in Task 7 occur after the submission of this report. The 16 Final Panel Comments will be entered into DrChecks by Battelle for review and response by USACE and the IEPR panel. USACE will provide Evaluator Responses to the Final Panel Comments and the IEPR panel will respond to the Evaluator Responses (via Backcheck responses). All USACE and IEPR panel responses will be documented by Battelle.

3.2 Identification and Selection of Independent External Peer Reviewers

Corresponding to the technical content of the Surf City FR/EIS and overall scope of the Surf City project, the technical expertise areas for which the candidate panel members were evaluated focused on six key areas: geotechnical engineering, economics, coastal engineering, environment/biology, plan formulation, and recreation.

Battelle initially identified more than 22 candidate IEPR panel members, evaluated their technical expertise and inquired about potential conflicts of interest. Of those initially contacted Battelle chose 10 of the most qualified candidates and confirmed their interest and availability. Of those 10 candidates, 5 were proposed as the final panel and 5 were proposed as backup reviewers. The five proposed primary reviewers constituted the final panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed conflicts of interest, or because they did not possess the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or conflicts of interest. Participation in previous USACE technical peer review committees and other technical review panel experience was also considered.

- Involvement by you or your firm[1] in any part of the Surf City and North Topsail Beach Authorized Project, including the Draft Integrated Feasibility Report and Environmental Impact Statement (EIS) for Surf City and North Topsail Beach, North Carolina
- Involvement by you or your firm[1] in any work related to Surf City, North Topsail Beach, and/or the City of Topsail Beach, North Carolina.
- Involvement by you or your firm[1] in any work on North Carolina Coastal Protection Projects.
- Involvement by you or your firm[1] in any work on the Draft Integrated Feasibility Report and Environmental Impact Statement (EIS) for Surf City and North Topsail Beach, North Carolina.
- Involvement by you or your firm[1] in the conceptual or actual design, construction, or O&M of the Surf City and North Topsail Beach Authorized Project or related projects.
- Current employment by the U.S. Army Corps of Engineers (USACE).
- Involvement with paid or unpaid expert testimony related to the Surf City and North Topsail Beach Authorized Project.
- Current or previous employment or affiliation with members of the cooperating agencies.
- Past, current or future interests or involvements (financial or otherwise) related to the Surf City and North Topsail Beach Authorized Project or the City of Topsail Beach.
- Current personal involvement with other USACE projects[2], including whether involvement was to author any manuals or guidance documents for USACE. If yes,

[1] Includes any joint ventures in which your firm is involved.

provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Baltimore or Wilmington Districts.

- Current firm[1] involvement with other USACE projects[2], specifically those projects/contracts that are with the Baltimore or Wilmington Districts. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm[1]) within the last 10 years, notably if those projects/contracts are with the Baltimore or Wilmington Districts. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Other USACE affiliation [e.g., scientist employed by USACE].[3]
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal protection projects, and include the client/agency and duration of review (approximate dates).
- Pending, current or future financial interests in Surf City and North Topsail Beach Authorized Project-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[1] revenues within the last 3 years came from USACE contracts.
- Any publicly documented statement, affidavit, or opinion on USACE coastal projects.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Surf City and North Topsail Beach Authorized Project including the Draft Integrated Feasibility Report and Environmental Impact Statement (EIS).
- Is there any past, present or future activity, relationship or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe:

In selecting final panel members from the list of candidates, an effort was made to select experts who best fit the expertise areas and disclosed no conflicts of interest. Based on these considerations, five peer reviewers were selected from the potential list (see Section 4 of this report for names and biographical information on the panel members). The five reviewers

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[2] "USACE projects" includes regulatory permits and applications, actual or threatened litigation against USACE, particularly the Wilmington district, and comment letters written regarding civil works and regulatory projects.

[3] Note: Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See the OMB (2004) memo p. 18, " ….when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

selected were from academic institutions, consulting companies, or were independent engineering consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of conflicts of interest through a signed conflict of interest form.

Prior to beginning their review and within seven days of their subcontracts being finalized, all members of the IEPR panel were required to attend a kick-off meeting teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication, and other pertinent information for the IEPR panel.

3.3 Preparation of the Charge and Conduct of the Peer Review

A preliminary charge document, including specific charge questions and discussion points, was drafted by Battelle, reviewed and approved by USACE, and provided to the IEPR panel to guide their review of the Surf City FR/EIS. The charge was prepared by Battelle to assist the USACE in the development of the charge questions that will guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). The draft charge was submitted to the USACE for evaluation as part of the draft Work Plan. USACE provided minor clarifications to the final charge questions. In addition to a list of 124 charge questions/discussion points, the final charge included general guidance for the IEPR panel on the conduct of the peer review (as provided in Appendix B of this final report).

Battelle planned and facilitated a final kick-off meeting via teleconference during which the USACE Project Delivery Team (PDT) presented project details to the IEPR panel. Before the kick-off meeting, the IEPR panel members were provided an electronic version of the Surf City FR/EIS documents and the final charge. A full list of the documents that were reviewed by the IEPR panel is provided in Appendix B of this report. The IEPR panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle.

3.4 Review of Individual Comments

In response to the charge questions/discussion points, over 400 individual comments were received from the IEPR panel. Battelle reviewed these comments to identify overall recurring themes, potential areas of conflict, and other overall impressions. As a result of this review, Battelle developed a preliminary list of 21 overall comments and discussion points that emerged from the IEPR panelists' individual comments. Each panel member's individual comments were shared with the full IEPR panel in a merged individual comments table.

3.5 Independent Peer Review Panel Teleconference

Battelle facilitated a three-and-a-half hour teleconference with the IEPR panel to provide for the exchange of technical information among the panel experts, many of whom are from diverse scientific backgrounds. This information exchange ensured that this final IEPR report would accurately represent the panel's assessment of the project, including any conflicting opinions. The panel review teleconference consisted of a thorough discussion of the overall negative comments, positive comments, and comments that appeared to be conflicting among IEPR panel. In addition, Battelle used the teleconference to confirm each comment's level of significance to the panel, add any missing issues of high-level importance to the findings, resolve whether to "agree to disagree" on the conflicting comments, and to merge related individual comments into

one Final Panel Comment. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments and to decide which panel member would serve as the lead author for the development of each Final Panel Comment.

In addition to identifying which issues should be carried forward as Final Panel Comments, the IEPR panel discussed responses to six specific charge questions where there appeared to be disagreement among the panel members. The conflicting comments were resolved based on professional judgment of the IEPR panel; each comment was either incorporated into a Final Panel Comment or determined to be a non-significant issue (i.e., either a true disagreement did not exist, or the issue was not important enough to include as a Final Panel Comment).

During the panel teleconference, the panel identified 16 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, a summary memorandum documenting each Final Panel Comment (organized by level of significance) was prepared by Battelle and distributed to the IEPR panel. The memorandum provided the following detailed guidance on the approach and format to be used in the development of the Final Panel Comments for the Surf City FR/EIS:

- Lead Responsibility: For each Final Panel Comment, one of the IEPR panel members was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Lead assignments were modified by Battelle at the direction of the IEPR panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed merged individual comments in the comment-response form table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and a template for the preparation of the Final Panel Comments.
- Directive to the Lead: Each lead was encouraged to communicate directly with other IEPR panel members as needed, to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Comments: Each Final Panel Comment was presented using a four-part structure, including:
    1. Comment Statement (i.e., succinct summary statement of concern)
    2. Basis for comment (i.e., details regarding the concern)
    3. Significance (high, medium, low; see description below)
    4. Recommendation for resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
    1. High: Describes a fundamental problem with the project that could affect the recommendation or justification of the project
    2. Medium: Affects the completeness or understanding of the reports/project

3. Low: Affects the technical quality of the reports but will not affect the recommendation of the project.

- Guidance for Developing the Recommendation: The recommendation was to include specific actions that the USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

As a result of this process, 16 Final Panel Comments were prepared. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with comment statements, and adherence to guidance on the panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the IEPR panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments were assembled and are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Panel member candidates were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and through referrals. A draft list of primary and backup candidate panel members who were screened for availability, technical background, and conflicts of interest was prepared by Battelle and provided to USACE. The final list of panel members was determined by Battelle.

An overview of the credentials of the five IEPR panel members and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and their technical area of expertise is presented in the text that follows the table.

Table 2. Surf City FR/EIS IEPR Panel: Technical Criteria and Areas of Expertise

	Bodge	Landry	Bender	Vittor	Loomis
Geotechnical Engineer	X				
Experience in geotechnical studies and design of stabilizing dunes[1]	X				
Experience in geotechnical studies and design of bluffs[1]	X				
Experience in geotechnical studies and design of beach berms[1]	X				
Familiar with geotechnical practices used in North Carolina	X				
Registered Professional Engineer	X				
Economist		X			
Experience with coastal economic evaluation	X	X			
Experience with flood risk evaluation	X	X			
Coastal Engineer			X		
Minimum of ten years of experience in coastal and hydraulic engineering with an emphasis on large public works projects	X		X		
Extensive background in coastal processes and hydraulic theory (if a professor)	X		X		
Familiarity with USACE application of risk and uncertainty analyses in coastal storm damage reduction studies	X		X		
Familiarity with standard USACE coastal, hydrologic, and hydraulic computer models	X		X		
Familiarity with the GRANDUC program	X		X		
Registered Professional Engineer	X		X		
Environment/Biologist				X	
Minimum of ten years of experience with projects on the U.S. mid-Atlantic coast	X			X	
Knowledge of tidal salt marshes				X	
Knowledge of construction impacts on marine and terrestrial ecology of coastal regions				X	
Knowledge of the characterization of benthic communities				X	
Familiarity with all National Environmental Policy Act (NEPA) EIS requirements	X			X	
Experience with the Endangered Species Act (ESA), Essential Fish Habitat (EFH), and the Marine Mammal Protection Act (MMPA)	X			X	

	Bodge	Landry	Bender	Vittor	Loomis
Plan Formulation Expert	X				
Minimum of ten years of experience in planning	X				
Experience in coastal planning	X				
Familiarity with USACE plan formulation standards and procedures	X		X		
Recreation Expert					X
Minimum of ten years of experience in recreational resources evaluation	X	X			X
Full understanding of consumer surplus		X			X
Full understanding of contingent value models		X			X
Full understanding of travel cost method	X	X			X
Broad understanding of the determination of Recreation Benefits, including:		X			X
the sampling plan		X			X
data collection methods (surveys)		X			X
data analysis to include use of appropriate models		X			X
the accurate and clear presentation of results		X			X

[1] A minimum of ten years of combined experience in these three activities was required.

Kevin Bodge, P.E.

Role: This panel member was chosen primarily for his geotechnical engineering and plan formulation expertise.
Affiliation: Olsen Associates, Inc.

Dr. Kevin Bodge, P.E., is a Senior Engineer for Olsen Associates, Inc. with more than 25 years of experience in research and engineering activities related to a diverse mix of shore protection, navigation, oceanfront development, and natural resource issues in the coastal (marine) environment. His site-specific experience is extensive throughout the southeastern U.S., the Caribbean and Mexico, and his contributions to the coastal engineering community are nationally and internationally recognized. Dr. Bodge has over 20 years of demonstrated experience in the measurement, design, construction review, and monitoring of stabilizing dunes in lake and ocean wave environments including monitoring surveys and analysis of dune changes, storm damage protection, flooding and dune erosion predictions, post-storm reparations to dunes by sand placement from upland and offshore sources, beach scraping, vegetation, and sand fencing, and preparation of designs, plans, and specifications for these works. Dr. Bodge has experience in the analysis and design of bluffs, addressing water-caused bluff erosion, and the restoration and stabilization of bluffs through sand placement and vegetation. Significant experience includes steep bluff erosion and reparation in southern Brevard County, Florida after Hurricanes Frances and Jeannie (2004) and Elbow Cay, Bahamas after Hurricanes Floyd and Michelle (1999-2005). Since 1986, Dr. Bodge has had significant demonstrated experience in the design of beach berms in marine environments, including the development of upland and offshore sand borrow areas, including compatibility analysis and sediment QA/QC plans and the preparation of designs, plans, and specifications for all types of beach berm projects from small scale (residential) to large scale (10+ miles). Dr. Bodge is the principal design engineer or Engineer of Record for over 50 such projects throughout the southeastern U.S. and Caribbean, with additional global experience. Dr. Bodge has familiarity with geotechnical practices used in North Carolina with specific regard to dune, bluff and beach erosion and related sedimentary processes, including project-specific experience in Bald Head Island, North Carolina (1989-1990, 2005-present) and Bogue Banks, North Carolina (2006-2008), and extensive beach and nearshore field work at the U.S. Army Field Research Facility (FRF) at Duck, North Carolina (1982, 1984). Dr. Bodge is familiar with the theory and application of the component models (or their predecessors) which make up the USACE Generalized Risk And Uncertainty suite of storm damage and economic analysis tools that are central to project formulation and design of coastal shore protection. He is a registered Professional Engineer in Florida, Hawaii, and Virginia.

Craig Landry

Role: This panel member was chosen primarily for his economics expertise.
Affiliation: East Carolina University

Dr. Craig Landry is an associate professor in the Department of Economics at East Carolina University, as well as the assistant director for the Center for Natural Hazards Research. He received his Ph.D. from the University of Maryland. Previous work experience includes positions with the U.S. Environmental Protection Agency and the H. J. Heinz III Center for Economics, Policy, and the Environment. Dr. Landry's primary research areas are environmental and natural resource economics, non-market valuation, experimental economics,

and coastal resource management. His dissertation research was on the application of optimal control theory to the coastal erosion management problem. He has published 12 academic papers on economic aspects of coastal erosion, beach quality, beach recreation, property markets, and coastal hazards, with another nine working papers and proceedings publications. Notable publications discuss the coastal housing market response to amenities and risk and an economic evaluation of beach erosion management alternatives. His current research projects deal with coastal erosion, beach recreation, property markets, coastal flooding hazards, and flood risk evaluation (from a homeowner perspective). Dr. Landry has given 15 research talks on coastal erosion, beach recreation, property markets, and coastal hazards. He has received three external research grants (National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), State of North Carolina) and four internal research grants for work on coastal erosion, property markets, and coastal hazards; one external research grant (NSF) is currently under review. He has directed graduate students in research on topics in coastal hazards and beach recreation, and teaches a split graduate/undergraduate course in Coastal Resource Economics. He serves as Guest Associate Editor of Natural Hazards Review, is a member of the Albemarle-Pamlico Science and Technical Advisory Committee, and is an expert panelist on the National Academies of Science/Government Accountability Office, "Coastal Ecosystem Vulnerability to Climate Change" panel.

Chris Bender, P.E.

Role: This panel member was chosen primarily for his coastal engineering expertise.
Affiliation: Taylor Engineering

Dr. Chris Bender, P.E., is a senior engineer in the coastal engineering group at Taylor Engineering. Since joining the firm, Dr. Bender has taken a leading role in the simulation and evaluation of hurricane surge, wave mechanics and loading, littoral processes, shoreline stability and protection, and sediment transport. He earned a Ph.D. in civil and coastal engineering from the University of Florida in 2003. Dr. Bender has experience with coastal engineering projects including a shore projection project study and design in Florida and coastal storm surge studies in Florida, Louisiana, Texas, and South Carolina. His involvement on the Fort Pierce, Florida Limited Re-Evaluation Report (LRR) and General Re-Evaluation Report (GRR) projects and the Panama City Beaches, Florida LRR project included becoming familiar with the USACE application of risk and uncertainty analyses in coastal storm damage reduction studies. His background in coastal processes and practice consists of project work throughout the southeast U.S., New York, and the Gulf of Mexico, including an ongoing project with the USACE/Federal Emergency Management Agency on Coastal Storm Surge Modeling for Texas. As project manager, he is developing the model setup and executing model testing and validation for additional wave studies stemming from the Louisiana coastal storm surge modeling effort. Dr. Bender is familiar with the application of USACE risk and uncertainty and standard USACE coastal planning and analysis models from participation in Fort Pierce, FL LRR and GRR projects, Nassau County GRR Project, and the Panama City Beaches, Florida LRR project. He is also familiar with the *Generalized Risk and Uncertainty Coastal Plan (GRANDUC model).* Dr. Bender's coastal engineering experience includes assessment tools such as STWAVE, Beach-fx, GENESIS, and SBEACH among other techniques. He has successfully applied these models to many Gulf Coast locations from Florida to Texas. Recently, Dr. Bender has taught an introduction to coastal engineering class at the University of North Florida as an adjunct

professor. He has authored or co-authored approximately 10 publications on nearshore wave transformation, coastal processes, and simulation of nearshore waves. He is a registered Professional Engineer in Florida and Mississippi.

Barry Vittor

Role: This panel member was chosen primarily for his environmental and biology expertise.
Affiliation: Barry A. Vittor and Associates, Inc.

Dr. Barry Vittor is President and Senior Scientist at Vittor & Associates, and has been involved with the planning and coordination of a wide range of environmental programs, including wetlands assessments, ecological restoration, toxicity studies, water quality monitoring, resource characterization and management, and long-range planning for dredged material disposal. Dr. Vittor has over 38 years of experience in the studies of tidal marshes, including creation and restoration, functional assessment, and biota; including study and analysis of tidal marshes in North Carolina. He also has over 38 years of experience conducting assessments of various impacts of coastal construction, including beach renourishment and navigation project impacts on water quality, marine fisheries, benthos, submerged aquatic vegetation, and terrestrial habitats. He has conducted analyses of several ocean dredged material disposal sites in the Mid-Atlantic region including North Carolina. Also in North Carolina, he has conducted studies of tidal marsh benthos, offshore sand borrow areas, and outer continental shelf petroleum exploration in manatee areas. Dr. Vittor has conducted several hundred benthic community assessments throughout the coastal U.S., including numerous studies in the Mid-Atlantic region related to beach repair and renourishment and other coastal construction. Has prepared several EISs including dredge disposal-related projects for USACE, and is familiar with the USACE's guidance for EIS preparation to comply with NEPA. He has over 30 years experience working with the ESA, including preparation of Biological Assessments and Habitat Conservation Plans; including projects such as Gulf Shores (Alabama) beach renourishment assessment. He has conducted several assessments of EFH, related to dredged material disposal, navigation projects, offshore sand borrow site evaluations, and other coastal construction projects. Dr. Vittor has also conducted reviews of offshore project impacts for compliance with MMPA, including oil/gas production noise and collision effects on whales and dolphins in the Gulf of Mexico.

Kevin Bodge, P.E.

Role: This panel member was chosen primarily for his plan formulation expertise.
Affiliation: Olsen Associates, Inc.

Dr. Bodge has significant practical experience in planning and plan formulation, particularly in regard to the coastal/marine elements of large-scale civil works projects, since 1988 through the present. These projects have spanned from mega-scale resorts to private residential compounds to shore protection and beach management programs, in both the U.S. and overseas. These projects have included the planning and layout of marinas, docks, navigation channels; recreational beaches; dunes, beaches, and seawalls and other coastal structures for purposes of shore protection; setback and elevation requirements for oceanfront development; and comparative economic evaluation of beach management alternatives for many different coastline settings. Dr. Bodge has been the Principal Investigator and/or Engineer of Record for dozens of studies engaged in coastal planning, with specific regard to the identification, formulation and

design of beach management alternatives, particularly in regard to shore protection (beach and dune nourishment), dune reclamation and revegetation, inlet sand management, coastal structure design, development of upland and offshore sand borrow areas, cost-benefit analysis and economic evaluation of incremental benefit analysis, and evaluation of non-structural plan alternatives including strategic acquisition/retreat. Dr. Bodge is familiar with USACE plan formulation standards and procedures, as the coastal engineering consultant to the non-federal sponsor for numerous navigation (inlet) and shore protection projects. These notably include the Canaveral Harbor, Florida Federal Navigation Project (1991-present), Brevard County, Florida Federal Shore Protection Project (1994-present), Duval County, Florida Federal Shore Protection Project (2005-present), and Morehead City, North Carolina Federal Navigation Project (2006-08), among others. Most recently, this experience includes Dr. Bodge's responsibilities as a principal contributor to the USACE plan formulation for the Brevard County, Florida Mid-Reach Federal Shore Protection Project (2005-present), for which Dr. Bodge was the Project Manager and a principal author of the Supplemental Environmental Impact Statement (SEIS) which is integrated into the General Re-Evaluation Report document.

John Loomis

Role: This panel member was chosen primarily for his recreation expertise.
Affiliation: Colorado State University

Dr. John Loomis has worked on recreation resource evaluation for more than 30 years, starting in 1978, with two U.S. Department of Interior agencies. His duties included serving as team leader on a recreation management plan and procedures to evaluate economic benefits of wilderness areas. While at the University of California-Davis, he conducted numerous recreation surveys including those on wildlife viewing, waterfowl hunting, and whale watching along the California Coast. In his current role as Professor at the Colorado State University, he teaches a course in Economics of Outdoor Recreation, and co-authored the leading textbook, *Recreation Economic Decisions*, 2nd Edition. He is active in researching and publishing on the economic value of recreational fishing, and economic values of recreation in state parks. He has written more than 150 journal articles explaining and quantifying consumer surplus of outdoor recreation activities. From 1982 to 1986, Dr. Loomis conducted training courses in conjunction with the USACE Waterway Experiment Station teaching the concept of consumer surplus to recreation planners. All three of his books have major sections devoted to the explanation of contingent valuation models (CVM), and his journal articles also use CVMs, including valuing whale watching, bird watching, stellar sea lions and sea otters. One quarter of his journal articles use travel cost method (TCM) for valuing fishing, hunting, and whale-watching; one of his first journal articles in 1980 was how to fix a statistical problem with the zonal TCM. He has been asked to develop TCM surveys in Belgium and Chile. Dr. Loomis has three decades of experience designing recreation studies. He has designed a variety of probability samples including random, systematic and stratified sample designs for both on-site recreation intercept surveys, mails surveys, and random digit dialing phone surveys. He has conducted and supervised dozens of data collection efforts of anglers, whale watchers, hikers, hunters, etc., both using on-site intercept surveys, mail and phone surveys and has been hired by agencies such as NOAA and the U.S. Geological Survey, as well as universities in Australia, Belgium, Chile and Spain to help them design and pretest surveys. He has extensive experience in analyzing recreation survey data for economic valuation. He has conducted numerous multiple regression analyses of recreation

data, not only for valuation, but also to do visitor use forecasting and to determine price elasticity of demand.

5. RESULTS – SUMMARY OF PEER REVIEW COMMENTS

The IEPR panel generally agreed that were several solid areas of analysis, and that acceptable models were used in the economic, engineering, and environmental analyses in the Surf City FR/EIS. The following statements provide a summary of the panel's findings, which are described in the Final Panel Comments presented in Table 3 and discussed in more detail in Appendix A.

Plan Formulation Rationale: The general approach used to develop and select the recommended plan was rational and clearly explained. However, the panel members expressed concern that the initial screening of plan alternatives may not have adequately accounted for project size, specifically as constrained by the availability of sand resources and the cost of multiple mobilizations for initial construction, and that the plan may not be constructible or economically justified as described. The panel also noted that the dune and berm geometries of the plan alternatives differ from naturally occurring beach profiles, and that other profile geometries may more optimally meet the project objectives, relative to the recommended plan.

Engineering: Overall, the panel members felt that the engineering methods and models used were appropriate. However, there was a lack of necessary detail provided on model input data and calibration, historical shoreline changes and sediment transport, volumetric loss rates and renourishment requirements, and beach response to discrete storm events, making it difficult to evaluate the model outputs and the appropriateness of the project's scale. The dune and berm geometry of the project, relative to naturally occurring beach profiles and the ability of other profiles to meet the project objectives, was additionally identified by the panel as an issue requiring further examination. The panel also had concerns about the borrow area being potentially incapable of providing a reliable, long-term source of sand, and whether the project could be physically constructed in accordance with the assumed schedules and costs. Based on the information provided, the panel felt that the project may not be justified from size and cost standpoints.

Environmental: The discussion of the environmental and biological aspects of the Surf City project was very well done overall, particularly the description of hardbottom and benthic communities. The Biological Assessment was also very good. However, the information in the Main Report was presented in fragments, resulting in readability challenges. The panel thought that the Main Report would benefit from more discussion of endangered species and Essential Fish Habitat.

Economic: While the valuation of recreational benefits utilized state-of-the-art methods and good visitor survey data, these benefits were not included in the evaluation of the structural versus non-structural alternatives even though recreational benefits represent approximately one-half of the total project benefits. The panel was also concerned with the accuracy of the property valuation methods and the apparent distribution of the predicted storm damages and benefits

between the oceanfront and non-oceanfront properties. They also found the cost estimation and recreation benefits information appeared to lack any formal risk analysis.

Table 3. Overview of 16 Final Panel Comments Identified by Surf City FR/EIS IEPR Panel

Significance – High	
1	Based on the information provided in Appendix D (Coastal Engineering) and the Main Report, the study documentation does not adequately describe the development and application of the coastal engineering models, including model calibration, input data, and explanation of results.
2	To justify the scale of the recommended project, additional explanation is needed regarding the formulation of the project's initial and periodic renourishment volume requirements, the predicted response of the project to discrete storm events, and the comparative size and response of corollary projects along this coastline.
3	The Selected Plan may not be implementable based on the engineering, construction, and fiscal resources information provided in the FR/EIS.
4	Estimates of property values are potentially incorrect for measuring the economic value of coastal locations.
5	The benefits associated with the non-structural alternative may have been underestimated or not fully evaluated, and the spatial distribution of benefits is unclear.
6	The presented geotechnical data are either incomplete or indicate that the proposed borrow sites are not well-suited to meet the requirements and predicted performance of the Selected Plan from engineering, economic, and environmental standpoints.
7	The justification for developing and applying the historical shoreline erosion rate, as presented in the FR/EIS, needs more detail.
8	The proposed geometry of the berm and dune appears inconsistent with natural beach profiles.
Significance – Medium	
9	The recreation benefits analysis omits overnight users, lacks an explanation for selecting the contingent valuation benefit estimate over the travel cost benefit estimate, and omits a discussion of congestion, all three of which can be addressed with existing project data or literature.
10	The cost estimates need more detailed explanation, including the rationale for calculating interest during construction.
11	The study documentation should indicate the degree to which anthropogenic replenishment and prior storm impacts have influenced the representative beach profiles applied in the SBEACH and GRANDUC models.
12	Local data sets and prior analyses on longshore sediment transport, wave height, and background erosion rate have not been fully discussed.
13	Additional risk and uncertainty analysis is necessary to address the assumptions and inherent variability in project costs, property values, climate change, and recreation.
Significance – Low	
14	The fishery resources discussion should be expanded to include nearshore shellfish species and relationships between Essential Fish Habitat (EFH) and commercial/recreational fishery values.
15	The FR/EIS should be expanded to address the relevant Federal and State protected species statutes and should be updated to clarify the present status of several species.
16	Historical conditions, including storm impacts and dredge disposal activities at and near the project area, need to be described more thoroughly due to their influence on future erosion rates and renourishment requirements.

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APPENDIX A

Final Panel Comments

on the

Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

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Final Panel Comment 1:

Based on the information provided in Appendix D (Coastal Engineering) and the Main Report, the study documentation does not adequately describe the development and application of the coastal engineering models, including model calibration, input data, and explanation of results.

Basis for Comment:

Appendix D (Coastal Engineering) describes the development and application of the cross-shore sediment transport (SBEACH), longshore sediment transport (GENESIS), and storm and hurricane economic damage (GRANDUC) models developed by the U.S. Army Corps of Engineers. Previous engineering studies have applied these models, and their capabilities generally meet the study needs. However, Appendix D and the Main Report do not provide adequate or project-specific descriptions of: 1) the model calibration, 2) model input, or 3) model output as evidence that the study properly applied the models or that the models' output provides reasonable results.

Calibration Details

Specifically, Appendix D does not discuss any calibration or validation for the GENESIS or SBEACH models (model descriptions in Appendix D, Section 5 [GENESIS] and Section 6 [SBEACH]). Additionally, the study documentation does not indicate if the models applied parameter settings similar to other studies in the region. The apparent lack of a calibration/ validation exercise or reference to the basis for the input parameters seriously limits the confidence in the GENESIS and SBEACH model output. This, in turn, significantly limits the ability to evaluate the recommended project, because the output of these models provides critical input data for the storm damage economic model (GRANDUC) that is used in the formulation, justification, and selection of the recommended plan.

Discussion of Model Input

Appendix D and the Main Report do not provide the engineering basis for the Depth Of Closure (DOC) of -23 ft NGVD. Page 153 of the Main Report states "(B)ased on calculations derived from the USACE Coastal Engineering Manual (2002), the calculated Depth Of Closure (DOC) for this study is -7 m (-23 ft.) NGVD." The study documentation does not provide the data sources applied to develop the DOC calculation. Additionally, the Main Report and Appendix D do not mention if any other studies have developed DOC values near the project site to support the value applied in this study. Note that -23 ft may provide a reasonable value, but the reports do not develop or justify the value.

Review of Model Output

Appendix D does not indicate if any other prior studies or data sets exist to support the SBEACH and GENESIS modeling results and analysis (e.g., pre- to post-storm volume change during hurricanes, longshore transport estimates in the area, etc.).

Neither Appendix D nor the Main Report provides GENESIS evaluation (prediction) of shoreline changes in the without- and with-project conditions.

The Main Report and Appendix D do not provide sufficient detail to understand the GRANDUC model results and therefore, the economic damage and benefit modeling. For

example, Section 5.05 of the Main Report does not provide sufficient detail on where the GRANDUC model estimates damages to occur (first row versus second or third row structures) to evaluate the reasonableness of the model output for the non-structural and structural alternatives.

Significance – High:

The lack of detail in Appendix D and the Main Report related to the coastal engineering model development, input data, and output data limits the ability to evaluate the models and could impact the selection or justification of the Selected Plan.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. A description of any GENESIS and SBEACH model calibration/validation efforts completed for the study, in addition to description of the principal input parameters and coefficients.
2. A description of any previous GENESIS and SBEACH modeling efforts completed by other studies near the project area and discussion of model input and parameter values.
3. A discussion of any existing data sets or prior analyses that provide longshore transport or pre- to post-storm volume change estimates that could support the GENESIS and SBEACH model simulations conducted for this study.
4. Use of GENESIS to predict absolute and/or comparative shoreline response from the without- and with-project conditions.
5. Additional details on the depth of closure calculations completed for the study and reference to any previous estimates of closure depth developed for nearby projects.
6. Additional documentation (text, tables, and figures) of the GRANDUC model results to detail where the GRANDUC model estimates damages to occur (first row versus second or third row structures) for the non-structural and structural alternatives.

Final Panel Comment 2:

To justify the scale of the recommended project, additional explanation is needed regarding the formulation of the project's initial and periodic renourishment volume requirements, the predicted response of the project to discrete storm events, and the comparative size and response of corollary projects along this coastline.

Basis for Comment:

Storm Events and Beach Response

Neither Appendix D (Coastal Engineering) nor the Main Report describes the physical response of the existing (representative) beach profiles or the recommended project profile to specific storm events. A thorough evaluation and understanding of the plan formulation typically requires graphic illustrations of the pre- and post-storm beach profiles, for both without- and with-project conditions, for discrete storms of various return-period intensity (or, at least for storms of various specified water-levels and wave heights associated with historic storm events such as Hurricane Fran, Floyd, etc.). These graphics, which are not included in the present report, are routinely produced by the SBEACH model and are typically required and expected in similar reports. These graphics are instrumental in understanding the predicted "idealized" physical extent to which the existing and recommended project beach profile may react to, or withstand, storms of various intensities.

The project is not formulated to provide protection against a given storm-event frequency, and its storm damage reduction benefits are based upon a probabilistic suite of storm events through the GRANDUC model (not discrete storms). Nonetheless, from the information provided, it is not possible to discern whether the proposed project provides protection from an estimated 10-year event versus a 100-year event. Assessment of the physical reasonableness of the recommended project requires physical description of the predicted project performance, relative to the without-project condition.

Initial Fill and Renourishment Volumes

Appendix D, Section 7, notes that 6-year renourishment intervals result in slightly higher computed net benefits but the report accepts a shorter 4-year interval based upon practical considerations. The plan formulation does not make an equivalent evaluation of the initial (design) beach fill. It selects the 1550 plan based upon highest apparent net benefits without practical consideration of the project's overall volume requirements and sand resource availability.

The report does not quantitatively describe the basis (computation) of the initial fill requirement, particularly in terms of the design fill and the initial advance nourishment, or the periodic renourishment requirement. It does not appear that any historic data, analysis, or model predictions are presented that describe or justify the selected renourishment volume.

It is not clear whether the predicted beach fill volume requirements, for initial construction and periodic renourishment, include the overfill factor (between 1.12 and 1.20, on average, according to Table 7.3) or allowance for direct handling losses during construction.

The numeric estimation that the initial renourishment volume is 0.5 times the normal

renourishment volume is potentially low. If losses of the initial construction in Years 1-4 are linear in time, then the initial renourishment requirement in Year 5 is theoretically 0.625 times the normal volume.

Corollary Projects

The report does not present examples or descriptions of corollary projects, or their performance, along the adjacent coastlines, nor of the prior dune or beach erosion control activities along the project shoreline. The Executive Summary (page i) and References (Section 15) indicate that there is a recently completed General Re-Evaluation Report (GRR) for the Town of Topsail Beach (for which the project has not yet been constructed) but there is no description in the Main Report of the recommended project (i.e., dimensions, volumes, costs, status, etc.). Likewise, there is no mention of the scale or performance of the existing nourished beach/dune profile, along adjacent (regional) insular shorelines, including the federal project at Wrightsville Beach (16 miles southwest of the study area, per Section 1.08 of the Main Report). Discussion of the scale of these constructed (and proposed) projects, relative to that proposed in the FR/EIS, would provide a useful means by which to evaluate and understand the recommended project.

Significance – High:

The study documentation provides insufficient data to understand or justify the probable physical performance of the project, the initial nourishment and periodic renourishment volume requirements, and the scale of the project relative to similar regional projects, each of which could impact the project justification or recommendation.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Graphical examples of the expected physical response of the existing beach profile and proposed beach profile to discrete storm events of various, specified intensity (e.g., approximate X-year return event, and/or approximation of Hurricane Bertha or Fran, etc.).
2. Quantified description of the physical basis of the estimated volume requirements for initial construction, including discussion of the design fill and advance fill, the assumptions associated with multi-year initial construction, and allowances for overfill ratio and for handling losses.
3. Quantified description of the physical basis of volume requirements for periodic renourishment, including allowances for overfill ratio and for handling losses.
4. Description of the scale and prototype performance of prior shore protection activities along the project shoreline and corollary (proposed and existing) shore protection projects along regionally located coastlines.

Final Panel Comment 3:

The Selected Plan may not be implementable based on the engineering, construction, and fiscal resources information provided in the FR/EIS.

Basis for Comment:

The Selected Plan is a very large project from perspectives of both cost and total material requirements. The initial nourishment — with a nourishment density of 220 cubic yards per linear foot (cy/lf) — requires over 11 million cy of sediment with four separate nourishments over a four year period to construct.

A realistic constraint is that the Selected Plan must prove implementable – both from standpoints of constructability and institutional financial capability. From the constructability standpoint, the documentation presents initial project and renourishment plans that may contain unrealistic expectations on the availability and productivity of dredge equipment in the allotted time frames. The initial construction requires two dredges operating for four seasons of 120-days each, in the winter months, with less than 15% down-time during each 120-day construction season (based upon estimated average production of 14,000 cy/day as described in Section 7.05.1). Further, this construction plan requires that one or more dredges are engaged on the project full-time between December 1 and March 31 for multiple years, and it does not account for the limited availability and competing project requirements of dredge equipment capable of constructing the proposed work.

Associated with the constructability of the project, the engineering assumptions regarding the practical availability of sand from the offshore borrow areas are not consistent with standard practice or prototype experience. The offshore sand resource identified (and solely dedicated) for the project does not meet the project's 50-year volume need without the need to rely on sand leftover from other projects (Main Report, page 113) to make up the deficit. This requirement introduces high uncertainty as to whether the available resources can meet the project's 50-year volume need.

The identification of a "maximum" theoretical sand volume in the borrow areas that is only 16% greater (Table 7.4 on Main Report page 117) than the projected sand fill requirement provides a low factor of safety to ensure the identified borrow sources can meet the project's total 50-year volume need. It is improbable that the maximum theoretical borrow area volume can be practically dredged, and, conversely, it is probable that the limits of the allowable borrow areas will decrease upon collection of further detailed geotechnical data and possible further restrictions associated with hardbottom impacts. In the event that there is insufficient availability of sand to meet the 50-year project need, it is probable that the cost of identifying and placing sand from future, alternative borrow areas may be significantly greater than the costs ascribed to the identified borrow areas. Further, the Report does not describe if the volume estimates account for uncertainty in future storm frequency and intensity – which could increase beach nourishment requirements.

From the standpoint of institutional financial capability, Section 5.01 of the Main Report (page 85) requires that the Plan must be implementable with respect to financial and institutional

capabilities. The estimated total initial construction cost of the recommended project ($118M) is very significant; and the FR/EIS does not adequately address the capability or support of the non-federal sponsors to fund the project relative to other competing project needs. Specifically, Appendix H (Correspondence) does not contain any recent documentation that State or local entities are willing to fund the recommended project beyond the initial investigation.

To summarize, the size of the recommended project results in unrealistically high costs, impractical schedule and equipment requirements for initial construction, and insufficient sand resources.

Significance – High:

The assumptions in the FR/EIS regarding the availability and productivity of dredge equipment, the availability of sand in the offshore borrow areas, and the financial and institutional capabilities required to construct the recommended project are questionable or undocumented; and these assumptions are central to the justification and success of the Selected Plan.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to:

1. Provide documentation or discussion that demonstrates the ability to meet the initial project construction schedule with two dredges required for four months (for four consecutive years) during limited winter-time construction windows, and the implications of these requirements upon probable project costs.
2. Provide documentation or discussion that demonstrates the ability and willingness of entities to fund the Selected Plan as outlined in the Main Report.
3. Provide additional discussion on the uncertainty introduced by relying on excess sand identified for other projects in order to meet the selected project's 50-year volume need, in addition to the physical and fiscal effect upon the project's predicted performance if the 50-year sand volume is not available.
4. Provide additional discussion and justification for identifying borrow source material that is only 16% greater than the project's 50-year volume need. Discuss the uncertainty related to extracting material from many different borrow sources with many borrow sources in close proximity to identified nearshore hardbottom areas.
5. Discuss the appropriateness of constraining the project formulation by reasonably available sand borrow quantities and/or total probable costs, similar to existing constraints already imposed by Coastal Barrier Resources Act (CBRA) considerations.

Final Panel Comment 4:

Estimates of property values are potentially incorrect for measuring the economic value of coastal locations.

Basis for Comment:

The FR/EIS uses replacement cost adjusted for depreciation as a measure of benefit for protection of coastal property; this could be an inaccurate measure of individual willingness-to-pay (WTP). Replacement cost only reflects the present value of necessary expenditures to reconstruct a property of similar quality, usually at the original condition level. Land on barrier islands is scarce, and competition among buyers and sellers can be significant. When market demand is strong (as has been the case on the east coast for the past 10 – 15 years, last couple of years excepted), market values can exceed replacement cost, as coastal parcels earn scarcity rents. Competition will affect the value of land more than structure, but since the two are linked, market structure values can exceed replacement cost.

Thus WTP can be best approximated by the market value of coastal property less the land value; regression analysis (hedonic property price analysis) can be used to net out the value of the land from the structure. In particular, a properly specified regression model can be used to estimate current market value, can be used to estimate the value of a vacant lot (if there are data on lot sales), and can predict the change in housing value associated with changing characteristics (Landry, Keeler and Kriesel 2003; Parsons and Powell 2001). Alternatively, assessed values (from tax collector records) can be used as a proxy for market values. Assessed values are usually measured at a common point in time (e.g., all reassessments done at the same time), so as long as recent estimates are available the complication of estimating current value is not a problem. Also, assessments are usually broken into land and structure value. Regression analysis can be used to adjust assessed values for changing property characteristics, as suggested above. Thus, if possible, market or assessed property values should be used in the FR/EIS benefit-cost analysis.

If replacement costs adjusted for depreciation are to be used for benefit-cost analysis of coastal protection, the analysis should provide a justification for this decision. The use of replacement cost could be justified as a lower bound on true economic value. In the panel's opinion, justification of depreciation is more difficult to make. If the housing stock is old, depreciated replacement costs may value many parcels at close to zero dollars (depending upon the age of the structure and depreciation method employed). Clearly, value estimates can be very different from market value under these conditions. The analysis should address this potential problem, perhaps by including a comparison of replacement costs to market (or assessed) values. Moreover, the discussion needs to include details on replacement costs calculations, specifically addressing the method used to estimate replacement cost, the method used to depreciate replacement costs, and the chosen depreciation rate. The additional use of assessed or market values in benefit-cost analysis, however, would provide valuable sensitivity analysis for the FR/EIS.

The use of interior land values as a measure of lost economic value due to oceanfront erosion is an appropriate assumption, as amenity value can be transferred (e.g., second row home

becoming beach front increases the value of that home) under the condition that the hedonic property price relationship is stable under changing management regimes (e.g., non-structural option) or changing risk perception (e.g., climate change and sea level rise) (Landry, Keeler and Kriesel 2003; Parsons and Powell 2001).

Lastly, neither Section 3.08 in the Main Report nor Appendix B quantifies the number of structures and the total baseline value (land, contents, and structure) for the "oceanfront" row versus the "second" row and/or other interior rows. Likewise, the projected without-project damages, and with-project benefits, are not separately itemized for the oceanfront and interior rows. Without this separate accounting, one cannot judge the reasonableness of the GRANDUC model results.

Significance – High:

Property value estimates play a prominent role in project justification and could impact the determination of whether coastal protection is economically efficient and plan selection.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Additional analysis that employs market or assessed values (possibly with hedonic price analysis) or a clear justification and defense of the use of replacement costs.
2. Sensitivity analysis to the use of particular property value estimates (e.g., replacement cost compared to market values or assessed values, replacement cost with and without depreciation, etc.)
3. More details on property values; for example:
   - It would be useful to know how many structures are being valued in each reach (tables 3-B, B-16 & B-17).
   - Separate quantification of the number of structures and total baseline value (land, contents and structure) modeled along the "oceanfront" row versus the "second" and/or other interior rows.
   - Separate quantification of the without-project damages, and with-project benefits, predicted along the "oceanfront" row versus the "second" and/or other interior rows.

Literature Cited:

Landry, C.E., A.G. Keeler and W. Kriesel. 2003. An Economic Evaluation of Beach Erosion Management Alternatives. *Marine Resource Economics* 18(2): 105-127.

Parsons, G.R. and M. Powell. 2001. Measuring the Cost of Beach Retreat. *Coastal Management* 29: 91-103.

Final Panel Comment 5:

The benefits associated with the non-structural alternative may have been underestimated or not fully evaluated, and the spatial distribution of benefits is unclear.

Basis for Comment:

The non-structural alternative involves retreat, relocation, and demolition of threatened properties. The determination of costs associated with retreat/relocation/demolition, the choice among these options, and the optimal timing of the choice needs to be better explained. And, recognizing the uncertainty and potential difficulties associated with a non-structural option, the evaluation should include sensitivity analysis in order to assess the effects of critical assumptions.

Appendix P provides details on the analysis of the non-structural alternative. The discussion indicates that unbuilt oceanfront lots are assumed to be fully developed before initiation of the protection project. This assumption seems significant and potentially unwarranted, given that future development likely hinges on expectations of coastal protection (i.e., people are more likely to develop oceanfront parcels if they believe they will be protected from erosion, and they are unlikely to develop if they expect their house will be condemned shortly thereafter). According to the maps in Appendix A, there appear to be only about 610 existing structures along the oceanfront. The analysis of the non-structural option should be based on the current level of oceanfront development (at least to provide a comparison to evaluate the impact of the assumption of full development in intervening years).

Initial estimates suggest that the retreat option has limited potential in the study area, due to small lot sizes and the presence of a roadway behind the first row of houses. Thus, relocation and demolition appear to dominate the exercise of the non-structural option. The appendix suggests that the least costly of these two options is the alternative chosen. More details, and perhaps some examples, would be useful in helping the reader to understand the types of tradeoffs that are made in assigning structures to relocation or demolition. Relocation is limited by the availability of lots in the study area. The analysis assumes that only 1/3 of current vacant lots will be available. This assumption, too, may be unwarranted and should be evaluated through sensitivity analysis. A comparison study should be conducted to see how the costs of the non-structural option might change if more vacant lots were available. Table 5.1 in the FR/EIS suggests that there are 615+289 = 904 structures subject to demolition and relocation/retreat. The relationship between the 739 lots to be purchased and relocated/demolished relative to the figure in Table 5.1 (904) is unclear. Also, it is not clear whether there is uncertainty in the relocation cost estimates. If so, the analysis could examine high and low estimates in order to ascertain the sensitivity of net benefits to uncertainty over implementation costs.

Real estate costs associated with the non-structural option include oceanfront land acquisition. The analysis uses a constant value of $500,000 per lot, but could be modified to employ the assessed lot value. This may provide for more realistic cost estimates. Moreover, the cost of land acquired to relocate homes is also assumed to be $500,000 per lot, but this is likely to be an overestimate of the cost of acquisition, as these lots are not oceanfront. The analysis should

include a more realistic estimate for relocation costs.

The non-structural alternative is assumed to initiate in year one of the project, but many of the threatened structures could have useful economic life beyond this time period. The analysis makes no attempt to optimally target the timing of the exercise of the non-structural option, presumably for simplicity. The analysis could be significantly improved if a better timing rule could be devised (e.g., exercise non-structural option when structure is within X feet of mean high water line). Such a timing rule would likely delay many of the costs associated with the non-structural option, which could make it more economically attractive.

The evaluation of the non-structural alternative in terms of storm damage reduction benefits presents results that appear suspect. From Table 5.1, the Present Worth benefit of "removing" the oceanfront structures is projected as $135M. However, from Table 3-4, even if land damages are removed, the present worth value of structure damages in the "without-project" condition is about $329M. Thus, the apparent benefit of eliminating all of the oceanfront homes is only 135/329 = 41% of the projected without-project structure damages. This result implies that the other 59% of the without-project, 50-year structure damages are predicted to accrue to the second, third, and other interior row structures; that is, the great majority of damages are ascribed to non-oceanfront structures. This proportion seems abnormally high. Instead, given the described nature of the existing development, the setback of the second row and interior structures, and prior corollary experience, one would expect that the vast majority of predicted damages would accrue to the oceanfront structures.

Lastly, the projected recreational benefits associated with the non-structural alternative could be inaccurate. Most important is that no recreation benefits are included for the non-structural plan (page 88 of FR/EIS). Retreat/ relocation/ demolition could improve beach conditions, and provide an amenity that might be considered more "natural" by visitors. Removing threatened structures would allow adaptation to natural shoreline processes, which could produce better beach quality and greater useable beach width for recreation relative to no-project conditions. Since the recreation benefits analysis of the 1550 plan includes benefits due to increases in beach width (see Appendix O, page O-19), it would seem feasible to conduct a similar analysis for beach width and the non-structural alternative. Beach width is likely to diminish slowly over the next decade, so the recreation benefits of the non-structural plan would likely diminish slowly over time. There is existing research that suggests the non-structural option (referred to as "shoreline retreat" in the literature) could result in improved beach conditions and that recreational users may value the changes associated with this type of policy (Daniel 2001; Kriesel, et al. 2005; Landry, et al. 2003). It is thus not clear that non-structural option would reduce recreational visitation and income (Table 7.14, page 134).

If the non-structural option does not protect road infrastructure, then costs should include expenditures necessary to maintain transportation infrastructure.

Significance – High:

Accurate evaluation of a non-structural alternative is an important part of the FR/EIS, as many skeptics and critics of conventional beach management claim that non-structural approaches are cost effective. In order for the FR/EIS to maintain objectivity, the non-structural alternative needs to receive an evaluation that recognizes its uncertainties, and that is consistent with the

assumptions about benefits and costs in the other alternatives.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. More details on range of costs for non-structural options and sensitivity analysis on the level of costs, including details describing the ultimate number and locations of structures assumed to be demolished or relocated.
2. More details, and perhaps some examples, indicating the factors that influence how structures are allocated to retreat, relocation, or demolition.
3. Optimal timing for exercise of non-structural alternative at the parcel level (or if this cannot be done, an explanation of the problems in implementation of phased or a "retreat as warranted" approach).
4. Sensitivity analysis to the assumptions used in evaluation of the non-structural alternative, including:
   - The level of oceanfront development in the initial year of the project
   - The number of vacant lots available for relocation
   - Acquisition costs for non-beachfront relocation land (employing lower estimates than currently used)
5. Interpretation of the distribution of storm protection benefits implied by approximately 59% of protective benefits accruing to second and third row houses.
6. A re-evaluation of the assumption that recreational benefits associated with the non-structural option are zero.

Literature Cited:

Daniel, H. 2001. Replenishment versus retreat: the cost of maintaining Delaware's beaches *Ocean & Coastal Management* 44(1-2): 87-104.

Kriesel, W., C. Landry, and A. Keeler. 2005. Coastal Erosion Management from a Community Economics Perspective: the Feasibility and Efficiency of User Fees *Journal of Agricultural and Applied Economics* 37(2): 451-61.

Landry, C.E., A.G. Keeler and W. Kriesel. 2003. An Economic Evaluation of Beach Erosion Management Alternatives. *Marine Resource Economics* 18(2): 105-127.

Final Panel Comment 6:

The presented geotechnical data are either incomplete or indicate that the proposed borrow sites are not well-suited to meet the requirements and predicted performance of the Selected Plan from engineering, economic, and environmental standpoints.

Basis for Comment:

The FR/EIS conclusions regarding the probable cost and amount of sand available from the offshore borrow areas requires that the borrow areas be dredged to within about 16% of their theoretical estimated cumulative volume in order to yield the 50-year project requirement, and additionally requires dependence upon "left-over" material in borrow areas designated for other projects, over which the project may have limited control. It is not clear if the 50-year project volume fully accounts for both overfill and handling losses. The geotechnical data are very limited in scope and likewise suggest that the ultimate amount of retrievable sand from the borrow areas may be significantly less than the estimates – owing to (a) the shallow depth and irregular nature of the deposits, and (b) proximity and potential impacts to hardbottom. Specific observations include the following.

1. From an engineering standpoint, a 16% allowance (margin) between the project's total material requirements and the estimated borrow-area resources is typically considered to be unacceptably small, particularly when the latter assumes that the borrow areas must be cut to their theoretical limits and they will not be subject to further reductions.

2. The estimated borrow area volumes are based upon limited core-borings, many of which are located in areas that will be excluded as buffers for hard-bottom. The data for many of the discrete borrow areas comprise limited or no core data, and some exhibit layers of very fine material. For example, only two cores are shown for Borrow Area E and both appear to be located in a hard-bottom buffer zone which is apparently excluded from dredging. Table 7.3 lists a 0.23 mm grain size for Borrow Area E, but this value is based only upon the cores located in exclusion zones. The estimated 720,000 cy yield of Area H is based upon only 2 cores.

3. In many instances, the underlying stratum (below the identified borrow area source) is either not identified, presumably rock, or contains unsuitable material. A buffer is not identified above these strata. For example, Borrow Area J, Core TI-03-V-270A, ascribes a 2-ft borrow depth of -46.3 to -48.3 feet. Immediately below this is fine-grained (0.11 mm), high-silt (17.7%) sediment that is not beach compatible. The minimum 2-ft vertical buffer that would be normally assigned atop this incompatible underlayer would wholly obviate the 2-ft thick potential borrow lens – thus eliminating any yield from this zone of Borrow Area J. Similarly, some cores suggest hard stratum immediately below the ascribed borrow-area depth; and it is not reasonable to assume that the dredge can cut neatly to this stratum. The tentatively identified borrow areas will not yield the theoretical "neat-line" volumes that are ascribed to them, especially in this case of shallow cuts, irregular borrow area planforms, and the potential presence of rock. Requirements of at least some minimum buffer between the suitable and non-suitable material would exclude a significant fraction of the theoretically available borrow area volumes.

4. In terms of compatibility, the analysis of the borrow area grain size includes data from cores that are within probable exclusion (no-dredge, buffer) areas. These cores typically contain

coarser material that biases the composite borrow-area granular data toward unrealistically coarser values. For example, Borrow Area "L" includes 10 core-log summaries, of which three cores are in "high-relief" buffer zones and depict some of the coarsest sand in the borrow area. Without these three cores in the apparent no-dredge area, the composite mean grain size ascribed to Borrow Area L is finer than that listed in Table 7.3 (i.e., 0.214 mm versus 0.24 mm). Thus, the tabulated summary of the preliminary grain size data – and overfill factors – appear to be non-conservative. It is reasonable to conclude that the borrow area grain sizes will likely be smaller, and the overfill-factors and sand borrow requirements will likely be greater, than the values in the FR/EIS, particularly after further requisite data are collected.

5. Section 7.03.1 states that the requisite fill volumes include 12% additional placement to account for "placement losses." This does not clarify between "overfill-factor requirements" for sand compatibility and "losses" during construction. The mean value of the overfill factor (neglecting Borrow Area C) from Table 7.3 (p. 116) is 1.12. Including the correction for silt fraction, the mean value of overfill is 1.20. Hence, the minimum requirement for beach fill placement is at least 1.12 to 1.20 times greater than the residual "in-place" requirement; and, the requirement for borrow area dredging is greater than these amounts to account for losses during the construction process (typically 5% to 10%). Hence, a 1.12 allowance for "placement losses" might minimally account for the overfill factor, but it does not account for dredging losses. Thus, the actual dredging requirements at the borrow area are expected to exceed the values specified in the report, once handling losses are added. This further reduces the 16% margin between the project's estimated 50-year requirements and available borrow area volumes.

6. From an economic standpoint, the predicted dredging costs appear consistent with those of a "typical" offshore borrow area that is relatively unencumbered by hardbottom and irregularities. The FR/EIS does not appear to take into account the higher dredging costs that are reasonably associated with the project's increased difficulty and risk: shallow, irregular cuts often underlain by hard strata or unsuitable soils, proximity to hardbottom, potential for suspensions due to sedimentation, and the large distance between the borrow areas and harbors of refuge.

7. Initial screening and optimization of the beach fill alternative plans assumed that sufficient sand quantities were available for all alternatives, at identical unit costs and single-year initial mobilization costs. This assumption, which is not supported by the information in the FR/EIS, influenced selection of the recommended plan.

8. From an environmental standpoint, identification of borrow area limits (toward achieving a total 50-year project requirement) requires minimization of all buffer distances relative to adjacent hardbottom. It is likely that future requisite surveys will identify additional hardbottom that will further limit (reduce) the available borrow area resources. USACE's commitment to monitor potential dredging impacts to hard-bottom and to alter dredging actions if needed – as described in Section 8.01.8.2 of the Main Report – greatly increases the likelihood that portions of the proposed borrow areas will be limited or excluded from dredging. This situation would further reduce the 16% margin between the project's estimated 50-year requirements and available borrow area volumes.

Significance – High:
The Report's conclusion that the offshore borrow areas are sufficient to provide for the project's 50-year volume requirements is not justified by the data that are presented.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: 1. Re-computation of the probable sand volume plausibly available for extraction from the borrow areas based upon the available geotechnical data, taking into account reasonable buffers above non-suitable material and hardbottom, allowances for imperfect extraction from irregular borrow areas, and potential for borrow area reductions associated with additional hardbottom areas or impacts to hardbottom. 2. Justification that the predicted costs of dredging reflect the risks and difficulties associated with the irregular borrow areas and hardbottom proximity, and/or graduated increase in future dredging costs to reflect increasing complexity and risk of dredging as resources within the borrow areas are depleted. 3. Alternative computation of the apparent overfill ratio requirements based upon existing data, exclusive of data from cores within hardbottom exclusion areas. 4. Quantified description of the extent to which the total anticipated volume requirement from the borrow areas includes specific allowances for overfill ratio and for losses during dredging and placement. 5. Justification that a 16% allowance between the project's total material requirements and the estimated borrow-area resources provides a reasonable buffer should the project need additional material or resources become unavailable. 6. Plan formulation with a constraint that limits the 50-year volume requirement of the project to that which is reasonably available from the dedicated project borrow areas, subject to consideration of the issues raised above.

Final Panel Comment 7:

The justification for developing and applying the historical shoreline erosion rate, as presented in the FR/EIS, needs more detail.

Basis for Comment:

The plan formulation and evaluation appears to rely upon annual shoreline erosion rates (for the without-project condition) developed by comparing a 2002 shoreline survey with a 1963 USACE survey of Topsail Island, as described in Appendix D, Section 4. Reliance upon only two data points (i.e., an "end-point analysis" between 1963 and 2002) can lead to either survey having a significant effect on the results. Appendix D does not describe the surveys' potential limitations nor does it describe the conflict between these two surveys' results and the only other shoreline-change rates that are presented (i.e., from North Carolina Division of Coastal Management [NCDCM]).

The months of the 1963 and 2002 surveys are not given. Seasonal differences may influence the conclusions drawn from comparison of two surveys from different seasons. The report does not clarify or indicate the degree to which the 2002 beach profile surveys were influenced by prior anthropogenic activity (dune fill, beach scraping, etc.) or immediate-preceding storms.

It is not clear how the 1963-2002 historical shoreline erosion data are directly used in plan selection and evaluation. Appendix D, page D-26 (item 2e.3) implies that a long-term erosion rate for each project reach is input to GRANDUC, but the erosion values and their application (through time and for various alternative analyses) are not specified.

The average annual rate of historical shoreline change cited in the report (from the 1963-2002 comparison), ranging from 1 to 2 ft per year along the project area, is a modest erosion rate relative to the 220 cy/ft initial fill of the recommended plan. In fact, the only other historical data that are presented (from NCDCM, Figure D-6) suggest that the shoreline exhibits a long-term trend of stability and accretion. The latter is more consistent with the results of the net longshore transport predictions from GENESIS, illustrated in Figure D-7. The effect upon the project's formulation of a 1 to 2 ft per year (without-project) erosion rate based upon the 1963-2002 data – versus an assumption of shoreline stability from the NCDCM data – is not evaluated or described in the Main Report or Appendix D.

Significance – High:

The development and application of the background erosion rate can significantly affect the predicted benefits and scale of the selected plan.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Discussion of the timing and potential limitations of the 1963 and 2002 shoreline surveys and their sole use to define the long-term shoreline change rates.
2. Discussion of the conflict between the 1963-2002 shoreline erosion rates and the stability/accretion described by the NCDCM data (and implied by the GENESIS longshore transport predictions).
3. Sensitivity evaluation of the project's predicted benefits as a function of the assumed shoreline change rate; e.g., benefit calculation using a null erosion rate.

Final Panel Comment 8:

The proposed geometry of the berm and dune appears inconsistent with natural beach profiles.

Basis for Comment:

In Section 5.03 of the Main Report, the plan formulation considers a flat low berm, with or without a dune feature. Neither the flat berm nor proposed dune-face slope of 1(vertical): 10(horizontal) appear to be consistent with natural beach profiles, including the representative profiles presented in the Main Report. Justification for these project geometries is not presented. More "typical" beach geometry with natural (steeper) dune slopes and slightly higher (sloping) berm elevations, not considered in the initial project scoping, may provide adequate storm damage reduction with slightly lesser fill requirements and improved long-term project performance relative to the Selected Plan.

The beach fill plan formulation assumes a flat, low berm at +7.0 ft NGVD because of concerns for scarping (Section 5.03, page 86). Inspection of the representative profiles (Figures 3.3 and 3.4) and corollary experience suggests that a berm elevation of +7 at this location is reasonably expected to be subject to frequent overwash, ponding, and erosion. Because a flat berm is not consistent with a natural beach berm, consideration might be normally made of a berm which slopes gently from +7 ft at its seaward edge to some slightly higher elevation (for example, +9 ft) at its landward edge. This is a "turtle friendly" profile, commonly implemented in Florida by the USACE Jacksonville District and others, which acts to prevent overwash, ponding, and wave attack of the dune-toe and vegetation, while minimizing the potential severity of escarpment formation.

The proposed dune slope of 1v:10h is not consistent with the dune slope of the existing profiles and traditionally observed natural dunes, both of which are about 1v:3h. Instead, the proposed 1v:10h slope is more emulative of the beach-face slope that exists below the berm and into the sea. Adoption of a 1v:10h dune slope results in a dune geometry that encroaches significantly upon the berm and is therefore prone to more frequent erosion from storm waves; and, it results in an overall design beach that is much wider (and which requires significantly greater initial fill) than traditional designs with a 1v:3h dune slope. Specifically, the proposed 1:10 dune slope between +15 and +7 elevation occupies 56-ft greater width than a traditional 1:3 slope. This contributes to an overall beach width in the Selected Plan that appears to be considerably wider (i.e., located substantially more seaward) than the historically recent, natural location of this shoreline, based upon the Main Report's assumption of a 2 ft/year shoreline erosion rate.

Likewise, establishment of a dune and vegetation across a 1:10 dune-face slope (versus the natural and traditional 1:3 slope, with a slightly higher landward berm edge) increases the requirements (and associated costs) for vegetation planting and new dune walkovers by over 50%. Additionally, establishment of dune vegetation on the proposed dune-face slope of 1:10 may likely result in greater potential human disruption of the dune feature and vegetation – because the gentle dune slope will appear as part of the upper beach – in addition to greater potential erosion impact, because the dune toe is significantly closer to the seaward edge of the proposed low, flat berm.

Significance – High:
Consideration of berm and dune geometries (elevations and slopes) that are more emulative of existing and natural beach profiles and modern "turtle friendly" designs may result in a more optimum project design that provides improved long-term performance.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: 1. Consider alternative design geometries that emulate natural (steeper) dune slopes and slightly higher, sloping berms that may potentially offer greater resistance to scarping, overtopping, dune-toe erosion, and which are consistent with turtle-friendly designs. 2. Likewise, the initial scoping analysis should consider at least one hybrid design (steeper dune slope and slightly higher, sloping berm) beyond the existing scoping consideration of only the flat berm with and without an unnaturally wide dune feature.

Final Panel Comment 9:

The recreation benefits analysis omits overnight users, lacks an explanation for selecting the contingent valuation benefit estimate over the travel cost benefit estimate, and omits a discussion of congestion, all three of which can be addressed with existing project data or literature.

Basis for Comment:

Recreation benefits represent about half the total project benefits, yet there are several important limitations to an otherwise very competently done analysis. The first possibly significant limitation is the analysis' focus only on day users to the exclusion of overnight users, even though a significant portion of overnight visitors may be on single destination trips. Omission of this type of overnight visitor will underestimate total recreation benefits from beach restoration. The second important issue relates to choice of Contingent Valuation Method (CVM) benefits per visitor day instead of Travel Cost Method (TCM). Discussion in Appendix O on pages O-10 and O-11 indicates the TCM benefit estimates contain only the value of visiting the site-specific beach, while the CVM benefits gives the total of both the value of visiting any beach in the study area plus the value of visiting the specific beach in the study area. This implies that the TCM benefits are the site-specific values attributable to the study area beach, and therefore appropriate to use rather than the CVM. Use of the CVM benefits would overstate recreation benefits by as much as a factor of ten. Third, on-site sampling frequently results in an avidity bias associated with more avid users being oversampled. This can result in an overstatement of benefits. Fourth, as predicted in the Main Report, visitor use will increase with restoration relative to the no project alternative, yet there is little attention paid to the effect of increased visitation on beach congestion. Increasing beach congestion could reduce per visitor day benefits to below what they are now. Hence simple multiplication of existing benefits per day times future increased visitation is likely to overstate future total recreation benefits. Fifth, comparison of increased peak visitor use to planned increases in parking facilities should be made so as to discuss whether even the new parking facilities would be able to meet the new higher peak time periods visitor demand. Some of these problems may be fixable with existing data (as described below), and others should at least be acknowledged so the reader knows that USACE recognizes the limitations in the recreation demand and benefit analysis. These changes are needed to make the analysis more consistent with good practice in the field of recreation benefit analysis and more clearly convey these in Appendix O and Chapter 7 of the FR/EIS.

Significance – Medium:

Since recreation benefits represent about half the total project benefits, taken together, addressing the first three concerns could have substantial effect on the magnitude of the recreation benefit estimates. Addressing the fourth and fifth concern will improve the completeness of the report.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Include single destination overnight visitors in the recreation benefits analysis and provide details on their relative contribution to total visitation or provide a strong rationale for solely focusing on day users and omitting single destination overnight visitors. Thus, the first correction is to report in Appendix O and Chapter 7 (Section 7.08) the proportion of visitors intercepted at the study area beaches that were day users from within 120 miles (the group included in USACE's analysis), day users from beyond

120 miles, overnight users within 120 miles, and overnight users beyond 120 miles. This provides the reader with perspective on what proportion of total visitors are reflected in the USACE's visitor use and benefit estimates. If data in the survey exist that identify whether an overnight trip was single destination or not, then single destination overnight trips should be included in the benefits and use estimates. At a minimum, elaborating on the statement on page O-17 (and adding it to Chapter 7 (Section 7.08)) that 70% of the day trips are included and what proportion of total use is omitted is required. If it is not feasible to include single destination overnight visitors, then an acknowledgement should also be added to page O-17 and Chapter 7 that omitting overnight visitors results in an underestimate of total recreation benefits.

2. Detailed explanation for the reliance upon CVM benefit estimates rather than TCM benefit estimates. Based on the discussion on Page O-10 & O-11, which suggests that the TCM benefit estimates contain only the value of visiting the site specific beach and the CVM benefits do not, the Panel recommends that: (a) TCM benefit estimates be used rather than CVM; or (b) better justification for using CVM estimates instead of TCM be made in Appendix O.
3. Discussion of issues surrounding beach congestion. Appendix O and Chapter 7 do not mention the impact of increased visitor use resulting from increased beach width and addition of parking spaces on beach congestion. While a complex topic to address empirically with this data and in this FR/EIS, it should be acknowledged that past research (McConnell, 1977) indicates that increased visitor use can reduce the benefits per visitor day if number of visitors per acre rises.
4. Correction for or acknowledgement of problem with an on-site sampling of visitors. While on-site sampling is the most cost-effective way to obtain recreation valuation data, the resulting data and benefit estimates are likely influenced by "avidity" bias or technically, endogenous stratification. This causes problems when the phenomenon under study varies with avidity (as economic value does). Ideally, the TCM estimates of benefits could be corrected for this problem (employing inverse probability weights) (see, e.g., Thomson, 1991), but at a minimum this limitation acknowledged and that the benefit estimates from TCM may be slightly over-estimated.
5. A more complete discussion of basis for recreation benefits in Chapter 7 (Section 7.08). The one short paragraph describing the basis of the $20 million in recreation benefits (half the project benefits) is inadequate to convey the methods and data to most readers. The term contingent valuation needs to be described in 2-3 sentences and the estimated visitor use levels underlying the $20 million with-project benefits stated. The omission of the visitor use estimates (or at least proportions) also needs to be noted.
6. More complete presentation (perhaps including graphs) of how well the expanded parking facilities meets peak visitor demand associated with forecasted increased visitation, assuming the same proportion of the new total visitation comes during peak time periods as current temporal pattern of existing visitation.

Literature Cited:

McConnell, K.E. 1977. Congestion and Willingness to Pay: A Study of Beach Use. *Land Economics* 53(2): 185-195.

Thomson, C.J. 1991. Effects of the Avidity Bias on Survey Estimates of Fishing Effort and Economic Value. *American Fisheries Society Symposium* 12: 356 – 366.

Final Panel Comment 10:

The cost estimates need more detailed explanation, including the rationale for calculating interest during construction.

Basis for Comment:

The FR/EIS makes use of cost estimation software and appears to employ some standard USACE practices with regard to costs. The details of cost and the procedures employed, however, can be difficult to follow. For example, in Appendix N, the estimates on pages 6-14 are difficult to understand. The units of measure (UOM) are never defined (e.g., abbreviations: CY – cubic yards?, APR, EA). Nourishment costs [ACCOUNT 17] appear to be based on historical estimates. It is not clear what the bases for Planning, Engineering, and Design [ACCOUNT 30] or Construction Management [ACCOUNT 31] are. (Appendix N, page 5)

At numerous points in the FR/EIS, reference is made to calculation of interest during construction. The rationale for this interest calculation is never made clear. It could be an attempt to measure opportunity costs of capital (if so it should only be applied to the value of capital assets) or could reflect funds tied up during the construction phase of the project, which must be compounded forward to a present value at the beginning of the operational life of the project. In any event the FR/EIS should make clear what this calculation is meant to accomplish. There may be a USACE guidance document that establishes these calculations as standard practice, but if so one is never referenced. The rationale for the procedure should be explained.

Significance – Medium:

Clarification and explanation of cost estimation will enhance understanding and lend credibility to the analysis.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Rationale and references (as appropriate) for the "interest during construction" calculations.
2. Additional details on units of measure and the basis for cost estimates.

Final Panel Comment 11:

The study documentation should indicate the degree to which anthropogenic replenishment and prior storm impacts have influenced the representative beach profiles applied in the SBEACH and GRANDUC models.

Basis for Comment:

The engineering and economic analyses require the proper development of representative profiles for application in the SBEACH and GRANDUC models. The Main Report and Appendix D (Coastal Engineering) do not provide adequate discussion of the methods and beach profile data applied to develop the representative profiles.

For example, the Main Report and Appendix D do not indicate if or how the development of the representative profiles considered recently nourished or post-storm profiles. The Main Report provides a plot of all representative reach profiles in Surf City (SC1 – SC8) and North Topsail Beach (NTB1 – NTB8) — Figures 3.3 and 3.4 on Main Report pages 76 and 77. However, the Main Report and Appendix D do not include plots or discussion of measured profile data within each representative reach to confirm similarity of general beach profile geometry and features within each specific reach.

Additionally, the Main Report and Appendix D do not provide adequate discussion of existing or prior shore protection actions along the project shoreline. Main Report Section 3.06 (page 75) makes mention of large dune reconstruction after Hurricane Fran in 1996, and there are photographs of beach scraping; but the number, frequency, order-of-magnitude volume, locations, and success of prior beach nourishment (or related) activities along the project area are not described in the report. There is no discussion of historical changes to the dune (i.e., width, seaward location, etc.), which largely influences the vulnerability of the island's infrastructure to storm damages.

The report does not depict a "natural" (possibly historical) beach profile in the broad vicinity of the study area, potentially unaffected by prior anthropogenic actions or 1996-99 hurricane impacts. The report states that the dune has little crest width, steep side slopes, and that the berm is narrow (Section 3.06, page 75); however, it presents no historical or natural dune/beach profile context by which to assess the existing representative profile(s) or proposed restoration.

Significance – Medium:

The lack of detail in the discussion of the representative profile development limits the understanding of the profiles applied in the SBEACH and GRANDUC models and limits evaluation of the model's output.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. A more complete discussion of the profiles applied and the procedure followed to develop the representative profiles. This discussion should provide details on how the method considered recently nourished or post-storm profiles.
2. A discussion of existing or prior shore protection actions along the project shoreline. This discussion should include available information on prior project activities and their performance.
3. A discussion of how prior storms have specifically changed the dune and berm

conditions in the project area, and/or depiction of “natural” dune and berm conditions in substantial absence of anthropogenic or recent hurricane impacts.

Final Panel Comment 12:

Local data sets and prior analyses on longshore sediment transport, wave height, and background erosion rate have not been fully discussed.

Basis for Comment:

Appendix D does not contain a complete discussion of available local data sets or prior analyses completed for coastal processes in the project area.

Notable areas needing further discussion or analysis include:

- Data on seasonal and yearly variation in wave records are needed to evaluate the longshore transport in the project area. The Main Report 2.03.1 (Page 55) provides only text that summarizes the Wave Information Study (WIS) wave record.
- The implications of the alongshore convergence of the longshore sediment transport (from GENESIS modeling) versus the conflicting observations of accretion (NCDCM data) and erosion (1963-2002 data) from the two different shoreline change analyses are not discussed. Appendix D does not explain why there is no accretion (or beach stability) demonstrated and/or predicted along this convergence zone, even though shoreline accretion is clearly indicated in the NCDCM shoreline change rates (Figure D-6). Instead, the report appears to indicate or presume that this area of convergence is eroding, like the adjacent shores, at 2 feet per year, and will continue to erode in the future.
- The longshore sediment transport rates were apparently developed from GENESIS, but with apparently no allowance for nearshore bathymetric (non-parallel) contours and with no discussion of calibration. Only net transport rates are presented, with no discussion of gross rates.
- There is no depiction or discussion of nearshore bathymetry, contours, or historical changes in the nearshore contour locations.
- The Main Report and Appendix D provide no volumetric erosion analysis. This analysis could provide justification for the large initial nourishment density (>220 cy/ft) and renourishment volume requirement.

Significance – Medium:

The lack of detail in the sections that highlight local data sets and prior analyses conducted affects the completeness of the report and limits the ability to understand and verify analyses completed during the study.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Additional information on the seasonal and yearly variation in wave records in the project area. It is unclear if the yearly variations in wave data appear in the yearly GENESIS results.
2. Discussion of the convergence of longshore transport demonstrated in the GENESIS modeling results and the NCDCM shoreline change estimates and the implications to historical shoreline change and expected project performance.
3. Discussion of local bathymetry in the project area and if the GENESIS model assumption of generally straight and parallel offshore bottom contours proves valid.
4. Discussion of any apparent large scale historical changes in the offshore bottom contours.
5. An analysis of historical volumetric change in the project area based on available data.

Given sufficient data, the volumetric analysis should define a long-term period and also a short-term (storm) period.

Final Panel Comment 13:

Additional risk and uncertainty analysis is necessary to address the assumptions and inherent variability in project costs, property values, climate change, and recreation.

Basis for Comment:

A review of Section 7.10 of the Main Report on Evaluation of Risk and Uncertainty (RU), along with Appendices B (Economics) and D (Coastal Engineering) suggests that significant sources of uncertainty were not formally itemized and evaluated for likelihood of occurrence and/or impact to the project's predicted outcome. Likewise, these sources of uncertainty do not appear to have been included in the GRANDUC model, or they were added as a constant fixed amount to the results of the GRANDUC model runs. These elements of risk include uncertainty over dredging costs, recreation benefits, and property values.

Page 31 of Appendix B states that the recreation benefits analysis had not been completed in time to include in the GRANDUC model and was added external to the model runs. It is not clear if this means that uncertainty in recreation benefits was considered or not. Since recreation benefits represent half the project benefits, and there is statistical variability in these benefit estimates (e.g., value per day and number of visitor days) and GRANDUC can incorporate recreation (page 31 of Appendix B), sensitivity of net project benefits to uncertainty in recreation benefits is important.

Risk/uncertainties regarding project costs also appear to have been omitted from the GRANDUC analysis, or at least, appear not to have been specifically evaluated. These uncertainties include:

- Impacts to project (dredging) costs, particularly related to the estimated amount of available sand in the borrow areas.
- Degree of complexity (increased cost) associated with the shallow-cut and irregular geometries of the borrow area.
- Likelihood that sufficient dredge plant will be available to construct the project within the tight environmental windows in light of competing nationwide project requirements (another reason that opportunity costs of capital should be included in cost estimation).
- Probability of weather delays due to winter-season construction requirements.
- Large distance between the dredge areas and the nearest harbors of refuge and staging.
- The potential for unsuitable material in the borrow areas, including tires, ordnance, and associated requirements for screening.
- Probability of further exclusions to the preliminarily identified borrow areas due to unsuitable material or hardbottom or sedimentation impacts.
- Likelihood that there will be left-over sand available in the adjacent shoreline's borrow areas over which the current project has limited control.

There may also be uncertainty regarding benefit estimates in terms of the value of property protected from storm and erosion damage. The FR/EIS currently uses replacement costs minus depreciation, but market and assessed values could be employed. These alternative valuation methods could incorporate variability in benefit estimation that could proxy for uncertainty over current and future benefits of storm protection. If regression analysis is used to predict property

values, parametric uncertainty can be quantified and uncertainty over property values can be incorporated and reflected in this manner.

The influence of climate change induced sea level rise is discussed but it is not clear how this is incorporated into the RU analysis and GRANDUC.

The Cost Engineering Branch Center of Expertise (Walla Walla District) provides detailed cost and schedule risk analysis guidance (USACE 2008a), including development of cost and schedule risk registers and models to conform with Memorandum CECW-CE (1110) (USACE 2007b), ER 1110-2-1302 (USACE 2008b), and EC Bulletin No. 2007-17 (USACE 2007c), which address the requirements for cost risk analysis methods to be used for the development of contingency for Civil Works projects exceeding $40M. These methods involve a formal, prescribed process that includes involvement of the Project Delivery Team (PDT) utilizing Monte Carlo principles. The USACE Jacksonville District provides an example of a more comprehensive Risk & Uncertainty analysis that includes costs of beach nourishment, based on USACE's "Cost and Schedule Risk Analysis Process" manual.

Significance – Medium:

The uncertainty regarding the dredging and beach nourishment costs and statistical variability in recreation benefit estimates (user days and benefits per day) could have a sizeable impact on project net benefits and therefore economic feasibility.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. A cost and schedule risk analysis should be conducted, in accordance with EC Bulletin No. 2007-17 (USACE, 2007c), and such as detailed in the "Cost and Schedule Risk Analysis Guidance" (USACE 2008a) from USACE's Cost Engineering Branch Center of Expertise (Walla Walla District). This analysis should consider the likelihood and impacts of risk/uncertainties regarding sand availability, dredging costs, recreation benefits, property benefits, and sea level rise as indicated below.
2. Risk and uncertainty regarding sand availability and dredging costs (beyond the existing 25% contingency factors) need to be included in the risk and uncertainty analysis. Ideally these would be incorporated into the GRANDUC model as integral elements of that model and/or as directed by the Guidance above.
3. Include as an integral part of the GRANDUC analysis, the statistical variability in recreation benefits (value per day and estimated number of visitor days) in the GRANDUC risk and uncertainty analysis.
4. Include as an integral part of the GRANDUC analysis, the statistical variability in property benefits (based on competing estimation methods or uncertainty in estimation) in the GRANDUC risk and uncertainty analysis.
5. Either explicitly incorporate sea level rise into the GRANDUC analysis or explain how it is reflected in the variables such as erosion distance or wave characteristics that are part of the existing GRANDUC analysis.

Literature Cited:

USACE. 2007b. Application of Cost Risk Analysis Methods to Develop Contingencies for Civil Works Total Project Costs. Memorandum CECW-EC (1110), dated July 3, 2007.

USACE 2007c. Engineering and Construction Bulletin: Application of Cost Risk Analysis Methods to develop Contingencies for Civil Works Total Project Costs. CECW-EC Bulletin EC 2007-17, dated September 10, 2007.

USACE. 2008a. Cost and Schedule Risk Analysis Guidance. U.S. Army Corps of Engineers, Cost Engineering Branch Center of Expertise, Walla Walla District.

USACE. 2008b. Engineering and Design: Civil Works Cost Engineering. U.S. Army Corps of Engineers, Washington, DC. CECW-EC Circular No. ER 1110-2-1302, dated September 15, 2008.

Final Panel Comment 14:

The fishery resources discussion should be expanded to include nearshore shellfish species and relationships between Essential Fish Habitat (EFH) and commercial/recreational fishery values.

Basis for Comment:

Characterizations of finfish assemblages in Section 2.01 (subsections 2.01.1 through 2.01.10) are generally thorough, but insufficient information is provided in regard to shellfish (mollusks and crustaceans). According to the discussion in Section 2.01.1 it appears that project area shellfish were considered to be important only in tidal saltwater (estuarine) habitats; however, several of these species, as well as other species of marine decapods and mollusks, are important components of fisheries along the coast and should be addressed in detail in the text.

The presentation for Essential Fish Habitat (EFH) is represented primarily by Tables 2.5 and 2.6; although the Main Report does describe habitat types, it does not relate those habitat types back to specific target species provided in the tables.

The nature and extent of commercial and recreational use of finfish and shellfish resources should also be discussed. The Main Report presently provides a brief description of commercial landings, and mentions key recreational finfish species (Section 2.04.3) and potential impacts to these finfish fisheries are described briefly in Section 8. However, neither section relates specific project area habitats to fishery resource utilization and value.

Significance – Low:

Further detail on shellfish species and EFH will improve the resource agencies' ability to assess the potential impacts on fishery resources.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Expand the text in Section 2.01 to thoroughly describe shellfish species that represent important components of nearshore commercial and recreational fishery resources.
2. Provide a discussion of major fishery species and how they are distributed in regard to the types of EFH in the project area.

Final Panel Comment 15:

The FR/EIS should be expanded to address the relevant Federal and State protected species statutes and should be updated to clarify the present status of several species.

Basis for Comment:

Neither the Main Report nor the Biological Assessment (Appendix I) explains key statutes that define the legal status and regulation of activities that may affect protected species, such as Endangered Species Act, Marine Mammal Protection Act, Eagle Protection Act, or State of North Carolina regulations regarding State-protected species. It would be helpful to describe how these various laws/rules would apply to the Surf City project. For example, there is no discussion of what level of protection is afforded to wildlife under North Carolina statute 113-331-350, which defines prohibited acts and penalties. State-protected species that could occur in the project area should be listed. There is no discussion of the Eagle Protection Act; information about Bald Eagle nests (positive or negative) should be presented.

Appendix I contains no mention of the smalltooth sawfish occurrence in North Carolina in 1999. This observation was reported by Schwartz in 2003 and was cited by National Marine Fisheries Service in 2009. Discussion of the shortnose sturgeon appears to be based upon a single occurrence in winter 1986-1987, in Brunswick River. The 1999 smalltooth sawfish observation was more recent and should have been the basis for including this species in the Biological Assessment.

The FR/EIS should use the standardized common names in the American Ornithological Union (AOU) 1983 checklist of birds (AOU, 1983). Also, Table 2.12 should be updated to include several other State-listed species, and should be consistent with Table 2.7. Table 2.7 is also out of date; the status of Wilson's plover and American oystercatcher was changed to Special Concern (SC) in 2008.

Significance – Low:

A discussion of all applicable statutes and updating the description of protected species will provide a more complete basis for assessing potential impacts on these species.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Create a new section in Chapter 2 that is devoted to Federal and State protected species. This section should include a discussion of the various statutes that afford protection to the listed species.
2. Appendix I should be updated to address smalltooth sawfish.
3. Tables 2.7 and 2.12 should be updated and checked for accuracy and consistency.

Literature Cited:

American Ornithologists' Union. 1983. Check-list of North American Birds. 7th edition. American Ornithologists' Union, Washington, D.C.

National Marine Fisheries Service. 2009. Recovery Plan for Smalltooth Sawfish (*Pristis pectinata*). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland.

Schwartz, F.J. 2003. Bilateral asymmetry in the rostrum of the smalltooth sawfish, *Pristis pectinata* (Pristiformes: Family Pristidae). J. North Carolina Acad. Sci. 119:41-47.

Final Panel Comment 16:

Historical conditions, including storm impacts and dredged material disposal activities at and near the project area, need to be described more thoroughly due to their influence on future erosion rates and renourishment requirements.

Basis for Comment:

The Main Report and Appendix D (Coastal Engineering) provide relatively little detail regarding prior shore protection activities, storm intensity and frequency, storm erosion impacts along the subject shoreline, and nearby inlet dredging and disposal activity.

Table 3.1 lists landfalling storms since 1800, but it provides incomplete data regarding the frequency of storm impacts. There is inadequate data to judge whether the hurricanes of 1996-1999 were a unique, recent, and historically unusual occurrence relative to expected future storm conditions. This, in turn, influences the degree to which the without-project, future erosion rate of 2 ft per year is deemed to represent a reasonable assumption. This erosion rate significantly influences the formulation and evaluation of the project.

Section 3.06 makes brief mention of dredged material disposal from New River Inlet, but there is otherwise no mention of the total dredge volume from the inlet nor from New Topsail Inlet. Section 3.07 assumes no allowance for future shore placement of maintenance dredging material from New River Inlet, although the report cites placement of 68,000 cubic yards per year every 1 to 3 years over a 10 year period. Neglecting this disposal material will influence project renourishment requirements, particularly in light of the southerly net transport described by the GENESIS results in Appendix D.

Significance – Low:

Information regarding the historical activities, storms and similar projects at and near the project area is helpful in understanding the scale/severity of the existing problem and the recommended project solution.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. Description of the history and volume of dredge and disposal practices at the two adjacent inlets, and the current dredge and disposal plan for sediment (particularly beach-quality sand) from these two inlets.
2. Justification for the exclusion of dredge disposal contributions from at least New River Inlet in the project formulation.
3. Description of the frequency and severity of recent storms (including through at least 2008) relative to the greater historical context.

APPENDIX B

Final Charge to the Independent External Peer Review Panel

on the

Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

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Draft Charge Guidance and Questions to the Peer Reviewers
for the
Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina

BACKGROUND

The Surf City and North Topsail Beach Integrated Feasibility Report and Environmental Impact Statement (Surf City FR/EIS) is being prepared in response to the following two resolutions adopted February 16, 2000 for Surf City, and April 11, 2000 for North Topsail Beach:

- Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on West Onslow Beach and New River Inlet, North Carolina, published as House Document 393, 102nd Congress, 2nd Session, dated September 23, 1992, and other pertinent reports, to determine whether any modifications of the recommendations contained therein are advisable at the present time in the interest of shore protection and related purposes for Surf City, North Carolina.
- Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on West Onslow Beach and New River Inlet, North Carolina, published as House Document 393, 102nd Congress, 2nd Session, dated September 23, 1992, and other pertinent reports, to determine whether any modifications of the recommendations contained therein are advisable at the present time in the interest of shore protection and related purposes for North Topsail Beach, North Carolina.

The principal study area includes the towns of Surf City and North Topsail Beach, both of which are located on Topsail Island. Topsail Island is a 22-mile long and 0.5-mile wide barrier island approximately 40 miles northeast of Wilmington, North Carolina. Due to the northeast-southwest orientation of the coastline, the island faces the Atlantic Ocean on the southeast. Other waterbodies in the vicinity include New River Inlet immediately to the northeast, Banks Channel and the Atlantic Intracoastal Waterway (AIWW) to the northwest, and New Topsail Inlet at the far southwestern end of the island.

The sponsors' interest is in developing a plan of protection against storm damage for 17 miles of shoreline extending from the Topsail Beach/Surf City town limits to the northern end of Topsail Island. The study is also documenting incidental recreation benefits. Being located between Cape Lookout and Cape Fear, Topsail Island is a frequent target for hurricanes and tropical storms tracking along the mid-Atlantic coast. In addition to these direct landfalling storms, many storms that have passed offshore without making landfall have also impacted the study area. Local impacts to the study area have varied depending on the location and strength of the storm. However, Bertha and Fran in 1996 and Floyd in 1999 were among the most damaging and costly storms ever to hit North Carolina.

Typical solutions considered for this study area are berm and dune beach-fills using material dredged from offshore borrow sites, and in some cases building relocations, or coastal structures such as groins or breakwaters. The estimated range of initial construction cost for the various

alternatives varies between $100 million and $150 million, and estimated annual renourishment costs are approximately $3 million. Renourishment would continue through 50 years if the project is authorized.

OBJECTIVES

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Surf City FR/EIS in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers Engineer Circular (EC) No. 1165-2-209, *Civil Works Review Policy*, dated January 31, 2010 (USACE, 2010) and the Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* released December 16, 2004 (OMB, 2004).

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

This purpose of the IEPR is to analyze the adequacy and acceptability of economic, engineering, and environmental methods, models, data, and analyses performed for the Surf City and North Topsail Beach Integrated FR/EIS project. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by panel members with extensive experience in engineering, economics, and environmental issues relevant to the project. They should also have experience applying their subject matter expertise to coastal risk management.

The panel members will be "charged" with responding to specific technical questions as well as providing a broad technical (engineering, economic, and environmental) evaluation of the overall project. The panel members will identify, recommend, and comment upon the assumptions underlying the analyses as well as evaluate the soundness of models and planning methods. The panel members will evaluate whether the interpretations of analyses and conclusions are technically sound and reasonable, provide effective review in terms of both usefulness of results and of credibility, and have the flexibility to bring important issues to the attention of decision makers. The panel members may offer opinions as to whether there are sufficient technical analyses upon which to base the ability to implement the project. The panel members will address factual inputs; data; the use of geotechnical, hydrologic, and hydraulic models; analyses; assumptions; and other scientific and engineering tools/methodologies used to inform decision-making.

DOCUMENTS PROVIDED

The following is a list of documents and reference materials that will be provided for the review. **The documents and files presented in bold font are those which are to be reviewed.** All other documents are provided for reference.

- **Draft Integrated Feasibility Report and Environmental Impact Statement, Coastal Storm Damage Reduction, Surf City and North Topsail Beach, North Carolina**
  - **Main Report**
  - **Appendix A: Project Maps**
  - **Appendix B: Economic Analysis**
  - **Appendix C: Geotechnical Analyses**
  - **Appendix D: Coastal Engineering**
  - **Appendix E: Sand Compatibility Analysis**
  - **Appendix G: Section 404(b)(1) Guidelines Analysis**
  - **Appendix H: Correspondence**
  - **Appendix I: Biological Assessment (Endangered Species)**
  - **Appendix J: Cumulative Effects**
  - **Appendix K: Scoping Letters and List of Respondents**
  - **Appendix L: Draft Fish and Wildlife Coordination Act**
  - **Appendix M: Real Estate Plan**
  - **Appendix N: Project Costs**
  - **Appendix O: Recreation Analysis**
  - **Appendix P: Nonstructural Alternatives**
  - **Appendix Q: Larval Entrainment**
  - **Appendix R: Nearshore and Offshore Hard Bottom Survey Reports**
  - **Appendix S: Benthic Community Characterization Survey**
  - **Appendix U: Archaeological Report**
- USACE guidance *Peer Review of Decision Documents* (EC 1165-2-209) dated January 31, 2010;
- CECW-CP Memorandum dated March 31, 2007; and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

6.1.1 SCHEDULE

Note: All dates in italics are tentative pending final review document availability

IEPR Task	Activity	Projected Date
1	NTP	September 10, 2009
	Draft Review documents available[1]	November 19, 2009
	Final Review documents available	February 8, 2010 (est.)
	*Submit Draft Work Plan	October 14, 2009
	USACE Provide comments on Draft Work Plan	October 19, 2009
	Conference Call, if necessary	October 20, 2009
	*Submit Final Work Plan	October 26, 2009
	USACE approves Final Work Plan	October 28, 2009
2	Battelle requests input from USACE for the COI for recruiting panel members	October 7, 2009
	Recruit and screen up to 6 potential panel members; prepare summary information	January 11 2010
	*Submit list of selected panel members	January 11, 2010
	USACE comments on panel members' COI	January 18, 2010
	Complete subcontracts for panel members	February 1, 2010
3	*Submit Draft Charge	December 3, 2009
	USACE provides comments on draft charge	December 8, 2009
	*Submit Final Charge	December 15, 2009
	USACE approves Final Charge	December 17, 2009
4	USACE/Battelle Kick off Meeting	September 17, 2009
	Battelle/panel Kick-off Meeting	*February 10, 2010* (pending panel member availability)
	USACE/Battelle/panel Kick-off Meeting with panel members	*February 10, 2010* (pending panel member availability)
5	Review documents sent to panel members	*February 9, 2010*
	External panel members complete their review	*March 10, 2010*
	Collate comments from panel members	*March 16, 2010*
	Convene panel review conference call	*March 18, 2009*
6	*Submit Final IEPR Report	*April 13, 2010*
7	*Input Final comments to DrChecks	*April 15 2010*
	USACE PDT provides draft Evaluator responses and clarifying questions to Contractor	*April 20 2010*
	Teleconference between Contractor, panel members, and PDT to discuss final panel comments, draft responses & clarifying	*April 27, 2010*
	USACE input final Evaluator responses in DrChecks	*May 6, 2010*

IEPR Task	Activity	Projected Date
	Battelle inputs BackCheck responses in DrChecks (i.e. BackCheck)	*May 17, 2010*
	*Battelle submits pdf printout of DrChecks project file	*May 18, 2010*
	Project Closeout	*July 20, 2010***

* - denotes a deliverable

** A no cost extension will be needed to extend the end date for the period of performance to July 20, 2010.

[1] Draft review documents being provided to develop the charge only.

CHARGE FOR PEER REVIEW

Members of this peer review panel are asked to determine whether the technical approach and scientific rationale presented in the Draft Integrated Feasibility Report and Environmental Impact Statement for Surf City and North Topsail Beach, North Carolina **(**Surf City and North Topsail Beach Integrated FR/EIS) are credible and whether the conclusions are valid. The reviewers are asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The reviewers are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the panel members (by report section or Appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the Surf City and North Topsail Beach Integrated FR/EIS. Please focus on your areas of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please not the following guidance. Note that the panel will be asked to provide a overall statement related to 1 and 2 below per USACE guidance (EC 1105-2-410; Appendix D).

1. Assess the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analysis used
2. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation for construction, authorization, or funding.
3. Identify, explain, and comment on assumptions that underlie economic, engineering, ecological, geotechnical, hydrological, or environmental analyses.
4. Evaluate whether the interpretations of analysis and conclusions are reasonable.
5. Please focus the review on scientific information, including factual inputs, data, the use and soundness of models, analyses, assumptions, and other scientific and engineering matters that inform decision makers.
6. Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making. However, there are several questions relating to the National Environmental Policy Act that will require comment. Comments should be provided based on your professional judgment, **not** the legality of the document.

7. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.
8. Please contact the Battelle deputy project manager (Corey Wisneski, wisneskic@battelle.org) or project manager (Karen Johnson-Young, johnson-youngk@battelle.org) for requests or additional information.
9. In case of media contact, notify the Battelle project manager immediately.
10. Your name will appear as one of the panelists in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Corey Wisneski, wisneskic@battelle.org, no later than March 10, 2009 *(estimated date)*, 10 pm EDT.

Independent External Peer Review
Biscayne Bay Coastal Wetlands (BBCW) Draft Integrated Project Implementation Report (PIR) and Environmental Impact Statement (EIS)

Draft Charge Questions

GENERAL QUESTIONS

1. Are the assumptions that underlie the economic, engineering and environmental analyses sound?
2. Comment on the adequacy and acceptability of the economic, engineering, and environmental methods, models and analyses used.
3. In general terms, are the planning methods sound?
4. Are the interpretations of analysis and conclusions based on the analysis reasonable?

SECTION 1 – STUDY OVERVIEW

1.01. Study Authority
No questions.

1.02. Study Area
No questions.

1.03. Purpose and Need for Action
No questions.

1.04. Scope of Study
No questions.

1.05. Study Process
No questions.

1.06. National Objective
No questions.

1.07. Prior Studies and Reports
No questions.

1.08. Existing Federal Projects
No questions.

SECTION 2 – AFFECTED ENVIRONMENT

2.01. Marine Environment

5. Please comment on the accuracy and comprehensiveness of the discussion of the project area's geology (i.e., wetlands and flood plains; inlets, flats, and sounds; and nearshore ocean).

6. Please comment on the accuracy and comprehensiveness of the characterization of the project area's fish and shellfish species (all stages).

7. Please comment on the accuracy and comprehensiveness of the benthic resources information and data provided in Sections 2.01.8 and 2.01.9.

8. Please comment on whether the level of detail provided in the "Summary of Corps Sand Resource and Hard Bottom Investigations Contracts" is adequate for this FR\EIS.

9. Please comment on the accuracy of the Essential Fish Habitat (EFH) information detailed in Tables 2-5 and 2-6.

2.02. Terrestrial Environment

10. Please comment on the accuracy and comprehensiveness of the information provided regarding birds in the project area.

11. Please comment on the accuracy and comprehensiveness of the description of and impacts/benefits to threatened and endangered species.

2.03. Physical Resources

12. Please comment on the accuracy and comprehensiveness of the discussion of the physical resources in the project area.

2.04. Socio-Economic Resources

13. Please comment on the accuracy and comprehensiveness of the descriptions of the demographic, esthetic, commercial and recreational resources of the study area/region.

2.05. Cultural Resources

14. Please comment on the accuracy and comprehensiveness of the descriptions of the cultural resources of the study area/region.

2.06. Water Resources

15. Please comment on the accuracy and comprehensiveness of the discussion of the project area's water resources.

2.07. Other Significant Resources

16. Please comment on the accuracy and comprehensiveness of the discussion of the project area's air, noise, and water pollution.

17. Please comment on the accuracy and comprehensiveness of the discussion of the project area's man-made and natural resources, esthetic values, community cohesion, and the availability of public facilities and services.

18. Please comment on the accuracy and comprehensiveness of the discussion of the project area's hazardous, toxic, and radioactive wastes.

SECTION 3 – PROBLEMS, NEEDS, AND OPPORTUNITIES

3.01 Hurricane and Storm Damage

No questions

3.02 Beach Erosion

19. Please comment on the extent to which the historical data enable overall conclusions to be drawn on trends in beach erosion or accretion, and the degree to which this has been considered later in plan selection.

20. Please comment on the accuracy and appropriateness of the annual erosion estimation method and the assumptions associated with the 2002 beach profile survey.

3.03 Beach Recreation

21. Please comment on the accuracy and comprehensiveness of the overall characterization of recreation in the study area/region.

3.04 Public Access

22. Please comment on the accuracy and comprehensiveness of the description of the requirements needed for public beach access designation.

3.05 Loss of Sea Turtle Nesting Habitat

23. Please comment on the accuracy and comprehensiveness of the information provided regarding nesting sea turtles in the project area.

3.06 Existing Shore Condition

24. Please comment on whether the selection of the 16 profiles is representative of existing conditions.

25. Please comment on the extent to which the relationship between beach morphology and erosion or accretion rates is identified.

26. Please comment on whether the beach profiles should be differentiated between those areas that have been anthropogenically replenished and those areas subjected only to natural processes.

3.07 Without Project Hydraulic Analysis

27. Please comment on the appropriateness of the analytical methodology and input parameters used in the analysis for the "without project" condition.

3.08 Without Project Economic Analysis

28. Please comment on the appropriateness of the assumption of future development conditions.

29. Please comment on whether costs and benefits associated with the without project condition are comprehensively and accurately discussed.

3.09 Without Project Environmental Analysis

30. Please comment on whether there are resources in addition to those described in Section 3.09 that potentially could be affected by the no action alternative.

SECTION 4 – PLANNING OBJECTIVES

4.01 Goals

No questions.

4.02 Constraints

No questions.

SECTION 5 – PLAN FORMULATION AND EVALUATION OF ALTERNATIVES

5.01 Formulation and Evaluation Criteria

31. Please comment on the comprehensiveness of the formulation and evaluation criteria.

5.02 Identification, Examination, and Screening of Measures

32. Please comment on whether all possible structural and non-structural management measures have been identified and evaluated.
    a. What, if anything, is missing?

5.03 Identification of Initial Alternative Plans

33. Please comment on whether the alternative plans are clearly identified.

5.04 Screening of Alternative Plans

34. Please comment on the clarity and comprehensiveness of the alternative screening process description.

5.05 Evaluation of Alternative Plans

35. Please comment on whether the criteria used to evaluate and screen the beachfill alternative measures are appropriate.
    a. Was sufficient data available to eliminate some of the measures from further study?

36. Please comment on the elimination of the nonstructural alternative along all reaches.

37. Please comment on the assumption that a sufficient quantity of offshore sand is available within 6 miles.

5.06 Optimization and Comparison of Beachfill Alternative Plans

No questions

SECTION 6 – PLAN SELECTION

No questions.

SECTION 7 – THE SELECTED PLAN

7.01 Plan Description and Components

38. Please comment on the extent to which the Selected Plan meets the Planning Objectives outlined in Section 4.

39. Please comment on the conceptual geometric specifications for the dune and berm system in the Selected Plan.

7.02 Rationale for Support of the Locally Preferred Plan

No questions.

7.03 Design and Construction Considerations

40. Please comment on the completeness and appropriateness of the Selected Plan's dune vegetation plan.

41. Please comment on whether the renourishment interval is appropriate given the wave action and storm frequency experienced in the project area.

42. Please comment on the accuracy and comprehensiveness of the discussion of borrow material relating to the beach renourishment plan.

43. Please comment on the borrow and placement quantities required for initial construction and renourishment estimates.

7.04 Borrow Area

44. Please comment on whether this section supports the established renourishment interval.

45. Please comment on Table 7-1 and whether it adequately characterizes the hard bottom monitoring during the dredging process.
    a. If not, what additional information should be included?

46. Please comment on the estimated availability of compatible offshore borrow material.

47. Please comment on whether this section considers the factors necessary for determining the borrow area contingency plan.
    a. What, if any, additional information should be considered?

48. Please comment on the characterization of the poorly graded clean sand (SP) and gravelly sand (SP-SM) characterization of the borrow area materials.

49. Please comment on whether the borrow materials comply with the 2007 North Carolina standards for beach fill.

50. Please comment on whether there is a sufficient factor of safety between the total lifetime borrow requirements and total available given the competing demand for borrow materials for several different projects.

51. Please comment on the configuration of the borrow areas based on the geotechnical evaluation conducted.

52. Please comment on the proposed spacing for the additional vibracore borings.

53. Please comment on the likelihood that contingency measures will need to be implemented during dredging operations.

54. Please comment on the clarity of the description of which entities are responsible for deriving and implementing the contingency plan.

7.05 Dredging and Material Shaping

55. Please comment on whether this section gives adequate consideration to the required real estate costs.

56. Please comment on the estimated average dredging production rate.

57. Please comment on the viability of the recommended construction and periodic nourishment plan.

7.06 Real Estate Considerations

58. Please comment on whether this section adequately addresses all real estate interests.

59. Please comment on the assumption of a zero cost/land value for the perpetual beach storm damage reduction easement.

7.07 Operation and Maintenance Considerations

60. Please comment on the comprehensiveness of the operation and maintenance discussion and the resulting estimate of costs.

61. Please comment on the comprehensiveness of the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) requirements.

62. Please comment on the annual cost estimate.

63. Please comment on the extent to which the Selected Plan will be successful in significantly reducing expected annual damages to structures and roads, and berm damages due to short and long term erosion.

7.08 Plan Accomplishments

64. Please comment on whether there are any additional plan accomplishments that should be highlighted.

65. Please comment on whether the anticipated plan accomplishments have been adequately addressed.

66. Please comment on whether the recreational benefits and their derivation have been accurately described in this section.

67. Please comment on the adequacy of the discussion on the anticipated average annual benefit (AAB) for the with-project condition.
    a. What, if any, additional information should be included?

7.09 Economics of the Selected Plan

68. Please comment on whether all costs and benefits have been adequately accounted.

69. Please comment on whether the cost and benefit estimates are based on sound economic practices.

70. Please comment on the interest rate used and the years of evaluation.

71. Please comment on the timing and consideration of project costs.

72. Please comment on the incremental analysis conducted.

73. Please comment on whether the negative net benefit results handled according to sound economic principles?

7.10 Evaluation of Risk and Uncertainty

74. Please comment on the breadth and suitability of the assumptions used to conduct the sea level rise uncertainty analysis.

75. Please comment on the decision not to protect to a given storm frequency.
    a. How could this consideration impact the cost benefit analysis?
    b. Is the reasoning for this decision accurately described and reasonable?

76. Please comment on whether the assumptions used in the assessment of the project's economic risk and uncertainty are valid and justified for the risk/sensitivity analysis.

77. Please comment on whether you agree with the extent of the predicted reduction in average annual storm damages.
    a. Will the project be successful in protecting against storm wave and storm-induced erosion?

78. Please comment on the use of 0.008 feet per year as the highest trend in sea level rise.

7.11 System of Accounts Evaluation

79. Please comment on the items that were considered or omitted for each of the accounts.

SECTION 8 – ENVIRONMENTAL EFFECTS

8.01 Marine Environment

80. Please comment on the assessment that construction impacts to surf zone fishes and prey availability will be temporary and minor.

81. Please comment on the assessment that dredging activities will not adversely affect marine fish larvae.

82. Please comment on the assessment that dredging activities are not expected to adversely affect nekton species at the population level.

83. Please comment on whether the environmental measures described will successfully mitigate the anticipated impacts to intertidal macrofauna.

84. Please comment on the anticipated impacts to nearshore ocean organisms and communities during construction and dredging.

85. Please comment on whether the anticipated impacts to Essential Fish Habitat and Habitat Areas of Particular Concern have been accurately and comprehensively considered.

8.02 Terrestrial Environment

86. Please comment on whether the anticipated impacts to the beach and dune areas have been accurately and comprehensively considered.

87. Please comment on whether the anticipated impacts to birds have been accurately and comprehensively considered.

8.03 Physical Resources

88. Please comment on the assessment that changes in wave conditions in the project area would be negligible.

89. Please comment on whether the anticipated impacts to shoreline and sand transport have been accurately and comprehensively considered.

8.04 Socio-Economic Resources

90. Please comment on the discussion of commercial and recreational fishery values lost during construction, including substitution effects and magnitude of localized impacts.

8.05 Recreational and Esthetic Resources

91. Please comment on the discussion of recreational values lost during construction, including substitution effects and magnitude of localized impacts.

8.06 Cultural Resources

92. Please comment on the whether the anticipated impacts to all cultural resources been accurately described and appropriately considered.

8.07 Water Resources

93. Please comment on whether the anticipated impacts to all water resources been accurately described and appropriately considered.

8.08 Other Significant Resources

94. Please comment on whether the anticipated impacts to air, noise, and water pollution have been accurately described and appropriately considered.

95. Please comment on whether the anticipated impacts to man-made and natural resources, esthetic values, community cohesion, and the availability of public facilities and services have been accurately described and appropriately considered.

96. Please comment on whether the anticipated impacts to hazardous, toxic, and radioactive waste have been accurately described and appropriately considered.

8.09 Summary of Cumulative Effects

No questions

SECTION 9 – PLAN IMPLEMENTATION

9.01 Project Schedule

97. Please comment on whether the timeframes and deadlines presented for the project schedule are reasonable.

98. Please comment on using a "best case" scenario for calculating the project schedule.
    a. What impact, if any, does this have on the overall costs presented in Table 9.2?

9.02 Division of Plan Responsibilities

No questions

9.03 Views of the non-Federal Sponsor

No questions.

9.04 Views of the State of North Carolina

No questions

9.05 Views of the U.S. Fish and Wildlife Service

No questions.

SECTION 10 – COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

No questions.

SECTION 11 – SUMMARY OF AGENCY AND PUBLIC INVOLVEMENT

99. Please comment on whether the outreach program was sufficient to solicit comments and concerns from the general public, state and Federal resource agencies, and any other interested party.

SECTION 12 – CONCLUSIONS

No questions

SECTION 13 – RECOMMENDATIONS

No questions

Appendix A: PROJECT MAPS

No questions.

Appendix B: ECONOMIC ANALYSES

100. Please comment on how the benefits and costs were derived for each alternative.
    a. Were all factors considered?

101. Please comment on whether the 50-year period of economic analysis is appropriate.

102. Please comment on whether the real estate forecasts are reasonable and based on well-founded assumptions and related economic factors.

103. Please comment on whether the methods for performing the benefit costs analysis, including discount rate, project lifetime, base year, etc., are adequately described and justified.

104. Please comment on whether the sensitivity analysis adequately captures the economic uncertainty of the project.

105. Please comment on the use of interior lot values versus ocean front or second row values.
    a. Are the value of structures and construction costs reasonable and justified?

Appendix C: GEOTECHNICAL ANALYSIS

No questions.

Appendix D: COASTAL ENGINEERING

106. Please comment on the thoroughness of the discussion of the plans investigated and eliminated from further consideration.

107. Please comment on whether the recommended plan template adequately mitigates the project issues outlined in the main report.

108. Please comment on reasonableness of the projected timeframe needed to replenish the borrow material.

109. Please comment on the use of the Generalized Risk AND Uncertainty- Coastal (GRANDUC) model to evaluate the various alternative and transition scenarios.

110. Please comment on the appropriateness of the input data used in the GRANDUC model.

111. Please comment on the accuracy of the calculations used to determine the estimated rise in sea level and the appropriateness of the sea level rise projections used to model shoreline recession.

112. Please comment on the adequacy of the estimated costs for the "with" and "without" project alternatives and resulting project damages/benefits associated with each alternative.

113. Please comment on whether the longshore sediment transport, wave height, and background erosion rate have been adequately addressed in the project analysis.

114. Based on past storm events (wave height and volume losses), please comment on the results from the SBEACH Model and the ability of the model to predict project success.

Appendix E: SAND COMPATIBILITY ANALYSIS

115. Please comment on the appropriateness of the approach used to conduct the native beach material sampling.

116. Please comment on whether the proposed borrow material is well-suited for beach fill material from an engineering, economic, and environmental standpoint.

117. Please comment on whether the discussion of borrow overfill and native/borrow sand compatibility is accurate, realistic, and comprehensive.

Appendix G: SECTION 404(b)(1) GUIDELINES ANALYSIS

No questions

Appendix H: CORRESPONDENCE

No questions

Appendix I: BIOLOGICAL ASSESSMENT – ENDANGERED SPECIES

No questions.

Appendix J: CUMULATIVE EFFECTS

118. Please comment on whether the volume of available borrow material should be a factor in the proposed plan and future nourishment activities.

Appendix K: SCOPING LETTERS AND LIST OF RESPONDENTS

No questions.

Appendix L: DRAFT FISH AND WILDLIFE COORDINATION ACT REPORT

No questions.

Appendix M: REAL ESTATE PLAN

119. Please comment on whether the plan adequately addresses all real estate interests and requirements allowing for appropriate comparisons across all alternatives?

Appendix N: PROJECT COSTS

120. Please comment on whether this appendix adequately describes the methods for estimating project costs.

121. Please comment on whether the costs are based on assumptions and/or data that accurately reflect market conditions.

Appendix O: RECREATION ANALYSIS

122. Please comment on whether the methodology and estimation technique presented is economically justified.
    a. Are all assumptions reasonable?
    b. Does the methodology address all potential components/topics of traditional non-market valuation?

Appendix P: NONSTRUCTURAL ALTERNATIVES

123. Please comment on whether all nonstructural alternatives have been accurately considered in this appendix.
    a. Do the evaluations accurately reflect market conditions (especially assumed costs) and realistic outcomes?

Appendix Q: LARVAL ENTRAINMENT

124. Please comment on the model used to estimate potential larval entrainment mortality due to dredging.

Appendix R: NEARSHORE AND OFFSHORE HARD BOTTOM SURVEY REPORTS

No questions

Appendix S: BENTHIC COMMUNITY CHARACTERIZATION SURVEY

No questions

Appendix U: ARCHAEOLOGICAL REPORT

No questions