APPENDIX N

PEER REVIEWS

THIS PAGE INTENTIONALLY LEFT BLANK.

ATTACHMENT A:
EXTERNAL PEER REVIEW

THIS PAGE INTENTIONALLY LEFT BLANK.

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080
http://www.mvd.usace.army.mil/

REPLY TO
ATTENTION OF:

CEMVD-PD-N

5 May 2008

MEMORAMDUM FOR Commander, North Atlantic Division (CENAD-PSD-P), 302 General Lee Avenue, Fort Hamilton Military Community, Brooklyn, NY 11252-6700

SUBJECT: ECO-PCX Endorsement of External Peer Review for the Middle Chesapeake Bay Islands Restoration Project.

1. The National Ecosystem Planning Center of Expertise (ECO-PCX) managed the External Peer Review (EPR) for the Middle Chesapeake Bay Island Restoration Project in the Baltimore District. The External Peer Review was conducted by Battelle Corporation through their contract with the Army Research Office. The EPR panel consisted of 4 individuals selected by Battelle with technical expertise in engineering (environmental, geotechnical); hydraulics/sedimentation; dredging and dredged materials management; economics and plan formulation; hydrology/coastal hydrology; biology/ecology with Chesapeake Bay/estuarine experience; habitat evaluation/ecological modeling; estuarine wetland restoration; coastal erosion/ shoreline protection; and experience with the review of EISs and Dredged Material Management Plans (DMMPs). Overall, 14 final EPR comments were identified and documented. Of the 14 final comments, 2 were classified as of high significance and 8 were categorized as medium significance. Four comments were identified as having a low level of significance. The report of the EPR panel is entitled, "Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation, January 23, 2008."

2. Responses to the EPR comments have been prepared by NAB and coordinated with the vertical team. Following signing of the Chief's Report, NAB should post the enclosed report and the coordinated responses on their website and the ECO-PCX, NAD, and CECW-P should establish links to this website.

Printed on Recycled Paper

CEMVD-PD-N 5 May 2008

SUBJECT: ECO-PCX Endorsement of External Peer Review for the Middle Chesapeake Bay Islands Restoration Project.

3. In summary, the EPR for the Middle Chesapeake Bay Islands Restoration Project was conducted in accordance with EC 1105-2-408, has been fully coordinated with the ECO-PCX, and the ECO-PCX endorses the "Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation, January 23, 2008."

Rayford Wilbanks

Encl

RAYFORD E. WILBANKS
Director, National Ecosystem
Planning Center of Expertise

CF:
CENAB-PL (Pace)
CENAB-PL-P (Guise)
CENAB-PP-C (Brennan)
CEMP-NAD (Jester)
CECW-PC (Ware)
CECW-CP (Kitch)
CEMVD-RB-T (Vigh)
CEMVR-PM-F (Staebell)

DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
BROOKLYN, NY 11252-6700

REPLY TO
ATTENTION OF

CENAD-PDS-P

9 April 2008

MEMORANDUM FOR: Commander Baltimore District ATTN: CENAD-PL-P (Pace)

SUBJECT: Transmittal of Final Responses to the Mid-Chesapeake Bay Island Ecosystem Restoration, Maryland Final Peer Review (EPR) Review Report Comments

1. References:

a. Battelle Corporation memorandum, dated 23 January 2008, transmitting the Finals EPR Report for the Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement and Supporting Documentation.

b. CENAB memorandum, dated 26 March 2008, transmitting the final responses to the EPR comments to CENAD for review and approval (enclosed).

2. As described in reference 1(b), the Baltimore district staff has prepared detailed responses to the fourteen EPR report comments. It is noted that particular attention has been made to provide background information regarding the analysis used and where applicable, providing additional information on the plan formulation rationale. As indicated in the cited reference, additional narrative discussion, along with information related to additional analyses, will be provided to better explain the plan formulation process selection process and conclusions. These changes will be fully incorporated in the project report as appropriate with text additions or amendments to the report.

3. Division staff has reviewed reference 1(b) and concurs that questions or issues raised by the EPR comments have been fully addressed by the district responses.

4. Please contact, Mr. Peter Doukas of my staff at 718.765.7068 should you have any questions require additional information.

Encl
as

JOSEPH R. VIETRI
Chief, Planning & Policy
Program Support Division
Programs Directorate

cc: CEMP-PC(Jester)
CEMVR-PM-P(Staebel)
CEMVD-PD-N(Wibanks)

Battelle
The Business *of* Innovation

Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

January 23, 2008

Prepared by

Battelle
505 King Avenue
Columbus, Ohio 43201

Prepared for
U.S. Army Corps of Engineers
North Atlantic Division
New England District
and
Mississippi Valley Division
Rock Island District

Contract Number: DACW33-03-D-0004

FINAL
EXTERNAL PEER REVIEW REPORT

for

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

Prepared by

Battelle
505 King Avenue
Columbus, Ohio 43201

for

Department of the Army
U.S. Army Corps of Engineers
North Atlantic Division
New England District
and
Mississippi Valley Division
Rock Island District

January 23, 2008

Contract Number: DACW33-03-D-0004
Delivery Order: DA01

TABLE OF CONTENTS

Executive Summary iii

1. Introduction 1
   1.1 Background of Report Reviewed 1
   1.2 Purpose of External Peer Review 1

2. Methodology 2
   2.1 Planning and Schedule 2
   2.2 Identification and Selection of External Peer Reviewers 2
   2.3 Preparation of the Charge and Conduct of the Peer Review 4
   2.4 Review of Verbatim Comments 5
   2.5 External Peer Review Panel Consensus Discussion 5
   2.6 Preparation of Final Comments 6

3. Biographical Information on External Peer Reviewers 7

4. Results ─ Summary of Peer Review Comments 10

Appendix A. Final Peer Review Comments from the Mid-Bay Final Integrated Feasibility Report and EIS and Supporting Documentation A-1
Appendix B. Final Charge to the External Peer Reviewers B-1

LIST OF TABLES

Table ES-1. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel iv
Table 1. Schedule 3
Table 2. Technical Criteria/Areas of Expertise for Potential External Peer Reviewers 3
Table 3. EPR Panel: Technical Criteria and Areas of Expertise 8
Table 4. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel 11

FINAL
EXTERNAL PEER REVIEW REPORT

for

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) has joined in an agreement with the State of Maryland Department of Transportation, Maryland Port Administration to conduct a feasibility study and prepare an Integrated Feasibility Report and Environmental Impact Statement (EIS) for restoration of islands and associated habitats through beneficial use of dredged material in the Mid-Chesapeake Bay. The Mid-Chesapeake Bay is located in the eastern half of Chesapeake Bay, from the Chester River to the Maryland/Virginia state line. In order to strengthen quality control processes and help ensure that the Mid-Chesapeake Bay Island Ecosystem Restoration Project (Mid-Bay) is supported by the best scientific and technical information, an external peer review (EPR) process has been implemented by USACE to complement the internal technical review (ITR). This final report describes the EPR process, summarizes final comments of the EPR panel, and describes the panel members and their selection. The results of this EPR report will be taken into consideration in preparation of the Chief of Engineer's Report.

Four panel members were selected for the EPR from nearly 25 identified candidates. The potential external reviewers were screened for potential conflicts of interest and expertise relative to predetermined technical criteria. These criteria focused on estuarine ecology, estuarine/coastal processes, engineering with expertise in placement of dredged material in a confined placement facility, and plan formulation. The reviewers selected were from academe or were independent engineering consultants. Corresponding to the technical content of the Final Integrated Feasibility Report and EIS, the areas of technical expertise of the selected peer reviewers included: engineering (environmental, geotechnical); hydraulics/sedimentation; dredging and dredged materials management; economics and plan formulation; hydrology/coastal hydrology; biology/ecology with Chesapeake Bay/estuarine experience; habitat evaluation/ecological modeling; estuarine wetland restoration; coastal erosion/shoreline protection; and experience with the review of EISs and Dredged Material Management Plans (DMMPs).

The peer reviewers were provided an electronic version of the Final Integrated Feasibility Report and EIS and supporting documentation (i.e., appendices and Issue Paper No. 1) on November 1, 2007, along with a charge that solicited their comments on specific sections of the documents that were to be reviewed. The peer reviewers had eight weeks for the review of the documents. Nearly 300 individual comments were received from the EPR panel in response to the charge questions.

Following the individual reviews of the Final Integrated Feasibility Report and EIS and supporting documentation by the EPR panel members, a consensus discussion was conducted to review key technical comments, discuss charge questions in which there were conflicting responses, and reach consensus on the final comments to be provided to USACE. The final comments were documented according to a five-part format that included, (1) nature of the comment, (2) basis for the comment, (3) significance of the comment (high, medium, and low), (4) comment cross-referencing if related to another comment, and (5) a recommendation on how to resolve the comment. Overall, 14 final EPR comments were identified and documented. Of the 14 final comments, two were classified as of high significance and eight were categorized as medium significance. Four comments were identified as having a low level of significance.

Table ES-1 summarizes the final comments by level of significance. Clarifications of each comment are contained in Appendix A of this report.

Table ES-1. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel

Significance – High	
#	Comment
1	The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.
2	Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Significance – Medium	
3	The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.
4	It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.
5	It is overly optimistic to assume that the marsh will be fully functioning in five years.
6	The report should make it clear that the “need” for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.
7	The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.
8	Connectivity between the salt marsh and estuary is unclear both during and post construction.
9	The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
10	National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.
Significance – Low	

11	Address how climate change will influence the engineering design.
12	To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
13	Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
14	The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

Overall, the external peer reviewers find the report to be well written and presented in a logical, thoughtful structure. Although cast as a restoration project, the report actually describes a beneficial use of dredged material important for Chesapeake Bay and surrounding regions, and this distinction should be made clear in the report. The analytic methods for the gross benefit approach used in plan formulation are carefully detailed and well documented. USACE policies and guidelines, however, require an analysis of net benefits, balancing habitat gains with habitat losses during construction. The EPR panel emphasized that more focused analyses of the turbidity and sedimentation generated during construction are needed to provide confidence that key estuarine habitats (submerged aquatic vegetation and natural oyster beds) will be safe from injury. Overall, the EPR panel felt these additional considerations are crucial to assure the maximum net environmental benefits per unit cost, and to justify the selection of the preferred alternative.

1. INTRODUCTION

1.1 Background of Report Reviewed

The U.S. Army Corps of Engineers (USACE) has joined in an agreement with the State of Maryland Department of Transportation, Maryland Port Administration to conduct a feasibility study and prepare an Integrated Feasibility Report and Environmental Impact Statement (EIS) for restoration of islands and associated habitats through beneficial use of dredged material in the Mid-Chesapeake Bay. The Mid-Chesapeake Bay is located in the eastern half of Chesapeake Bay, from the Chester River to the Maryland/Virginia state line. The proposed Mid-Chesapeake Bay Island Ecosystem Restoration Project (Mid-Bay) is intended to restore and protect valuable, but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material. There is also the opportunity to provide capacity for placement of dredged material.

As authorized by the Senate Committee on Environment and Public Works resolution, dated June 5, 1997, USACE has reviewed previous USACE reports on the Chesapeake Bay and other pertinent reports with a view to conduct watershed management studies of water resources improvements in the interest of navigation, environmental restoration, and other interests. The Eastern Shore, Maryland (MD) and Delaware (DE) Section 905(b) analysis concluded that a Federal interest existed to assess the needs and opportunities within the study area and recommended a variety of potential projects for further study including a study to evaluate protecting and/or restoring island habitat loss because of erosion and subsidence through the beneficial use of dredged material.

The recommended plan for the Mid-Bay project includes restoration at two islands – James Island and Barren Island – using dredged material from the Upper Chesapeake Bay Approach Channels to the Port of Baltimore. Some features of the recommended project include the following:

- Restore 2,072 acres of remote island habitat at James Island.
- Restore 72 acres of remote island habitat and protect 1,325 acres of submerged aquatic vegetation habitat at Barren Island.
- Provide 90 to 95 million cubic yards (mcy) of dredged material placement capacity.

The recommended plan would restore 2,144 acres of habitat. It would protect 623 acres of existing island ecosystem habitat, including 352 acres of critical submerged aquatic vegetation.

This report describes the external peer review (EPR) process that was conducted, and summarizes comments on the Final Integrated Feasibility Report and EIS and supporting documentation, including Issue Paper No. 1, that were received from the external peer reviewers. Detailed information on the comments is provided in Appendix A.

1.2 Purpose of External Peer Review

The purpose of EPR, in general, is to strengthen USACE's quality control processes for the development of decision documents in support of its Civil Works program. Independent,

objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

To help ensure that USACE documents are supported by the best scientific and technical information, a peer review process has been implemented by USACE that utilizes EPR to complement the internal technical review (ITR), as described in the Department of the Army, U.S. Army Corps of Engineers, guidance *Peer Review of Decision Documents* (EC 1105-2-408) dated May 31, 2005, and CECW-CP Memorandum dated March 30, 2007. In this case, the EPR of the Mid-Bay Final Integrated Feasibility Report and EIS was conducted and managed using contract support from an independent 501(c)(3) organization (Battelle Memorial Institute; hereafter Battelle) to ensure independent objectivity, along with a high degree of flexibility and responsiveness, which was essential for USACE to meet deadlines.

2. METHODOLOGY

This section describes the methodology followed in selecting external peer reviewers, and in planning and conducting the EPR. The EPR was conducted following procedures described in USACE's guidance cited above (Section 1.2) and in accordance with the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. Supplemental guidance on evaluation for conflicts of interest used the National Academies' *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports*, dated May 12, 2003.

2.1 Planning and Schedule

Table 1 defines the schedule followed in execution of the EPR.

2.2 Identification and Selection of External Peer Reviewers

Battelle initially identified nearly 25 potential peer reviewers, confirmed their availability, evaluated their technical expertise, and inquired about potential conflicts of interest. Of those initially contacted, 10 external peer review candidates confirmed their interest and availability, and 12 candidates declined either due to the schedule and anticipated level of effort, or because of disclosed conflicts of interest.

Preliminary information about the 10 available reviewers, including their expertise, level of previous engagement in applied evaluations, and requested rates of compensation, was evaluated in consultation with USACE. The reviewers were primarily from academic institutions, but consultants (company-affiliated and independent) or experts associated with industry, non-governmental organizations, and non-USACE government agencies were also considered.

Table 1. Schedule

Action	Completed by Date
Notice to proceed received	September 28, 2007
Potential external peer reviewers identified and screened	October 11, 2007
EPR panel selected and contracts completed	November 2, 2007
Final Integrated Feasibility Report and EIS, supporting documentation, and draft charge sent to EPR panel	November 1, 2007
Final charge sent to EPR panel	November 16, 2007
Individual comments from the EPR panel completed	December 31, 2007
EPR panel consensus meeting	January 7, 2008
Final EPR comments completed	January 14, 2008
Working draft peer review report completed	January 16, 2008
EPR panel provides comments on working draft peer review report	January 21, 2008
Final peer review report submitted to USACE	January 23, 2008

The credentials of the peer reviewers were evaluated according to the overall scope of the Mid-Bay Final Integrated Feasibility Report and EIS, focusing on two key areas: 1) dredged material placement and 2) habitat management and restoration. Detail on these technical criteria, as well as other areas of expertise considered, is provided in Table 2.

Table 2. Technical Criteria/Areas of Expertise for Potential External Peer Reviewers

Dredged material placement	Habitat Management and Restoration	Other Desirable Areas of Expertise
• Engineering (environmental, geotechnical) • Hydraulics/sedimentation • Dike construction • Dredging and dredged materials management	• Biology/ecology with Chesapeake Bay/estuarine experience • Habitat evaluation/ecological modeling • Estuarine wetland restoration • Submerged aquatic vegetation (SAV) restoration/protection • Natural oyster beds (NOBs)	• Economic analysis (resource economics) • Experience with review of Environmental Impact Statements and Dredged Material Management Plans • Coastal erosion/shoreline protection

The following additional factors were considered:

- Participation in previous USACE technical review committees;
- Other technical review panel experience; and
- Chesapeake Bay experience.

The peer reviewers were additionally screened for the following *potential* exclusion criteria or conflicts of interest:

- Involved in producing the Final Integrated Feasibility Report and EIS or supporting documentation;
- Current USACE employee;
- Involvement in any USACE projects in the Chesapeake Bay region or relating to the Mid-Bay Island restoration;
- Other USACE affiliation [Scientist employed by the USACE (except as described in NAS criteria, see EC 1105-2-4 section 9d)][a];
- Current or future financial interests in Chesapeake or Mid-Bay Island contracts/awards from USACE[a];
- Other possible perceived conflict of interest for consideration, e.g.,
    - Former USACE employee
    - Repeatedly served as USACE technical reviewer
    - A significant portion of personal or company revenues within the last 3 years came from USACE contracts
    - Made a publicly documented statement advocating for or against the subject project.

In selecting final peer reviewers from the list of potential peer review candidates, an effort was also made to select experts who best fit the criteria presented in Table 2 and the factors described above. Based on these considerations, four peer reviewers were selected from the potential list (see Section 3 for names and biographical information on the selected peer reviewers). Battelle established subcontracts with the peer reviewers indicating their willingness to participate and confirmed the absence of conflicts of interest (through a signed conflict of interest form).

2.3 Preparation of the Charge and Conduct of the Peer Review

A charge for peer review, which contained specific questions regarding the Final Integrated Feasibility Report and EIS and supporting documentation, was developed to assist the EPR panel. The draft charge was prepared by Battelle with input from USACE and guidance provided in USACE's guidance *Peer Review of Decision Documents* (EC1105-2-408) and the

[a] 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 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."

Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. A draft charge was submitted to the USACE for consideration and evaluation. The USACE edited the draft questions and recommended eliminating some questions. The charge was finalized based on the USACE's input. The charge was presented in comment response table format, and was organized according to the order of the documents to be reviewed. The charge consisted of approximately 80 specific questions on the Final Integrated Feasibility Report and EIS and supporting documentation. The EPR panel was instructed to respond to the charge questions within the comment response form table. The final charge is shown in Appendix B of this report.

The peer reviewers were provided with electronic copies of the draft final charge, Final Integrated Feasibility Report and EIS and supporting documentation on November 1, 2007.[b] The peer reviewers had eight weeks for the review of the documents.

2.4 Review of Verbatim Comments

Nearly 300 verbatim (i.e., individual) comments in response to the charge questions were received from the individual EPR panel members. Battelle reviewed these comments to identify overall recurring themes, potential areas of conflict, and other impressions of the report. As a result of this review, Battelle developed a preliminary list of 28 overall comments and discussion points that emerged from the EPR panelists' verbatim comments. Each reviewer's verbatim comments were shared with the EPR panel.

2.5 External Peer Review Panel Consensus Discussion

Battelle convened a consensus discussion conference call with the EPR panel on January 7, 2008. The purpose of the consensus discussion was to allow the exchange of technical information among the panel experts, many of whom are from diverse scientific backgrounds. This information exchange ensured that the EPR report represents the synergy of the panel and avoided isolated or conflicting information and analyses. The main goal of the consensus discussion was to review the overall comments and ascertain and confirm their importance to the EPR panel, remove points having a lack of consensus, identify and add any missing issues of high-level importance to the EPR panel, and finally, reach consensus on the final comments to be provided to USACE.

The panel discussion resulted in 15 overall consensus comments. A summary explaining each consensus comment organized by level of significance, as defined by the EPR panel, was also prepared and distributed to the EPR panel by Battelle in a memorandum dated January 7, 2008. The memorandum provided a detailed approach for developing the final comments for the Final Integrated Feasibility Report and EIS and supporting documentation.

In addition to reaching consensus on the final comments to be provided to USACE, the EPR panel discussed responses to about a half-dozen specific charge questions where there appeared to be disagreement among the reviewers. The disagreement was resolved and the comment was

[b] The final charge was provided to the peer reviewers on November 16 after receiving comments from USACE.

either incorporated into the final comments or determined to stand as is (i.e., was not important enough to include as a final comment).

2.6 Preparation of Final Comments

The EPR panel used the 15 overall consensus comments as a basis for preparing the final comments. A memorandum was distributed on January 7, 2008, to the EPR panel providing detailed instructions on developing the final comments. A summary of the directive is provided below:

- Lead Responsibility: A lead reviewer was assigned for each consensus comment. A lead was responsible for coordinating the development of the final comment and submitting it to Battelle by January 14, 2008. Lead assignments were modified by Battelle at the direction of the EPR panel. To assist each lead in the development of the final comments, Battelle distributed individual verbatim comments in the comment response form table format, a summary detailing each consensus comment (in the memorandum), an example final comment following the five-part structure (described below), and a template for the preparation of the final comments.

- Directive to the Lead: Each lead was encouraged to communicate directly with other reviewers, as needed, to contribute to a particular consensus comment. If a significant comment was identified that was not covered by one of the original 15 overall consensus comments, the appropriate lead was instructed to draft a new consensus comment. For this EPR, no additional comments were identified by the EPR panel; however, two consensus comments were consolidated into one comment, resulting in 14 final comments. If a consensus comment was related to another consensus comment, the lead was to cross-reference them.

- Format for Final Comments: Each final comment was presented as part of a five-part structure, including:

    1. Nature of comment (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. Comment cross-referencing
    5. Recommendation (see description below).

- Criteria for Significance: The following were used as criteria for assigning a significance level to each final comment:

    - High — Describes a fundamental problem with the project that could affect the recommendation or justification of the project
    - Medium — Affects the completeness or understanding of the reports/project
    - 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 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, etc.).

As a result of this process, 14 final comments were prepared. Battelle reviewed and edited all final comments for clarity and adherence to the requested final comment template format. The final EPR comments were assembled and are presented in Appendix A.

3. BIOGRAPHICAL INFORMATION ON EXTERNAL PEER REVIEWERS

Potential peer review candidates were identified through Battelle's EPR Database, targeted internet searches using key words (e.g., technical area, geographic region), search of websites of local universities or other compiled expert sites, and through referrals from candidates who declined. A draft list of screened (for availability, technical background, conflict) potential reviewers was prepared by Battelle and provided to USACE. The final list of peer reviewers was agreed upon based on Battelle recommendations and USACE input.

An overview of the credentials of the four reviewers selected for the EPR panel and their qualifications in relation to the technical evaluation criteria is presented in Table 3. Reviewer identities were unknown to the USACE authors of the Final Integrated Feasibility Report and EIS and supporting documentation during the EPR process. More detailed biographical information regarding each candidate and his or her technical areas of expertise is presented following the table.

Table 3. EPR Panel: Technical Criteria and Areas of Expertise

Name	Affiliation	Engineering				Biology/Ecology			Economics	
		Environmental, civil, geotechnical	Hydraulics/sedimentation	Dredging and dredged material management	Coastal erosion/shoreline protection	Biology/ecology with Chesapeake Bay/estuarine experience	Habitat evaluation/ecological modeling	Estuarine wetland restoration	Economic analysis	Plan formulation
	totals -->	1	1	1	1	1	2	2	1	1
Chris Craft	Indiana University				1		1	1		
Don Hayes	University of Louisiana at Lafayette	1	1	1						
Charles "Pete" Peterson	University of North Carolina at Chapel Hill					1	1	1		
Dan Smith	The Tioga Group, Inc.								1	1

Christopher B. Craft, Ph.D.
Role: This reviewer was chosen primarily for his expertise in estuarine wetland restoration.
Affiliation: Indiana University, Bloomington, IN

Dr. Craft is Associate Professor in the School of Public and Environmental Affairs at Indiana University Bloomington where he teaches courses in Wetlands Ecology, Restoration Ecology, and Applied Ecology. He has nearly 25 years of experience working in estuarine and freshwater wetlands, including tidal marsh creation on dredged material and eroding shorelines. Dr. Craft has published more than 60 peer-reviewed papers on creation and restoration of wetlands, wetland eutrophication and nutrient enrichment and effects of climate change and sea level rise on tidal wetlands. He is Associate Editor of the journals, *Wetlands* and *Soil Science Society of America Journal* and is President-elect (2007-2008) of the Society of Wetland Scientists, a 3500-member international organization that promotes sound wetland science, policy and management.

Donald F, Hayes, Ph.D., P.E., D.E.E.
Role: This reviewer was chosen primarily for his expertise in dredged material management and engineering.
Affiliation: University of Louisiana at Lafayette, Lafayette, LA

Dr. Hayes is Director, Institute for Coastal Ecology and Engineering and is UNOCAL/BORSF Professor of Civil Engineering at the University of Louisiana at Lafayette. His areas of expertise include the environmental impacts of dredging, managing contaminated sediments, use of dredged sediments for restoration, and engineering design of wetlands restoration projects. He has authored numerous technical reports and journal publications, refereed conference publications, and serves on several engineering committees and societies. He is also the author of several Automated Dredging and Disposal Alternatives Management System (ADDAMS) modules – software distributed by the USACE to manage dredging projects and dredged material placement. He serves on the editorial board of the Western Dredging Association's *Journal of Dredging Engineering*. With over 25 years of experience, Dr. Hayes has delivered presentations to the international community and is recognized as an expert in the remediation of contaminated sediments and dredged material management as indicated by his consulting work and testimony for industry and government. He received his M.S. in civil engineering from Mississippi State University and a Ph.D. in civil engineering from Colorado State University.

Charles H. (Pete) Peterson, Ph.D.
Role: This reviewer was chosen primarily for his expertise in estuarine biology/ecology.
Affiliation University of North Carolina at Chapel Hill, Morehead City, NC

Dr. Peterson has been a professor in academia for 36 years and is now Alumni Distinguished Professor at the University of North Carolina at Chapel Hill. He has over 160 peer-reviewed publications on marine and estuarine ecology and has done research on estuarine habitat valuation and compensatory restoration, on ecological responses to shoreline erosion and to engineering measures designed to stabilize estuarine shorelines, and on how flow regimes and sedimentation affect estuarine organisms and habitats. Dr. Peterson has served on several panels of the National Academy of Sciences, as editor of several ecological journals, and as reviewer of

many ecological restoration projects. He has testified before Congress and the North Carolina Legislature on environmental issues. He has been appointed to and provided 36 person-years of service on the North Carolina Environmental Management Commission, the North Carolina Marine Fisheries Commission, the North Carolina Sedimentation Control Commission, and the Steering Committee for the North Carolina Coastal Habitat Protection Plan.

Daniel S. Smith
Role: This reviewer was chosen primarily for his expertise in economics and plan formulation.
Affiliation: The Tioga Group, Inc., Moraga, CA

Mr. Smith is a Principal and Co-Founder of The Tioga Group, a consulting firm specializing in freight transportation and logistics whose clients include ports, railroads, shippers, leasing companies, industry organizations, and government agencies. Mr. Smith has over 25 years of consulting experience in freight transportation operations, economic, policy, and planning, with special emphasis on truck, rail, and marine intermodal transportation. He has authored numerous articles in trade journals, is a contributor to industry conferences and publications, and is a member of the Intermodal Association of North America. He has testified before Congress on the economic conditions in the world shipping industry. He received his M.S. from the Graduate School of Public Policy at the University of California at Berkeley and did further postgraduate work in transportation economics and policy.

4. Results – Summary of Peer Review Comments

Overall, the external peer reviewers find the report to be well written and presented in a logical, thoughtful structure. Although cast as a restoration project, the report actually describes a beneficial use of dredged material important for Chesapeake Bay and surrounding regions, and this distinction should be made clear in the report. The analytic methods for the gross benefit approach used in plan formulation are carefully detailed and well documented. USACE policies and guidelines, however, require an analysis of net benefits, balancing habitat gains with habitat losses during construction. The EPR panel emphasized that more focused analyses of the turbidity and sedimentation generated during construction are needed to provide confidence that key estuarine habitats (submerged aquatic vegetation and natural oyster beds) will be safe from injury. Overall, the EPR panel felt these additional considerations are crucial to assure the maximum net environmental benefits per unit cost, and to justify the selection of the preferred alternative.

As a result of the consensus discussion process, the EPR panel identified 14 final comments, segmented into rankings of high, medium, and low significance. In total, as shown in Table 4, two were classified as of high significance and eight were categorized as medium significance, while four comments were identified as having a low level of significance.

Table 4. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel

Significance – High	
#	Comment
1	The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.
2	Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Significance – Medium	
3	The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.
4	It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.
5	It is overly optimistic to assume that the marsh will be fully functioning in five years.
6	The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.
7	The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.
8	Connectivity between the salt marsh and estuary is unclear both during and post construction.
9	The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
10	National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.
Significance – Low	
11	Address how climate change will influence the engineering design.
12	To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
13	Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
14	The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

As indicated in Table 4, the majority of the comments focus on areas viewed by the reviewers as needing improvement. The final EPR comments in their entirety are included in Appendix A.

APPENDIX A

FINAL PEER REVIEW COMMENTS FROM THE MID-BAY FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT (EIS) AND SUPPORTING DOCUMENTATION

Comment 1:

The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.

Basis for Comment:

This comment is based upon (1) recognition that whereas gross benefits of island creation are assessed in a detailed set of analyses, which even include benefits of SAV protection in the nearby bay, the injuries (costs) of filling water column and benthic habitats are not included in these analyses and thus net environmental benefits of each alternative alignment are never computed, (2) information that the benthic habitat around James Island differs from that around Barren Island by containing much higher densities of a small bivalve of high value as fish and crab food, (3) existence of established, published methods of estimating such habitat injury of filling, and (4) recognition that without incorporating such injuries (costs) of filling and computing net environmental benefits, the method used to select the preferred alignment for the project is flawed by use of gross instead of net environmental benefits and thus produces unreliable outcomes.

Gross vs. Net Environmental Benefits. In conducting a very detailed analysis of environmental benefits using the ICU (Island Community Units) approach, this report includes only the positive (gross) environmental benefits of the project. Filling of water column and benthic habitats induces large injuries to existing environmental resources and ecosystem services that are completely ignored in the ICU method. This process must be redone to include these environmental costs of filling so as to produce a means of assessing net environmental benefits of the entire island restoration project and of each potentially viable alignment alternative that leads to an unbiased choice of the optimal alignment option.

USACE plan formulation guidelines emphasize net benefits, whether monetarized as National Economic Development (NED) benefits or otherwise quantified as National Environmental Resource (NER) benefits. Our review of project documentation to date indicates that the loss of existing marine (water column and benthic) or upland habitat resulting from project construction has not been quantified and that the project benefit analyses use gross rather than net restoration gains. The analysis must take explicit account of habitat lost as well as habitat gained. Even if the environmental value of the habitat lost was identical (as for the water column) for each alternative, the comparison must still be made to distinguish net from gross benefits. Where the environmental value of the habitat lost varies among alternatives (as for the benthic habitat), the analysis of net benefits may re-order the priorities.

Quantifying Environmental Injuries of Filling. Methods of quantifying habitat injury from filling exist and one of them, Habitat Equivalency Analysis (HEA), is described in published scientific literature (e.g., see pages 173-307 in Volume 264 of Marine Ecology Progress Series from 2003) and is widely used by NOAA and other federal agencies. In addition, Peterson & Associates (2003) provided an analysis of impacts and compensatory mitigation options using HEA to the Norfolk Office of the USACE through Craig Seltzer for a project involving expansion of the Craney Island port in the Elizabeth River of the Virginia portion of the

Basis for Comment (Continued):

Chesapeake Bay (copy of document included in individual review by Peterson). This method estimates the secondary production lost by filling and measures benefits by quantifying the secondary production gained through habitat restoration. The logical basis for choice of this production metric to quantify environmental gains and losses is that these estuarine habitats provide the ecosystem service of food chain support, which has acknowledged high value. Production of the invertebrates at the base of the estuarine food chain provides a means of quantifying the forage base that leads to valued higher trophic levels, such as blue crabs, demersal (bottom-feeding) fishes, birds, turtles, and mammals. The currently included analysis of gross benefits is based only on positive impacts (largely to birds), while ignoring negative injuries (largely to crabs and fishes). By doing an analysis on net environmental benefits, this bias of ignoring estuarine injuries to crabs and fishes would be removed.

Likely Outcome of Including Environmental Costs of Filling in the ICU Analysis. Sampling of the benthic invertebrates within the island fill footprint around the alternative James and Barren Island alignments revealed that the benthic macro-invertebrate communities differed between islands. The bay bottom in the fill footprint around James Island contained a benthic community that possessed a lower Benthic Index of Biological Integrity (B-IBI) than the analogous benthic community around Barren Island. On those grounds, this report concluded that the loss of benthos from filling would be greater if Barren Island received the bulk of the fill than if James Island were chosen for most of the fill. This use of the B-IBI fails to recognize that the benthic community in the James Island fill footprint had a lower B-IBI in large part because of high abundance and dominance of a small bivalve mollusk, *Gemma gemma*, which is highly productive and represents high-quality prey for blue crabs and bottom-feeding fishes. Consequently, if the secondary production method used widely in HEA analyses were employed here to quantify the losses of food for important fisheries, it is likely that environmental costs of filling would be greater at James Island than at Barren per unit of benthic habitat area covered by fill. Because the environmental injuries associated with loss of water column habitat would not be likely to differ much between islands, the analysis of benthic habitat injuries would likely be the primary contributor to differences in environmental costs associated with different project alignments. When the ICU analysis is redone to involve analysis of net (not gross) environmental benefits, the preferred option yielding the most environmental benefits may be different from the preferred option now indicated by using gross environmental benefits. Because filling around James Island removes production of an important food for blue crabs and demersal fishes, redoing the ICU analysis on net environmental benefits is likely to alter the choice of alignments in a way that fills more around Barren Island and less around James Island. Only upon completion of re-analysis will we know for sure.

Significance – High:
This comment is of High Significance because it addresses the very basis on which the entire island restoration project is justified and, even more critically, on which the preferred island alignment is selected. There is evidence from sampling the benthic habitat around James and Barren Islands that their benthic invertebrate communities differ in a fashion that makes filling around James Island more injurious to blue crab and demersal fish production than filling around Barren Island, the opposite of what is now assumed in the absence of quantification of environmental losses from filling. Computation of net environmental benefits, including costs of habitat filling, could lead to changing the preferred alignment such that more filling is done around Barren than James Island.
Comment Cross-referencing:
(10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.* This comment links to Consensus Comment #10 on how the flows of environmental benefits are projected out over the project lifetime. Specifically, all analyses of environmental benefits and how they accrue over years must use net, not gross, environmental benefits. This has not been done.
Recommendations for Resolution:
To resolve the concerns raised by this comment, the report would need to include: • Application of a rigorous quantitative method (probably HEA) to estimate environmental injuries (losses) that will arise from filling water column and benthic habitats for each alternative island alignment under careful consideration. • Inclusion of these environmental injuries into the ISU computation process such that analyses can be based on net environmental benefits, computed by subtracting the newly computed costs from the gross benefits, which are what the report now uses. This will result in analyses focused on net habitat gain, balancing habitat lost in project construction with habitat gained by restoration. • Re-assessment of the selection of the preferred island alignment so that it can be based upon maximizing net environmental benefits not gross benefits.

Comment 2:
Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Basis for Comment:
The most significant water quality concerns will probably arise during construction when sediment releases to the water column due to placement activities or erosion from unprotected banks potentially threaten SAV and NOB in the vicinity. Unfortunately, the 2D hydrodynamic and water quality modeling consider only general sediment transport and flow regimes for pre- and post-construction conditions. Further, the reported 2D modeling efforts are probably inappropriate for evaluating these impacts. SAV increases flow resistance and results in significant non-uniform vertical velocity profiles. The reduced near-bottom velocities can increase settling and retention of solids.
Significance – High:
The potential for construction impacts could mitigate all other project benefits; thus, the resolution of this concern is essential to project selection and implementation.
Comment Cross-referencing:
No other related comments
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A simplistic assessment of sediment resuspension, transport, and deposition during construction. • If the simplistic evaluation can not definitively prove that SAV and NOB impacts are manageable, 3D hydrodynamic and sediment transport modeling may be necessary.

Comment 3:
The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The Preferred Alternative should be incorporated in the CE/ICA process.
Basis for Comment:
The Mid-Chesapeake plan formulation, i.e. the choice of a preferred alternative, depends on cost-effectiveness (CE) analysis and incremental cost analysis (ICA) rather than the usual cost-benefit analysis. The CE/ICA approach is appropriate in this application since the project results cannot be readily monetarized. The Final Integrated Feasibility Report and EIS of July 2007 generally follows USACE guidelines for Cost Effectiveness and Incremental Cost Analysis (CE/ICA) as set forth in *Evaluation of Environmental Investment Procedures Manual* (IWR Report 95-R-1, May 1995). The guidelines encourage the development of new alternatives by combining features of existing options. To retain the integrity of the CE/ICA, however, such new alternatives must be evaluated side-by-side with existing alternatives and be subjected to the same analytic methods and scrutiny. The project development team appears to have had a very valuable "Hey, what if we…" moment, resulting in the James 5/Barren E alternative after the original CE/ICA analysis was complete. At a minimum, however, the Project Development Team (PDT) should re-formulate the CE/ICA analysis to include the new alternative. Otherwise throwing in another alternative at the end (however attractive it may be) voids the CE/ICA process. Report Appendix B notes *"Although James Alignment 5 plus Barren Alignment E was not evaluated during the incremental cost analysis, based on its average annual costs of $32,500,000 (total cost is $941,658,000) and 813 average annual ICUs (total ICUs of 40,650), it would have remained in the final array of cost effective plans."* (page B-70). Inclusion of the preferred alternative in the full CE/ICA process is therefore unlikely to change the plan formulation outcomes, but would strengthen the Plan Formulation.* Inclusion in the full CE/ICs process is fundamentally a procedural issue, but an important one than appears to be easily addressed. **** As Comment 1 indicates, however, consideration of net benefits after loss of existing habitat could conceivably change plan recommendations. This observation increases the need to incorporate the preferred alternative in the CE/ICA process on the same basis as the other options.***

Significance – Medium (assuming Comment 1 addressed)
Including the preferred alternative in the fill CE/ICA process would strengthen the plan formulation and project justification, but is itself unlikely to affect alternative rankings.
Comment Cross-referencing:
(1) Comment: *The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.* Comment 1 regarding net versus gross benefits should be addressed in conjunction with this comment (3).
Recommendations for Resolution:
To resolve these concerns, the report would need to be revised to include the preferred alternative in the CE/ICA Analysis and the appropriate report tables. • Reformulate the CE/ICA analysis to consider the preferred alternative alongside the other alternatives. • The preferred alternative should be incorporated in the CE/ICA analysis starting with Alternatives Formulation and Screening (Item B.4 in Appendix B). • The preferred alternative should be carried through the analysis up to the Re-Evaluation of the Two Island Alternative (Item B.10 in Appendix B, page B-70). The reevaluation section might be usefully moved forward to the Alternatives Formulation section. • Appropriate text and tables in the main report body and executive summary should be updated accordingly.

Comment 4:
It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.
Basis for Comment:
Sensitivity analysis is required by USACE guidelines to assist the project team in identifying and assessing sources of risk and uncertainty. The reports reviewed to date reveal numerous sources of uncertainty regarding project costs, timing, or outcomes. Some sources of uncertainty are mentioned in the text. Other sources of uncertainty, such as the exact amount of dredging material to be placed or the time required for colonization of new habitat, are inherent in this or any similar project. Both types of uncertainty must be addressed. Risk and uncertainty are addressed in USACE's Economic And Environmental Principles And Guidelines For Water And Related Land Resources Implementation Studies, 1983. Section 1.4.13 Risk and Uncertainty—Sensitivity Analysis, notes, in part: *(a) Plans and their effects should be examined to determine the uncertainty inherent in the data or various assumptions of future economic, demographic, social, attitudinal, environmental, and technological trends. A limited number of reasonable alternative forecasts that would, if realized, appreciably affect plan design should be considered.* *(b) The planner's primary role in dealing with risk and uncertainty is to identify the areas of sensitivity and describe them clearly so that decisions can be made with knowledge of the degree of reliability of available information.* The Principles & Guidelines give additional detail.
Significance – Medium:
Sensitivity analysis is required by USACE guidelines to address issues of risk and uncertainty. Without a sensitivity analysis the project may be vulnerable to unanticipated outcomes, increasing costs or jeopardizing anticipated environmental benefits.
Comment Cross-referencing:
Comments 5, 9, 10, and 11 illustrate sources of unaddressed uncertainty that could affect project justification or realization of anticipated benefits. (5) Comment: *It is overly optimistic to assume that the marsh will be fully functioning in five years.* (9) Comment: *The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.* (10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.* (11) Comment: *Address how climate change will influence the engineering design.*

Recommendations for Resolution:
To resolve these concerns, a four-step analysis is recommended: • Review of project plans and reports to identify and document all sources of uncertainty. • Screening (documented) to distinguish significant from insignificant sources of uncertainty. • In-depth analysis as required to establish the sensitivity of plan costs and outcomes/benefits to significant sources of uncertainty. • Follow-up research, data collection, etc., to assist the project team in analyzing and/or reducing sources of uncertainty. The Principles & Guidelines note that *"Methods of dealing with risk and uncertainty include:* *(1) Collecting more detailed data to reduce measurement error.* *(2) Using more refined analytic techniques.* *(3) Increasing safety factors in design.* *(4) Selecting measures with better known performance characteristics.* *(5) Reducing the irreversible or irretrievable commitments of resources.* *(6) Performing a sensitivity analysis of the estimated benefits and costs of alternative plans."*

Comment 5:

It is overly optimistic to assume that the marsh will be fully functioning in five years.

Basis for Comment:

Numerous published studies have shown that development of a fully functioning tidal marsh requires more than five years. While above ground biomass develops to levels found in natural marshes within 3-5 years, other biological components (belowground biomass, algae, benthic invertebrates, heterotrophic microbial activity) take longer and physical components (e.g. soils) take even longer (Craft et al., 2003).

Studies of tidal marshes created on dredge material in North Carolina indicate that algae, benthic and heterotrophic microbial activity take about 5 to 10 years to achieve equivalence to natural marshes in the area (Zheng et al., 2004; Craft et al., 2003; Cornell et al., 2007). Development of fully functioning benthic invertebrate communities requires as much as 20 years to become equivalent (Craft and Sacco, 2003).

We suggest that 10 years is a more realistic timeline for the development of (mostly) fully functioning tidal marshes at James Island.

References

Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250.

Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58.

Craft, C.B., J.P. Megonigal, S.W. Broome, J. Cornell, R. Freese, R.J Stevenson, L. Zheng and J. Sacco. 2003. The pace of ecosystem development of constructed *Spartina alterniflora* marshes. *Ecological Applications* 13:1417-1432.

Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.

Significance – Medium:

By using a *realistic* timeline of marsh development, accrual of environmental and ecological benefits can be accurately calculated over the life of the project.

Comment Cross-referencing:

(10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.* The incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.

(13) Comment: *Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.*

Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by recalculating the rate at which environmental benefits accrue following creation of low marsh and high marsh in the tidal marsh cells using 10 years, rather than 5 years, as the time required for a fully functioning tidal marsh to develop. • This means that Island Community Units (ICU's) would need to be recalculated for the selected alternative (James 5/Barren E) in Section 4.5.4, Island Community Unit Incremental Calculation, but not for the other alternatives since recalculation of ICU's using (10 years rather than 5 years) will not alter the ranking of the sites. • The maturity dates for low and high marshes in table 4.21 also would need to be changed.

Comment 6:
The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than being based on the incremental cost and incremental benefits.
Basis for Comment:
Fundamentally, the project is driven by the amount of dredged material that needs to be placed. The use of CE/ICA presumes that the scope and scale of the project would be determined by a comparison of incremental costs and incremental outputs per *Evaluation of Environmental Investment Procedures Manual* (IWR Report 95-R-1, May 1995). As the procedures manual indicates, the issue of project need and of "where to stop" in project scale are ordinarily approached through a comparison of net incremental environmental benefits and net incremental costs for various alternative project configurations and plans. While the report follows that procedure in general, it does so to choose among alternatives for disposal of a fixed material volume. The analysis is generally valid (although see Comments 1 and 3), but diverges from the procedures manual. It would be more forthcoming (and less risky) to state up front that the habitat creation/restoration project is a secondary driver, and that the scale of the project is determined by the amount of dredging material to be placed.
Significance – Medium:
In the absence of this transparency, the project reports could be criticized as misleading, even though the recommendation may not change.
Comment Cross-referencing:
See Comments 1 and 3 regarding the use of net benefits and the CE/ICA process. (1) Comment: *The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.* (3) Comment: *The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) analysis was completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include a clear explanation of the motivation for the restoration efforts and the determinants of project scope and scale.

Comment 7:
The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.
Basis for Comment:
This comment is based upon (1) recognition that environmental monitoring before and after such a project has several important roles and detailed information about the design is necessary to insure the usefulness of monitoring, (2) vagueness of the monitoring proposed, (3) failure to provide a clear commitment to monitoring of all biological response variables at reference sites, and (4) recognition that, without parallel monitoring at environmentally matching reference sites, adaptive management decisions would be compromised. **Project Monitoring to Assess Performance and Success**. Environmental monitoring represents a scientific enterprise that, when applied to environmental restoration, employs performance standards against which success of restoration is judged following restoration. To allow such measurement of environmental/ecological benefits and their development over time, the design of the monitoring must be carefully constructed. The monitoring must include all physical and biological components integrated in time and space so that inferences about mechanisms can be made. Details are required to confirm that such monitoring has sufficient depth and breadth to track accrual of benefits over the project lifetime. **Selection of Reference Sites**. Use of multiple reference sites is critical to allow evaluation of success or failure of an environmental restoration and to guide adaptive management. In this document, the methods for selecting reference islands and reference marshes for monitoring are not presented. Reference sites should be environmentally similar to the James and Barren Islands selected for restoration, but practicing this wisdom requires the development of criteria on which to judge similarity and prioritization of criteria. Presumably, selection of reference sites for environmental monitoring has been done for the Poplar Island restoration, yet the experience and lessons learned from that analogous project are not incorporated into this document. To track development of environmental/ecological benefits following restoration, integrated measures of many physical environmental variables and biological responses must be made. The monitoring design does not show that this will be done. Finally, before initiating adaptive management of the restoration project, it is important to know whether the failure to achieve any specific biological benchmark reflects regional changes. That inference is possible only if multiple, environmentally matching reference sites are also monitored along with the restoration sites themselves.
Significance – Medium:
This comment is of Medium Significance because it addresses the basis on which the degree of success or failure of the restoration will be evaluated and it determines to what extent project management adaptations will be needed.

Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.* This comment links to Comment 8 on how control structures at the constructed marsh outlets may inhibit the connectivity between marsh and estuary, producing environmental services that fall short of projected benchmarks, requiring consideration of management adaptations to enhance flows of organic detritus into the estuary and enhancing nekton access to and utilization of the restored marsh habitat.
Recommendations for Resolution:
To resolve the concerns raised by this comment, the report would need to include in Section 8 (Adaptive Management and Monitoring) and in Appendix F (Adaptive Management Plan) the following information, probably in a specific section on Selection of Reference Sites: • Detailed monitoring plans for all physical and biological environmental variables, including clear demonstrations that the monitoring design is sufficient to allow tests of alternative hypotheses explaining success or failure of restoration. • Explanation of the criteria on which reference islands and marshes will be chosen for monitoring. • Information about how monitoring designs have been constructed for the analogous Poplar Island restoration and what this previous experience has done to improve monitoring for the James and Barren Island projects. • Discussion of how the monitoring of reference sites will serve in the decision making process on whether to initiate management adaptations when performance thresholds are not met.

Comment 8:
Connectivity between the salt marsh and estuary is unclear both during and post construction.
Basis for Comment:
"Production export" from the proposed James island wetland complex to the estuary is assumed to provide measurable ecological benefits to the Chesapeake Bay ecosystem. The wetland cells would serve as highly productive and protected nursery grounds for a wide range of organisms (some nektonic and some not) that utilize the marsh during some or all of their life cycle. Recreational boat traffic through the tidal channel is also assumed to be beneficial, although the benefits are not assumed to be significant. Ostensibly, both of these benefits will require the salt marsh be connected to the estuary in manner that allows the exchange of organisms and boats between the two. Figure 10 in Appendix C shows a "culvert control structure" at each end of the tidal channel and nine (9) "spillways" along the perimeter dike. It seems that these structures would preclude boat flow and possibly impede the flow of organisms from the salt marsh to the estuary. However, no discussions of post-construction removal of these structures or operational changes that would facilitate connectivity between the salt marsh and the estuary were found in the document.
Significance – Medium:
The proposed control structures at the constructed marsh outlets may inhibit the connectivity between marsh and estuary, producing environmental services that fall short of projected benchmarks, requiring consideration of management adaptations to enhance flows of organic detritus into the estuary and enhancing nekton access to the marsh. Although these benefits might not change the final project decision, it is important to the assessment of the project benefits.
Comment Cross-referencing:
(11) Comment: *Address how climate change will influence the engineering design.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A section on connectivity between the salt marsh and the estuary during and after construction, including how the control structures will be managed.

Comment 9:
The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
Basis for Comment:
The Adaptive Management Plan contains no discussion as to how climate change (i.e. sea level rise) and colonization of wetland and upland cells by invasive species will be addressed. For example, how will the monitoring plan be designed/used to detect encroachment by invasive species such as *Phragmites communis* into the wetland cells? How will it be eradicated and controlled? And, if herbicides are used, how will potential effects be on non-target species be minimized? Or, if the rate of sea level rise accelerates, how will surface elevations in the wetland cells be maintained to support the desired wetland vegetation? For example, will thin-layer placement of dredge material be used to maintain the appropriate elevation in the wetland cells so they will not be flooded/submerged?
Significance – Medium:
This is important because these stressors may adversely affect the development of environmental and ecological benefits over the 50 year life of the project. Inclusion of this information will help managers anticipate potential problems that may crop up during the 50 year life of the project
Comment Cross-referencing:
(7) Comment: *The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.* (11) Comment: *Address how climate change will influence the engineering design.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by including a discussion of how the Adaptive Management Plan (section 8 of the Final Integrated Feasibility Report and EIS and Appendix F) will address the following issues: • Invasive species detection and control, including a list of known invasive species, including terrestrial, wetland and aquatic invasives, encountered at Poplar Island or that are problematic elsewhere in the Mid-Bay region. • Measures to address how surface elevation in wetland cells will be maintained if sea level rise accelerates during the 50 year life of the project.

Comment 10:
National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.
Basis for Comment:
The Mid-Chesapeake plan formulation, i.e., the choice of a preferred alternative, depends on cost-effectiveness (CE) analysis and incremental cost analysis (ICA) rather than the usual cost-benefit analysis. The CE/ICA approach is appropriate in this application since the project results cannot be readily monetarized. The CE/ICA approach does, however, forgo the analytic convenience of monetary units that can be easily compared and discounted over time. Since the output units in a CE/ICA approach are not discounted, it is not clear that appropriate account been taken of potential changes in ICU value or equivalence over time. Per USACE CE/ICA guidelines, ICUs are not discounted over time as are monetarized costs and benefits. The analysis therefore implicitly treats an ICU in year one and in year 50 as equally valuable, and a year 10 ICU at one location equivalent to a year 20 ICU at another location. The monetary costs, however, are discounted per USACE guidelines and practice. It would be a reasonable precaution to try discounting the ICU outputs in parallel with the monetary costs to see if that comparison would shift the rankings of plan alternatives. Review team experience in other projects suggests that a 3% discount rate is appropriate for environmental outcomes. The literature (see Comment 13 should be consulted for best practices. While a definitive treatment of outcome timing may not be possible, the issue should be explored to avoid having project sponsors blindsided in the future.
Significance – Medium:
This may be regarded as a procedural step, but should be given serious consideration to ensure that benefit timing does not affect plan formulation and alternative choice.
Comment Cross-referencing:
(4) Comment: *It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.* (13) Comment: *Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include a discussion of environmental benefit (and environmental loss) timing issues and equivalence over the project lifetime.

Consensus Comment 11:
Address how climate change will influence the engineering design.
Basis for Comment:
Changing climatological conditions may impact some areas of the engineering design. Specific design details are not appropriate for this document, but there should be some discussion of the potential for climate change to influence the engineering design for the project.
Significance – Low:
The failure to address climate change leaves the reader uncertain as to whether the potential consequences of climate change will be considered in the engineering design, but the significance is low since it will not likely influence the final project decision.
Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • An acknowledgement of the potential for climate change and its influence on the engineering design process including statements about where and when it will be duly considered.

Comment 12:
To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
Basis for Comment:
Nowhere in the Final Integrated Feasibility Report and EIS is there a diagram or schematic showing the layout or design of the wetland cells. One must go to Appendix C (Engineering Design Analysis) to find this information. This information is essential for evaluating the connectivity of the wetland cells to the Bay and connectivity is important for nekton (fish, motile invertebrates) to access the created wetlands.
Significance – Low:
Inclusion of these figures aids in understanding the connectivity between the wetland cells and the estuary since they clearly show the configurations of the tidal gut that the wetland cells connect to and creeks that connect each cell to the tidal gut.
Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.* It seems that the outstructure may be problematic.
Recommendations for Resolution:
These two figures need to be presented in Section 5.0 (Recommended Plan) of the Final Integrated Feasibility Report and EIS. Specifically, the figures should be presented and described in Section 5.4.2.a, James Island – Wetland Cell Development.

Comment 13:
Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
Basis for Comment:
The report/EIS contains almost no references pertaining to creation of tidal marshes using dredge material, of which here is a large body of published literature, papers and books. Cited below, are several books pertaining to tidal marsh creation and assessment of biological structure and function, including timelines and expectations for achieving equivalence to natural tidal marshes. See also journal articles cross-referenced in Comment 5. **References** Kusler, J.A. and M.E. Kentula (ed.). 1989. Wetland creation and restoration: the status of the science. EPA/600/3-89/038. U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, OR. Lewis, R.R. 1982. Creation and Restoration of Coastal Plant Communities. CRC Press. Boca Raton, FL. Weinstein, M.P. and D.A. Kreeger (ed.). 2000. Concepts and Controversies in Tidal Marsh Ecology. Kluwer Academic Publishers. Dordrecht., The Netherlands. Zedler, J.B. (ed.). 2001. Handbook for restoring Tidal Wetlands. CRC Press. Boca Raton, FL.
Significance – Low:
Inclusion of this material in report informs the reader that the project team is familiar with what is known (and not known) about tidal marsh creation using dredged material as well as the rate at which environmental/ecological benefits develop following creation of these wetlands.
Comment Cross-referencing:
(5) Comment: *It is overly optimistic to assume that the marsh will be fully functioning in five years.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by inclusion of a review of this literature in Sections 1 (Introduction, 1.5.2 – Beneficial Use of Dredged Material), 5 (Recommended Plan, 5.6 – Monitoring and Adaptive Management) and 8 (Adaptive Management and Monitoring, 8.3 – Monitoring Elements).

Comment 14:
The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.
Basis for Comment:
The report attempts to portray the project as an ecosystem restoration project rather than the dredged sediment placement and beneficial use project that it is. This appears in several places in the report, but the most significant omission is the failure to consider alternatives for dredged sediment placement in the absence of the project. This is a crucial omission for the proper analysis of project benefits.
Significance – Low:
Although important, this is considered of low significance because the additional benefits of dredged sediment placement will not change the final decision.
Comment Cross-referencing:
No other related comments
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A discussion of dredged sediment placement options in the absence of any island creation project.

APPENDIX B

FINAL CHARGE TO THE EXTERNAL PEER REVIEWERS

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Charge and Specific Focus Questions

Charge and Specific Focus Questions for the Final Integrated Feasibility Report and Environmental Impact Statement (EIS)

Executive Summary

None.

1.0 Introduction

None.

2.0 Problem, Needs, and Opportunities

Please comment on whether or not the problems, needs, and opportunities are correctly defined in terms of environmental and economic considerations.

3.0 Existing Resources

Comment on whether you agree with the general analysis of the existing resources within the study area.

For your particular area of expertise, provide an in-depth review of whether the analysis of the existing resources (both physical and biological) within the project area is sufficient to support the impact analysis in Section 6.0 (and in general, the EIS embedded throughout the Feasibility Study (see Appendix A)).

Given your area of expertise, does this section appropriately address all existing conditions?

Were the surveys conducted to evaluate the existing resources (e.g., fish, avian, benthos, mammals) adequate? If not, what types of surveys should have been conducted?

Were socioeconomic conditions adequately addressed? Were specific socioeconomic issues not addressed?

Please comment on the conclusion of the most probable future without project condition. Do you envision other potential outcomes?

Does the analysis sufficiently describe resources with direct or indirect use values and resources with non-use values?

4.0 Plan Formulation

Comment on whether you agree or disagree with how the selected alternative was derived. Were key policies and guidelines included in the plan formulation?

Comment on the plan formulation. Does it meet the study objectives and avoid violating the study constraints?

Are the future conditions expected to exist in the absence of the proposed project logical and adequately described and documented?

Are the changes between the without and with project conditions adequately described?

Are risks and uncertainties of benefits, costs, and impacts adequately addressed and described?

Please comment on whether you feel the objectives and constraints developed by the PDT at the beginning of the feasibility plan formulation are adequate? Where are they lacking?

Please comment on the Island Ranking Process used to select the islands for restoration. Were the engineering and environmental suitability analyses appropriate? Why or why not?

Please comment on the engineering design and ecological design considerations and constraints used to develop island alignment alternatives. Are there additional factors that need consideration?

Please comment on the screening of the proposed alternatives. Are the screening criteria appropriate? In your professional opinion are the results of the screening acceptable?

Please comment on the adequacy of the Island Community Unit method for quantifying environmental benefits. Is the process adequately described?

Please comment on the Island Community Index (ICI) approach used to identify habitat requirements.

(The next three questions should be considered here and in consideration of the referenced Appendix B.)

Was the economic analysis used for this project consistent with generally accepted economic analysis methodologies? Why or why not?

Are the considerations in the screening phase likely to ensure inclusion of the "Best Buy" restoration alternatives for further planning and in-depth evaluation?

The cost-benefit considerations in this plan are limited to ICU creation/protection and direct restoration costs. Is this limitation appropriate and justified to select the most cost-effective restoration alternatives? If not, what other values might be included?

5.0 Recommended Plan

Please comment on the likelihood of the recommended restoration project to achieve significant ecosystem output.

Please comment on the appropriateness of location, sizing and design of restoration measures.

Please comment on the likelihood of the recommended restoration project to maintain existing submerged aquatic vegetation (SAV) beds and protect the extent of former SAV beds.

Please comment on whether the ICU model was appropriately applied to quantify benefits and whether this application appropriately incorporated the science of estuarine ecology.

In your opinion, are there sufficient analyses upon which to base a recommendation for construction authorization?

6.0 Impacts to Project Area

Are the impacts to the project area as defined in this section consistent with a project of this scope and size?

Please comment on whether the hydrodynamic modeling was sufficient to identify potential impacts.

Please comment on whether the sediment transport analyses conducted for this effort were sufficient to identify potential impacts.

In your professional opinion, do the stated impacts on water quality, sediment quality aquatic and terrestrial resources and rare, threatened and endangered species appear reasonable? Why or why not?

Do the stated socioeconomic, economic (e.g., fisheries), and other impacts appear adequate and reasonable?

Please comment on whether the effects/impacts of the alternative plans are sufficiently considered to allow identification of potentially significant short term and long term costs and benefits.

Please comment on whether any of the identified effects/impacts are of sufficient magnitude to suggest that the economic analysis used to identify the "Best Buy" plans described in Section 3 may be inadequate to select the plan with the greatest net benefit.

7.0 Plan Implementation

Is the total project cost and schedule for the recommended plan appropriate for a project of this scope and size, given the future escalation in fuel and construction costs during the construction of the project?

8.0 Adaptive Management and Monitoring

Based on your expertise, is the adaptive management strategy proposed for this project appropriate? Why or why not?

Are the objectives for the monitoring elements (sediment, wetland vegetation, water quality etc.) reasonable? Should additional monitoring be considered?

9.0 Public Involvement and Agency Coordination

NA

10.0 Recommendations

Is the recommended plan and associated requirements clearly described and consistent with the rest of the report?

Appendix A. Environmental Impact Statement Index

NA.

Appendix B. Plan Formulation Supporting Documentation

Are the site identification, ranking, screening, and selection processes appropriate, comprehensive, and consistent with project goals? In your professional estimation, are the chosen sites the most suitable?

Were engineering and environmental considerations appropriately and comprehensively applied when selecting the alignments for the two sites?

(The next three questions are considered here and in Section 4.)

Was the economic analysis used for this project consistent with generally accepted economic analysis methodologies? Why or why not?

Are the considerations in the screening phase likely to ensure inclusion of the "Best Buy" restoration alternatives for further planning and in-depth evaluation?

The cost-benefit considerations in this plan are limited to ICU creation/protection and direct restoration costs. Is this limitation appropriate and justified to select the most cost-effective restoration alternatives? If not, what other values might be included?

Appendix C. Engineering Design Analysis

Provide an assessment of the overall engineering analysis, including an assessment of its quality, completeness, and feasibility.

Comment on the island engineering ranking and its application to the site selection process.

Does the analysis demonstrate sufficient engineering understanding of the subsurface conditions and impacts, particularly related to foundations and settlement, and existing ecosystems?

Does the analysis demonstrate sufficient engineering understanding of the hydraulics, hydrodynamics, and potential sedimentation of the two study sites?

Comment on the construction sequences and their relation to successful completion of the project with minimal negative environmental impact.

Is the future design effort sufficiently and adequately described in order to clearly define the engineering analysis to be conducted during the preconstruction engineering and design phase?

Appendix D. Real Estate Plan

NA

Appendix E. Environmental Compliance

NA

Appendix F. Adaptive Management Plan

Please comment on the two components (restoration and cell development) in the Adaptive Management Plan. Is the review process and interrelationship between the two components sufficient? Why or why not?

Are the goals and subgoals for each of the two components adequate? Should others be considered?

Appendix G. Public Involvement

NA

Appendix H. Report on Existing Conditions and Impacts to Socioeconomics, Aesthetics, and Recreational Resources

NA

Appendix I. Executive Summaries of Technical Reports

NA

Appendix J. List of Preparers & Reviewers

NA

Appendix K. References

NA

Appendix L. Recreation Justification

Although recreation features are being included in the Mid-Bay project as an additional project benefit only (i.e., they are not part of the overall project benefit cost analysis), does the conceptual plan that is being proposed for recreation purposes on the Mid-Bay Islands appear reasonable?

Appendix M. Formal Response to Comments

NA

ISSUE PAPER No. 1
Mid-Chesapeake Bay Island Ecosystem Restoration
Integrated Feasibility Report and Environmental Impact Statement
Revised August 2007

The report recommends commencing placement of dredged material at James Island in 2018. Do you believe that this is the correct timing based on the pertinent elements of cost, ICU's, capacity requirements, and DMMP recommendations contained in the Issue Paper?

Does the issue paper accurately reflect the optimized use of Poplar and James Islands in terms of accommodating projected dredged material capacity requirements and maximizing ecosystem restoration benefits?

This project does not produce monetary benefits, but rather ecosystem restoration expressed in Island Community Units and therefore does not have a traditional benefit-cost ratio and net benefits. Based on Corps of Engineers guidance for this type of project, are the economic principles employed in the analysis appropriate to support the recommended plan and the conclusion of the Timing analysis?

Mid-Chesapeake Bay Islands Ecosystem Restoration
CENAB responses to EPR comments

High Significance

- Comment 1:

The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.

The team is working with fishery managers from the Plan Formulation Workgroup (Jane Boraczek of EA Engineering, Science, and Technology, and John Nichols of NOAA National Marine Fisheries Service) to quantify negative benefits from filling the water column and benthic habitats. The group is developing additional Island Community Indices (ICI) for the open water column (including benthic habitats) to add to the current Island Community Unit (ICU) methodology. Currently, the ICU method quantifies the benefit of creating island habitat and protecting SAV resources. ICUs will be calculated for the offshore area that would be filled at James and Barren Island. This will allow a net ICU to be calculated. The offshore areas that would be filled to restore an island with dredged material exist because previous islands have eroded. Similar water column and benthic areas are abundant in the Chesapeake Bay. The acreage to be filled is miniscule (2072 ac) compared to similar mesohaline acreage (1, 477, 638 ac).

The team will provide a discussion to support their conclusions produced by the plan formulation selection process. The team will use the net ICU calculation, monitoring data, and the written justification to support their recommended plan selection. Specific responses to issues such as the importance of particular ecosystem components (e.g. gem clams) will be included in the modified ICU analysis and supporting documentation.

At the beginning of the Mid-Bay project, the PDT decided that individual species would not be used to quantify environmental benefits. Rather than individual species, the team decided to base the evaluation of benefits on the fish and wildlife communities that would inhabit the restored island ecosystem. The ICU method was developed for Mid-Bay to capture the value of the island habitat diversity and the benefit to the communities that inhabit remote islands.

The ICU method was just one piece of the plan formulation process. ICUs were developed to assign a national ecosystem restoration (NER) benefit to the final set of alternatives. The plan formulation included a study area screening, an island ranking process based on engineering and environmental suitability, a GIS analysis based on engineering and ecological design considerations, a screening of proposed alternatives, and a refinement of the screening results, followed by assigning benefits using the ICU method. The benefits of ecosystem restoration projects can be quantified using a variety of measures, such as acres of habitat produced or miles of shoreline restored. Indices that combine separate measurements can also be used, and offer the advantage of lumping multiple types of benefits together into one unit. This ability of indices to capture

varying types of benefits into one comparable unit is what made this method suitable to evaluate the diverse island ecosystems being planned in the Mid-Bay project.

ICUs are similar in concept to the Habitat Evaluation Procedure (HEP) and its associated Habitat Units and Habitat Suitability Units developed by USFWS. Similar to HEP, the main foundation is quality (indices) multiplied by quantity. However, ICUs provide the advantage for this project by allowing quantification of benefits to communities of wildlife rather than an individual species. The PDT did not want to focus the benefits quantification on a single species as the remote islands provide benefits to a wide range of species. These benefits vary functionally and seasonally depending on the species or community. That is, some communities will use the islands for foraging habitat, some for mating/nesting habitat, and others for resting and refuge. Habitat use changes seasonally and is dependent upon the life cycles and migration patterns of species. Furthermore, the ICU method was able to account for changes to benefits as the project developed and habitats matured.

The development of the ICU and its associated Island Community Indices was performed with a work group involving regional agency resource managers. The process relied on the input and best professional judgment of a number of resource experts and available scientific literature. The ICUs were intended to estimate benefits, but were not meant to serve as a quantitative research project.

The EPR reviewers suggested using a Habitat Equivalency Analysis (HEA) or productivity model to quantify the environmental injuries of filling the offshore areas. Data requirements for the HEA method include net gain in primary production expected from restoration, the food web structure, energetic transfer efficiencies (McCay and Rowe 2003), and site-specific kinetic data (e.g. wet-dry ratios, average kcal/species). Some of the detailed data needed to run the HEA are not available for Mid-Bay such as the kinetic data. Efforts to use these methods in the Chesapeake Bay region (explained below) have shown these methods are of limited value if detailed information is not available, which is the case for Mid-Bay.

The Masonville Dredged Material Confined Facility (DMCF) Permit Application is one effort that attempted to use these methods in the Chesapeake Bay region. For the DMCF in the Baltimore Harbor of the Patapsco River, it was suggested that a productivity model (along the lines of that used for the Craney Island EIS in Virginia) be used to assess the functional losses of filling 130 acres of open water with approximately 0.5 Mcy of dredged material annually. (Craney Island is a DMCF in the Elizabeth River that is undergoing a 580 acre expansion to provide a marine terminal.) As a conservative assumption, the water column (zooplankton including icthyoplankton and invertebrates) productivity was assumed to be similar between the Masonville and Craney Island sites even though the Masonville site lies in an area with much lower salinity and lower overall plankton productivity. The resource agencies accepted this conservative approach for the water column losses. However, applying the productivity modeling to the epibenthic community met with professional criticism. The productivity calculations are based on ecosystem kinetics and are dependent upon a variety of factors, including

salinity, species-composition, and current patterns. Without site-specific kinetic data (e.g. wet-dry ratios, average kcal/species), the calculations must be done with surrogate species. The Craney Island model developers reviewed the calculations for the Masonville area and concluded that application of the Craney Island HEA model inputs to other areas of the Bay (particularly with lower salinities such as Masonville) would not be accurately predictive. Therefore, productivity modeling was abandoned. In summary, the lesson learned from Masonville was that reliable results are not achievable from the HEA without site-specific data, as would be the case in applying the HEA to Mid-Bay. Therefore, it was decided that this method was not applicable given the current level of information to the Mid-Bay project.

Although, HEA was not applicable, the Masonville DMCF project did utilize a site-specific modification of NOAA's Habitat Equivalency Analysis,that served as a justification for the compensatory mitigation options (to demonstrate sufficient replacement of ecosystem function). In order to demonstrate that the proposed mitigation options were replacing the values and functions lost to open water filling, a project-specific Habitat Condition Analysis, was developed (based on the NOAA HEA approach). This involved a multi-metric evaluation of the open water impacts and the benefits of the mitigation options based on standard measures of ecological value. The condition factors derived for the analysis came from standard regionally-appropriate and broadly-accepted measures of environmental quality (and were reviewed by local resource regulators/managers). To conduct the actual evaluation, an initial and final condition factor was assessed for the impacted area and the proposed mitigation options. The difference between the initial and final condition was scaled by the amount of acreage affected to yield the amount of compensation needed for the affected area. The same calculation was then completed for each of the mitigation options and the offsets from the mitigation options were balanced against the calculated loss. It was estimated that the aquatic projects generated more mitigation credits than were necessary to compensate for the wetland losses. However, although the Masonville methodology serves as an example the application of a method similar to what the EPR reviewers were suggesting and the method was reviewed by local resource agencies, it was, ultimately, a relatively qualitative approach that would not be compatible with the ICU outputs used to predict the benefits of habitat restoration of the Mid-Bay Islands.

In addition to the data limitations discussed, HEA or productivity methods are not consistent with the Island Community Unit methodology. That is, these methods would not have provided a means to calculate a 'net' ICU value as the output of the methods suggested by the EPR reviewers would not have been in units compatible with the ICU methodology. Further, the Mid-Bay project and the ICU methodology were formulated in conjunction with and have the support of the various resource agencies that ultimately have the responsibility for the island resources, NOAA NMFS, USFWS, MDNR, and MDE. A great deal of work was devoted to developing this project with the resource agencies. Modifying the ICU method that has the buy-in of the resource agencies is more favorable and timely than attempting a new method.

Literature Cited

McCay, Deborah P. and Jill J. Rowe. 2003. Habitat restoration as mitigation for lost production at multiple trophic levels. Marine Ecology Progress Series. 264: 233-247.

- Comment 2

Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.

The team prepared a "Simplistic Assessment" as suggested by the EPR reviewers considering sediment resuspension, transport, and deposition, and oyster and SAV requirments to assess construction impacts for both Barren and James Island. The team concluded that there will be no significant turbidity or environmental impacts to the oyster bars or SAV from construction at Barren or James Island. During the development of the Mid-Bay project Federal and State resource were involved in planning and in the assessment of impacts. Their opinions were heeded and their agencies agreed with our findings and decisions regarding the benefits and impacts of the proposed construction. No issues were raised by the assessment to warrant the 3D hydrodynamic and sediment modeling proposed as an additional tool by the EPR reviewers if the simplistic assessment was inconclusive.

The Simplistic Assessments are as follows:

BARREN ISLAND
Given:
1. Distance to SAV and Oyster Bars is approximately 2,500 ft and 2,000 ft, respectively.
2. Construction Technique is mechanical placement and there will be no dredging
3. Time of Year restrictions (1,500 ft during sensitive periods for SAV and Oysters) will apply.
4. Experience level is very high for this application (Poplar Island toe dike and north Barren Island dike construction).

Assumptions:
- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).
- No dredging will occur at Barren Island to disturb sediments.
- Barges will be small and light-loaded from a larger barge moored offshore for Barren construction. Vessel speed will be low further limiting bottom disturbances.
- Construction will not occur during SAV growing season. It is not known at this time if there will be SAV in breakwater construction area, but SAV surveys performed in 2002 and 2003 did not detect any. Further, SAV surveys by the Virginia Institute of Marine Sciences (VIMS) have not identified any SAV in the breakwater construction area in the last ten years. It is unlikely that SAV would grow in the Phase 2 (9. 5 ac) footprint because of water depths which are deeper than the photic zone (6feet) Phase 1 is the proposed lateral expansion of an existing breakwater. It is possible that some

SAV may occur in the 1.1 acre footprint of Phase 1 which is in 4 foot water depths; however none has been identified.

- 1,300 lb armor stone at Barren will be individually placed. Fabric will be placed on bay bottom prior to placement.
- Very little turbidity will occur and will not disperse far (Mid-Bay p 6-8).
- Breakwaters will be in depths of 4 feet to 6 feet. The photic zone is considered to be from the water surface to approximately 6 feet in depth or 2 meters in the bay.
- Breakwaters would occupy 10.6 acres of Bay bottom if both Phase 1 and 2 are built (p 5-2) while construction would protect 1325 acres of SAV habitat (Mid-Bay p 5-3).
- Flow appears to be sufficient to keep leaves clean of sediment as indicated by thriving SAV in the area.
- Sediment resuspension naturally occurs in the area but the creation of stone breakwaters is not expected to add significantly to turbidity and will help to reduce sediment.
- The Poplar Island test toe dike construction was very similar and no adverse consequences resulted.
- Previous Barren Island construction activities have not produced SAV impacts.
- TOY restrictions would be followed.

Conclusion:
No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV due to distance of project from SAV beds and oyster bars, time of year restrictions and construction techniques.

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

JAMES ISLAND
Given:
1. Distance to SAV and Oyster Bars is approximately 1,750 to 2,000 ft, and 500 to 1,000 ft, respectively.
2. Construction Technique. Dredging will occur for the access channel which is 12,720 feet in length. Of the total length, 3, 070 would be within the diked foot print of the project. All dredging for dike construction material will be within the footprint. (Mid-Bay p.5-1). Stone will be mechanically placed over sand cored cloth covered dikes.
3. Time of Year restrictions apply (1,500 ft.?? during sensitive periods for SAV and Oysters).
4. Experience level is very high for this application (Construction of 1,140 acre Poplar Island and approximately 6 miles of dikes).

Assumptions:
- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).

- Construction will not occur during SAV growing season.
- Turbidity will not disperse far (Mid-Bay p.6-8).

- . Time of Year (TOY) restrictions would be followed

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

Other Significant Factors to Consider:
1. The Poplar Island Restoration Project has been under construction since 1999. This project is very similar and our experience with its relative absence of significant adverse consequences served as a basis (Poplar Island construction has not produced negative impacts to nearby SAV and oysters) for these assumptions.
2. TOY restrictions will be applied to protect SAV and oysters during sensitive periods.

Conclusion:
No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV due to construction techniques, time of year restrictions, experience and distance from SAV beds and oyster bars.

Medium Significance

➢ Comment 3

The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.

The preferred alternative was originally included in the CE/ICA. Per HQUSACE guidance as documented in the Project Guidance Memorandum (PGM) of May 2007, the preferred alternative was removed from the CE/ICA as it was an iteration added after the CE/ICA. Section 4.7 was significantly changed, providing detailed information on how the recommended plan was selected. The entire comment from the PGM follows. Language specific to this decision is highlighted.

From p 26 of the May 2007 PGM:
1) HQUSACE Comment: Formulation Rationale. The rationale for linking the formulation of the two island features is not evident and results in some confusion in the incremental analysis. These islands are physically separated by about 14 miles, would utilize different navigation projects as a source of material, their scales and costs are vastly different (James Island restores 2072 acres, Barren Island restores 72), and their authorization is being sought under separate processes and authorities. Therefore, it is unclear why the formulation and CE/ICA analyses are linked and whether that linkage

affects the incremental justification of the features. Further rationale is needed to support the formulation of the islands, which appear to be separable increments. The scaling of the Barren Island project also needs clarification. The text notes that the scale is limited due to the impacts to the surrounding ecosystem, but it isn't evident how scaling of Barren Island alternatives was accomplished to determine the optimum investment. See section E-36.c. and E-14.g.(2) in ER 1105-2-100.

CENAB Response: (21 March 2006) Need further clarification from HQ at FRC to address comment appropriately. Formulation focused meeting dredged placement needs (3.2 mcy/year) while maximizing environmental benefits. Plans were formulated that were stand alone options, which were then combined to maximize potential benefits. Will review and clarify section 4.3.6.a which describes how scaling down of Barren Island project was accomplished.

Discussion at FRC: Need to ensure consistency among incremental analysis for one island and multiple island scenarios. Discussion on whether "If/Then" analysis should affect the incremental analysis. Best increment should be used for each island.

CENAB Revised Response: (11 May 2006) Formulation focused on meeting dredged placement needs (3.2 mcy/year) while maximizing environmental benefits. Plans were formulated that were stand alone options, which were then combined to maximize potential benefits. Will review and clarify section 4.3.6.a which describes how scaling down of Barren Island project was accomplished and remove Barren Island E from incremental analysis. "Best Buy" graph will be included in final draft if necessary to communicate results.

Action Required: The plan formulation and selection section of the report needs to be recast. HQ suggests that the text be reviewed and expanded to clearly explain the key assumptions and objectives for each step of formulation. The formulation and selection process needs to address the development of alternative Barren E as well as the timing for construction and filling of James Island, based on needs for dredged material disposal and ecosystem restoration. The If/Then analysis may be helpful to some extent in telling the story. Although linked to an extent by the formulation process and cumulative impacts, each feature must demonstrate that the formulation requirements are satisfied under the authority being recommended. The draft report should be revised to address these points and coordinated with HQ prior to its circulation for public review.

CENAB Response: (11 Aug 2006) Many changes were made to section 4 – Plan Formulation, in an attempt to address this comment. The final array of best buy plans was changed to not include Barren E alignment, as this was iteration after the CE/ICA was conducted (see response to comment B.3 above- 'Location and Timing' analysis). Section 4.7 was significantly changed, providing detailed information on how the recommended plan was selected. These changes include: 1) a more detailed description on the objective comparison in 4.7.2; and 2) an NED/NER trade-off analysis discussion (4.7.5);

HQUSACE Analysis (September 2006): The concern is partially resolved. The early cycle formulation rationale has been edited, but changes/discussion on timing of James need to be included. The revised section 4 text discusses James coming on line in 2018 and Barren ASAP, but the discussion/rationale needs to be expanded. James construction is completed in 2014/2015, but could be delayed three years to avoid overfilling or even longer (if overfilling is acceptable) to 2021. The text should present information on the cost effectiveness of the individual islands- what $/ICU results relative to the timing. Also, the recommendations and implementation sections indicate that materials from the northern shipping channels may be used to accelerate the habitat development at Barren. This would appear to constitute another alternative-the Barren E costs would have to reflect the increased haul costs of dredged material from the northern channels (not the base disposal plan as is the case for the Honga River materials) and the outputs would be accelerated leading to different annual costs and outputs. The outputs for James Island would be affected slightly as a result.

Discussion/Action Required (21 September 2006): HQ wants to compare the life cycle costs of the various start dates as indicated by the timing analysis of James. Inconsistencies between the MCACES for Barren and James led to questions about the incremental costs of outputs for each proposed project in the recommended plan. For example, wetland plantings are included at James but not at Barren. The district explained that wetland planting at Barren will be accomplished using volunteer efforts. The final text will strike language about using the material from upper bay channels at Barren Island. The incremental costs per output for the recommended plan at each island will be presented in the report. The analysis of timing for development of James Island will be addressed. See Comment 3.b.3 on Location and Timing.

CENAB Response (23 May 2007): Language referring to placement of material from the upper channels at Barren has been struck from the document. The wetland plantings for the stand alone Barren alternatives included in the CE/ICA are not different from those at James. The only difference in costs for the alternative analysis is the distance it takes to haul the material to Barren vs. James. In terms of benefits, there is no difference in the way benefits were calculated for James or Barren. The same method was applied, so no bias towards one alternative over another was made. The Barren Island E alignment was a reiteration of one of the best buy plans, James 5/Barren D. This iteration is explained in Section 4.6.9. Therefore, the volunteer planting option at Barren was not a part of the plans included in the CE/ICA, and would not be an option for any of the Barren Island alignments used in that phase of the plan formulation. Timing analysis is included in Attachment 1 of this PGM. The incremental costs per ICU and acre for the recommended plan at each island are included in the Executive Summary and in Section 4. See Attachment 2, Issue Paper No. 2, of this PGM for more documentation on the linking of these two sites and projects.

- Comment 4

It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.

Recent Corps guidance requires that any decision documents after 1 Oct 2007 which are over $40M that go to Congress for funding will require a risk analysis. To meet this new requirement the Corps has initiated a cost and schedule risk analysis. The project delivery team has met and brainstormed to identify project risk elements. Risk elements are any aspects of the project which could cause the cost and/or schedule to vary from the estimators' cost estimate and schedule. The cost and schedule risk assessment will utilize Crystal Ball software in order to conduct a risk analysis. Walla Walla District is performing the Crystal Ball analysis. Results are due on February 29, 2008.

In addition, risk and uncertainty was addressed in other comment-responses herein as it relates to the timeframe to develop a fully functioning marsh, sea level rise, and adaptive management.

- Comment 5

It is overly optimistic to assume that the marsh will be fully functioning in five years.

CENAB agrees fully with comment. The cited references provided by reviewers (and listed below) have been reviewed. Wetland cells, in fact, do continue to increase in value through 10 years in the current ICU quantification. Wetland maturity was not clearly communicated. The five year marker identified in the Feasibility Report was specific to vegetation development. In addition, the findings of Cornell et al. 2007 suggest that most major carbon fluxes are likely established in less than 5 years. However, additional wetlands function was accounted for and ICU increases do occur through year 10 as the benthic community develops. In the current formulation, the wetland cells gain nearly 20% of their value between years 5 and 10 as the benthic community matures. This was poorly communicated. The increase in benefits from benthic development was identified only in a footnote in Table B-17. Table B-17 will be corrected to state that wetlands mature fully in 10 years, not 5 years. No changes will be made to the ICU calculations as they do account for what the reviewers were requesting.

Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250.

Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58.

Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.

- Comment 6

The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.

The dredged material disposal 'need' for the project is quantified in Objective 3 which states: Provide capacity for placement of dredge material (3.2 mcy/y). (Federal DMMP identified a need to place 30 to 70 mcy of material over a 20-year period.) The placement

capacity was considered at two steps in the plan formulation, 1) during the island ranking process as an engineering suitability criteria (Section 4.3.2a) and 2) as an engineering design consideration when developing island alignments (Section 4.4.1).

CENAB will reiterate the placement capacity needed (3.2 mcy/y and 30-70 mcy) throughout the report and more adequately stress the need to provide a project that sufficiently provides the needed placement capacity. The sections to be updated include:

Report Summary- Study Objectives- Problems and Opportunities
- Planning Objectives

Section 1.3- Study Purpose and Need
Section 2.1.2- Dredged Material Placement Needs
Section 4.1.1 Federal Objective

An explanation will also be added to the Recommended Plan sections of the Report Summary and main report to communicate why the recommended plan (28-30 mcy/y over 28-30 years) exceeds the projected placement capacity needs as identified in Objective 3. The reasons for recommending a project with the ability to handle a greater capacity of dredged material include the ability to accommodate risk and uncertainty surrounding annual dredging needs (3.2 mcy/y is an average), provide a factor of safety in the plans, and be able to manage increased placement needs if existing channels are enlarged to authorized widths (currently many channels are below authorized widths).

- Comment 7

The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.

USACE and the Maryland Port Administration have contracted with ARCADIS to develop Mid-Bay Island Ecological Design Criteria and a Habitat Development Work Plan in support of the Mid-Bay Adaptive Management Framework. The detailed monitoring plan will be based upon the selection of reference ecosystems within the similar environmental conditions as the constructed systems. A detailed monitoring plan will be developed at a later time and will rely upon review of published results dealing with the use of dredged material in wetland construction and wetland restoration. A large repository of literature related to dredged material as wetland substrate is at the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi in the 1980-1990's. The effort was directed by Dr. Mary C. Landin and her colleagues and is the basis of the effort being proposed around the nation. Over 100,000 acres have been created using dredged material over the last two decades (Landin 1997). Data from the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island (Poplar Island) will be utilized where acceptable. References associated with east coast marsh restoration will be reviewed and incorporated into the detailed monitoring plan as well as obtaining reference sites as close as possible to the site (Kusler and Kentula 1989, Craft et al 1999, Weinstein et al 2000).

The importance of the reference marshes is to identify naturally occurring changes in the environment that would affect restoration success; therefore the reference marshes have

to be subjected to similar conditions and the use of ecological benchmarks (Shisler 1989, Shisler et al 2007). The Poplar Island data will be reviewed to identify potential issues that will allow the development of strategies in the Adaptive Management Plan (AMP).

Literature Cited:

Craft, C., J. Reader, J.N. Sacco and S.W. Broome. 1999. Twenty-five years of ecosystem development of constructed *Spartina alterniflora* (Loisel) marshes. Ecological Applications 96:1405-1419.

Landin, M.C. 1997. Twenty-five years of long-term monitoring of wetland projects constructed with dredged material, with comparisons to natural wetlands, throughout U.S. waterways. pp. 26-29. In: Landin, M.C. (editor). 1997. *Proceedings: International Workshop on Dredged Material Beneficial Uses.*

Mohan, R.K., J.K. Shisler, W.J. Dinicola, T.J. Iannuzzi and D.F. Ludwig. In press. Design and construction considerations for wetland restoration using dredged material. *Journal of Dredging Engineering*.

Shisler, J.K. 1989. Creation and restoration of coastal wetlands of the Northeastern United States. pp. 145-165 In Wetlands Creation and Restoration: The status of the Science, Vol I. ed. J.A. Kusler and M.E. Kentula (editors). Island Press.

Shisler, J.K., T.J. Iannuzzi, A.D. Standbridge, J.M. Gonzalez and D.F. Ludwig. In Press. Ecological benchmarking in an urbanized estuarine river system. *Urban Restoration.*
Teal, J.M. and L. Weishar. 2005. Ecological engineering, adaptive management, and restoration management in Delaware Bay salt marsh restoration. *Ecological Engineering* 25:304-314.

- Comment 8

Connectivity between the salt marsh and estuary is unclear both during and post construction.

The issue of connectivity also arises at the Poplar Island Environmental Restoration project and has been addressed by the Workgroup and the Habitat sub-group. Concur that connectivity, fish access, and climate changes are issues that need to be addressed and these issues are being considered by the Mid-Bay project. It should be noted that many of the members of the Mid-Bay team have worked to address these issues at Poplar.

Figures 10 and possibly 16 in the Engineering Appendix will be revised to clarify possible options for connectivity and will also be presented in the Main Report. The spillways shown on Figure 10 were misinterpreted as connection structures. These act only to decant water during filling of cells with dredge material. Cells may connect directly to estuary or the tidal gut(s).

Climate change is being addressed at Poplar by increasing the elevations of the wetlands planting.

The issue of inlet size and design is being worked on now at Poplar. Efforts are underway to maximize large fish ingress and egress while permitting wetlands establishment and construction activities at the site. The Poplar marshes have performed as well as reference marshes in terms of forage fish production and some predatory fish have started to utilize the marshes. It is expected that detrital export will occur from the marshes once the wetlands vegetation has really established. However, given the uncertain information on climate change the Poplar team is aiming for more of a flood dominated rather than an ebb dominated regime.

- Comment 9

The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.

Concur. The AMP will include a discussion on how these issues will be addressed. Titus (1990a, 1990b) identified the impacts of sea level rise as a documented factor affecting coastal areas as result of climate warming with documented loss of coastal wetlands (Gornitz et al 2002). The sea level rise impacts on salt marsh ecosystems have been identified to be most aggressive in the high marsh habitats (Warren and Niering 1993, Rogers et al 1998, Orson et al 1998, Donnelly and Bertness 2001, Miller et al 2001); therefore to address these impacts would be to adjust the proposed percentage of low to high marsh. The adjustment will have to be addressed in the evaluation of the engineering design. Marsh accretion is a method of addressing sea level rise which mostly occurs by mineral sedimentation (Callaway et 1996, Callaway et al 1997); therefore long range consideration would be the periodic application of a thin layer of approved dredged material to selected areas that are identified in the Adaptive Management Plan (AMP). The current draft ecological design criteria for the Adaptive Management Plan include attributes for meeting habitat goals and monitoring marsh accretion rates, elevation, and subsidence.

The AMP will be similar to the concept addressed in Weinstein et al (2000) that address methods of monitoring of salt marsh habitats and development of attainable objectives (Thom 2000, Teal and Weishar 2005). The construction of wetlands creates an opportunity for aggressive invasive species to dominate created systems over a period of time (Daiber 1986, Odum 1988). *Phragmites australis* (common reed) has become a major problem in constructed wetlands (Roman 1984, Havens et al 1997); therefore a *P. australis* component in the AMP will be to monitor the species colonization and implement control strategies on the site. One of the methods would be the application of glyphosate which has been demonstrated as an effective means of control with minimum impacts to the non-target species. The restoration of *P. australis* marshes have documented increased to the salt marsh ecosystem (Warren et al 2002, Seigel et al 2005). A number of plant and animal invasive species are documented in the area; the current

draft of the ecological design criteria for the AMP will address these species and make recommendations for control to insure long range success.

Literature Cited:

Callaway, J.C., J.A. Nyman and R.D. DeLaune. 1996. Sediment accretion in coastal wetlands: a review of a simulation processes. *Current Topics in Wetland Biogeochemistry* 2:2-23.

Callaway, J.C., R.D. DeLaune and W.H. Patrick, Jr. 1997. Sediment accretion rates from four coastal wetlands along the Gulf of Mexico. *Journal of Coastal Research* 13:181-191.

Daiber, F.C. 1986. Conservation of Tidal Marshes. Van Nostrand Reinhold Co., NY. NY.

Donnelly, J.P. and M.D. Bertness. 2001. Rapid shoreward encroachment of salt marsh cordgrass in response to accelerated sea-level rise. *Proc. National Academy of Sciences of United States of America* 98:14218-14223.

Gornitz, V., S. Couch and E.K. Hartig. 2002. Impacts of sea level rise in the New York City metropolitan area. Global and Planetary Changes 32:61-88.

Havens, K.J., W.I. Preist and H. Serquist. 1997. Investigation of long-term monitoring of *Phragmites australis* within Virginia's constructed wetland sites. *Environmental Management* 21:599-605.

Miller, W.D., S.C. Neubauer and I.C. Anderson. 2001. Effects of sea level induced disturbances on high salt marsh metabolism. *Estuaries* 24:357-367.

Orson, R.A., R.S. Warren and W.A. Niering. 1998. Interpreting sea level rise and rates of vertical marsh accretion in a southern New England tidal salt marsh. *Estuarine, Coastal Shelf Science* 47:419-429.

Rogers, J., J. Harris and I. Valiela. 1998. Interaction of nitrogen supply, sea level rise, and elevation on species form and composition of salt marsh plants. *Biological Bulletin* 195:235-237.

Roman, C.T., W.A. Niering and R.S. Warren. 1984. Salt marsh vegetation change in response to tidal restriction. *Environmental Management* 8:141-150.

Siegel, A., C. Hatfield and J.M. Hartman. 2005. Avian response to restoration of urban tidal marshes in the Hackensack Meadowlands, New Jersey. *Urban Habitats* 3:87-116.

Teal, J.M. and L. Weishar. 2005. Ecological engineering, adaptive management, and restoration management in Delaware Bay salt marsh restoration. *Ecological Engineering* 25:304-314.

Titus, J.G. 1990a. Greenhouse effect, sea level rise, and land use. *Land Use Policy* 7:138-153.

Titus, J.G. 1990b. Greenhouse effect, sea level rise, and barrier islands: Case study of Long Beach Island, New Jersey. *Coastal Management* 18:65-90.

Thom, R,M. 2000. Adaptive management of coastal ecosystem restoration projects. *Ecological Engineering* 15:365-372.

Warren, R.S. and W.A. Niering. 1993. Vegetation change on the northeast tidal marsh: interaction of sea-level rise and marsh accretion. Ecology 74:96-103.

Warren, R.S. P.E. Pell, J.L. Grimsby, E.L. Buck, G.C. Rilling and R.A. Fertik. 2001. Rates, patterns, and impacts of *Phragmites australis* expansion and effects of experimental *Phragmites* control on vegetation, macroinvertebrates, and fish within tidelands of the lower Connecticut River. *Estuaries* 24:90-107.

Weinstein, M.P., J.M. Teal, J.H. Balletto and J.H. Strait. 2000. Restoration principles emerging from the world's largest tidal marsh restoration project. *Wetlands Ecology and Management* 8:1-21.

- Comment 10

National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.

USACE guidance states that environmental benefits are not to be discounted. In fact, guidance dictates that environmental benefits are to be averaged over the life of the project. Since the project alternatives generally has ever increasing ecosystem outputs as time goes on, and since they all had the same project start date, discounting benefits would not yield a change in the selected plan. Further, since the benefits are not monetary and there is to be no benefit-cost-ratio calculated discounting is not critical to determining an "apples to apples" benefit as compared to the monetary cost.

The study did not initially consider variation in the start date, or base year, of the project alternatives. The Federal Dredged Material Management Plan (DMMP) for the Port of Baltimore concluded that a new site would be required in 2018. It was not until after completion of the draft report and coordination with HQUSACE about the PGM that the issue of other base years was considered. Since a delay in project start will reduce the annual cost of a project due to discounting, but benefits are unaffected, a later start date compares unfairly to the earlier project. This is not logical since the earlier ecosystem benefits are realized, the better. During consideration of various project start dates, NAB was not able, due to the existing guidance, to discount benefits and allow for a fair comparison. That being stated, it would be improper to undergo this analysis unless directed by HQUSACE due to the implications to existing guidance.

Low Significance

- Comment 11

Address how climate change will influence the engineering design.

The report will be revised to acknowledge the potential for climate change and what influence relative sea level rise would have on the engineering design. Statements will be added to address how it may impact the project and the measures needed to accommodate relative sea level rise. Consideration will be given to increasing the width of the perimeter dikes to allow future raising of the top of the dikes without impact to operations. The impact on design of the dike armor stone with regard to size and elevation will also be assessed. The dike armor would most likely be extended up the slope if dike raising is required. The operation and maintenance costs would be adjusted as required to account for these future actions. The elevation ranges and percentages of high and low marsh will be assessed to possibly accommodate a limited rise in sea level. Detailed considerations of climate change will occur during detailed design of project features.

Clarifying question posed to reviewers: For climate change we will be considering sea level rise as a factor in our design of the wetlands during the Pre-construction Engineering and Design Phase. We are not sure if the comment is for us to consider climate change as it relates to the wetland designs; the dikes design; or both.

- Comment 12

To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.

Concur that Figures 10 and 16 should be shown in main body of the report. In addition, Figure 10 will be revised to better indicate the division of the salt marsh into cells that are connected either to tidal guts or directly to the bay.

Clarifying question posed to reviewers: You refer to a diagram in Appendix C of the Engineering Design Analysis for wetland cells. Are you interpreting the spillways shown in the diagram as the connection of the wetlands to the bay?

- Comment 13

Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.

Concur. There are numerous citations provided in Appendix K of the Feasibility Study. The development of the Ecological Development Criteria that will be used in island design and development of the AMP relies heavily on the scientific literature, but was not provided to the reviewers. This work cites over 200 scientific publications on ecology, engineering, macrofauna, microfauna, macroflora, microflora, soil, water quality, Chesapeake Bay flow dynamics, dredged material placement, and ecological restoration with dredged material. While the team feels that scientific literature has been considered,

it should be recognized that from the Poplar Island Restoration Project, USACE-Baltimore is at the forefront of environmental restoration using dredged material within the Mid-Atlantic region. Much information and experience specific to building islands within the Chesapeake Bay has been achieved through that project that is not available through any other sources of scientific literature.

- Comment 14

The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

Currently, Section 3-5 states 'Further placement sites will need to be identified and online by 2016 in order to accommodate a 57-million cubic yard shortfall in dredged material placement capacity for C&D Canal approach channels and Chesapeake Bay approach channel maintenance, which is discussed in Section 2.' Additional language will be added to Section 3.5 ('Most Probable Future Without-Project Conditions') that explains that if the proposed project does not proceed, the DMMP will need to be revisited. Other strategies will need to be devised to handle the shortfall in dredged material placement capacity. Under a worse case scenario, if no other alternatives are developed, ocean dumping could be used to dispose of the sediments. However, the cost of this practice is very high and is not Federally cost-shared.

THIS PAGE INTENTIONALLY LEFT BLANK.

ATTACHMENT B:
PLANNING MODEL INDEPENDENT TECHNICAL REVIEW

THIS PAGE INTENTIONALLY LEFT BLANK.

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080
http://www.mvd.usace.army.mil/

REPLY TO
ATTENTION OF:

CEMVD-PD-N

MEMORAMDUM FOR HQUSACE (CECW-CP), WASH DC 20314-1000

SUBJECT: Summary of Model Review of the Island Community Units Model for Middle Chesapeake Bay Islands Restoration Project

1. The National Ecosystem Planning Center of Expertise (ECO-PCX) conducted review of the planning model used to quantify ecosystem outputs for the Middle Chesapeake Bay Island Restoration Project in the Baltimore District. The proposed Middle Chesapeake Bay Island Ecosystem Restoration Project is intended to restore and protect valuable, but threatened Middle Chesapeake Bay island ecosystems through the beneficial use of dredged material from the Upper Chesapeake Bay Approach Channels to the Port of Baltimore. The Island Community Units Model was used to evaluate and compare project alternatives. The model is not going to be recommended for certification as the Baltimore District does not plan to use it in the future. Rigorous Independent Technical Review of the model was conducted in accordance with EC 1105-2-407 and the Protocols for Certification of Planning Models (July 2007). This memorandum summarizes the findings of the model review.

2. The reviewers agreed that the project would create significant bird habitat and would be an overall benefit to the local fish assemblages, but the reviewers felt that more technical information was needed to support model assumptions. The review team concluded that the determinations and ultimate conclusions of the model may be accurate but there was no mechanism for assessing the model's validity. The model justifies the overall benefits of the proposed restoration, but it is not clear how useful it is in evaluating the cost-effectiveness of the project or in optimizing the project. The review identified several concerns with the technical quality of the model. Some of these concerns are not likely to affect identification of the National Ecosystem Restoration Plan or realization of restoration benefits.

Printed on Recycled Paper

3. The ECO-PCX recommends approval of application of the Island Community Units model in the Middle Chesapeake Bay Islands Restoration Project with the acknowledgement of the model deficiencies described below. If the model is proposed for use on future projects, further coordination with the ECO-PCX is required. Prior to use on another project, the ECO-PCX would likely require preparation of additional documentation supporting model assumptions, justification of guild weightings, and sensitivity analysis of individual guild models and guild weighting. Issues identified in the model review should be considered in detailed project design.

4. The Island Community Units model is a regional model developed by an interagency PDT from the Baltimore District for use in the Poplar Island Expansion Project and the Middle Chesapeake Bay Island Restoration Project. Model documentation is included in enclosure 1. The model identified guilds which are a group of interacting animals that utilize the resources of a given habitat in a similar way. The following guilds were used:

- Colonial nesting wading birds (herons, egrets, and ibises)
- Waterfowl
- Colonial nesting waterbirds (gulls, terns, and skimmers)
- Raptors
- Shorebirds
- Herpetofauna
- Benthic invertebrates
- Resident/forage fish
- Commercial/predatory/higher trophic level fish

Ecosystem quality was estimated for 4 habitat types—upland, high marsh, low marsh, and intertidal.

The Delphi method was used to develop the model. The Delphi method is used for combining the knowledge and opinions of a group of experts. It was adapted by the USFWS to assist in developing habitat suitability curves for habitat evaluation procedures. Using the Delphi method, a panel of experts was polled on key habitat requirements by phone and email in

November 2003. The information gathered along with information gathered through a scientific literature search was used to develop the quality indices for each guild. A summary of the expert panel composition can be found in the table below.

	MDNR	USGS	USFWS	NFMS	USACE	NOAA	VERSAR[1]	VIMS[2]	CBF[3]	Total
Birds, general	1	1								2
Waterfowl	1									1
Raptors										0
Fish	1			1						2
SAV	1					1		1		3
Oysters	1								1	2
Reptiles			1		1					2
Benthic Invertebrates							1			1
TOTAL	5	1	1	1	1	1	1	1	1	13

[1] VERSAR – Versar, Inc.
[2] VIMS - Virginia Institute of Marine Science
[3] CBF - Chesapeake Bay Foundation

A weighting factor was assigned to each guild according to the extent to which the guild would utilize remote island habitat (See table below). Weights were determined by consensus of the Mid-Chesapeake Bay Island Plan Formulation Group which included representatives from MDE, USFWS, NOAA National Marine Fisheries Service, NOAA National Ocean Service, University of Maryland Center for Environmental Science, US Environmental Protection Agency, and Maryland Department of Natural Resources.

Table 5: Weighting Factors (W) Assigned to Each Guild/Community/Assemblage to Calculate ICUs

Colonial Nesting Wading Birds (herons, egrets, ibises)	12 %
Waterfowl	10 %
Colonial Nesting Waterbirds (gulls, herons, and skimmers)	12 %
Raptors	2 %
Shorebirds	14 %
Birds (total)	**50 %**
Resident Forage Fish	23 %
Commercial/Predatory/Higher Trophic Level Fish	5 %
Fish (total)	**28 %**
Herpetofauna	**2 %**
Benthic Invertebrate	**20 %**

5. The review was conducted by a team of ERDC scientists and was led by Dr. Morris Mauney. The review team included experts in avifauna, herpetofauna, submersed aquatic vegetation, fish and benthic macroinvertebrates. The team was asked to address the technical and system quality of the model and was not asked to review the application of the model to the Mid-Bay project. Review comments are included in enclosure 2.

6. The primary criteria for model review is technical soundness with the performance metrics being theory and computational correctness. Below is a summary of the major findings. The detailed comments and responses from DrChecks are found in enclosure 3.

a. Delphi Method. The major assumptions were clearly stated; however, the reviewers questioned the use of the Delphi Method for model development. The Delphi Method relies on professional judgment of experts rather than definitive supporting evidence. The review team concluded that the resulting determinations and ultimate conclusions of the model may be accurate but there was no mechanism for assessing the model's validity.

b. Submerged Aquatic Vegetation. The reviewers specifically questioned the theoretical correctness of the model for Submerged Aquatic Vegetation (SAV) because the model does not have the ability to adequately address the potential for both positive and negative effects that may occur as a result of

project construction. The SAV component of the model was added later in the study to capture one of the benefits of island structures - the ability to provide the conditions suitable for SAV to grow. The model used recent historic SAV acreage (based on SAV mapping) as an indicator of the suitability of the site for SAV if the protection of the island was restored. Current theory would consider water velocity, sediment quality and water clarity in evaluating the suitability of the area for SAV.

The model deficiency is unlikely to affect the identification of the recommended plan, but could potentially negatively affect realization of benefits of the project on SAV. If wave energy is the primary limiting factor, the islands could cause a decrease in wave height and energy on their lee side, facilitating expansion of SAV in some areas. The proposed project could also have detrimental effects on SAV, particularly during the construction phase. Wave reflection in the vicinity of breakwaters and hardened shorelines could result in SAV declines. An increase in turbidity and sedimentation during and post-construction would likely cause SAV declines in the affected areas. Hydrologic modeling was performed for design of breakwaters off the southern tip of Barren Island to ensure this area had suitable water velocity, sediment quality and water clarity for SAV growth. The PDT indicated that previous construction activities at Barren Island had no detrimental impacts on the SAV resources.

c. Benthic Macroinvertebrates. The review team was concerned with the assumption of a single maturity rate for benthic macroinvertebrates in three habitat types—high marsh, low marsh and intertidal. Current theory recognizes that the rate of benthic community development differs substantially across habitat types especially where there are differences in sediment type, degree of immersion, presence and nature of vegetation, and salinity regime. The reviewers stated that the assumption of a single, conservative rate might be appropriate if sufficient evidence were provided to support the decision but in the absence of any supporting evidence which they felt was inherent in use of the Delphi Method, it was impossible to evaluate the adequacy of model's theoretical basis. The reviewers did not think this potential model deficiency would

significantly impact the selection of a recommended plan or the realization of project benefits to benthic macroinvertebrates.

d. Model Sensitivity. A sensitivity analysis was not conducted by model developers or model reviewers. However, the reviewers concluded that the model structure does not provide a capability to discern subtle functional differences across a wide spectrum of island configuration. The reviewers thought that the community model would have the same outcome if used on any generic island construction project in open-waters of Mid-Chesapeake Bay. It appeared that the ability of this model to distinguish among alternatives was based on differences in acreage, not habitat quality. The model *justifies* the project i.e., the model is useful in documenting that significant ecosystem benefits would result from project construction. However, it is unclear how useful the model output is of comparing the alternatives using cost-effective and incremental cost analyses to identify an optimal project alternative.

e. Weighting among guilds. Reviewers concluded the assignment of weights among guilds appeared arbitrary. The weights assigned to the fish guilds were considered within the bounds of professional judgment, but lacked a true means of model validation and verification. The relative weighting among waterfowl, shorebirds and raptors seemed appropriate. Greater weighting on Colonial Nesting Waterbirds and a lower weighting to Colonial Nesting Wading Birds would be more appropriate based on published waterbird conservation prioritization information and considering the greater difficulty in providing and maintaining habitat for Colonial Nesting Waterbirds. Weighting justification could have been further substantiated by including additional information on relative abundance of CNWT and CNWB in the area. The sensitivity of model outputs to the distribution of weights between Colonial Nesting Waterbirds and Colonial Nesting Wading Birds was conducted using data from the Mid-Bay Project. Changing the weighting from 12% Wading Birds/ 12% Waterbirds to 4% Wading Birds/20% Waterbirds did not result in a change in the recommended plan. For both scenarios, the recommended plan was the lowest cost, best buy plan.

f. Fisheries. The reviewers stated that the assumption that high marsh derives less habitat value for fish than low

marsh is defensible. While the determination of weights assigned to the fish guilds appeared arbitrary and lacked a true means of model validation and verification, the weights were considered within the bounds of professional judgment. The reviewers stated that the model structure did not provide a technically defensible rationale for quantitative comparisons of habitat value for fishes among alternatives.

g. Colonial Nesting Waterbirds. The reviewers felt that the Colonial Nesting Waterbirds model did not give adequate attention to the need for early succession sand habitat, the value of which degrades quickly for Colonial Nesting Waterbirds. Reviewers commented that the model, as applied, did not adequately address how early successional habitat would be maintained into the future for Colonial Nesting Waterbirds. This comment addressed application of the model, not the technical soundness of the model. The Mid-Bay PDT stated that early successional habitat would be maintained on the cross dikes and interior sand areas as has been documented at Poplar Island. In final design, the Mid-Bay PDT may incorporate islands at tidal inlets or breakwaters. The islands would be maintained as unvegetated habitat for Colonial Nesting Waterbirds. The reviewers appeared satisfied that Mike Erwin (USGS Patuxent Wildlife Research Center and Department of Environmental Sciences, University of Virginia), a recognized expert on Colonial Nesting Waterbirds along the mid-Atlantic coast, would be consulted in the detailed design of islands for waterbird nesting habitats for the Mid-Bay project.

h. Computational Accuracy. Island Community Units calculations were conducted using Excel spreadsheets. The reviewers found that the calculations for Island Community Units and the guide weighting appeared to be accurate.

i. Corps Policies and Requirements. Following is a description of how the model incorporates key Corps policies and requirements. The model is strictly ecosystem-based and does not include inappropriate factors. The model outputs are strictly related to the aquatic ecosystem. While one habitat type is labeled "upland", it is interior island habitat which is considered part of the aquatic ecosystem. A sensitivity analysis and risk and uncertainty analysis were not conducted.

A sensitivity analysis could be conducted on various model components including sensitivity of guild weighting. Risk and uncertainty are not addressed by the model, but can be addressed qualitatively in the model application. The model relies on the professional judgment of experts in the ecology of Chesapeake Bay to identify the key drivers of ecosystem quality and estimate the relationship between these drivers and the quality component of ecosystem output.

7. In summary, the ECO-PCX recommends approval of application of the Island Community Units model in the Middle Chesapeake Bay Islands Restoration Project with the acknowledgement of the model deficiencies described above. Additional supporting documentation would likely be required if the model is proposed for use on future projects.

3 Encls

RAYFORD E. WILBANKS
Director, National Ecosystem
Planning Center of Expertise

CF:
CENAD-PSD-P
CENAB-PL
CENAB-PL-P
CENAB-PP-C (Brennan)
CEERD-EE (Tazik)
CEERD-EP-W (Deliman)
CEERD-EE-W (Mauney)
CEMVR-PM-F (Staebell)
CECW-PC (Carlson, Ware, Matusiak)
CEMVD-RB-T (Vigh)

Mid-Chesapeake Bay Islands
Model Reviewers Comments and Team Responses

Comment Report: All Comments
Project: Mid-Chesapeake Bay Island Restoration
Review: Island Community Index Model
Displaying 41 comments for the criteria specified in this report.

704 ms to run this page

Id	Discipline	Section/Figure	Page Number	Line Number
1835270	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Supporting Documentation)

The model documentation does not fully describe the decision process. Additional explanations are needed as to why or how the other species listed in the various appendices (particularly herps) were either excluded or included in values for this model.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The species listed in the various appendices were summary lists of species identified in the area and at James and Barren Islands. These species lists were used to identify the guilds and communities to be targeted- colonial nesting waterbirds, colonial nesting wading birds, waterfowl, raptors, shorebirds, resident/forage fish, herptofauna, invertebrates, and commercial/predatory/higher trophic fish. The focus of the Mid-Bay habitat restoration is to provide remote island habitat for birds and not mammals or reptiles with the exception of the diamondback terrapin. The terrapin was given additional protection by MD DNR in 2007 and commercial harvesting has been banned. Nesting areas that have few predators are scarce and Poplar Island is one of the most successful nesting areas in the Maryland part of the Bay. According to Dr. Willem Roosenburg (personal communication with Mark Mendelsohn March 10, 2008) the terrapins would likely use the proposed project for nesting. A decision was made by the PDT to not include mammals as they are predators of many of the bird species desired. In fact, much effort is devoted to preventing mammal colonization and removing mammals from the restored islands. Deer browsing would be detrimental to planted trees, shrubs, and marsh plants. The creation of habitat suitable for fox, raccoon, and opossum is not considered desirable because of their potential impacts on birds (Erwin et al. 2001). The threat of mammalian predators on colonial nesting wading birds (Williams et al. 2007), Black ducks, other groundnesting avian species, and Diamondback terrapins (Costanzo and Hindeman 2007), and on seabirds (including shorebirds and colonial nesting waterbirds) (Brinker et al 2007. 2007) has been recently documented and is summarized in Erwin et al. 2007. With respect to the herptofauna, it is not that one species was targeted, but that the diamondback terrapin is the only species desired on the restored island habitat due to the predatory nature of snakes and the reality that the area is likely to be too saline for most amphibians for many years. Snake populations can be detrimental to birds and terrapin populations. In fact, an Eastern Kingsnake has been sighted taking terrapin eggs at Poplar Island. Black racers are also known predators of avian species. Sediment characteristics will likely limit amphibians. Freshwater habitat suitable for them may develop in the upland area once the salinity of the sediments is reduced through rainfall or sediment treatment. Literature Cited is attached. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response1.doc)
1-1	Backcheck Recommendation **Close Comment** Response is adequate Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835271	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Supporting Documentation)

Due to the inherent limitation of this modeling approach whereby general assumptions are made with little or no supporting documentation or rationale for decisions or assigned values, it is impossible to assess the values provided for a given guild (or a single species) such as weighting of guilds, Island Community Index (ICI), habitat maturity dates, and Island Community Units (ICU). Without this information, it is impossible to evaluate the adequacy of the model's

theoretical basis.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The weights were assigned through a series of meetings in the spring of 2004 with regional resource managers that participate on the PDT team. These weights were based on what communities would benefit the most from the restoration of island habitat and were largely a compromise between the managers. For instance, managers focused on nesting birds preferred completely upland islands that would provide nesting habitat. However, fisheries managers preferred all wetlands to contribute to fishery resources. After many discussions and iterations (characteristic of the Delphi method), consensus was obtained on the weights used in the model. The final weights are a reflection of how the group expects the restored island to benefit the various guilds. The weights of the bird guilds sum to 50% due to the heavy reliance avian species have on remote islands as a sanctuary from predators. Dave Brinker of MD DNR recommended the distribution of this 50% between the 5 bird guilds- waterfowl, shorebirds, raptors, colonial wading birds, and colonial nesting birds. John Nichols of NOAA NMFS provided the distribution of weights between resident/forage fish and commercial/predatory/higher trophic fish. From his experience, the islands will only provide a small benefit to higher trophic species. Most benefit to fisheries resources will be to the resident/forage fish that can enter the marsh through tidal guts. All groups agreed that the benthic invertebrates were an important component of the island ecosystem and that no habitat would provide its full benefit if this ecosystem component were missing. Therefore, the group decided to assign the benthic invertebrates a weight of 20% to reflect its importance to all species and habitats. During the discussions, the group did recognize that typically benthic invertebrates are not recognized with such a high proportion of the community, but felt it was appropriate in this situation because if the benthics do not colonize the marsh and intertidal habitats, they will provide a much reduced resource to foraging avian and fishery species. A small portion of the weight was assigned to herptofauna because only one species, the diamondback terrapin, would benefit from the restored island. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** This comment does a reasonable job of addressing weights. But what about maturity dates, guilds, ICI, and ICU? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835274	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Supporting Documentation)

The ICI scores of zero, 0.25, 0.50, 0.75, or 1.0 were assigned with no explanation of technical justification. A 2% weighting factor was assigned to the herpetofauna guild with no explanation (e.g. based on species diversity or percent total species). As related to testing and evaluation the documentation does not address this certification criterion.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** ICI scores were assigned based on the following considerations: habitat quality, and characteristics expected at the evaluation time (year 1, year 5, year 10 or year 25) based on habitat maturity; habitat features as outlined by the panel of experts; experience at Poplar Island; and the highest quality habitat that could be designed. The indices were developed based on the input received from the panel of experts. Indices were additionally reviewed by regional resource managers on the PDT to identify inconsistencies and improvements that could be made. The model was applied to the Poplar Island Expansion which has since received a Chief's Report. No other testing or evaluation was performed. There was not a requirement at the time to carry out testing and there appeared no scientifically sound way to do this that would have benefited the exercise. That is, there are no restored islands in the Chesapeake Bay region old enough to use as a reference.

	Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** It would be helpful to know the difference between habitat quality at year 1 and at year 25. It is difficult to tell what habitat quality means with out some upper and lower limit. What is habitat quality based on? Is it diversity, composition, stem counts, etc. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835275	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Technical Information)

There is very a limited amount of technical information provided in the report, to the extent that it is impossible to evaluate the reasonableness of the conclusions reached by applying the model. It appears that the model simply constructs a framework around a professional judgment-driven decision system. The review team unanimously agreed that this was a major constraint in adhering to guidance on how the certification process findings were to be based.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** At the time of model development in 2003 and 2004, the development team tried to incorporate all available supporting scientific literature. A list of scientific literature used in model development is provided in the attachment, but there were limited sources specific to remote island habitat and their communities. At the time of model development the team requested supporting documentation from the expert panel, but found that they did not have much to provide. In fact, Erwin et al. (2007) recognized that there have been relatively few reports published in peer-reviewed literature specifically on waterbird populations or their habitats. It is interesting to note that many of the contributors to the recent Special Publication of the Journal of Waterbird Society focused on Waterbirds of the Chesapeake Bay have been consulted for input by the Mid-Bay project (Erwin, Haramis, Hindman, Therres, and Brinker) either as members of the PDT, a participant on the expert panel, or through NEPA consultation. Due to this recognized shortage of peer-reviewed literature, the model does rely heavily on professional judgment. At the time of development, there were no specific standards to state that this was unacceptable. The District does not believe the reliance on best professional judgment to be inadequate as internationally recognized experts were involved along with many resource managers familiar with Chesapeake Bay were involved. Additionally, it should be recognized that from the Poplar Island Restoration Project, USACE-Baltimore is at the forefront of environmental restoration using dredged material within the Mid-Atlantic region. Poplar Island is recognized by Brinker et al. (2007) as a promising model essential to maintaining some seabird populations. Much information and experience specific to building islands within the Chesapeake Bay has been achieved through that project that is not available through any other sources of scientific literature. Finally, many members of the PDT and participants on the expert panel that represent the various resource agencies were also members of the Poplar Island PDT. Their expert knowledge therefore captures all the lessons learned and experiences of the planning and construction at Poplar Island. An additional source of information was the multi-seasonal environmental monitoring performed for James and Barren Island and Poplar Island monitoring reports. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response#4.doc)
1-1	Backcheck Recommendation **Close Comment** Although technical information may not be available specific to remote island habitat, information should be available for similar types of habitat in the area (benthic, avian, etc.). This information could be used to develop a range of values expected. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835277	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Sensitivity)

A general consensus was reached that the models lack sensitivity to distinguish among various alternatives based on qualitative indices. The reviewers fail to see how the model itself lends credence to the assertion that one scenario or alternative is better (more optimal?) than any other. The model structure simply does not provide a capability to discern subtle functional differences across a wide spectrum of island configurations. In our opinion, any generic island construction project in open-waters of mid-Chesapeake Bay would have the same outcome if this community model approach were used. By running the community model in a sensitivity analysis mode, i.e. determine which input factors most heavily influenced the output, we suspect that altering the input values by large amounts would not appreciably alter the prioritization of alternatives. Therefore, it seems that the ability of this model to distinguish among alternatives is based on differences in acreage, not habitat quality. If this is the case, there is clearly no need for the construction of a "community model" and decisions can be based on acreage of the various alternatives alone.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** No sensitivity analyses were performed on the weights assigned to guilds or the Island Community Indices as these were agreed upon values and definitions between the resource agencies. Although acreage is a major driver of the model, habitat maturity as well as gain and loss of benefits from habitat features that change with maturity is an important component of the model. The ICU method was able to account for changes to benefits as the project developed and habitats matured that would not have been possible by basing the formulation strictly on acreage. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** It would be helpful if you would demonstrate how maturity is an important component of this model. Acreage is the only quantitative component of the model. Run some numbers and show why maturity is important. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835278	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Arbitrariness)

The determination of weights assigned to the fish guilds is one example of arbitrariness, certainly within the bounds of professional judgment, but lacking a true means of model validation and verification. For example a Fish Total weight of 28% seems entirely reasonable based on a general allocation of 23% to resident fishes and 5% to commercially important predatory fishes. Nevertheless, one might speculate that 20% and 8% respectively would be just as reasonable. That is impossible to determine given the lack of documentation provided.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response #2 that explains development of weights. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** This question was not addressed. Why is one percentage preferred over another? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835280	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Arbitrariness)

Another example is that various measures of percent cover and habitat use/value are assigned indices ranging from 1.0 to 0. Although these numbers seem reasonable, no rationale or documentation for assigning these indices is provided.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** ICI scores were assigned based on the following considerations: habitat quality, and characteristics expected at the evaluation time (year 1, year 5, year 10 or year 25) based on habitat maturity; habitat features as outlined by the panel of experts; experience at Poplar Island; and the highest quality habitat that could be designed. The indices were developed based on the input received from the panel of experts and any available supporting literature. Indices were additionally reviewed by regional resource managers on the PDT to identify inconsistencies and improvements that could be made. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** What is the difference between a score of 1 and a score of .25. What is it about habitat features that make a 1 a 1 and a .25 a .25. Is it number of species, canopy height, diversity, stem density? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835281	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Arbitrariness)

The benthic macroinvertebrate model is based on the assumption of a single maturity rate in all habitats and scores community development in five year intervals. As a result there are only two possible habitat quality scores, 0 and 1. Although the assumption of a single, conservative maturity rate may be appropriate there is no supporting documentation to indicate why that rate was chosen.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The PDT did simplify benthic invertebrate guild by assuming a single maturity rate of 10 years in all habitats. Although, this is an assumption and the scientific literature provides a range of maturity dates, the 10 year maturity date is scientifically reasonable and supported by scientific literature for marsh systems (see below). The development team agreed to include this 'catch-all' invertebrates guild because of the importance of the benthics to the quality of high marsh, low marsh, and intertidal habitat. At the planning level that this model was developed at, it did not seem necessary to go into more detail. It was recognized that the inclusion of a benthics group was not typical of comparable analyses, but the team included them as the suitability of the habitats for various guilds largely depends on the quality of the benthic community. However, there were not just two possible habitat quality scores assigned to benthic invertebrates. A score of 1.0 was assigned to mature communities, a 0.5 was assigned to immature communities, and a score of 0.25 was assigned to newly established communities. Benthic invertebrates were not included as part of the uplands, and therefore only formulated as part of the high and low marsh, and intertidal habitat. Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. Wetlands 27:240-250. Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed Spartina alterniflora marshes. Marine Ecology – Progress Series 257:45-58. Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. Wetlands 24:309-323. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** What are the components of this system at maturity and why is it reasonable. How do you

	identify a mature community? What makes it a 1 or a .25? Is it based on number of species present, diversity, organisms per square foot? There should be benthic data available that could be used to describe the difference between mature and disturbed habitat. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835283	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Arbitrariness)

Finally, it does not appear that the model development team effectively utilized all the information available to them. For example, a panel of three SAV experts made a number of recommendations, presented in table form in the documentation package. However, it appears that these suggestions were disregarded. There was no explanation as to why these recommendations were not used.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The SAV component of the ICU model was added in a second phase to capture one of the great benefits of island structures- the ability to provide the conditions suitable for SAV to grow. The information provided by the SAV experts was not utilized in the SAV ICU development because the team agreed that the project did not have the responsibility or objective of creating SAV habitat, but rather protecting what was currently in existence. The presence of the islands provides conditions suitable for SAV survival. Therefore, if the islands go, the SAV will go. Energies associated with winds and currents, substrates, and water depths all change as islands erode. This effect has been a reality for the Mid-Bay island chain as islands have eroded during the past century. The SAV ICU was, therefore, added to account for the benefit the islands provide by merely being present in the estuary. It was not the objective of the project to design the correct velocities, sediment quality, or water clarity for SAV. This specificity was taken into consideration in the hydrologic modeling performed to evaluate constructing breakwaters off the southern tip of Barren Island, but for ICU purposes an indices based on past acreage that is reflective of the protection the islands provide was viewed as a more suitable measure by the team. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** How can you be sure that you are "protecting" what currently exists if you do not consider potential impacts to the SAV community. How do you know that the benefits to the SAV component will be realized if it was not the objective of the project design to correct velocities, sediment quantity, or water quality? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835284	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Avian Component)

This model fails this certification criterion primarily due to the lack of adequate attention paid to the need for early-successional sand habitat, how this habitat will be maintained into the future for Colonial Nesting Waterbirds (CNWT), and (if not maintained) how habitat value in the model will quickly degrade for this guild

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** Early-successional sand habitat for CNWT was valued in the first 5 years within the upland habitat. After that, this type of habitat in the upland cells was considered lost due to the successional growth of vegetation. However, the sand interior and cross dikes would maintain

	their suitability to CNWT nesting in perpetuity. Also, sand beach habitat was incorporated as a feature of the intertidal/unvegetated mudflat habitat. Although included in this intertidal category, some of this sand beach habitat is specified to be above the tidal range. This was a second way that sand beach habitat provided value to CNWT. At Poplar Island, sand and gravel 'bird islands' were included in the formulation as a feature within each wetland cell. These 'bird islands' are surrounded by a tidal channel and are maintained as unvegetated areas for CNWT nesting. Similar islands were not included in the formulation of Mid-Bay because the PDT thought there were better ways of providing this habitat that would be more isolated from predators. Also, there is a great deal of maintenance required to maintain the suitability of the Poplar 'bird islands' for CNWT nesting. A larger single island at the mouth of the tidal inlet has been discussed with regional resource managers for Mid-Bay. This island would be maintained as unvegetated specifically for CNWT. However, as it is unsure how this would be constructed at this time and it would be included with any island alternative selected, the 'bird island' was not included in the ICU quantification. Additionally, not included in the ICU quantification is the possibility of incorporating bird islands into the breakwater system that is being considered off the southern tip of Barren Island. These breakwaters are to be further evaluated and if determined to be beneficial to SAV, would be constructed in a second phase of construction. The idea has been proposed to make some of the breakwaters into unvegetated islands for CNWT nesting. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** Response is adequate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835285	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Benthic Component)

The chief theoretical problem with the benthic macroinvertebrate model is the assumption that the communities of all habitat types will develop at the same rate. The rate of benthic community development differs substantially across habitat types especially where there are differences in sediment type, degree of immersion, presence and nature of vegetation, and salinity regime. Assumption of a single, conservative rate might be appropriate if sufficient evidence were provided to support the decision but in the absence of any supporting evidence, as seems inherent in use of the Delphi Method, it is impossible to evaluate the adequacy of model's theoretical basis.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #8. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** It would be helpful to have an explanation as to why communities of all habitat types will develop at the same rate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835287	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Fish Component)

Attempting to use a guild approach to quantifying habitat for resident/transient fishes based upon a high marsh/low marsh/open water habitat breakdown is inherently weak as determined by logistics and the factual reality that species-specific relationships within the appropriate assemblages are notoriously variable. That fish species will occupy the created habitat is a given. Associations of fish with physical marsh structure and their movements in tidally influenced systems have been examined in numerous studies spanning wide geographic settings. Thus the assumption that high marsh derives less habitat value than low marsh, for example, is defendable. The stated theory and assumptions of the

model, however, do not detail those attributes of the habitat treatments that account for the assigned values. The incremental values incorporated into the analyses are therefore arbitrary. Those involved in the exercise certainly followed the dictates of the mandated model construction process, however the results consequently suffered.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The attributes of the 2 fish indices were developed in cooperation with the model development group. Specifically, John Nichols of NOAA NMFS, Roland Limpert of MD DNR, and Jane Boraczek of EA Engineering, Science, and Technology provided a lot of input and review. John Nichols provided the following habitat features for various species: Menhaden- -important food for herons, egrets, ospeys, and eagles -DO is critical -no specific need for structure Bay anchovy- -DO critical (>3 for eggs and larvae; <2 is critical) -specific habitat features, structure, and shoreline development not important, but hydrographic features that affect water quality are -rarely in water depths >24 m Alewife and Blueback herring (important forage species) -important forage species for birds (blueback- seabirds, alewife- osprey and green heron), fish, amphibians, reptiles, and mammals Spot- -few measures available to increase population- increase summer DO -absent during winter for most part -little preference for specific habitats except substrate- muddy/mud-sand -feed primarily on organisms found in depths (< 10m) -DO > 4 mg/L -most concentrate in 6-10 m zone in mainstem and 3-6 m in tribs except during fall months White Perch- -DO > 6 mg/L -spend entire life in Bay -open water close to shore and deeper channel areas where they overwinter -bottom-oriented; older become piscivourous -commonly found near underwater structures, but prefer mud, sand, or clay bottoms with little or no cover -older prefer 4.6-9 m during day and move in shore to ~1m at night Striped Bass- -sandy beaches, rocky shorelines, shallow water, deep trenches, bays, and rivers -winter depths > 9m Summer Flounder- Able and Kaiser (1994) -young-of-year exhibit a preference for tidal guts and marsh edge. -Tidal gut widths from 40-50 ft to 10-12 ft, with a depth of 0.4 to 1.8' at mlw. -Spartina is critical component of adjacent marshes. -Mud substrate, but as they age there is a gradual shift in preference for sand. -Mudflats are used. The important habitat features for resident/forage fish are access to high and low marsh, and proximity to SAV, and the presence of sand beaches cut with channels. These features would provide resident/forage fish with the greatest access into the low and high marsh. Features specific to commercial/predatory/higher trophic level are the presence of channels to provide access, and close proximity to SAV and sand beaches. In further discussions since model development, John Nichols has identified a need for wide tidal guts into wetland cells that are at least 6 feet deep to permit access to the wetlands by predatory fish. The other key features are adequate flushing to provide suitable dissolved oxygen levels (important to menhaden especially) and the transfer of marsh productivity into the surrounding waters. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response#12.doc)
1-1	Backcheck Recommendation **Close Comment** Still need an explanation as to how the differences between incremental values are identified. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835289	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: SAV Component)

The package narrative states that existing SAV beds occur on the wave-protected side of the island. An increase in the size of the island footprint will affect waves, currents, and sediment processes, which in turn will affect SAV distribution and growth. For example, a decrease in wave height and energy could enhance growth and facilitate expansion of SAV in some areas, but only if wave energy is the primary limiting factor. In fact, one could equally argue that the proposed project would have detrimental effects on SAV in the project vicinity, particularly during the construction phase. Wave reflection in the vicinity of breakwaters and hardened shorelines could result in SAV declines. An increase in turbidity and sedimentation during and post-construction would likely cause SAV declines in the affected areas.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** SAV beds are typical on the wave-protected side of remote islands in the Chesapeake Bay. Just as typical is the loss of these SAV resources as the islands erode and are loss. This is clear at James Island where extensive island erosion has occurred and negligible SAV beds exist. The islands provide the conditions favorable for SAV growth. The recommended plan took this into consideration. One of the many reasons the proposed plan recommends protection of Barren Island and large-scale restoration through dredged material placement at James Island is to prevent the further loss of Barren Island and subsequent loss of the dense and widespread SAV beds. The other benefit of doing the main construction at James Island is that it minimizes any potential impacts to current SAV beds. SAV beds are currently very minimal at James due to the extensive erosion of that island compared to the SAV resources at Barren that are still quite extensive. The possible construction of extended breakwaters from the southern tip of Barren would not occur during Phase I construction. These efforts have been studied through hydrologic modeling, are to be further evaluated, and if deemed to be beneficial to SAV resources would occur as a Phase II construction. Previous construction at Barren Island, similar to what is being proposed, had no detrimental impacts on the SAV resources. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** The impact of detrimental effects has not been addressed. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835290	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Herpetological Component)

The chief theoretical problem with the herptofauna model is that the assumptions given throughout the Mid-Chesapeake Island model report appear to be solely based on one species (diamondback terrapin) (see page14, paragraph 3) instead of a guild of herp species as defined by the model's method. A list of 9 herp species (7 turtles, 2 snakes) were given in Appendix A-1 as faunal species identified for the Mid-Bay region. It was not made clear how this list was derived since there are 58 species/subspecies of reptiles and 11 species of amphibians documented from the Chesapeake Bay area. However, as stated on page 14, the diamondback terrapin was identified as the target species for values used in this model. Additional explanations are needed as to why or how the other species listed in Appendix A-1 were either excluded or included in values for this model. Because the model itself relies upon general assumptions with no supporting documentation or rationale for decisions or assigned values, it is impossible to assess the values provided for a given guild (or a single species) such as weighting of guilds, Island Community Index (ICI), habitat maturity dates, and Island Community Units (ICU). Without this information, it is impossible to evaluate the adequacy of the model's theoretical basis.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment 1. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** Response is adequate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835294	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: Avian Component)

This effort would certainly have more merit (and hence, the model more validity) if more attention had been paid to various prioritization schemes for birds listed within the various guilds. These prioritization schemes provide information on relative conservation needs for management of declining species. This would likely have at least a marginal effect

on the weighting factors that were listed in the report. Based on conservation needs and likelihood of providing suitable habitat for waterfowl, shorebirds, and raptors, the relative weightings for these guilds seem appropriate. However, I suggest that a much greater weighting score should have been placed on Colonial Nesting Waterbirds (CNWT) (especially terns and skimmers), and a lower score given to Colonial Nesting Wading Birds (CNWB). I base this on the waterbird prioritization information (http://www.waterbirdconservation.org/assessment.html) that provides guidance on conservation priorities of CNWT (i.e., High Concern – Black Skimmer, Gull-billed Tern, Least Tern; Moderate Concern – Forster's Tern, Royal Tern) relative to CNWB (High Concern – Snowy Egret, Little Blue Heron). Furthermore, provision and maintenance of upland nesting habitat for CNWB is much easier than for CNWT, since the latter require vegetated habitats that are much more abundant than early-successional sandy habitats required for nesting CNWB.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #2 that explains how weights were determined. Additionally, The Waterbird Conservation for the Americas was used as a reference and resource managers familiar with the assessment served on panel of experts and on the PDT group that assigned weights. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** District response adequately describes how prioritization was conducted and the expert who made the recommendation. I still feel that there should be a reevaluation for CNWT and CNWB. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835295	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: Avian Component)

Although an extensive species list for the area was provided as an appendix, it would have been helpful to have more in-depth information on relative abundance of these species on islands and other coastal habitats within the region. This is particularly true for the situation on Poplar Island (and perhaps Craney Island) where good information on relative abundance and habitat use of various species should be available. This would provide very important input to weighting factors of CNWT and CNWB.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The requested information is documented in the Mid-Bay Integrated Feasibility Report and EIS in Section 3.1.9.d Avifauna. This section is attached as well as an excerpt from the 2006-2007 avian monitoring report at Poplar Island. This information is very familiar to the resource agency representatives that provided input to determine weighting factors and was therefore, used indirectly in that exercise. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response#16.doc)
1-1	Backcheck Recommendation **Close Comment** District response is adequate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835296	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: Avian Component)

To be more specific regarding guild prioritization relative to conservation needs, I raised the issue in earlier comments regarding the model development team only paying cursory attention to open sand habitats for colonial nesting

waterbirds (i.e., specifically terns and skimmers). Open sandy habitats that are void of disturbance and high predation rates are in very short supply, and hence, the lack of these habitats is negatively impacting Atlantic coast populations. The District response suggested that Mike Erwin's research and input was used to determine appropriate size(s) of open, sandy habitats in uplands, and that additional attention should be paid to the topic in the Feasibility Report/EIS. Mike Erwin is the recognized expert on these species along the mid-Atlantic coast and his input was of critical importance to this effort. Given that, open sandy habitats in the upland cells should be in abundant supply during project construction and particular attention should be paid to avoid making these habitats too large or small. What was unclear to me was the long-range plan to maintain open areas by additional deposition of material. The report clearly states that open, unvegetated habitat for CNWT will be available during year 1, but there is little or no mention of the fact that this habitat will quickly degrade and lose value as nesting habitat when vegetation encroaches during the second year and beyond. As I understand the model, there appears to be a long-term benefit to CNWT on the project site and in the model without a clear plan to maintain this type of critical nesting habitat into the future. Open sand habitats will quickly undergo succession and eventually become more favorable for CNWB. This topic should be explicitly addressed in model construction

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response # 10 that explains CNWT quantification in model. Additionally, this issue of maintaining areas for CNWT will be addressed by the Adaptive Management Plan that is being developed for Mid-Bay. Although, the Mid-Bay project proposes to incorporate this habitat in new ways, much experience and information is available on this topic from USACE's experience at Poplar Island that will be applied to Mid-Bay. Michael Erwin is closely involved with Poplar Island and will be invited to provide his expertise in the design of CNWT nesting habitat. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** District response is adequate and satisfies the concern. Dr. Erwin is the leading expert on this topic and should be involved where possible and appropriate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835298	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: Benthic Component)

The key assumption in the model is the determination of the maturity date. As previously stated, this value was arrived at by best professional judgment using the Delphi Method without any supporting evidence. As a result, it is impossible to evaluate the adequacy of the underlying assumptions and therefore the ability of the model to accurately predict habitat quality. While this renders the model inadequate in its present form, the problem could easily be rectified by providing the theoretical background for the assumptions. Examination of the other models suggests this problem is common throughout the island model.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #8. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** Maturity date addressed in a prior comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835301	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: Fish Component)

The mandated model structure simply does not provide a technically defensible rationale for quantitative comparisons of habitat value for fishes among alternatives. The underlying approach may yield qualitative estimates of habitat value, but to conclude that comparisons so derived are anything other than extremely qualitative would be misleading.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The model development group worked to find as much scientific information as was available to base an island community model on and make it as technically defensible as possible, but peer-reviewed documentation was limited (as highlighted in Erwin et al. (2007)). The process relied on the input and best professional judgment of a number of resource experts and available scientific literature. The ICUs were intended to estimate benefits and be used as a planning tool. The ICU method was just one piece of the plan formulation process. ICUs were developed to assign a national ecosystem restoration (NER) benefit to the final set of alternatives. The plan formulation included a study area screening, an island ranking process based on engineering and environmental suitability, a GIS analysis based on engineering and ecological design considerations, a screening of proposed alternatives, and a refinement of the screening results, followed by assigning benefits using the ICU method to the final array of alternatives. The benefits of ecosystem restoration projects can be quantified using a variety of measures, such as acres of habitat produced or miles of shoreline restored. Indices that combine separate measurements can also be used, and offer the advantage of lumping multiple types of benefits together into one unit. This ability of indices to capture varying types of benefits into one comparable unit is what made this method preferred for the evaluation of the diverse island ecosystems being planned in the Mid-Bay project. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** This was more of an observation on the process. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835302	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: SAV Component)

Table 3 in the report lists a number of factors that were recommended as SAV parameters by the expert panel, all of which were apparently disregarded. The SAV index is based solely on average percent SAV cover during the period from 1994 to 2003. Various measures of percent cover are assigned indices ranging from 1.0 to 0. Although these numbers seem reasonable, no rationale or documentation for assigning these indices is provided.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The percent cover ranges were adopted from VIMS monitoring (VIMS, 2008). These classifications are how the densities are portrayed on the annual VIMS SAV monitoring maps and provided a consistent data set for use in development of the SAV indices. See further discussion on development of SAV formulation in comment response #9 and #21. Literature Cited: Virginia Institute of Marine Sciences (VIMS). 2008. SAV in Chesapeake Bay: Monitoring-Historical Report [Online.] Accessed March 20, 2008 at http://www.vims.edu/bio/sav/sav06/HistoricReports.html. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** As in similar cases why is a 1 a 1 and a .25 a .25. What characteristics does a unit of SAV have to display to be called a 1. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258

	Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835303	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions: SAV Component)

If the intent is to characterize SAV in the vicinity of the proposed project under pre-project conditions, then this seems a reasonable approach. However, no evidence is presented that would support or refute the next leap of logic, e.g. that the proposed project will "protect" and maintain existing SAV. Logic would require that in order for this assumption to be valid, it must be conclusively demonstrated that: 1) there has been a steady long-term decline in SAV in the vicinity of the proposed project areas, AND 2) that this decline can be clearly linked to an increase in wave energy caused by the progressive deterioration of the island (as opposed to a host of other factors known to cause declines in SAV, such as nutrient loading, sediment resuspension, decreased water clarity). The package does not support either of these assumptions.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to SAV comment #20. In response to issue (1), a steady long-term decline in SAV has been documented Bay-wide using SAV seeds preserved in sediment cores (Brush and Hilgartner, 2000). However, detailed Bay-wide annual SAV monitoring by VIMS was only started in 1994. Information prior to that, and in particular, prior to Bay-wide water quality degradation and the dramatic Bay-wide decline of all SAV species in the late 1960s and 1970s are rare. A description of the SAV resources currently at James and Barren Island as well as a summary of the VIMS monitoring since 1994 is provided in the response to Comment #25. Maps provided by MDNR from the early 1950s identify more widespread and extensive SAV beds in the James and Barren Island vicinities as well as larger island structures. In response to issue (2), the team is not aware of documentation that conclusively links SAV loss in these areas to island loss. There are a number of changes that occur when islands are loss including an increase in energy from waves and currents, water depth alterations, and changes in substrate with erosion of the island. The VIMS mapping of the past 14 years it is clear that there are currently no SAV beds present in the mesohaline region of the Bay in open water. That is, SAV beds exist along shorelines and in waters surrounding islands in the mesohaline region. Literature Cited Brush, G.S., and Hilgartner, W.B. 2000. Paleoecology of Submerged Macrophytes in the Upper Chesapeake Bay. Ecological Monographs. 70(4): 645-667. Virginia Institute of Marine Sciences (VIMS). 2008. SAV in Chesapeake Bay: Monitoring- Historical Report [Online.] Accessed March 20, 2008 at http://www.vims.edu/bio/sav/sav06/HistoricReports.html. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835304	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of Assumptions:Herpetological Component)

The adequacy of the assumptions cannot be assessed due to the limited or lack of supporting documentation or rationale for the process used in this model or the values selected for the herpetological guild. The process used by the Delphi Method relies on "best professional judgment" rather than more defined supporting evidence. The resulting assumptions and ultimate conclusions of this process may not be incorrect or invalid but it is difficult to assess given the nature of this process.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve**

	See previous responses discussing why best professional judgment was used (#4 and #19), and how weights (#2) and indices were developed (#3). Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** This has been addressed in prior comments. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835305	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of System Description: Avian Component)

There is a somewhat reasonable description of the project and "system", but enough shortcomings in the detail on juxtaposition and maintenance of various habitat components (and how they will differ among different model runs) to warrant an inadequate rating. This could be improved by providing a more solid description of how upland cells would be constructed (including sizes important for CNWT breeding occupancy), and then maintained over time with additional deposition. Providing more input on relative abundance of species in the region and how they used other island habitats (e.g., Poplar and Craney Islands) would also bolster the system description.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** During model development, it was assumed that given the acreage of a dredged placement cell, the most suitable features and characteristics would be included in the design to enable the habitat to provide the maximum use possible. The team saw no benefit to designing island habitat that provided a lower suitability when it was feasible to construct more suitable habitat. This assumption was consistent through all scenarios considered. Additional information on CNWT habitat, relative abundance of species in region and how species use other (Poplar) Island habitats has been provided in previous comments. Uplands cells are developed over many years. The uplands at James Island are expected to be divided into 4 cells of equal size although sizes could change upon further analyses and experience. It is likely that a particular cell will not be used for placement for two consecutive years. It is desirable from a dredged material management perspective to allow one and preferably two years for a cell to dry out to optimize capacity before the placement of more material. Consequently, it is likely that each cell could be in a different stage of dewatering and that there will be extensive mudflats and ponded water during placement and dredged material management activities up to the very end of material placement. It is unlikely that all the cells will reach their final elevation at the same time. Once a cell has reached its final elevation and sediment salinity and other conditions are suitable then planting will begin. It is possible that a cover crop will be planted or the soil amended prior to planting of woody vegetation. It is likely that there will be some permanent ponding in the cells after placement is completed due to the size of the cells. As defined in the CNWT index with input from Michael Erwin, preferred size of islands for nesting is 2.5 to 5 ac. The reality of upland construction is that it takes years to fully fill an upland cell. Poplar Island has been under construction since 1999 and still does not have a finished upland cell. Due to this fact, all of the CNWT nesting at Poplar has occurred on interior dikes and the bird islands. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** District response is adequate and satisfies the concern. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835306	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of System Description: Benthic Component)

The model is based on assumption of a single maturity rate in all habitats and scores community development in five

year intervals. As a result there are only two possible habitat quality scores, zero or one. The scores are then multiplied by the associated acreage and weighted as 20% of the total habitat score. The benthic macroinvertebrate model, its application, and the structure of the overall island model are adequately described however there is no explanation for why the other invertebrate models (Crabs and oysters) were not employed.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #8. The benthic invertebrates model was simplified and specific to invertebrates that would serve as the food web foundation for the birds and fish resources. Oysters were not addressed because oyster resources are not present within the project footprint. The oyster objective for the project was to avoid impacts to any existing oyster habitat in the vicinity of the project. The project did not have an objective of creating new oyster reefs. Crabs were not specifically addressed because it was the view of the group that structure-whether the submerged rock of the dikes, the low marsh habitat, or via the protection of the SAV beds, that is the important feature of crab habitat. Additionally, crabs use many diverse habitats and are highly mobile. This concept was separate from the target of providing a diverse benthic invertebrate community to fuel the avian and fish species. Crabs have been widely using the dikes and low marsh habitat at Poplar Island. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** District response is adequate. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835307	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of System Description: SAV Component)

The report does not describe the SAV beds that currently exist adjacent to the proposed island construction site (species composition, total area, density), nor the environmental conditions relevant to SAV growth (sediment type, waves and currents, salinity, etc. Furthermore, the document does not describe how any of these factors may change as a result of project construction, and how these changes could be expected to affect SAV distribution and cover.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** A description of the SAV resources currently at James and Barren Island as well as a summary of the VIMS monitoring since 1994 is provided in the attached excerpt from Section 3 (Existing Conditions) of the Mid-Bay Islands Integrated Feasibility Report and EIS. The conditions required for SAV growth are provided in Table 3 of the model documentation. No monitoring was done on conditions within the current SAV beds targeted at SAV other than coverage. However, at Barren there was one substrate and water quality sampling point within the SAV beds east of the island (WB-10). Substrate sampling identifies a fines content (silt/clay % in summer 2002 of 33.7 and in spring 2003 of 41.1) greater than the 30% limit identified as suitable for SAV growth in Table 3. Additionally, the organic matter content slightly exceeded the 5% limit identified by the SAV experts (5.8% in Spring 2003 sampling). Secchi depths at this site (0.6 m in Spring 2003) did not meet the standard of >1.9 m. There was no water quality or sediment sampling performed in the vicinity of James Island SAV beds. Hydrologic modeling (Dinicola et al. 2006) was performed by ERDC to evaluate changes in conditions to SAV resulting from construction of the project including the construction of various lengths of breakwaters from the southern tip of Barren Island. The summary conclusions are provided in the attachment. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response#25.doc)
1-1	Backcheck Recommendation **Close Comment** Do SAV beds currently exist in the area of or adjacent to the proposed island? Submitted on

	behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835308	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Adequacy of System Description: Herpetological Component)

The variables used within the equations for the model are adequately described; however, no explanation is given for the values used in the calculations for the herpetofauna guild. The ICI scores of zero, 0.25, 0.50, 0.75, or 1.0 were assigned to the herp guild (or diamondback terrapin species) with no explanation of rationale. A 2% weighting factor was assigned to the herpetofauna guild with no explanation (e.g. based on species diversity or percent total species). The ICU's are calculated by multiplying the ICI values for each guild by the quantity (acreage) of habitat to be created. A major fallacy of this model system is the assumption that bigger is better and that all acreage created is actually suitable habitat for a target species or designated guild. No accountability is given for quality of habitat. The model and formula being used for the Mid-Chesapeake Bay Islands Environmental Restoration Project is adequately described in the supporting document but the values used in the calculations are not adequately described.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See responses that explain why herpetofauna indices are specific to diamondback terrapin (#1), how indices were developed (#2), and weighting factors were assigned (#3). The model does not assume the bigger is better in all situations. This is a true statement is some situations such as intertidal mudflats and high and low marsh for foraging avian species. Where available, the team included most suitable habitat ranges such as for upland nesting acreage for CNWT, and the minimum intertidal acreage for waterfowl. In the absence of scientific literature, the team depended on the opinions of the resource managers and experts from the various agencies. The team made every effort to identify the most suitable habitat ranges and critical habitat sizes. However, there was minimum data available for these communities. In many cases, the panel of experts provided a minimum acreage needed, but could provide not cap. All acreages whether a range or a quantification of 'bigger is better' were defined in discussions with our expert panel. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** How will you ensure that the acreage created will be suitable habitat for the target species? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835309	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Limitations and Capabilities:Avian Component)

The model's limitations and capabilities clearly relate to the assumption that species within selected guilds will use habitats as expected in the system description. I believe most bird experts would agree that significant bird habitat will be created, but more technical information and attention to species of conservation priority would bolster model capability.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The model was developed as a planning tool, not an absolute research project. Assumptions were made about habitat use based on the scientific literature available and best professional judgment of regional resource agency representatives. Dave Brinker (MD DNR) and Mike Erwin (USGS) provided as much specificity as they could to refine the model indices. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08

1-1	Backcheck Recommendation **Close Comment** District response is adequate and satisfies the concern. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835311	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Limitations and Capabilities:Benthic Component)

The choice of the five year time interval for estimating community development simplifies the calculations but limits model sensitivity to an "all or none" evaluation. It is likely that this lack of sensitivity will limit its application to other projects. Likewise, the assumption of a single maturity rate for all benthic habitats will limit its usefulness.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** An 'all' or 'none' evaluation was not performed. Additional clarification is provided in comment #8. Further, benefits were interpolated between years 1 and 5 to reflect increasing benefit as the habitats developed. With regards to the limit on usefulness, the model was developed specifically for this project and Poplar Island Expansion. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** The district response indicates that benefits were interpolated within the five year time frame. Was this based on a straight line? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835313	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Limitations and Capabilities:Fish Component)

Although the model as constructed places the project in a context that most experts on fish ecology would agree would be an overall benefit to the local fish assemblages, there is no justification to conclude that the model itself lends credence to the selection of alternatives.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to Comment #5 and #19. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** This has been addressed elsewhere. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835315	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Limitations and Capabilities:SAV Component)

The SAV model as constructed does not have the ability to adequately address the potential for both positive and negative effects that may occur as a result of project construction.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See comment #25 for a description of current SAV resources at Barren and James Island. The model was not intended to address the potential for positive and negative effects to SAV that may result from construction. An evaluation of impacts was made elsewhere in the Mid-Bay Islands Integrated Feasibility Report and EIS. The Mid-Bay team has addressed a comment raised through our External Peer Review regarding construction impacts to SAV that is provided below. The team's response is attached. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08 (Attachment: Response#30.doc)
1-1	Backcheck Recommendation **Close Comment** If you do not address the potential for negative effects how do you know that projected benefits will be realized? Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835319	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Limitations and Capabilities:Herpetological Component)

The application of this model in predicting actual utilization of habitat by herps is severely limited given that all values appear to be based on one species and no consideration is given to quality of habitat created. Herpetofauna are a highly diverse group occupying a wide range of habitats which may not be reflected in this model or the application of this model. This review has identified numerous limitations and deficiencies in the model presented. This review only reflects an evaluation of the model and does not present a review of the proposed Mid-Chesapeake Island Environmental Restoration Project. The proposed project cannot be fairly and adequately assessed through the model presented.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See responses that explain why herptofauna indices are specific to diamondback terrapin (#1), how indices were developed (#2), and weighting factors were assigned (#3). Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835321	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Double Check Equations: Avian Component)

The equations themselves are not necessarily inadequate, but the weighting factors need additional technical input to improve validity.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #2 above that explains how weighting factors were developed. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258

	Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835326	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Double Check Equations: Benthic Component)

The structure of the model limits its response to values of either zero (0) or one (1). The habitat unit and habitat weighting calculations appear to be accurate.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment #7 above that explains that the index values were not limited to 0 or 1. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835327	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Double Check Equations: Fish Component)

The equations incorporated into the modeling exercise are not necessarily erroneous, but they definitely lack substance.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See previous responses discussing how weights (#2) and indices (#3) were developed. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835331	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Double Check Equations: Herpetological Component)

The calculations presented in the tables appear to be correct for the formulas presented. The accuracy and validity of the values used in these calculations are unknown.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See previous responses discussing the development of herpetological guild (#1), and weights (#2) and index (#3) development. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment**

	No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835337	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: Avian Component)

To my knowledge, no testing and validation on the model was performed

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** The model was used for the Poplar Island Expansion Project. That application was reviewed by the Poplar PDT as was the Mid-Bay evaluation reviewed by the Mid-Bay PDT. As there are no mature, restored islands in the region to use as a reference, the team did not see that there was a beneficial way to test and validate the model. Additionally, the weights and indices were developed based on the available scientific literature and the resource agency representatives. The weights were based on the professional experience of the resource managers and were partly a consensus agreed upon between often conflicting interests of the resource agencies. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835350	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: Benthic Component)

There does not appear to have been any testing or validation.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment 36. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835351	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: Fish Component)

The documentation does not address this certification criterion. However, to do so would largely be an irrelevant, impossible task. The model is based on generalities that do not lend themselves to comparison to empirical data. Although monitoring and results of the Poplar Island project should yield many powerful insights into the likely outcome of the present project, those data, if they exist, were not utilized.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment 36. Additionally, the knowledge, data, and lessons learned from Poplar Island Project is information very familiar to members of the PDT and expert panel, and was therefore considered in development of this model. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835353	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: SAV Component)

No testing and validation performed. Inadequat

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment 36. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835354	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: SAV Component)

No testing and validation performed.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** Duplicate comment (#39). See response to comment 36. Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

1835357	Biology-Ecology	n/a'	n/a	n/a

(Document Reference: Evaluate Testing and Validation: Herpetological Component)

No evidence of testing or validation was discussed in this report.

Submitted By: Camie Knollenberg (309-794-5487). Submitted On: 17-Mar-08

1-0	Evaluation **Check and Resolve** See response to comment 36.

	Submitted By: angela sowers (410-962-7440) Submitted On: 20-Mar-08
1-1	Backcheck Recommendation **Close Comment** No further comment. Submitted on behalf of Morris Mauney, CEERD-EE-W, 601-634-4258 Submitted By: Jodi Staebell (309.794-5448) Submitted On: 03-Apr-08
	Current Comment Status: **Comment Closed**

There are currently a total of 253 users online as of 04:10 PM 03-Apr-08.

Patent 11/892,984. | About ProjNet[SM] | About Us | Privacy Policy | Test Browser | Test Connection | Call Center | SBU Only | SM property of ERDC since 2004.

Questions and comments to Call Center staff@rcesupport.com, 217-367-3273 or 800-428-HELP (4357)

Classified information is NOT permitted on this site. Do NOT share your ProjNet password.

Response #1

Literature Cited:

Brinker, David F., Bill Williams, Bryan D. Watts, and R. Michael Erwin. 2007. Colonial nesting seabirds in the Chesapeake region: where have we been and where are we going? *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 93-104.

Costanzo, Gary R., and Larry J. Hindman. 2007. Chesapeake Bay Breeding Waterfowl Populations. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 17-24.

Erwin, R.M., B.R. Truitt, and J.E. Jimenez. 2001. Ground-nesting waterbirds and mammalian carnivores in the Virginia barrier island region: Running out of options. *Journal of Coastal Research.* 17(2): 292-296.

Erwin, R. Michael, G. Michael Haramis, Matthew C. Perry, and Bryan D. Watts. 2007. Waterbirds of the Chesapeake Region: An Introduction. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 1-3.

Williams Bill, David F. Brinker, Bryan D. Watts, and R. Michael Erwin. The status of colonial nesting wading bird populations within the Chesapeake Bay and coastal barrier island lagoon system. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 82-92.

Response #4

Literature Cited:

Brinker, D. F. and McCann, J.M. 2004. Breeding Status, Distribution and Population Trends of Colonial Nesting Waterbirds in Maryland. Poster provided through personal communication.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Chesapeake Bay Program (CBP). 2000. Chesapeake Bay Submerged Aquatic Vegetation Water Quality and Habitat-Based Requirements and Restoration Targets: A Second Technical Synthesis. US EPA Chesapeake Bay Program.

Crance, J.H. 1987. *Guidelines for using the Delphi technique to develop habitat suitability index curves*. US Fish and Wildlife Service Biological Reports 82 (10.134) 21 pp.

Dalal, V.P., J.E. Baker, and R.P. Mason. 1999. Environmental assessment of Poplar Island dredged material placement site, Talbot County, Maryland. *Estuaries* 22(3B): 770-784.

Dennison, W.C., R. Orth, K. Moore, J.C. Stevenson, V. Carter, S. Kollar, P.W. Bergstrom, and R.A. Batiuk. 1993. *Assessing water quality with submersed aquatic vegetation. Habitat requirements as barometers of Chesapeake Bay health*. Bioscience 43: 86-94.

Dobrzynski, T. and K. Johnson. 2001. National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Office of Habitat Conservation. *Regional Council Approaches to the Identification and Protection of Habitat Areas of Particular Concern*. Silver Spring, MD. May.

Erwin, R.M. 2002. Integrated management of waterbirds: Beyond the conventional. *Waterbirds*. 25(Special Publication 2): 5-12.

Erwin, M. 1997. Enhancing waterbird habitat with dredged materials: Some suggestions for improvement. *Proceedings of the Second Marine and Estuarine Shallow Water Science and Management Conference, April 3-7, 1995, Atlantic City, New Jersey*.

Erwin, R.M., D.H. Allen, D. Jenkins. 2003. Created versus natural coastal islands: Atlantic waterbird populations, habitat choices, and management implications. *Estuaries*. 26(4A): 949-955.

Erwin, R.M, J.S. Hatfield, and T.J. Wilmers. 1995. The value and vulnerability of small estuarine islands for conserving metapopulations of breeding waterbirds. *Biological Conservation.* 71: 187-191.

Erwin, R.M., B.R. Truitt, and J.E. Jimenez. 2001. Ground-nesting waterbirds and mammalian carnivores in the Virginia barrier island region: Running out of options. *Journal of Coastal Research.* 17(2): 292-296.

Evans, Joyce, A. Norden, F. Cresswell, K. Insley, and S. Knowles. 1997. Sea Turtle Strandings in Maryland, 1991 through 1995. *The Maryland Naturalist*. 41(1-2): 23-34.

Funderburk, S.L., S.J. Jordan, J.A. Mihursky, and D. Riley. 1991. *Habitat requirements for Chesapeake Bay living resources.* Prepared for Living Resources Subcommittee of Chesapeake Bay Program (CBP). June.

Heck, K.L. and T.A. Thoman. 1984. The Nursery Role of Seagrass Meadows in the Upper and Lower Reaches of Chesapeake Bay. *Estuaries.* Vol. 7. No. 1; pp. 70-92.

Hildebrand , S.F., and W.C. Schroeder. 1928. Fishes of Chesapeake Bay. *U.S. Bur. Fish. Fish. Bull*. 43 (Part I). 366 pp.

Kimmel, T. 2004. Sea Turtle Tagging and Health Assessment Study in Maryland's Chesapeake Bay and Summary of Sea Turtle Strandings in Maryland, 1991 to 2003. Final Report to NMFS, March.

Kirby, R.E. 1988. *American black duck breeding habitat enhancement in the northeasetern United States: A review and synthesis*. U.S. Fish and Wildlife Service, Biol. Rep. 88(4). 40 pp.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. *Waterbird Conservation for the America: the North American Waterbird Conservation Plan, Version 1.* Waterbird Conservation for the Americas, Washington, D.C., 78 pp.

Lewis, J.C.,and R.L. Garrison. 1984. *Habitat suitability index models: American black duck (wintering).* U.S. Fish and Wildlife Service. FWS/OBS-82/10.68. 16 pp.

Lippson, A.J. 1973. *The Chesapeake Bay in Maryland: An Atlas of Natural Resources*. The John Hopkins University Press. Baltimore, Maryland.

Lippson, A.J., and R.L. Lippson. 1984. *Life in the Chesapeake Bay.* The John Hopkins University Press. Baltimore, Maryland.

Maryland Department of Natural Resources. *1996. Population trends of colonial nesting waterbirds on Maryland's coastal plain*. Final Report.

Murdy, E.O., R.S. Birdsong, and J.A. Musick. 1997. *Fishes of Chesapeake Bay*. Smithsonian Institution Press, Washington D.C.

National Marine Fisheries Service (NMFS). 2005b. *Summary of Essential Fish Habitat (EFH) and General Habitat Parameters for Federally Managed Species*. Northeast Regional Office, Habitat Conservation Division. [Online] http://www.nero.noaa.gov/ro/doc/efhtables.pdf

Newell, R.I.E., and J.A. Ott. 1999. *Macrobenthic communities and eutrophication.* (p. 265-294). In: T.C. Malone, A. Malej, L.W. Harding, Jr., N. Smodlaka, and R.E. Turner (eds.), Ecosystems at the Land-Sea Margin. Coastal and Estuarine Studies, vol. 55. American Geophysical Union, Washington, D.C. 381 p.

Ranasinghe, J.A., S.B. Weisberg, D.M. Dauer, L.C. Schaffner, R.J. Diaz, and J.B. Frithsen. *Chesapeake Bay Benthic Community Restoration Goals.* Prepared for U.S. Environmental Protection Agency, Chesapeake Bay Program Office, Annapolis, MD and The Governor's Council on Chesapeake Bay Research Fund, Chesapeake Bay Research and Monitoring Division, Tidewater Admin., Maryland Dept. of Natural Resources, Annapolis, MD. December.

Rasmussen, W.C and T.H, Slaughter. 1957. *The Water Resources of Caroline, Dorchester, and Talbot Counties.* State of Maryland Department of Geology,

Mines, and Water Resources. Bulletin 18.
Reese, J. 2004. *Poplar Island Environmental Restoration Project Preliminary List of Butterflies*. July.
Robbins, C.S., ed. 1996. *Atlas of the Breeding Birds of Maryland and the District of Columbia*. University of Pittsburg Press, Pittsburgh, PA.
Roosenberg, W.M., P.E. Allman, and B.J. Fruh. 2003. Diamondback terrapin nesting on the Poplar Island Restoration Project. *Proceedings of the 13th Biennial Coastal Zone Conference, July 13-17, 2003, Baltimore, MD.*
Roosenburg, W.M., and P.E. Allman. 2002. Terrapin Monitoring at Poplar Island. Final Report submitted to the Army Corps of Engineers.
Roosenburg, W.M., T.A. Razio, and P.E. Allman. 2003. Terrapin Monitoring at Poplar Island. Final Report submitted to the Army Corps of Engineers.
Setzler-Hamilton, E.M. 1987. *Utilization of Chesapeake Bay by early life history stages of fishes.* In: *Contamination Problems and Management of Living Chesapeake Bay Resources* (eds. S.K. Majumdar, L.W. Hall and H.M. Austin). American Association for the Advancement of Science. pp. 64-93
U.S. Fish and Wildlife Service (USFWS). 1980. Habitat Evaluation Procedures: ESM 102. 1980.
Vana-Miller, S.L. 1987. Habitat suitability index models: osprey. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.154). 46 pp.
Virginia Institute of Marine Sciences (VIMS). 2004. Bay Grasses (SAV) in Chesapeake Bay and Delmarva Peninsula Coastal Bays 1994-2003. [Online.] Accessed October 13, 2004 at http://www.vims.edu/bio/sav/ (last updated September 13, 2004).
Weisberg, S.B., J.A. Ranasinghf, D.M. Dauer, L.C. Schaffner, R.J. Diaz, and J.B. Frithsen. 1997. An estuarine benthic index of biotic integrity (B-IBI) for Chesapeake Bay. *Estuaries*. 20(1): 149-158.

Poplar, James, and Barren Island reports:

EA Engineering, Science, and Technology. 2005a. Poplar Island Expansion Study – *Final Supplemental Studies to Evaluate Existing Conditions of Aquatic Resources, Spring 2004 through Fall 2004. Chesapeake Bay, Maryland.* Prepared for USACE-Baltimore District. May.
EA Engineering, Science and Technology (EA). 2004b. *Poplar Island Environmental Restoration Project, Exterior Monitoring: Post-Placement (2002), Benthic and Epibenthic Community Report*. Prepared for Maryland Environmental Service. March.
EA Engineering, Science, and Technology (EA). 2004e. *Poplar Island Environmental Restoration Project. Adaptive Management Plan*. Prepared for USACEBaltimore and Maryland Port Administration. July.
EA Engineering, Science, and Technology (EA). 2003a. *Recreational Fisheries Aerial Surveys: Upper, Mid, and Lower Chesapeake Bay 2000-2001*. February. Draft.
EA Engineering, Science and Technology (EA). 2003c. *Poplar Island Expansion Beneficial Use of Dredged Material, Final Consolidated Reconnaissance Report*. Prepared for Maryland Environmental Service. July.
EA Engineering, Science and Technology (EA). 2002e. *Reconnaissance Study of Poplar*

Island Sites for Beneficial Use and Habitat Restoration: Environmental Conditions. Prepared for Maryland Environmental Service. November.

Erwin, R.M. 2004. *Post Phase I Dike Construction Faunal Component Surveys of the Poplar Island Beneficial Use Project. Field Phase: 2004 Assessment of Waterbird Nesting.* USGS Patuxent Wildlife Research Center, Department of Environmental Sciences, Clark Hall, University of Virginia. Charlottesville, VA. 10 November.

Erwin, R.M. 2003. *Poplar Island Baseline Monitoring Program, Final Report, Wetland and Upland Use by Wildlife*. USGS Patuxent Wildlife Research Center, Department of Environmental Sciences, Clark Hall, University of Virginia. Charlottesville, VA. 13 November.

Maryland Environmental Service (MES). 2005b. *Fauna of Poplar Island Environmental Restoration Project*. Monthly Cumulative Fauna Count at Poplar Island. January.

Maryland Environmental Service (MES). 2004b. *Poplar Island Environmental Restoration Project, Habitat Development Framework, Talbot County, MD*. Prepared for Maryland Port Administration. April.

Maryland Environmental Service (MES). 2004c. *Poplar Island Environmental Restoration Project, Bird Monitoring. Annual Report.* October 2003-October2004.

Maryland Environmental Service (MES). 2003a. *Poplar Island Environmental Restoration Project, Bird Monitoring. Annual Report*. October 2002-October 2003.

Maryland Port Administration (MPA). 2002a. Preliminary Assessment of Environmental Conditions on Barren Island, Dorchester County, Maryland. April 2002. Prepared by Weston Solution, Inc. (Weston).

MPA. 2002b. Final Consolidated Report Reconnaissance of the Proposed Environmental Restoration Project Near Barren Island Dorchester County, Maryland. August 2002. Prepared by Weston.

MPA. 2003a. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Winter 2003 Field Survey. December 2003. Prepared by Blasland, Bouck, & Lee, Inc. (BBL).

MPA. 2003b. Spring 2003 Aquatic Sampling by Pop Net at Barren Island. October 2003. Prepared by Chesapeake Environmental Management, Inc. (CEM).

MPA. 2003c. Spring 2003 Aquatic Sampling by Pop Net at James Island. October 2003. Prepared by CEM.

MPA. 2003d. Final James Island Habitat Restoration Existing Environmental Conditions: Fall 2001 and Summer 2002 Surveys. February 2003. Prepared by EA Engineering, Science, and Technology, Inc. (EA).

MPA. 2003e. Final James Island Habitat Restoration Existing Environmental Conditions: Fall 2002 Survey. May 2003. Prepared by EA.

MPA. 2003f. Final Barren Island Habitat Restoration Existing Environmental Conditions: Summer 2002 Survey. May 2003. Prepared by EA.

MPA. 2003g. Final Barren Island Habitat Restoration Existing Environmental Conditions: Fall 2002 Survey. June 2003. Prepared by EA.

MPA. 2003h. James and Barren Island Fisheries Resources. Bay Enhancement Working Group Meeting. Maryland Port Administration. July 2003. Prepared by

University of Maryland Center for Environmental Science (UMCES).
MPA. 2004a. Feasibility-Level Environmental Conditions Studies for a Potential Island Mid-Chesapeake Bay Islands Environmental Restoration Project 20 Supporting Documentation for Island Community Unit Model July 2007 Restoration Project at Barren Island, Dorchester County, MD: Spring 2003 Field Survey. May 2004. Prepared by BBL.
MPA. 2004b. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Final 2003-2004 Supplemental Field Survey Report. October 2004. Prepared by BBL.
MPA. 2004c. Late Season 2003 Aquatic Sampling by Pop Net at Barren Island. February 2004. Prepared by CEM.
MPA. 2004d. Late Season 2003 Aquatic Sampling by Pop Net at James Island. February 2004. Prepared by CEM.
MPA. 2004e. Final James Island Habitat Restoration Existing Environmental Conditions: Winter 2003 Survey. March 2004. Prepared by John E. Harms, Jr. & Associates, Inc. (Harms).
MPA. 2004f. Final James Island Habitat Restoration Existing Environmental Conditions: Spring 2003 Survey. September 2004. Prepared by Harms.
MPA. 2004g. Final James Island Habitat Restoration Existing Environmental Conditions: Supplemental 2003-2004 Survey. September 2004. Prepared by Harms.
MPA. 2005a. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Final Consolidated Report. February 2005. Prepared by Blasland, Bouck, and Lee, Inc. (BBL).
MPA. 2005b. Final James Island Habitat Restoration Existing Environmental Conditions: Consolidated Report. February 2005. Prepared by John E. Harms, Jr. and Associates, Inc. (Harms).
National Oceanic and Atmospheric Administration (NOAA). 2003. *Report on the Pre-Construction Baseline for Cell 4DX: Nekton Surveys of the Poplar Island Beneficial Use Project*. Prepared for USACE-Baltimore District.
National Oceanic and Atmospheric Administration (NOAA). 2001. *Annual Report on the Post-Phase I Nekton Surveys of the Poplar Island Beneficial Use Project*. Prepared for Maryland Environmental Service.
U.S. Fish and Wildlife Service (USFWS). 2004a. *Submerged aquatic vegetation monitoring for the Poplar Island restoration project 2003.* Report CBFO-FA04-01, U.S. Fish and Wildlife Service, Annapolis, Maryland. August.
U.S. Fish and Wildlife Service (USFWS). 2003. *Submerged aquatic vegetation monitoring for the Poplar Island restoration project 2002.* Report CBFO-FA03-01, U.S. Fish and Wildlife Service, Annapolis, Maryland. May.

Additional literature reviewed since model development:

Brinker, David F., Bill Williams, Bryan D. Watts, and R. Michael Erwin. 2007. Colonial nesting seabirds in the Chesapeake region: where have we been and where are we going? *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 93-104.

Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250.

Costanzo, Gary R., and Larry J. Hindman. 2007. Chesapeake Bay Breeding Waterfowl Populations. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 17-24.

Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58.

Erwin, R. Michael, and Ruth A. Beck. 2007. Restoration of waterbird habitats in Chesapeake Bay: great expections of *Sisyphus* revisited. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 163-176.

Erwin, R. Michael, G. Michael Haramis, Matthew C. Perry, and Bryan D. Watts. 2007. Waterbirds of the Chesapeake Region: An Introduction. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 1-3.

Williams Bill, David F. Brinker, Bryan D. Watts, and R. Michael Erwin. The status of colonial nesting wading bird populations within the Chesapeake Bay and coastal barrier island lagoon system. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 82-92.

Wilson, Michael D., Bryan D. Watts, David F. Brinker. 2007. Status Review of Chesapeake Bay Marsh Lands and Breeding Marsh Birds. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 122-137.

Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.

Brinker, D. F. and McCann, J.M. 2004. Breeding Status, Distribution and Population Trends of Colonial Nesting Waterbirds in Maryland. Poster provided through personal communication.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Chesapeake Bay Program (CBP). 2000. Chesapeake Bay Submerged Aquatic Vegetation Water Quality and Habitat-Based Requirements and Restoration Targets: A Second Technical Synthesis. US EPA Chesapeake Bay Program.

Crance, J.H. 1987. *Guidelines for using the Delphi technique to develop habitat suitability index curves*. US Fish and Wildlife Service Biological Reports 82 (10.134) 21 pp.

Dalal, V.P., J.E. Baker, and R.P. Mason. 1999. Environmental assessment of Poplar Island dredged material placement site, Talbot County, Maryland. *Estuaries* 22(3B): 770-784.

Dennison, W.C., R. Orth, K. Moore, J.C. Stevenson, V. Carter, S. Kollar, P.W. Bergstrom, and R.A. Batiuk. 1993. *Assessing water quality with submersed aquatic vegetation. Habitat requirements as barometers of Chesapeake Bay health*. Bioscience 43: 86-94.

Dobrzynski, T. and K. Johnson. 2001. National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Office of Habitat Conservation. *Regional Council Approaches to the Identification and Protection of Habitat Areas of Particular Concern*. Silver Spring, MD. May.

Erwin, R.M. 2002. Integrated management of waterbirds: Beyond the conventional. *Waterbirds*. 25(Special Publication 2): 5-12.

Erwin, M. 1997. Enhancing waterbird habitat with dredged materials: Some suggestions for improvement. *Proceedings of the Second Marine and Estuarine Shallow Water Science and Management Conference, April 3-7, 1995, Atlantic City, New Jersey*.

Erwin, R.M., D.H. Allen, D. Jenkins. 2003. Created versus natural coastal islands: Atlantic waterbird populations, habitat choices, and management implications. *Estuaries*. 26(4A): 949-955.

Erwin, R.M, J.S. Hatfield, and T.J. Wilmers. 1995. The value and vulnerability of small estuarine islands for conserving metapopulations of breeding waterbirds. *Biological Conservation.* 71: 187-191.

Erwin, R.M., B.R. Truitt, and J.E. Jimenez. 2001. Ground-nesting waterbirds and mammalian carnivores in the Virginia barrier island region: Running out of options. *Journal of Coastal Research.* 17(2): 292-296.

Evans, Joyce, A. Norden, F. Cresswell, K. Insley, and S. Knowles. 1997. Sea Turtle Strandings in Maryland, 1991 through 1995. *The Maryland Naturalist*. 41(1-2): 23-34.

Funderburk, S.L., S.J. Jordan, J.A. Mihursky, and D. Riley. 1991. *Habitat requirements for Chesapeake Bay living resources.* Prepared for Living Resources Subcommittee of Chesapeake Bay Program (CBP). June.

Heck, K.L. and T.A. Thoman. 1984. The Nursery Role of Seagrass Meadows in the Upper and Lower Reaches of Chesapeake Bay. *Estuaries.* Vol. 7. No. 1; pp. 70-92.

Hildebrand , S.F., and W.C. Schroeder. 1928. Fishes of Chesapeake Bay. *U.S. Bur. Fish. Fish. Bull*. 43 (Part I). 366 pp.

Kimmel, T. 2004. Sea Turtle Tagging and Health Assessment Study in Maryland's Chesapeake Bay and Summary of Sea Turtle Strandings in Maryland, 1991 to 2003. Final Report to NMFS, March.

Kirby, R.E. 1988. *American black duck breeding habitat enhancement in the northeasetern United States: A review and synthesis*. U.S. Fish and Wildlife Service, Biol. Rep. 88(4). 40 pp.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. *Waterbird Conservation for the America: the North American Waterbird Conservation Plan, Version 1*. Waterbird Conservation for the Americas, Washington, D.C., 78 pp.

Lewis, J.C.,and R.L. Garrison. 1984. *Habitat suitability index models: American black duck (wintering)*. U.S. Fish and Wildlife Service. FWS/OBS-82/10.68. 16 pp.

Lippson, A.J. 1973. *The Chesapeake Bay in Maryland: An Atlas of Natural Resources*. The John Hopkins University Press. Baltimore, Maryland.

Lippson, A.J., and R.L. Lippson. 1984. *Life in the Chesapeake Bay.* The John Hopkins University Press. Baltimore, Maryland.

Maryland Department of Natural Resources. *1996. Population trends of colonial nesting waterbirds on Maryland's coastal plain*. Final Report.

Murdy, E.O., R.S. Birdsong, and J.A. Musick. 1997. *Fishes of Chesapeake Bay*. Smithsonian Institution Press, Washington D.C.

National Marine Fisheries Service (NMFS). 2005b. *Summary of Essential Fish Habitat (EFH) and General Habitat Parameters for Federally Managed Species*. Northeast Regional Office, Habitat Conservation Division. [Online] http://www.nero.noaa.gov/ro/doc/efhtables.pdf

Newell, R.I.E., and J.A. Ott. 1999. *Macrobenthic communities and eutrophication.* (p. 265-294). In: T.C. Malone, A. Malej, L.W. Harding, Jr., N. Smodlaka, and R.E. Turner (eds.), Ecosystems at the Land-Sea Margin. Coastal and Estuarine Studies, vol. 55. American Geophysical Union, Washington, D.C. 381 p.

Ranasinghe, J.A., S.B. Weisberg, D.M. Dauer, L.C. Schaffner, R.J. Diaz, and J.B. Frithsen. *Chesapeake Bay Benthic Community Restoration Goals.* Prepared for U.S. Environmental Protection Agency, Chesapeake Bay Program Office, Annapolis, MD and The Governor's Council on Chesapeake Bay Research Fund, Chesapeake Bay Research and Monitoring Division, Tidewater Admin., Maryland Dept. of Natural Resources, Annapolis, MD. December.

Rasmussen, W.C and T.H, Slaughter. 1957. *The Water Resources of Caroline, Dorchester, and Talbot Counties.* State of Maryland Department of Geology, Mines, and Water Resources. Bulletin 18.

Reese, J. 2004. *Poplar Island Environmental Restoration Project Preliminary List of Butterflies*. July.

Robbins, C.S., ed. 1996. *Atlas of the Breeding Birds of Maryland and the District of Columbia*. University of Pittsburg Press, Pittsburgh, PA.

Roosenberg, W.M., P.E. Allman, and B.J. Fruh. 2003. Diamondback terrapin nesting on the Poplar Island Restoration Project. *Proceedings of the 13th Biennial Coastal Zone Conference, July 13-17, 2003, Baltimore, MD.*

Roosenburg, W.M., and P.E. Allman. 2002. Terrapin Monitoring at Poplar Island. Final Report submitted to the Army Corps of Engineers.

Roosenburg, W.M., T.A. Razio, and P.E. Allman. 2003. Terrapin Monitoring at Poplar Island. Final Report submitted to the Army Corps of Engineers.

Setzler-Hamilton, E.M. 1987. *Utilization of Chesapeake Bay by early life history stages of fishes.* In: *Contamination Problems and Management of Living Chesapeake Bay Resources* (eds. S.K. Majumdar, L.W. Hall and H.M. Austin). American Association for the Advancement of Science. pp. 64-93

U.S. Fish and Wildlife Service (USFWS). 1980. Habitat Evaluation Procedures: ESM 102. 1980.

Vana-Miller, S.L. 1987. Habitat suitability index models: osprey. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.154). 46 pp.

Virginia Institute of Marine Sciences (VIMS). 2004. Bay Grasses (SAV) in Chesapeake Bay and Delmarva Peninsula Coastal Bays 1994-2003. [Online.] Accessed October 13, 2004 at http://www.vims.edu/bio/sav/ (last updated September 13, 2004).

Weisberg, S.B., J.A. Ranasinghf, D.M. Dauer, L.C. Schaffner, R.J. Diaz, and J.B. Frithsen. 1997. An estuarine benthic index of biotic integrity (B-IBI) for Chesapeake Bay. *Estuaries*. 20(1): 149-158.

Poplar, James, and Barren Island reports:

EA Engineering, Science, and Technology. 2005a. Poplar Island Expansion Study – *Final Supplemental Studies to Evaluate Existing Conditions of Aquatic Resources, Spring 2004 through Fall 2004. Chesapeake Bay, Maryland.* Prepared for USACE-Baltimore District. May.

EA Engineering, Science and Technology (EA). 2004b. *Poplar Island Environmental Restoration Project, Exterior Monitoring: Post-Placement (2002), Benthic and Epibenthic Community Report*. Prepared for Maryland Environmental Service. March.

EA Engineering, Science, and Technology (EA). 2004e. *Poplar Island Environmental Restoration Project. Adaptive Management Plan*. Prepared for USACEBaltimore and Maryland Port Administration. July.

EA Engineering, Science, and Technology (EA). 2003a. *Recreational Fisheries Aerial Surveys: Upper, Mid, and Lower Chesapeake Bay 2000-2001*. February. Draft.

EA Engineering, Science and Technology (EA). 2003c. *Poplar Island Expansion Beneficial Use of Dredged Material, Final Consolidated Reconnaissance Report*. Prepared for Maryland Environmental Service. July.

EA Engineering, Science and Technology (EA). 2002e. *Reconnaissance Study of Poplar Island Sites for Beneficial Use and Habitat Restoration: Environmental Conditions*. Prepared for Maryland Environmental Service. November.

Erwin, R.M. 2004. *Post Phase I Dike Construction Faunal Component Surveys of the Poplar Island Beneficial Use Project. Field Phase: 2004 Assessment of Waterbird Nesting.* USGS Patuxent Wildlife Research Center, Department of Environmental Sciences, Clark Hall, University of Virginia. Charlottesville, VA. 10 November.

Erwin, R.M. 2003. *Poplar Island Baseline Monitoring Program, Final Report, Wetland and Upland Use by Wildlife*. USGS Patuxent Wildlife Research Center, Department of Environmental Sciences, Clark Hall, University of Virginia. Charlottesville, VA. 13 November.

Maryland Environmental Service (MES). 2005b. *Fauna of Poplar Island Environmental Restoration Project*. Monthly Cumulative Fauna Count at Poplar Island. January.

Maryland Environmental Service (MES). 2004b. *Poplar Island Environmental Restoration Project, Habitat Development Framework, Talbot County, MD*. Prepared for Maryland Port Administration. April.

Maryland Environmental Service (MES). 2004c. *Poplar Island Environmental Restoration Project, Bird Monitoring. Annual Report.* October 2003-October2004.

Maryland Environmental Service (MES). 2003a. *Poplar Island Environmental Restoration Project, Bird Monitoring. Annual Report*. October 2002-October 2003.

Maryland Port Administration (MPA). 2002a. Preliminary Assessment of Environmental Conditions on Barren Island, Dorchester County, Maryland. April 2002. Prepared

by Weston Solution, Inc. (Weston).
MPA. 2002b. Final Consolidated Report Reconnaissance of the Proposed Environmental Restoration Project Near Barren Island Dorchester County, Maryland. August 2002. Prepared by Weston.
MPA. 2003a. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Winter 2003 Field Survey. December 2003. Prepared by Blasland, Bouck, & Lee, Inc. (BBL).
MPA. 2003b. Spring 2003 Aquatic Sampling by Pop Net at Barren Island. October 2003. Prepared by Chesapeake Environmental Management, Inc. (CEM).
MPA. 2003c. Spring 2003 Aquatic Sampling by Pop Net at James Island. October 2003. Prepared by CEM.
MPA. 2003d. Final James Island Habitat Restoration Existing Environmental Conditions: Fall 2001 and Summer 2002 Surveys. February 2003. Prepared by EA Engineering, Science, and Technology, Inc. (EA).
MPA. 2003e. Final James Island Habitat Restoration Existing Environmental Conditions: Fall 2002 Survey. May 2003. Prepared by EA.
MPA. 2003f. Final Barren Island Habitat Restoration Existing Environmental Conditions: Summer 2002 Survey. May 2003. Prepared by EA.
MPA. 2003g. Final Barren Island Habitat Restoration Existing Environmental Conditions: Fall 2002 Survey. June 2003. Prepared by EA.
MPA. 2003h. James and Barren Island Fisheries Resources. Bay Enhancement Working Group Meeting. Maryland Port Administration. July 2003. Prepared by University of Maryland Center for Environmental Science (UMCES).
MPA. 2004a. Feasibility-Level Environmental Conditions Studies for a Potential Island Mid-Chesapeake Bay Islands Environmental Restoration Project 20 Supporting Documentation for Island Community Unit Model July 2007 Restoration Project at Barren Island, Dorchester County, MD: Spring 2003 Field Survey. May 2004. Prepared by BBL.
MPA. 2004b. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Final 2003-2004 Supplemental Field Survey Report. October 2004. Prepared by BBL.
MPA. 2004c. Late Season 2003 Aquatic Sampling by Pop Net at Barren Island. February 2004. Prepared by CEM.
MPA. 2004d. Late Season 2003 Aquatic Sampling by Pop Net at James Island. February 2004. Prepared by CEM.
MPA. 2004e. Final James Island Habitat Restoration Existing Environmental Conditions: Winter 2003 Survey. March 2004. Prepared by John E. Harms, Jr. & Associates, Inc. (Harms).
MPA. 2004f. Final James Island Habitat Restoration Existing Environmental Conditions: Spring 2003 Survey. September 2004. Prepared by Harms.
MPA. 2004g. Final James Island Habitat Restoration Existing Environmental Conditions: Supplemental 2003-2004 Survey. September 2004. Prepared by Harms.
MPA. 2005a. Feasibility-Level Environmental Conditions Studies for a Potential Island Restoration Project at Barren Island, Dorchester County, MD: Final Consolidated Report. February 2005. Prepared by Blasland, Bouck, and Lee, Inc. (BBL).

MPA. 2005b. Final James Island Habitat Restoration Existing Environmental Conditions: Consolidated Report. February 2005. Prepared by John E. Harms, Jr. and Associates, Inc. (Harms).

National Oceanic and Atmospheric Administration (NOAA). 2003. *Report on the Pre-Construction Baseline for Cell 4DX: Nekton Surveys of the Poplar Island Beneficial Use Project*. Prepared for USACE-Baltimore District.

National Oceanic and Atmospheric Administration (NOAA). 2001. *Annual Report on the Post-Phase I Nekton Surveys of the Poplar Island Beneficial Use Project*. Prepared for Maryland Environmental Service.

U.S. Fish and Wildlife Service (USFWS). 2004a. *Submerged aquatic vegetation monitoring for the Poplar Island restoration project 2003.* Report CBFO-FA04-01, U.S. Fish and Wildlife Service, Annapolis, Maryland. August.

U.S. Fish and Wildlife Service (USFWS). 2003. *Submerged aquatic vegetation monitoring for the Poplar Island restoration project 2002.* Report CBFO-FA03-01, U.S. Fish and Wildlife Service, Annapolis, Maryland. May.

Additional literature to original model certification reference list:

Beaver, D.L., R.G. Osborn and T.W. Custer. 1980. Nestsite and colony charateristics of wasing birds in selected Atlantic coast colonies. Wilson Bulletin 92: 200-220.

Brinker, David F., Bill Williams, Bryan D. Watts, and R. Michael Erwin. 2007. Colonial nesting seabirds in the Chesapeake region: where have we been and where are we going? *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 93-104.

Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250.

Costanzo, Gary R., and Larry J. Hindman. 2007. Chesapeake Bay Breeding Waterfowl Populations. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 17-24.

Custer, T.W., W.R. Osborn, and W.F. Stout. 1980. Distribution, species abundance, and nesting-size use of Atlantic coast colonies of herons and their allies. Auk. 97: 591-600.

Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58.

Erwin, R. Michael, and C.E. Korschgen. 1979. Coastal waterbird colonies: Maine to Virginia, 1977. An atlas showing colony locations and species composition. U.S. Fish and Wildlife Service, Biological Services Program, FWS/OBS-79/08, Washington, DC.

Erwin, R. Michael, and J.A. Spendelow. 1991. Colonial wading birds: herons and egrets. Pages 19-1 to 19-14 *in* Habitat Requirement for Chesapeake Bay Living Resources, Revised edition (S. Funderburk, S. Jordan, J. Mihursky, and D. Riley, Eds.) Chesapeake Research Consortium, Inc., Solomons, MD.

Erwin, R. Michael, and Ruth A. Beck. 2007. Restoration of waterbird habitats in Chesapeake

Bay: great expections of *Sisyphus* revisited. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 163-176.

Erwin, R. Michael, G. Michael Haramis, Matthew C. Perry, and Bryan D. Watts. 2007. Waterbirds of the Chesapeake Region: An Introduction. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 1-3.

Gibbs, J.P., and L.K. Kinkel. 1997. Determinants of the size and location of Great Blue Heron colonies. Colonial Waterbirds 20:1-7.

Watts, B.D. and M.A. Byrd. 2006. Status and distribution of colonial waterbirds in coastal Virginia: The 2003 breeding season. Raven 77: 3-22.

Williams Bill, David F. Brinker, Bryan D. Watts, and R. Michael Erwin. The status of colonial nesting wading bird populations within the Chesapeake Bay and coastal barrier island lagoon system. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 82-92.

Wilson, Michael D., Bryan D. Watts, David F. Brinker. 2007. Status Review of Chesapeake Bay Marsh Lands and Breeding Marsh Birds. *Journal of the Waterbird Society.* Vol 30. (Special Publication 1): 122-137.

Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.

Response #12

Literature Cited:

Able, K.W., and S.C. Kaiser. 1994. Synthesis of summer flounder habitat parameters. NOAA Coastal Ocean Program. Decision Analysis Series. I. NOAA Coastal Ocean Office, Silver Spring, MD, 68 p.

Response 16:
Excerpts from relevant reports.

Existing Conditions discussion of avian resources from Section 3 of Mid-Bay Islands Integrated Feasibility Report and EIS:

3.1.9.a Avifauna

The Chesapeake Bay provides valuable and diverse habitat for avian species. Seasonal surveys conducted in the Chesapeake Bay have identified five major groups of inhabiting birds—colonial waterbirds, shorebirds and marsh birds, waterfowl, predatory and scavenging birds (raptors), and other land birds.

Six species of colonial nesting waterbirds inhabit the Chesapeake Bay region: great blue heron (*Ardea herodias*), the great egret (*Ardea alba*), the snowy egret (*Egretta thula*), the little blue heron (*Egretta caerulea*), the green-backed heron (*Butorides striatus*), and the night heron (*Nycticorax nycticorax)*. Colonial waterbirds hunt in shallow water habitat, feeding mainly on small fish, amphibians, and arthropods. They nest in tall trees in mainland areas, but can nest on shrubs and even dense grassy vegetation on islands isolated from terrestrial predators. Colonial waterbirds concentrate their reproductive energies in colonies at just a few locations.

Shorebirds, marsh birds, and waterfowl are common residents throughout the Chesapeake Bay. Other common avians are gulls, terns, brown pelicans (*Pelecanus occidentalis*), and the cormorants (*Phalacrocorax* sp.). Wading birds include the sandpipers, sanderlings, willet (*Cataoptrophorus semipalmatus*), black-bellied plover (*Pluvialis squatarola*), dowitchers (*Limnodromus* sp.), and glossy ibis (*Plegadis falcinellus*). Dozens of species of waterfowl (i.e., ducks and geese) inhabit or migrate to the Chesapeake Bay region, including the commonly sighted mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), and red-breasted merganser (*Mergus serrator*) (CBP, 2004j).

The American bald eagle and osprey are the Chesapeake Bay's most familiar raptors. The osprey is tolerant of human activity, and it builds its nests along the shoreline and on navigation markers, utility poles, dead trees, and manmade structures near the water. The American bald eagle nests, roosts, and perches at the top of tall trees in upland areas, often in loblolly pine stands. The trees must be in areas where human activity is limited because bald eagles have little tolerance for human activity.

Land birds include birds typically present in upland habitats in the mid-Atlantic region, such as American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*), blue jay (*Cyanocitta cristata*), and various species of finches and sparrows.

The diversity of avian fauna in the Chesapeake Bay is largely affected by the number of migratory species. The Chesapeake Bay is located along the Atlantic Flyway, a major migration route for neotropical migrants and migrating waterfowl. Waterfowl and other birds migrating along the Flyway find food and shelter in the Chesapeake Bay's many coves and marshes. The Chesapeake Bay also serves as one of the most heavily used wintering areas for waterfowl. On average, nearly a million waterfowl winter each year on the Chesapeake Bay; more than 35 percent of all the waterfowl using the Atlantic Flyway (NPS 2003). Waterfowl staging and concentration areas have been identified in Maryland by MDNR throughout Chesapeake Bay. These areas are typically afforded additional protection from activities that could disrupt waterfowl concentrations. Surveys suggest that unvegetated island habitats are preferentially selected by many migratory bird species because of their relative lack of human disturbance and predators (USACE-Baltimore, 2004c).

Loss of habitat along waterways poses the biggest threat to many bird species in the Chesapeake Bay watershed. Deforestation, shoreline development, and shoreline erosion disrupt nesting activities, and chemical contaminants in the water damage the food source of many Chesapeake Bay birds. The Chesapeake Bay's vast tidal marshlands are important nesting, nursery, and wintering areas for colonial waterbirds, wading birds, and several Federally listed and state-listed endangered species. Rare, threatened, and endangered species found in the Chesapeake Bay are discussed in Section 3.1.9.

One goal of the Chesapeake Bay Program is to restore avian populations in the Chesapeake Bay to levels measured in the 1970s. In order to assess the status of Chesapeake Bay avian fauna, state biologists and USFWS count at least 20 species or species groups of waterfowl each winter in the watershed. Although waterfowl populations are variable because of their migratory nature and the effects of factors outside the basin, these annual counts provide an estimate of trends in Chesapeake Bay waterfowl.

As of September 2004, ten of the 20 monitored waterfowl species have met their goals and are showing improving trends in populations: mallard, gadwall (*Mareca strepera*), American widgeon (*Mareca Americana*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), green-winged teal (*Anas crecca*), scaup (*Aythya affinis*), ring-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola*), and ruddy duck (*Oxyura jamaicensis*). Ten of the 20 monitored waterfowl have not met their goals. Four of these 10 species have shown improving trends (but have not met goals): black duck, redhead, scoters, and Canada goose (migratory). The remaining six species have shown declining trends: canvasback (*Aythya valisineria*), common goldeneye (*Bucephala clangula*), long-tailed duck (*Clangula hyemalis*), mergansers sp., brant (*Branta bernicla*), and tundra swan (*Cygnus columbianus*) (CBP, 2004k).

3.1.6.a.1 James and Barren Avian Surveys

Qualitative and quantitative avian surveys were performed during the four quarters of study at James Island and Barren Island. The qualitative surveys consisted of identifying bird species encountered while conducting the terrestrial portion of each quarterly survey, and noting the habitats in which they occurred. Quantitative bird surveys were conducted as part of the quarterly survey sampling at five locations at James Island and five locations at Barren Island. The quantitative survey methods consisted of observing all avifauna within a 180° arc of a set location for 15 minutes, and noting the species, habitat, and number of individuals observed. Observations were repeated twice at each station. The quantitative surveys provide bird species information primarily from the intersection of the aquatic and terrestrial habitats, which captures shorebirds, wading birds, and waterfowl (MPA, 2005a).

The quantitative surveys at James Island detected 41 different species during all four seasons of surveys. Table 3-37 presents the bird species and number of individuals counted during the James Island timed surveys for each location and season, and also includes a combined total number of individuals. Surf scoter (*Melanitta perspicillata*) (179), bufflehead (*Bucephala albeola*) (177), common grackle (*Quiscalus quiscula*) (58), osprey (*Pandion haliaetus*) (32), and herring gull (*Larus argentatus*) (29) had the highest total number of individuals from all the stations and seasons during the timed surveys (MPA, 2003e; MPA, 2003f; MPA, 2004g; MPA, 2004h). Osprey (10) was the most abundant species detected in the Summer 2002 survey. Brown pelican (*Pelecanus occidentalis*), mute swan (*Cygnus olor*), great blue heron (*Ardea herodias*), great egret (*Ardea albus*), American bald eagle (*Haliaeetus leucocephalus*), Forster's tern (*Sterna forsteri*), pine warbler (*Dendroica pinus*), and red-winged blackbird (*Agelaius phoeniceus*) were observed four or fewer times during the Summer 2002 timed surveys (MPA, 2003e). Bufflehead (76), herring gull (29), and black scoter (*Melinitta nigra*) (17) were most abundant in the Fall 2002 survey (MPA, 2003f). Surf scoter (176), bufflehead (101), common grackle (48), osprey (12), ring-billed gull (*Larus delawarensis*) (12), and sanderling (*Calidris alba*) (12) were the most abundant during Winter 2003 (MPA, 2004g). No bird species was observed

more than nine times during the Spring 2003 timed surveys; osprey (9) and common grackle (7) had the highest number of observations during this survey (MPA, 2004h).

The qualitative bird surveys at James Island detected a total of 71 different species during all quarterly surveys. Table 3-38 lists the species observed and the season in which they were observed at James Island. Double crested cormorant (*Phalacrocorax auritus*), mute swan, Canada goose (*Branta canadensis)*, osprey, American bald eagle, American crow (*Corvus brachyrhynchos*), and Carolina chickadee (*Poecile carolinensis*) were observed in all four seasons at James Island. MPA (2004h) notes that osprey, northern cardinal, Eastern kingbird (*Tyrannus tyrannus*), northern flicker (*Colaptes auratus*), and red-winged blackbird were nesting on James Island during Spring 2003.

James Island is located within a MDNR Sensitive Species Project Review Area noted to feature waterfowl, wading bird, and shorebird use (MDNR, 2004e). Waterfowl such as scoters, mallards, geese, and swan were documented utilizing James Island during the environmental surveys; and shorebirds such as terns, sandpipers, and yellowlegs were documented on James Island during one or more quarters of study (MPA, 2003e; MPA, 2003f; MPA, 2004g; MPA, 2004h). The island is less than one mile north of an area known as a colonial waterbird nesting site (MPA, 2003i), and the quarterly survey results document green heron (*Butorides virescen*s), great egret, great blue heron, brown pelican and cormorant on James Island. Section 3.1.10 details the State and Federally listed rare, threatened, and endangered species observed at James Island.

The quantitative avian surveys at Barren Island detected a total of 45 different bird species during four seasons of surveys. Table 3-39 presents the bird species and number of individuals counted during the Barren Island timed surveys for each location and season, and also includes a combined total number of individuals. Mute swan (531), brown pelican (309), double crested cormorant (170), turkey vulture (*Cathartes aura*) (136), and great black-backed gull (*Larus marinus*) (127) had the highest count of individuals as a combined total over all the stations and seasons during the timed surveys. Mute swan (110), double crested cormorant (30) and herring gull (36) were the most abundant species detected in the Summer 2002 survey. Mute swan (356), brown pelican (293), double crested cormorant (79), turkey vulture (136), and great black-backed gull (114) were most abundant in the Fall 2002 survey. Mute swan (60) followed by semi-palmated sandpipers (15), great blue heron (12), and herring gull (10) were the most abundant during Winter 2003. The combined seasonal and sampling location totals of great blue heron and great egret individuals were 70 and 74 respectively; these species were detected in the greatest numbers (55 and 70, respectively) during the Spring 2003 survey (MPA, 2005a).

The qualitative bird surveys at Barren Island detected a total of 107 different species during all four seasons of sampling. Table 3-40 lists the species observed at Barren Island, the season and habitat they were observed in, and their probable residency status. Mute swan, herring gull, great blue heron, American bald eagle, northern cardinal, American crow, Carolina chickadee, Carolina wren (*Thryothorus ludovicianus*), and double-crested cormorant were observed during all four seasons of Barren Island surveys, and are believed to be resident species. Migrant species observed include tundra swan (*Cygnus columbianus*), bufflehead, scoter species, ruby throated hummingbird (*Archilocus colubris*), sanderlings, sandpipers, plovers, gulls, terns, yellowlegs, sharp-shinned hawk, northern harrier, loons, thrushes, warblers, kinglets, and wrens (MPA, 2005a). Bird species diversity and abundance were highest at quantitative sampling stations that consisted of shallow, sheltered, aquatic ecosystems. The presence of the Barren Island remnants appear to be partially responsible for maintenance of the sheltered shallow water habitat, and it is expected that the avian utilization of these habitats would be affected as Barren Island continues to erode (MPA, 2005a).

Barren Island is located within a MDNR Sensitive Species Project Review Area noted to feature colonial water bird nesting. Two colonial water bird nesting sites are noted on the southern remnant (MDNR, 2004e; MPA, 2005a). Brown pelican, double crested cormorant, and herring gull were

observed nesting on a small remnant islet just south of the main southern remnant. During the Winter 2003 survey, great blue heron nesting activity was noted in the forested areas of the southern remnant (MPA, 2005a). State and Federally listed rare, threatened, and endangered species observed at Barren Island are discussed in Section 3.1.10a.

A letter received from MDNR (Byrne, 2004; Appendix G) mentions historic waterfowl concentration and staging areas known to occur along the open water that is part of or adjacent to the shorelines of both James and Barren Islands. Additionally, Barren Island supports a breeding colony of waterbirds.

Additional information on RTE from the Mid-Bay Integrated Feasibility Study and EIS-
The only Federally listed avian RTE species identified in recent years at James and Barren was the American bald eagle. Additional state listed avian RTE species at James Island include sharp-shinned hawk (highly state rare to rare for breeding); spotted sandpiper (state rare on watch list for breeding); northern harrier, golden-crowned kinglet, and dark-eyed junco (state rare for breeding); laughing gull, brown pelican, and double-crested cormorant (highly state rare for breeding); yellow-billed sapsucker (historically from State for breeding); least tern (state rare for breeding/threatened); and royal tern (highly state rare for breeding/endangered). State listed avian species identified at Barren Island include sharp-shinned hawk (highly state rare to rare for breeding); northern harrier, golden-crowned kinglet, gadwall, winter wren, and dark-eyed junco (state rare for breeding); laughing gull, brown pelican, and double-crested cormorant (highly state rare for breeding); saltmarsh sharp-tailed sparrow and American oystercatcher (watch list- rare to uncommon for breeding); American bittern (highly state rare to rare for breeding/in need of conservation); hermit thrush, black-throated blue warbler, and magnolia warbler (watch list-rare to uncommon to apparently secure for breeding); Wilson's plover (highly state rare for breeding/endangered); Swainson's thrush (believed extirpated in state for breeding); sedge wren (highly state rare for breedng/endangered); peregrine falcon (state rare/in need of conservation); and royal tern (highly state rare for breeding/endangered).

Table 3-37: Results of James Island Timed Avian Surveys

Avian Station Location		B-1					B-2				
Common Name	**Scientific Name**	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003
Common Loon	*Gavia immer*	1		1			0				
Horned Grebe	*Podiceps auritus*	0					1		1		
Brown Pelican	*Pelecanus occidentalis*	6	3	3			0				
Great Blue Heron	*Ardea herodias*	0					3	1		1	1
Great Egret	*Ardea alba*	1	1				0				
Double-Crested Cormorant	*Phalacrocorax auritus*	1		1			0				
Mallard	*Anus platyrhynchos*	0					3				3
Mute Swan	*Cygnus olor*	2				2	2			2	
Canada Goose	*Branta canadensis*	0					2			2	
Surf Scoter	*Melanitta perspicillata*	3		3			0				
Black Scoter	*Melanitta nigra*	8		8			1		1		
White Winged Scoter	*Melanitta fusca*	0					2			2	
Bufflehead	*Bucephala albicollis*	16			16		63		28	35	
Long Tailed Duck	*Clangula hyemalis*	2			2		1			1	
Bald Eagle	*Haliaeetus leucocephalus*	3	1	1	1		1				1
Osprey	*Pandion haliaetus*	9	3		4	2	8	3		3	2
Sharp-Shinned Hawk	*Accipiter striatus*	1			1		0				
Laughing Gull	*Larus atricilla*	0					0				
Great Black-Backed Gull	*Larus marinus*	1		1			3		1	2	
Herring Gull	*Larus argentatus*	13		13			1		1		
Ring-Billed Gull	*Larus delawarensis*	1			1		5			5	
Sanderling	*Calidris alba*	0					12			12	
Royal Tern	*Sterna maxima*	2		2			0				
Common Tern	*Sterna hirundo*	0					0				
Forster's Tern	*Sterna forsteri*	1				1	0				
Spotted Sandpiper	*Actitis macularia*	0					1				1
Brown Creeper	*Certhia americana*	1		1			0				
American Crow	*Corvus brachyrhynchos*	2	1		1		3	1		2	
Tree Swallow	*Tachycineta bicolor*	4				4	1				1
Barn Swallow	*Hirundo rustica*	2				2	0				
Carolina Chickadee	*Poecile carolinensis*	1	1				0				
Brown Headed Cowbird	*Moluthrus ater*	0					0				
Eastern Bluebird	*Sialis sialis*	1			1		0				
Eastern Kingbird	*Tyrannus tyrannus*	1				1	0				
American Robin	*Turdus migratorius*	0					0				
Pine Warbler	*endroica pinus*	5	2		3		0				
Northern Cardinal	*Cardinalis cardinalis*	1	1				0				
Red-Winged Blackbird	*Agelaius phoeniceus*	0					1	1			
Common Grackle	*Quiscalus quiscula*	2				2	54	2		48	4
European Starling	*Sturnus vulgaris*	1				1	0				
Northern Flicker	*Colaptes auratus*	1			1		1		1		
TOTALS		**93**	**13**	**34**	**31**	**15**	**169**	**8**	**33**	**115**	**13**

Table 3-37: Continued.

Avian Station Location		B-3					B-4				
Common Name	**Scientific Name**	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003
Common Loon	*Gavia immer*	0					0				
Horned Grebe	*Podiceps auritus*	0					1			1	
Brown Pelican	*Pelecanus occidentalis*	0					3		3		
Great Blue Heron	*Ardea herodias*	0					0				
Great Egret	*Ardea alba*	0					0				
Double-Crested Cormorant	*Phalacrocorax auritus*	0					0				
Mallard	*Anus platyrhynchos*	0					0				
Mute Swan	*Cygnus olor*	4	2			2	0				
Canada Goose	*Branta canadensis*	4			4		0				
Surf Scoter	*Melanitta perspicillata*	18			18		1			1	
Black Scoter	*Melanitta nigra*	0					2		2		
White Winged Scoter	*Melanitta fusca*	0					0				
Bufflehead	*Bucephala albicollis*	48		8	40		49		40	9	
Long Tailed Duck	*Clangula hyemalis*	0					4			4	
Bald Eagle	*Haliaeetus leucocephalus*	2	1	1			2		2		
Osprey	*Pandion haliaetus*	8	3		5		5				5
Sharp-Shinned Hawk	*Accipiter striatus*	0					0				
Laughing Gull	*Larus atricilla*	0					1	1			
Great Black-Backed Gull	*Larus marinus*	1		1			2	1	1		
Herring Gull	*Larus argentatus*	3		3			3		3		
Ring-Billed Gull	*Larus delawarensis*	4			4		0				
Sanderling	*Calidris alba*	0					0				
Royal Tern	*Sterna maxima*	2		2			0				
Common Tern	*Sterna hirundo*	2	1		1		0				
Forster's Tern	*Sterna forsteri*	0					2	2			
Spotted Sandpiper	*Actitis macularia*	0					2				2
Brown Creeper	*Certhia americana*	0					0				
American Crow	*Corvus brachyrhynchos*	0					0				
Tree Swallow	*Tachycineta bicolor*	0					0				
Barn Swallow	*Hirundo rustica*	3	1			2	2				2
Carolina Chickadee	*Poecile carolinensis*	0					0				
Brown Headed Cowbird	*Moluthrus ater*	1			1		0				
Eastern Bluebird	*Sialis sialis*	1	1				0				
Eastern Kingbird	*Tyrannus tyrannus*	0					3				3
American Robin	*Turdus migratorius*	0					0				
Pine Warbler	*Dendroica pinus*	0					0				
Northern Cardinal	*Cardinalis cardinalis*	0					0				
Red-winged Blackbird	*Agelaius phoeniceus*	3	3				0				
Common Grackle	*Quiscalus quiscula*	1	1				0				
European Starling	*Sturnus vulgaris*	0					0				
Northern Flicker	*Colaptes auratus*	0					1			1	
TOTALS		**105**	**13**	**15**	**73**	**4**	**83**	**4**	**51**	**16**	**12**

Table 3-37: Continued.

Avian Station Location		B-5					Combined Locations				
Common Name	**Scientific Name**	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003	Total	Summer 2002	Fall 2002	Winter 2003	Spring 2003
Common Loon	*Gavia immer*						1		1		
Horned Grebe	*Podiceps auritus*						2		1	1	
Brown Pelican	*Pelecanus occidentalis*						9	3	6		
Great Blue Heron	*Ardea herodias*						3	1		1	1
Great Egret	*Ardea alba*						1	1			
Double-Crested Cormorant	*Phalacrocorax auritus*						1		1		
Mallard	*Anus platyrhynchos*						3				3
Mute Swan	*Cygnus olor*						8	2		2	4
Canada Goose	*Branta canadensis*						6			6	
Surf Scoter	*Melanitta perspicillata*	157			157		179		3	176	
Black Scoter	*Melanitta nigra*	6		6			17		17		
White Winged Scoter	*Melanitta fusca*						2			2	
Bufflehead	*Bucephala albicollis*	1			1		177		76	101	
Long Tailed Duck	*Clangula hyemalis*	2			2		9			9	
Bald Eagle	*Haliaeetus leucocephalus*	2				2	10	2	4	1	3
Osprey	*Pandion haliaetus*	2	1	1			32	10	1	12	9
Sharp-Shinned Hawk	*Accipiter striatus*						1			1	
Laughing Gull	*Larus atricilla*						1	1			
Great Black Backed Gull	*Larus marinus*	1		1			8	1	5	2	
Herring Gull	*Larus argentatus*	9		9			29		29		
Ring-billed Gull	*Larus delawarensis*	2			2		12			12	
Sanderling	*Calidris alba*						12			12	
Royal Tern	*Sterna maxima*	2		2			6		6	0	
Common Tern	*Sterna hirundo*						2	1		1	
Forster's Tern	*Sterna forsteri*						3	2			1
Spotted Sandpiper	*Actitis macularia*						3				3
Brown Creeper	*Certhia americana*						1		1		
American Crow	*Corvus brachyrhynchos*						5	2		3	
Tree Swallow	*Tachycineta bicolor*						5				5
Barn Swallow	*Hirundo rustica*						7	1			6
Carolina Chickadee	*Poecile carolinensis*						1	1			
Brown Headed Cowbird	*Moluthrus ater*	1			1		2			2	
Eastern Bluebird	*Sialis sialis*						2	1		1	
Eastern Kingbird	*Tyrannus tyrannus*						4				4
American Robin	*Turdus migratorius*	2			2		2			2	
Pine Warbler	*Dendroica pinus*	1	1				6	3		3	
Northern Cardinal	*Cardinalis cardinalis*						1	1			
Red-Winged Blackbird	*Agelaius phoeniceus*						4	4			
Common Grackle	*Quiscalus quiscula*	1				1	58	3		48	7
European Starling	*Sturnus vulgaris*						1				1
Northern Flicker	*Colaptes auratus*	2			2		5		1	4	
TOTALS		**191**	**2**	**19**	**167**	**3**	**641**	**40**	**152**	**402**	**47**

Table 3-38: Bird Species Observed during Site Visits to James Island

Common Name	Scientific Name	Season and Number Observed			
		Summer 2002	Fall 2002	Winter 2003	Spring 2003
Common Loon	*Gavia immer*		X		X
Horned Grebe	*Podiceps auritus*		X	X	
Brown Pelican	*Pelecanus occidentalis*	X	X		X
Double-Crested Cormorant	*Phalacrocorax auritus*	X	X	X	X
Green Heron	*Butorides virescens*	X			
Great Egret	*Ardea alba*	X			
Great Blue Heron	*Ardea herodias*	X		X	X
Mute Swan	*Cygnus olor*	X	X	X	X
Snow Goose	*Chen caerulescens*				X
Canada Goose	*Branta canadensis*	X	X	X	X
Mallard	*Anas platyrhynchos*				X
Black Scoter	*Melanitta nigra*		X		
White-Winged Scoter	*Melanitta fusca*		X	X	
Surf Scoter	*Melanitta perspicillata*		X	X	X
Long-Tailed Duck	*Clangula hyemalis*			X	
Bufflehead	*Bucephala albeola*		X	X	X
Red-Breasted Merganser	*Mergus serrator*		X		
Turkey Vulture	*Cathartes aura*		X		
Osprey	*Pandion haliaetus*	X	X	X	X
Bald Eagle	*Haliaeetus leucocephalus*	X	X	X	X
Sharp-Shinned Hawk	*Accipiter striatus*		X	X	
American Kestrel	*Falco sparverius*			X	
Semi-Palmated Plover	*Charadrius semipalmatus*				X
Killdeer	*Charadrius vociferus*	X	X		
Greater Yellowlegs	*Tringa melanolueca*				X
Spotted Sandpiper	*Actitis macularia*				X
Ruddy Turnstone	*Arenaria interpres*				X
Sanderling	*Calidris alba*			X	
Dunlin	*Calidris alpina*				X
Least Sandpiper	*Calidris minutilla*				X
Laughing Gull	*Larus atricilla*	X			X
Ring-billed Gull	*Larus delawarensis*			X	X
Herring Gull	*Larus argentatus*		X		X
Great Black-Backed Gull	*Larus marinus*	X	X	X	
Royal Tern	*Sterna maxima*		X		X
Forster's Tern	*Sterna forsteri*	X	X		X
Common Tern	*Sterna hirundo*	X		X	X
Least Tern	*Sterna antillarum*				
Mourning Dove	*Zenaida macroura*			X	
Barred Owl	*Strix varia*				X
Northern Flicker	*Colaptes auratus*		X	X	X
Downy Woodpecker	*Picoides pubescens*		X		
Hairy Woodpecker	*Picoides villosus*		X		
Eastern Phoebe	*Sayornis phoebe*		X	X	

Table 3-38: Continued.

Eastern Kingbird	*Tyrannus tyrannus*	**X**			**X**
Blue Jay	*Cyanocitta cristata*		**X**		**X**
American Crow	*Corvus brachyrhynchos*	**X**	**X**	**X**	**X**
Tree Swallow	*Tachycineta bicolor*				**X**
Northern Rough-Winged Swallow	*Stelgidopterix serripennis*				**X**
Barn Swallow	*Hirundo rustica*	**X**			**X**
Tufted Titmouse	*Baeolophus bicolor*		**X**		
Carolina Chickadee	*Poecile carolinensis*	**X**	**X**	**X**	**X**
Brown Creeper	*Certhia americana*		**X**	**X**	
House Wren	*Troglodytes aedon*				**X**
Carolina Wren	*Thryothorus ludovicianus*	**X**		**X**	
Golden-Crowned Kinglet	*Regulus satrapa*			**X**	
Eastern Bluebird	*Sialia sialis*	**X**		**X**	**X**
American Robin	*Turdus migratorius*			**X**	
Gray Catbird	*Dumetella carolinensis*				**X**
European Starling	*Sturnus vulgaris*				**X**
Yellow-Rumped Warbler	*Dendroica coronata*			**X**	
Pine Warbler	*Dendroica pinus*	**X**		**X**	**X**
Yellow Warbler	*Dendroica petechia*				**X**
Louisiana Waterthrush	*Seiurus motacilla*			**X**	
Song Sparrow	*Melospiza melodia*			**X**	
Swamp Sparrow	*Melospiza georgiana*			**X**	
Northern Cardinal	*Cardinalis cardinalis*			**X**	**X**
Red-Winged Blackbird	*Agelaius phoeniceus*				**X**
Common Grackle	*Quiscalus quiscula*			**X**	**X**
Brown-Headed Cowbird	*Molothrus ater*			**X**	**X**
American Goldfinch	*Carduelis tristis*				**X**
TOTAL NUMBER OF SPECIES	**72**	**21**	**29**	**35**	**44**

Table 3-39: Results of the Barren Island Avian Quantitative Surveys (MPA, 2005a)

Avian Location	A-1					A-2				
Year	Total	2002		2003		Total	2002		2003	
Common Name **Season**		Summer	Fall	Winter	Spring		Summer	Fall	Winter	Spring
American Goldfinch	**2**		2							
American Crow										
Bald Eagle	**1**	1				**3**	1	2		
Barn Swallow										
Boat Tail Grackle										
Brown Pelican	**14**		14			**20**		17		3
Bufflehead	**17**		17			**7**		7		
Canada Goose	**3**		3							
Carolina Chickadee										
Carolina Wren						**1**		1		
Common Egret										
Common Grackle										
Common Loon	**4**		3	1		**2**		2		
Common Tern	**10**				10	**1**				1
Double Crested Cormorant	**22**	4			18	**15**	11			4
Downy Woodpecker						**1**		1		
Dunlin										
Fish Crow						**1**				1
Forster's Tern	**2**	1			1	**2**	1			1
Gadwall										
Golden Crowned Kinglet										
Great Black Backed Gull	**2**		2			**7**	1	4	2	
Great Blue Heron	**2**		1		1	**9**				9
Great Egret						**2**	1			1
Herring Gull	**9**	9				**26**	11	8	4	3
Laughing Gull	**1**	1								
Mute Swan	**2**				2					
Northern Cardinal										
Northern Gannet	**5**		5							
Oldsquaw	**1**			1						
Osprey						**3**				3
Peregrine Falcon						**1**	1			
Red-Throated Loon	**1**		1							
Ring-Billed Gull										
Red-Winged Blackbird										
Royal Tern	**1**				1					
Semipalmated Sandpipers										
Surf Scoter										
Tree Swallow						**2**				2
Tundra Swan										
Turkey Vulture										
Willet										
Winter Wren										
Yellow-Rumped (Myrtle) Warbler										
Yellow-Shafted Flicker						**2**				2
Unidentified ducks	**20**		20							
Unidentified shorebirds										
Species Count	**17**	5	10	2	6	**17**	7	8	2	11
TOTAL	**119**	16	68	2	33	**105**	27	42	6	30

Table 3-39: Continued.

Avian Location	A-3					A-4				
Year	Total	2002		2003		Total	2002		2003	
Common Name Season		Summer	Fall	Winter	Spring		Summer	Fall	Winter	Spring
American Goldfinch										
American Crow						**3**			2	1
Bald Eagle	**5**	2		2	1	**2**	1	1		
Barn Swallow						**1**				1
Boat Tail Grackle						**2**				2
Brown Pelican	**274**	4	262		8					
Bufflehead	**14**		14			**5**		5		
Canada Goose						**11**		11		
Carolina Chickadee						**1**			1	
Carolina Wren						**3**	1		2	
Common Egret										
Common Grackle	**4**				4					
Common Loon	**2**		1	1						
Common Tern	**5**				5					
Double Crested Cormorant	**118**	3	77	2	36	**4**	1	2		1
Downy Woodpecker						**1**	1			
Dunlin										
Fish Crow						**1**				1
Forster's Tern	**8**		8			**2**	2			
Gadwall										
Golden Crowned Kinglet						**1**		1		
Great Black Backed Gull	**10**	1	9			**15**	9	6		
Great Blue Heron	**14**			6	8	**34**			6	28
Great Egret						**58**	1			57
Herring Gull	**9**	7		1	1	**11**	9			2
Laughing Gull						**1**	1			
Mute Swan						**377**	106	270		1
Northern Cardinal						**1**			1	
Northern Gannet										
Oldsquaw										
Osprey	**1**				1	**2**				2
Peregrine Falcon										
Red-Throated Loon										
Ring-Billed Gull										
Red-Winged Blackbird										
Royal Tern	**1**				1	**3**	3			
Semipalmated Sandpipers										
Surf Scoter	**7**		7							
Tree Swallow	**2**				2					
Tundra Swan	**7**		7							
Turkey Vulture						**100**		100		
Willet						**2**			2	
Winter Wren						**1**		1		
Yellow-Rumped (Myrtle) Warbler						**1**		1		
Yellow-Shafted Flicker										
Unidentified ducks						**5**	5			
Unidentified shorebirds										
Species Count	**15**	5	8	5	10	**26**	12	10	6	10
	481	17	385	12	67	**648**	140	398	14	96

Table 3-39: Continued.

Avian Location	A-5					Combined Locations				
Year	Total	2002		2003		Total	2002		2003	
Common Name Season		Summer	Fall	Winter	Spring		Summer	Fall	Winter	Spring
American Goldfinch						**2**		2		
American Crow	**10**	7			3	**13**	7		2	4
Bald Eagle	**2**		2			**13**	5	5	2	1
Barn Swallow						**1**				1
Boat Tail Grackle	**10**				10	**12**				12
Brown Pelican	**1**					**309**	5	293		11
Bufflehead	**3**		3			**46**		46		
Canada Goose	**2**		2			**16**		16		
Carolina Chickadee						**1**			1	
Carolina Wren						**4**	1	1	2	
Common Egret	**3**				3	**3**				3
Common Grackle	**14**				14	**18**				18
Common Loon						**8**		6	2	
Common Tern						**16**				16
Double Crested Cormorant	**11**	11				**170**	30	79	2	59
Downy Woodpecker						**2**	1	1		
Dunlin	**5**			5		**5**			5	
Fish Crow	**4**				4	**6**				6
Forster's Tern	**5**	1	4			**19**	5	12		2
Gadwall	**2**		2			**2**		2		
Golden Crowned Kinglet						**1**		1		
Great Black Backed Gull	**93**		93			**127**	11	114	2	
Great Blue Heron	**11**	1	1		9	**70**	1	2	12	55
Great Egret	**14**	2			12	**74**	4			70
Herring Gull	**21**		16	5		**76**	36	24	10	6
Laughing Gull	**2**	2				**4**	4			
Mute Swan	**152**	4	86	60	2	**531**	110	356	60	5
Northern Cardinal						**1**			1	
Northern Gannet						**5**		5		
Oldsquaw						**1**			1	
Osprey	**2**				2	**8**				8
Peregrine Falcon						**1**	1			
Red-Throated Loon						**1**		1		
Ring-Billed Gull	**1**			1		**1**			1	
Red-Winged Blackbird	**10**				10	**10**				10
Royal Tern	**1**	1				**6**	4			2
Semipalmated Sandpipers	**15**			15		**15**			15	
Surf Scoter						**7**		7		
Tree Swallow	**3**				3	**7**				7
Tundra Swan	**5**		5			**12**		12		
Turkey Vulture	**36**		36			**136**		136		
Willet						**2**			2	
Winter Wren						**1**		1		
Yellow-Rumped (Myrtle) Warbler						**1**		1		
Yellow-Shafted Flicker						**2**				2
Unidentified ducks						**25**	5	20		
Unidentified shorebirds	**6**		6			**6**		6		
Species Count	**27**	9	11	5	11	**45**	16	23	16	20
TOTAL	**444**	30	256	86	72	**1,797**	230	1,149	120	298

Table 3-40: All Bird Species Observed at Barren Island. (MPA, 2005a)

Order	Common Name	Scientific Name	Status	Habitat	Summer 2002	Fall 2002	Winter 2003	Spring 2003
Anseriforms	Mallard	hos	R	O,S,FW			X	X
	American Black Duck	*Anas rubripes*	WR,R?	O,M		X		
	Gadwall	*Anas streptera*	WR?	O		X		
	Canada Goose	*Branta Canadensis*	WR,R?	O		X		
	Bufflehead	*Bucephala albeola*	WR,M	O		X		
	Oldsquaw	*Clangula hyemalls*	WR,M, R*	O,FO		X	X	X
	Tundra Swan	*Cyngus columblanus*	WR,M	O		X		
	Mute Swan	*Cyngus olor*	R	O	X	X	X	X
	Black Scoter	*Melanitta nigra*	WR,M	O		X		
	Surf Scoter	*Melanitta perspicillata*	WR,M	O		X	X	
Apodiformes	Ruby Throated Hummingbird	*Archilochus colubris*	M	F	X			
Charadriformes	Sandering	*Caildris alba*	M	SH	X	X		
	Dunlin	*Caildris alpina*	W,M	MF			X	
	Western Sandpiper	*Caildris mauri*	M	SH	X			
	Least Sandpiper	*Caildris minutilla*	M	SH	X			
	Semi-Palmated Sandpiper	*Caildris pusilla*	M	SH,MF	X		X	
	Willet	*Catoptrophorus semipalmatus*	R	MF,SH, FO			X	X
	Semi-Palmated Plover	*Charadrius semmipalmatus*	M	SH	X			
	Wilson's Plover	*Charadrius wilsonia*	M	SH	X			
	American Oystercatcher	*Haematopus pallatus*	R	SH,MF				X
	Herring Gull	*Larus argentatus*	R	S,MF,SH	X	X	X	X
	Laughing Gull	*Larus atricilla*	R	SH,O	X		X	
	Ring-Billed Gull	*Larus delawarensis*	W,M	O,FO			X	
	Great Black-Backed Gull	*Larus marinus*	R	SH,O,FO	X	X	X	
	Black-Bellied Plover	*Pluvialis squatarola*	M	SH	X			
	Caspian Tern	*Sterna caspia*	SR/M	SH,O	X			
	Forster's Tern	*Sterna fosteri*	SR/R	SH,O	X	X		X
	Common Tern	*Sterna hirundo*	S	O,SH				X
	Royal Tern	*Sterna maxima*	SR	S,FW,SH,O	X			X
	Lesser Yellowlegs	*Tringa flavipes*	M	SH	X			
	Greater Yellowlegs	*Tringa melanoleuca*	M	SH	X			
Clconiformes	Great Egret	*Ardea albus*	R	SH,MF,S	X			X
	Great Blue Heron	*Ardea herodias*	R	F,S,MF,SH	X	X	X	X
	American Bittern	*Botaurus lentiginosus*	WR,R?	M		X		
	Green Heron	*Butorides virescens*	S,R?	SH,FW	X			X
	Turkey Vulture	*Cathartes aura*	SR/R	FO	X	X		
	Snowy Egret	*Egretta thula*	R	S,FW,SH	X			X

Table 3-40: Continued.

Order	Common Name	Scientific Name	Status	Habitat	Summer 2002	Fall 2002	Winter 2003	Spring 2003
Coraciformes	Belted Kingfisher	*Ceryle alcyon*	R?,M?	M		X		
Cucuiformes	Yellow-Billed Cukoo	*Coccyzus americanus*	S	F				X
Falconiformes	Sharp-Shinned Hawk	*Accipiter striatus*	R/M	F,FO	X			
Falconiformes	Northern Harrier	*Circus cyaneus*	WR,M	M		X		
	Peregrine Falcon	*Falco peregrinus*	M	SH,FO	X			
	Bald Eagle	*Halliaeetus leucocephalus*	R	SH,F,FO	X	X	X	X
	Osprey	*Pandlon hallaetus*	R	SH,F,FO	X		X	X
Gaviformes	Common Loon	*Gavia immer*	WR,M	O		X	X	
	Red-Throated Loon	*Gavia stellata*	WR,M	O		X		
Gruiformes	Clapper Rail	*Rallus longirostris*	R	SH				X
Passeriformes	Red Winged Blackbird	*Agelaius phoeniceus*	R	FW,SH,F			X	X
	Saltmarsh Sharp-Tailed Sparrow	*Ammodramus caudacutus*	R	S			X	
	Seaside Sparrow	*Ammodramus maritimus*	R	M,S	X		X	
	Northern Cardinal	*Cardinalis cardinalis*	R	F	X	X	X	X
	American Goldfinch	*Carduelis tristis*	R	FO,F		X	X	X
	Veery	*Catharus fuscescens*	M	F	X			
	Hermit Thrush	*Catharus guttatus*	M	F	X			
	Swainsons Thrush	*Catharus ustulatus*	M	F	X			
	Sedge Wren	*Cistothorus platensis*	W	FW				X
	American Crow	*Corvus brachyrhynchos*	R	F,SH,FO	X	X	X	X
	Fish Crow	*Corvus ossifragus*	R	S,F,FW				X
	Black Throated Blue Warbler	*Dendroica caerulescens*	M	F	X			
	Yellow-Rumped Warbler	*Dendroica coronata*	WR,M,	F		X		X
	Magnolia Warbler	*Dendroica magnolia*	M	F	X			
	Yellow Warbler	*Dendroica petechia*	SR/M	F,S,FW	X			X
	Pine Warbler	*Dendroica pinus*	SR/R	F	X			
	Gray Catbird	*Dumetella carolinensis*	R	F	X			X
	Acadian Flycatcher	*Empidonax virescens*	SR/M	F	X			
	Common Yellowthroat	*Geothlypis trichus*	SR/R	M,SH,F	X			X
	Barn Swallow	*Hirundo rustica*	SR/M	O,SH,FW	X			X
	Wood Thrush	*Hylocichla mustelina*	M	F	X			
	Yellow-Breasted Chat	*Icteria virens*	M	F	X			
	Dark-Eyed Junco	*Junco hyemalis*	WR,M	M,F		X	X	
	Swamp Sparrow	*Melospiza georgianna*	WR,M	F		X		
	Song Sparrow	*Melospiza melodia*	R?, WR	F		X		
	Northern Mockingbird	*Mimus polyglottos*	R	F				X

Table 3-40: Continued.

Order	Common Name	Scientific Name	Status	Habitat	Summer 2002	Fall 2002	Winter 2003	Spring 2003
	Black-And-White Warbler	*Mniotilta varia*	M	F	X			
	Tufted Titmouse	*Parus bicolor*	R	F			X	X
	Fox Sparrow	*Passerella iliaca*	WR,M	F		X		
	Eastern Towhee	*Pipilo erythrophthalmus*	R	F				X
	Carolina Chickadee	*Poecile carolinensis*	R	F	X	X	X	X
	Blue-Gray Gnatcatcher	*Polioptila caerulea*	SR/M	F	X			X
	Boat-Tailed Grackle	*Quiscalus major*	R	F,S,SH	X		X	X
	Common Grackle	*Quiscalus quiscula*	R	SH,F				X
	Ruby-Crowned Kinglet	*Regulus calendula*	WR,M	F		X		
	Golden-Crowned Kinglet	*Regulus satrapa*	WR,M	F		X		
	Eastern Phoebe	*Sayornis phoebe*	SR/M	F	X			
	Ovenbird	*Seiurus aurocapillus*	M	F	X			
	Louisiana Waterthrush	*Seiurus motacilla*	M	F	X			
	American Redstart	*Setophaga ruticilla*	M,S	F	X			X
	Eastern Bluebird	*Sialis sialis*	R	F		X		

Notes:
Status/Habitat Key:
M = migrant; R = year-round resident; S = summer resident; W = winter resident; ? = uncertain classification;
F=Forest; S=Salt Marsh; FW=Freshwater Marsh; M = Marsh; O=Open Water; FO=Fly Over; MF=Mud Flat;
SH=Shore.
* – injured wing

From the 2006-2007 annual bird monitoring report for Poplar Island:

Bird monitoring at PIERP the past year continues to find occurrence of new, unusual or rare species and/or numbers at the site. Highlights of south transients in 2006 include Hudsonian Godwit on 5 October; Pied-billed Grebe, late Short-billed Dowitcher, Western Sandpiper, the first project site Redhead, Ruby-crowned Kinglet and Chipping Sparrow on 19 October; late Baird's Sandpiper and Snow Bunting on 31 October; while a Cooper's Hawk on 15 November, and Snow Goose and Golden-crowned Kinglet on 27 November are new species for the site. A total 194 American Black Duck and 873 Mallard on 27 November are noteworthy.

Wintering species of interest include on 29 December an American Coot a new species for the project site, and on 12 January Red-throated Loon, Northern Gannet, Brown Pelican, Double-crested Cormorant, 113 Gadwall, 283 Greater Scaup, Black-bellied Plover, and Belted Kingfisher.

North transient highlights include American Widgeon, Canvasback, Red-tailed Hawk and Horned Lark on 1 March; Common Snipe and Boat-tailed Grackle new for the project site plus Great Egret and Dark-eyed Junco on 14 March; 64 Horned Grebe, 300 Mallard and 28 Bonaparte's Gull on 28 March; Virginia Rail on 23 April; Cooper's Hawk and Blue-winged Teal on 2 May; Wilson's Phalarope and late Purple Sandpiper on 15 May; late White-rumped Sandpiper on 31 May; and very late Black-bellied Plover, Semipalmated Plover, Semipalmated Sandpiper, Least Sandpiper and Dunlin on 18 June.

A total of 19 species are confirmed nesting within the project site in 2007 with an unidentified Crow species being the only species not previously found nesting there. In 2007 potential nesting species such as Virginia Rail, Laughing Gull, Purple Martin, Seaside Sparrow and Boat-tailed Grackle were found within the project site during the nesting season, while May-July Purple Martin occupying the nest box in Cell 4DX and Seaside Sparrow singing from the Cell 3D wetlands suggest these two species may be confirmed nesting in the near future. Unusual summering and/or vagrant species include Horned Grebe, Caspian Tern, and Black Tern on 18 June; Brown Pelican on 12 July and thereafter; and 23 Caspian Tern on 4 September.

South transient highlights include early Greater Yellowlegs, Lesser Yellowlegs, Semipalmated Sandpiper and Least Sandpiper on 29 June; Western Sandpiper, Stilt Sandpiper; American Avocet and Chimney Swift on 24 July; Black-crowned Night Heron, Red-necked Phalarope and six species of terns on 8 August; Tri-colored Heron on 20 August and thereafter; Palm Warbler on 4 September; 73 Blue-winged Teal, Peregrine Falcon, Ruby-throated hummingbird, Blue-gray Gnatcatcher and Savannah Sparrow on 17 September; Cooper's Hawk on 1 October; and Semipalmated Plover, American Avocet, Common Snipe, Royal Tern, Blue Jay, Horned Lark, Golden-crowned Kinglet, Ruby-crowned Kinglet, Swainson's Thrush, Hermit Thrush, Yellow-rumped Warbler, Common Yellowthroat, Swamp Sparrow and White-throated Sparrow on 15 October. The thrushes are new for the project site.

Perhaps two of the most exciting species occurrence at the site to date happened in 2007. Both species are normally found in coastal dune habitats. A south transient Ipswitch race of the Savannah Sparrow was observed on the barren substrate of the Cell 2 dike roadway on 27 November. This race of the Savannah Sparrow was previously considered a separate species, is the only land bird that nests on Sable Island a sand bar 100 miles east of Nova Scotia, and commonly winters only on coastal dunes south to Georgia. A north transient Piping Plover observed and photographed in Cell 4A-B on 23-24 April is a globally threatened and North American highly endangered species that migrates, inhabits and nests along Atlantic Coast beaches with its nearest regular occurrence at Assateague Island where it is afforded Federal protection.

Response 25:

As stated in the Mid-Bay Integrated Feasibility Report and EIS:

3.1.6.a.1 James and Barren Island SAV Resources

SAV surveys were conducted at James Island during Summer 2002, Spring 2003, and Summer 2003. During the Summer 2002 (June) field survey, a qualitative SAV survey was performed which indicated that widgeon grass (*Ruppia maritime*) was the dominant species along the eastern shorelines of James Island. The four SAV beds identified (Figure 3-10) ranged from 91.4 to 137.2 m (100 to 150 yards) from the eastern shoreline of all three-island remnants (MPA, 2003e). During the Spring 2003 (May) field survey, transects were performed in those areas where SAV beds had been reported in previous qualitataive surveys conducted in 2001 and 2002, as well as several areas in the immediate vicinity where SAV beds had not been reported. SAV gathered from each rake throw was recorded and all SAV collected consisted of horned pondweed (*Zannichellia palustris*). Dense beds were noted to the east of the northern remnant and smaller less-dense beds to the east of the southern remnant (MPA, 2004h). Figure 3-10 illustrates the extent of SAV at James Island found during the spring 2003 survey. During the Summer 2003 (August) sampling event, transects with rake throws were performed in the same areas as the spring survey and a diver also entered the water to make visual observations. A single blade of SAV was collected off the eastern shore of the northern remnant, and identified as horned pondweed, by Dr. Peter Bergstrom of NOAA's Chesapeake Bay office. Dr. Bergstrom commented that much of the widgeon grass on the Eastern Shore of Maryland had died back during the 2003 season. Widgeon grass is the species most likely to be present during the summer months, whereas both horned pondweed and sago pondweed (*Potamogeton pectinatus*) are usually only present during the spring to early summer months (MPA, 2004i).

A review was performed on SAV bed location maps from 1994 through 2000 of James Island and its immediate surrounding waters produced by VIMS. The VIMS aerial SAV maps showed no SAV beds located around James Island prior to 1999; the closest SAV beds in these years were adjacent to the northeastern shores of Taylors Island, one mile south of James Island. VIMS surveys showed James Island to have 18.1 ac in 1999, no SAV in 2000, 22.6 ac in 2001, 7.0 ac in 2002, and no SAV in 2003. Recently, two small beds periodically occur along the eastern shore of the James Island remnants, averaging 10 ac between 1999 and 2003. Both beds were reportedly dominated by widgeon grass. Neither bed was present in 2003 surveys.

SAV surveys were conducted around Barren Island during Summer 2002, Spring 2003, and Summer 2003. During the Summer 2002 (September), a qualitative survey described monotypic (containing only one species) beds of widgeon grass. These beds were predominantly located adjacent to the eastern shoreline of the remnants of Barren Island in waters of about 3 feet in depth. Eelgrass (*Zostera marina*) and the macroalgae sea lettuce (*Ulva lactucna)* were also observed washed up on the beach of the northern tip of the northern remnant (MPA, 2003g).

During the Spring 2003 and the Summer 2003 a total of seven transects and three locations within the geotextile tube areas (located along the western shoreline of the Barren Island northern remnant) were surveyed (156 total stations). At each station, a rake throw was performed to collect SAV for identification. During the Spring 2003 survey, there were 113 observations of SAV in all transects, with the exception of the geotextile tube areas (MPA, 2004b) where no SAV

was present. SAV crown densities were highest along the northern and eastern shorelines (MPA, 2004b). During the Summer 2003 survey, there were only 12 observations of SAV. During these observations only horned pondweed was found and it was always located in shallow waters, approximately 0.4 to 2.1 m (1.2 to 6.9 ft) in depth. Dense growths of eelgrass were also observed in shallow salt ponds on the northern end of the northern remnant and southwestern end of the southern remnant (MPA, 2004c). During the Spring 2003 surveys, visual diving surveys revealed that horned pondweed was present in varying densities in most of the shallow water areas surrounding the east, northeast, and southeast areas of the island (MPA, 2004b). Figure 3-11 shows SAV bed crown density found during the Spring 2003 survey.

Annual SAV monitoring by VIMS has shown that SAV beds have made a resurgence since 1999 in the waters on the eastern side of Barren Island. An average of 695 ac of SAV beds was present between 1999 to 2003, peaking at 1,325 ac in 2001. Minimal beds of SAV were found prior to 1999, averaging 1.3 ac between 1994 and 1998. No SAV was documented by the VIMS maps off the western shoreline of Barren where the project would be primarily constructed. However, SAV has been intermittently present along the northern shoreline (VIMS, 2004a). The northern SAV bed has ranged in size from 3 ac in 2003 to 4.9 ac in 1997 to approximately 25 ac in 2001 and 2002. This bed was identified as widgeon grass *(Ruppia maritima)* in 1997 and 2001. The most recent SAV maps of the Barren Island vicinity were generated based on aerial photographs taken on July 26, 2003, and on October 25, 2003 by VIMS. 2003 SAV beds were greatly reduced in size and density compared to 2001 and 2002; and were even smaller than 1999 and 2000 SAV beds. 2003 mapping shows that there are three SAV beds in the vicinity of Barren Island: a SAV bed with 0 to 10 percent cover located along the northern shoreline of Barren Island; a SAV bed with 0 to 10 percent cover located approximately 2,000 ft to the north of Opossum Island; and, a SAV bed with 10 to 40 percent cover located along the southern shoreline of Barren Island and extending for approximately 914.4 m (3,000 ft) along the eastern side of the sand bar that extends southward (MPA, 2005a).

The Chesapeake Bay Program has defined Tier I, II, and III SAV recovery zones. The Tier I SAV distribution restoration target is the restoration of SAV to areas currently or previously inhabited by SAV as mapped through regional and baywide aerial surveys from 1971 through 1990 (Batuik *et al.* 1992; Dennison *et al.* 1993). The Tier II and Tier III distribution restoration targets are the restoration of SAV to all shallow water areas identified as existing or potential SAV habitat, down to the 1- and 2-meter (3.3 and 6.6 feet) depth contours, respectively. Tier 1 areas surround all James Island remnants. Tier I areas have been delineated to the northeast, east, and southeast of Barren Island. Tier II and Tier III zones surround both islands. It is estimated that 298.8 ac of bottom less than 2 m in depth exist within the project footprint at James Island. All of the Barren project area, approximately 92 ac, is less than 2 m in depth.

The summary of the H&H modeling follows:

Results from wave, hydrodynamic, and sediment transport numerical simulation models were analyzed to evaluate the performance of James Island and Barren Island plan view alternatives from engineering assessments. For the James Island alternatives, the wave height reduction was found to be approximately 1-2 ft on the lee of the island, as compared to the existing configuration and future without-project condition, for four severe storms. With respect to current velocity and sediment transport, no major performance differences were found among the alternatives (Alts JI-1 to JI-6). In the absence of protective structures (such as riprap dikes), significant erosion can occur at the southeast corner of the alternative island and at the

south end of the existing island in a hurricane. If a bird island is present at the tidal gut south entrance, erosion under a hurricane was predicted to be greater at the bird island (Point 16) for a narrow tidal channel (Alt JI-3) as compared to a wider tidal channel (Alt JI-6).

Bed erosion of as much as 10 to 20 cm was calculated to occur in the local channel (Points 1 and 12) for all alternatives in a hurricane because of the increased gradients in current velocity. Similarly, channel erosion of 10 to 20 cm can occur at the narrower tidal gut in a hurricane for Alts JI-1 to JI-3 because of increased current magnitude. For all alternative configurations, accretion of 20 to 60 cm was calculated to occur at the tidal gut south entrance (Point 5) under a hurricane as a result of scour of the tidal gut channel and erosion at the south end of the existing island, as well as erosion at the southeast corner of the island alternative. Sediment accumulation at the tidal gut south entrance can be minimized by reducing the erosion at the south end of the existing island and southeast corner of the island alternative with protective structures.

For the Barren Island alternatives, Alts BI-1 and BI-3 have a longer south breakwater and provide the greatest wave height reduction, reaching 2-3 ft in the lee of the island for the four storms evaluated. The future without-project condition results in a 2-4 ft increase in wave height at the mainland nearshore. With respect to current velocity and sediment transport, no significant performance differences were found among the existing configuration and alternatives (Alts BI-1 to BI-6) at locations distant from the site (Points 6 to 13). The influence of the alternatives is localized in the area at and near the south breakwater (Points 1 to 5).

For the four storm conditions, the maximum current velocity at the Honga River Tar Bay entrance (Point 12) was always strong, approximately 3.3 ft/sec, regardless of the existing configuration or future without-project or the island alternatives. As a result, the Honga River Tar Bay entrance usually experiences bed erosion of 10 to 50 cm during severe storms. The predicted erosion is slightly greater for the future with-project condition than for the existing configuration and the alternatives. Alts BI-3 and BI-4, with a low-crest south breakwater, are likely to induce relatively greater current velocities during storms, causing potentially significant temporary erosion at the breakwaters. Segmented breakwaters (Alts BI-5 and BI-6) can create a similar condition with strong current around the segmented breakwater element, causing either sediment deposition or erosion at the structures, depending on the direction of the current. The strong current at the north island cut (Points 14 and 15) in a hurricane can also cause extensive bed erosion or accretion at various locations along and near this cut.

Literature Cited:

Walter J. Dinicola, Edward T. Fulford, Mathew R. Henderson, Nicholas C. Kraus, Lihwa Lin, Ram K. Mohan, Mark Reemts, Ann R. Sherlock, Jane M. Smith, and Oner Yucel. 2006. Mid-Bay Islands Hydrodynamics and Sedimentation Modeling Study, Chesapeake Bay. ERDC/CHL TR-06-X.

Response #30

EPR Comment: Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.

Response: The team prepared a "Simplistic Assessment" as suggested by the EPR reviewers considering sediment resuspension, transport, and deposition, and oyster and SAV requirements to assess construction impacts for both Barren and James Island. The team concluded that there will be no significant turbidity or environmental impacts to the oyster bars or SAV from construction at Barren or James Island. During the development of the Mid-Bay project Federal and State resource were involved in planning and in the assessment of impacts. Their opinions were heeded and their agencies agreed with our findings and decisions regarding the benefits and impacts of the proposed construction. No issues were raised by the assessment to warrant the 3D hydrodynamic and sediment modeling proposed as an additional tool by the EPR reviewers if the simplistic assessment was inconclusive.

The Simplistic Assessments are as follows:

BARREN ISLAND
Given:
1. Distance to SAV and Oyster Bars is approximately 2,500 ft and 2,000 ft, respectively.
2. Construction Technique is mechanical placement and there will be no dredging
3. Time of Year restrictions (1,500 ft during sensitive periods for SAV and Oysters) will apply.
4. Experience level is very high for this application (Poplar Island toe dike and north Barren Island dike construction).

Conclusion:
No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV.

Assumptions:
- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).
- No dredging will occur at Barren Island.
- Barges will be small and light-loaded from a larger barge moored offshore for Barren construction. Vessel speed will be low.
- Construction will not occur during SAV growing season. It is not known at this time if there will be SAV in breakwater construction area, but SAV surveys performed in

2002 and 2003 did not detect any. Further, SAV surveys by the Virginia Institute of Marine Sciences (VIMS) have not identified any SAV in the breakwater construction area in the last ten years. It is unlikely that SAV would grow in the Phase 2 (9. 5 ac) footprint because of water depths which are deeper than the photic zone (6feet) Phase 1 is the proposed lateral expansion of an existing breakwater. It is possible that some SAV may occur in the 1.1 acre footprint of Phase 1 which is in 4 foot water depths; however none has been identified.

- 1,300 lb armor stone at Barren will be individually placed. Fabric will be placed on bay bottom prior to placement.
- Very little turbidity will occur and will not disperse far (Mid-Bay p 6-8).
- Breakwaters will be in depths of 4 feet to 6 feet. The photic zone is considered to be from the water surface to approximately 6 feet in depth or 2 meters in the bay.
- Breakwaters would occupy 10.6 acres of Bay bottom if both Phase 1 and 2 are built (p 5-2) while construction would protect 1325 acres of SAV habitat (Mid-Bay p 5-3).
- Flow appears to be sufficient to keep leaves clean of sediment as indicated by thriving SAV in the area.
- Sediment resuspension naturally occurs in the area but the creation of stone breakwaters is not expected to add significantly to turbidity and will help to reduce sediment.
- The Poplar Island test toe dike construction was very similar and no adverse consequences resulted.
- Previous Barren Island construction activities have not produced SAV impacts.
- TOY restrictions would be followed.

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

JAMES ISLAND

Given:

1. Distance to SAV and Oyster Bars is approximately 1,750 to 2,000 ft, and 500 to 1,000 ft, respectively.
2. Construction Technique. Dredging will occur for the access channel which is 12,720 feet in length. Of the total length, 3, 070 would be within the diked foot print of the project. All dredging for dike construction material will be within the footprint. (Mid-Bay p.5-1). Stone will be mechanically placed over sand cored cloth covered dikes.
3. Time of Year restrictions apply (1,500 ft. during sensitive periods for SAV and Oysters).
4. Experience level is very high for this application (Construction of 1,140 acre Poplar Island and approximately 6 miles of dikes).

Conclusion:

No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV.

Assumptions:

- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).
- Construction will not occur during SAV growing season.
- Turbidity will not disperse far (Mid-Bay p.6-8).
- TOY restrictions would be followed.

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

Other Significant Factors to Consider:

1. The Poplar Island Restoration Project has been under construction since 1999. This project is very similar and no significant adverse consequences have resulted.
2. Poplar Island construction has not produced negative impacts to nearby SAV and oysters.
3. Time of Year (TOY) restrictions will apply to protect SAV and oysters during sensitive periods.