BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

October 12, 2021

Peter Blum, Chief, Planning Division
U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107
VIA EMAIL

Re: *New Jersey Back Bays Coastal Storm Risk Management Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement*

Dear Mr. Blum:

I am submitting these comments to the U.S. Army Corps of Engineers (USACE) regarding the *New Jersey Back Bays Coastal Storm Risk Management Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement* on behalf of the Barnegat Bay Partnership (BBP), which comprises federal, state, and local government agencies, academic institutions, nongovernmental organizations, and businesses working together to restore and protect a nationally significant estuary, the Barnegat Bay-Little Egg Harbor (BB-LEH) estuary.

We have significant concerns and questions about this report and the project currently proposed as the Tentatively Selected Plan (TSP). First, the project does not appear to meet the stated project management framework, resilient community, sustainable landscape, or risk to ecosystem reduction purposes. Second, the project description is both incomplete and inadequate to assess its scope, degree and extent of protection, and its benefits and impacts. As a result of this lack of information, the estimated costs ($18.5 billion, not counting operations and maintenance costs) may be even higher to federal and state, and possibly even local government entities and the benefits and impacts cannot be fully assessed. Because of the Corps' reliance on economic information alone for some analyses, we have some questions about the equity of the protections provided to economically vulnerable groups (*i.e.*, elderly residents on fixed incomes, small business owners and employees), previously recognized to be relatively vulnerable to climate change and sea level impacts.

Perhaps most importantly, we are disappointed that this projected is being solely implemented as a risk management project, and not as a risk management *and* restoration/enhancement project. One of the project's stated purposes is to "…support resilient coastal communities, and robust

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sustainable coastal landscape systems, considering future sea level and climate change scenarios, to reduce risk to …ecosystems… ." From the information in the report, it does not appear that the TSP will meet these project purposes, particularly resilient coastal communities and sustainable coastal landscape systems. Considerable adverse environmental impacts were identified; moreover, the project has no environmental benefits. Lastly, the TSP has significant potential to adversely impact the bay's coastal water quality, habitats, and living resources. Because of the importance of water quality and those resources to shore communities, we can only conclude that the proposed project will be detrimental to the environment and economy of coastal communities, and the quality of life of those living near, working in, and playing in Barnegat Bay. Additional details regarding these and other concerns are provided below.

AUTHORITY

The BBP submits these comments pursuant to Section 320 of the Clean Water Act (33 U.S.C. 1330; as amended by P.L. 100-4, 114-162, and 116-337), which established the Barnegat Bay as an estuary of national significance. Section 320 further identifies important purposes of our management conference: a) addressing point and nonpoint sources of pollution, b) restoring and maintaining the chemical, physical, and biological integrity of the estuary, c) restoring and maintaining water quality, balanced indigenous populations of shellfish, fish, and wildlife, and recreational activities in the estuary, and d) assuring that the designated uses of the estuary are protected. Section 320 also requires that the BBP review federal development projects in accordance with the requirements of Executive Order 12372 (Intergovernmental Review of Federal Programs), to determine whether the proposed New Jersey Back Bays project would be consistent with and further the purposes and objectives of the BBP's 2021 Comprehensive Conservation and Management Plan.

In accordance with the BBP's Memorandum of Understanding Regarding the Roles and Responsibilities of Partners and its attendant charters and policies, the Environmental Protection Agency, New Jersey Department of Environmental Protection (NJDEP), and the U.S. Army Corps of Engineers (USACE) neither participated in the development of these comments nor reviewed them for endorsement.

BACKGROUND AND PROJECT OVERVIEW

The Corps' *Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement* (DIFR) presents preliminary findings of a study to identify coastal storm risk management strategies to increase resilience and reduce risk from future storms and additional effects of sea level rise on the New Jersey Back Bays (NJBB) region, including the Barnegat Bay-Little Egg Harbor estuary. The DIFR identified various problems and solutions to reduce damages from coastal flooding which may affect the human environment (*i.e.,* critical infrastructure, property, and ecosystems). The DIFR builds on the USACE 2019 NJBB Draft Interim Feasibility Study, to which the BBP provided initial comments on October 26, 2018, and additional comments on March 29, 2019 (both attached).

The TSP identifies numerous strategies and alternatives to reduce coastal storm risk and the effects of SLR throughout the study area in Monmouth, Ocean, Atlantic, Burlington, and Cape May counties. For the Barnegat Bay-Little Egg Harbor component of the study, the TSP includes both structural and non-structural measures, including storm surge barriers at Manasquan and Barnegat inlets, elevating approximately 8,500-9,000 homes and businesses, and *possibly* other non-structural measures and natural and nature-based features, such as marsh enhancement and/or living shoreline projects, which could be added to the plan in the future. USACE estimates the cost of implementing all TSP strategies at $13.7 billion with the local cost-sharing sponsor of the study, NJDEP, contributing $4.8 billion. Once the TSP is completed, the DIFR states that NJDEP will also be required to bear the full costs to operate and maintain the TSP, estimated at $196 million annually (approximately $10 billion over the 50-year life of the project).

The TSP identifies substantial direct impacts to the aquatic environment, including the filling of over 154 acres of wetlands, mud flats, submerged aquatic vegetation, and open waters of the Study Area. Because these direct impacts are so substantial, we feel strongly that additional information regarding the compensatory mitigation for this project should be included in the public consideration of this project. For example, the public is generally unfamiliar with the requirements of mitigation for impacts to federal trust resources, the poor success record of mitigation projects for impacts to wetland habitats in New Jersey (Balzano *et al*., 2002), the difficulty and high costs of restoring SAV habitats, or typical mitigation ratios (e.g., 3:1 acreage ratio) and the costs of mitigation efforts (up to $1 million) in New Jersey. Furthermore, no mitigation ratios were identified in the DIFR, though typical ratios (3:1) would result minimally in mitigation of 462 acres, which would represent a considerable undertaking in New Jersey (with limited uplands available for restoration as wetlands). Providing mitigation over the lifespan of this project and its impacts will undoubtedly present a considerable challenge, especially if funding for monitoring and subsequent adaptive management are to be provided, as often required in other permitted projects.

Equally important, the report identifies the potential for the TSP to have many and considerable indirect impacts to water quality and the life stages of myriad aquatic organisms and other wildlife throughout the Study Area. Unfortunately, the DIFR only provided a limited assessment of potential impacts because of the incomplete information contained in the TSP. Environmental impacts of such large magnitudes to environmental resources appears inconsistent with the stated goals of this project (*i.e.*, NOAA/USACE Risk Management Framework, resilient communities, *etc*.), possibly inconsistent with other federal laws (*e.g.*, Clean Water Act, Endangered Species Act), and the water quality and living resources objectives of the BBP's 2021 Comprehensive Conservation and Management Plan.

GENERAL COMMENTS

Schedule and Opportunities For Public Input And Comment

This project was initiated in October 31, 2016 with a Public Notice announcing the initiation of scoping and inviting agencies, stakeholders, and the public to participate. The BBP initially

commended the Corps for holding public meetings in 2016 and 2018 to share information about the Feasibility Study and receive public comment. Subsequently, there was an interruption in the funding provided by Congress to complete the report. When the project funding was renewed sometime later, completion of the report remained on its previous schedule, which resulted in little time for coordination with agency partners and the public. This also likely contributed to a hastily completed DIFR with a project schedule which did not provide adequate time for public review and discussion and thus does not serve public interests.

The DIFR is lengthy (more than 500 pages with 8 appendices), difficult to comprehend, and poorly organized; in addition, it contains a number of factual errors and erroneous statements (*e.g.*, non-structural measures do not reduce risks to infrastructure). Jargon and unidentified acronyms occur throughout the document. The reader must search through several different parts of the document to understand the full scope of impacts associated with the TSP. The discussion of impacts could be unified in one section in order to create a document that decision makers and the public can understand and use.

Project Purpose

The stated project goals are to: 1) provide a risk management framework, consistent with NOAA/USACE Infrastructure Systems Rebuilding Principles, and 2) support resilient coastal communities, and robust sustainable coastal landscape systems, considering future sea level and climate change scenarios, to reduce risk to vulnerable populations, property, ecosystems, and infrastructure. The risk management framework and guiding principles are not fully articulated anywhere in the document; however, the project does not appear to be consistent with the agreed-upon NOAA/USACE principles[1]. Specifically, we question that this proposed project is consistent with one of the interagency guiding principles, "Improve coastal resilience by pursuing a systems approach that incorporates natural, social, and built systems as a whole." Resilient coastal communities and sustainable coastal landscape ecosystems depend on coastal estuaries and their living resources; however, the project as proposed does little if anything to reduce risks to the natural environment from sea level rise, larger and more frequent coastal storms, and other manifestations of climate change.

We are somewhat concerned to learn recently that other USACE projects proposed in the Northeast (*e.g.,* Nassau County[2]) do not include storm surge and cross bay barriers because "hydraulic modeling indicated that storm surge barriers and cross-bay barriers did not significantly reduce water levels and, in some cases, exacerbated flooding in certain areas," whereas USACE projects elsewhere (*e.g.*, Coastal Texas Protection and Restoration Feasibility Study[3]) directly integrate protection and restoration priorities. In light of the significant economic benefits resulting from the natural environment in New Jersey (NJDEP, 2007; Kaufman and Ortiz 2012), we respectfully request interagency and public reviews of the

[1] https://www.nad.usace.army.mil/Portals/40/docs/ComprehensiveStudy/Infrastructure%20Systems%20Rebuilding%20Principles%202013-0228d%20FINAL%20-%20april%202013.pdf
[2] https://www.nap.usace.army.mil/Media/News-Releases/Article/2751904/army-corps-releases-draft-report-for-nassau-county-back-bays-study/
[3] https://www.swg.usace.army.mil/Portals/26/Coastal%20Texas%20Protection%20and%20Ecosystem%20Restoration%20Feasibility%20Study_Aug2021_FEIS_1.pdf

decision-making process and the specific information that led USACE to include storm surge and cross bay barriers in the BB-LEH system and restrict the scope of this study, *i.e.*, not include restoration and protection as a component as in other ongoing USACE reports elsewhere.

Project Description

The project description is incomplete in several places in the document (*e.g.*, TSP overview in the Executive Summary, Appendices). The Corps acknowledges in several sections of the document that additional natural and nature-based features (NNBF), substantial additional non-structural measures (including elevating and floodproofing several thousand [?] additional structures in the BB-LEH Study Area alone), and various perimeter plans are still under consideration. With so many potential project pieces still to be considered, it begs the question as to why the proposed project should be considered for funding at this time.

The description should clearly and consistently identify all aspects of the TSP under consideration, so that the public can understand and recognize the project's initial and cumulative benefits, impacts, and costs.

Alternatives Assessment and Scoping

USACE identified approximately two dozen project alternatives during the scoping of the TSP. The BBP has repeatedly expressed concerns about hard-engineered solutions, such as storm surge barriers and perimeter walls, due to the substantial footprint of these components and the likelihood of considerable indirect impacts extending well beyond the project impact. The TSP states that the TSP was based on net National Economic Development (NED) benefits, environmental acceptability, residual risk, life-safety risk, long term performance, and sea-level change adaptability. As stated, this explanation is unclear and vague; moreover, major components of the TSP (*i.e.*, storm surge and cross bay barriers) appear inconsistent with numerous comments previously provided by the BBP and other agencies and organizations regarding environmental acceptability. We question how the USACE selection process can be applied in any meaningful manner, when specific natural and nature-based features and non-structural measures have neither been identified and developed to a level of detail comparable to the other plan components nor fully evaluated.

We are concerned that the TSP was selected primarily on NED benefits and thus may result in two unintended consequences. First, we are concerned that the TSP, as currently articulated, may promote protection of high-risk economic assets (*i.e.*, expensive neighborhoods) solely because of their relative economic value and thus promote a never-ending cycle of post-storm redevelopment resulting in ever-increasing property values in areas with ever-increasing risk (*e.g.*, filled wetlands) due to continuing sea level rise. The outcome will place an increasing economic burden on the public to rebuild increasingly risky private properties. Second, because of the limited information provided by the TSP, and the uncertainties explicitly raised by USACE throughout the document, we question if the level of protection provided to risky but relatively valuable neighborhoods will be provided to equally risky, but less valuable properties and neighborhoods (which may not rank as highly in NED benefits). It is not possible for us to assess this possibility due to the incomplete information included in the current TSP; however,

we are concerned about any selection process which may create or contribute to economic or risk inequity.

We suggest that USACE reassess its selection process to achieve other desirable public goals and objectives. For example, perhaps the USACE could develop a TSP selection process specifically to prioritize risk reduction for all economic groups or to buy out properties along a sea-level elevation gradient to provide habitats for marsh reclamation and future wetland migration as sea level continues to rise. We encourage USACE to work with all level of government to develop a selection process to achieve consensus goals and objectives consistent with the region's environmental and economic priorities.

Storm Surge Barriers

Within the Barnegat Bay watershed, the TSP includes the placement of storm surge barriers (SSBs) across the Mantoloking and Barnegat Inlets. The BBP and our partners have previously expressed numerous concerns with such structures (*e.g.*, the highly dynamic nature of the Barnegat inlet [Stutz and Pilkey, 2005], the lack of success by previous USACE projects [*i.e.*, geotubes] in stabilizing erosion in the vicinity of the Barnegat inlet, the bay's hydrodynamics [see below], and impacts of other breaches). As currently depicted, the Barnegat SSB would tie into an existing jetty structure on the southern side of the inlet at the north end of Long Beach Island. The Mantoloking SSB would require replacement of the current "architecture" along both sides of the inlet, and considerably change the waterfronts along both sides of the inlet. The proposed barriers, had they been in place prior to Sandy, likely would NOT have prevented storm surge from inundating much of the BB-LEH watershed, due to the breech at the Mantoloking bridge and the "overtopping" of barriers islands in several places.

It is also unclear how the proposed SSBs would maintain any efficacy with continuing sea level rise or other changes in local conditions; moreover, it is uncertain if storm surge and cross bay barriers might exacerbate flooding, by not allowing water to exit the system under dynamic storm, precipitation, and tidal conditions. Storm surge and cross bay barriers were considered as USACE project components along another barrier island complex (*i.e.*, Nassau County, New York) but were not included in the TSP due to concerns about the potential for flooding.

Even if the current study investigated the effects of SSBs at both Mantoloking and Barnegat inlets, recent hydrodynamic modelling by the US Geological Survey (Defne and Ganju, 2014) has documented that most of the tidal flow into Barnegat Bay enters through Little Egg Inlet. It is not clear if water flow through Little Egg Inlet was considered during the current analysis. Further, the Little Egg Inlet is not maintained as a navigation channel and is highly dynamic, and future natural changes to this feature may impact the physiography of the Great Bay, Little Egg Harbor, Barnegat Bay, and their biotic resources. The TSP is projected to reduce the bay's tidal prism unevenly; we are concerned that any reduction will exacerbate poor water quality and eutrophication.

We are concerned about the provision of power to the operation of the flood gates before, during, and after storms. Electric power was disrupted during Superstorm Sandy throughout extensive portions of Ocean County, including barrier islands; some places remained out of electric service

for months. We believe that the main and back-up power supply systems, their operation, and maintenance, deserve special scrutiny to ensure they operate as intended, under severe and protracted storms, during especially warm- and cold-weather conditions.

Lastly, we note that the Barnegat Inlet storm surge barrier would be located near extensive beds of eelgrass (*Zostera marina*), where a number of mitigation and other restoration projects are being conducted. We are concerned about the potential direct and indirect impacts of the barrier on eelgrass, which is one of the bay's most critical habitats. Barnegat Bay is home to the state's largest population of eelgrass, which is declining and continues to be threatened by anthropogenic activities in New Jersey.

Natural and Nature-based Features

We previously recommended that natural and nature-based features (NNBFs) be a prominent component of the TSP. Human infrastructure with robust coastal wetlands and dune features between them and a water body typically fare far better than those without during storms (Barbier *et al.* 2013; Narayan *et al.* 2017). Wetlands, seagrass beds, oyster reefs, living shorelines, and other biogenic structures attenuate wave energy, ameliorate flood impacts effectively (Wamsley *et al.* 2010, Costanza *et al*. 2008, Koch *et al.* 2006), and are fairly robust to sea level rise, which increases their longevity. While not feasible to implement everywhere in the watershed, substantial shoreline and other areas would undoubtedly benefit from these approaches and the additional ecosystem services, including water quality benefits, they provide. Federal regulations (*e.g.*, Section 404(B)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 40 CFR 230) also considers NNBFs practicable, capable, and cost-efficient; they also help support robust sustainable landscape systems, which is one of the stated project goals.

Unfortunately, little detail is provided regarding the incorporation of NNBFs into the TSP. This was surprising in light of ongoing USACE projects utilizing NNBFs (*i.e.*, Engineering with Nature) in Barnegat Bay (Mordecai Island, Section 122 island creation) and elsewhere along the New Jersey Shore (*e.g.*, Seven-Mile Island Innovation Lab). The failure to develop specific NNBFs in the TSP may also have contributed some flaws/biases in the cost-benefit analyses of the TSP. Undeveloped upland and wetland habitats are under the same threats as those to homes, businesses and infrastructure; however, the economic valuation of their goods and ecosystems services were not incorporated in the USACE cost-benefit analyses (as either costs or benefits). This strongly biased the selection of the TSP. We suggest that NNBFs have the potential for reduced costs and increased benefits over time, unlike the TSP's hard infrastructure, which likely has increased costs and reduced benefits over time. NNBFs should be more fully developed and incorporated into the TSP as a component of a comprehensive effort to reduce future costs and risks, and support the natural environment and its attendant goods and ecosystem services.

Non-structural Measures

We were initially encouraged by the inclusion of non-structural measures (NSM) in this feasibility study, as such approaches are often overlooked during the discussion of how to practically manage flood risk. However, upon further consideration, we were disappointed to see

that residential retrofits (*i.e.*, elevation and floodproofing) were the principal NSMs identified to be employed throughout the NJBBS Study Area. This is especially disappointing because retrofits (such as home elevation) in areas of continually increasing risks (*e.g.*, sea level rise) essentially maintains some level of risk into the future, which can only be addressed at more public expense. As sea level continues to slowly rise, at what point will people no longer tolerate flood waters or tides washing over or under their properties (seasonally, monthly, weekly)? Perhaps more broadly, how many times must the public pay for water washing over or under the other people's property?

Lastly, we were disappointed that "managed retreat" and the use of tools to achieve it, did not receive more detailed attention in the report. In particular, land acquisition in areas that suffer from repetitive losses has been and can be a particularly useful strategy, and thus merits consideration as an important component of many coastal risk management effort, especially for back bay areas with low elevations and other risk factors (*e.g.*, wind and wave fetch) which increase the vulnerability of property and infrastructure to sea level rise. The NJBBS effort potentially provides an opportunity to implement land acquisition at watershed-wide spatial scales (*i.e.*, managed retreat) not only to reduce risks and costs but also provide other, often unrecognized public benefits (*e.g.*, marsh enhancement, restoration, and migration help ensure the future of wetland and other habitats which support fisheries, numerous trust species, storm surge protection, and the region's economy). Land acquisition has been a principal tool of the NJDEP's Green Acres and Blue Acres programs, the latter which successfully used land acquisition to achieve risk management and other benefits along Delaware Bay communities in Cumberland County.

Contrary to at least one statement in the USACE NJBBS report, land acquisition is an effective non-structural measure for reducing both risks and costs from coastal storms and sea level rise. Acquisition of properties at risk to flooding or sea level rise could reduce future operational and maintenance costs to state, county, and local governments; counties and towns throughout coastal New Jersey already are experiencing higher, regular and periodic costs associated with heavy precipitation and tidal flooding events. These costs will only continue to increase in the future. Land acquisition programs could be phased to sea level rise rates or "tied" to flood insurance programs to achieve a number of beneficial public purposes (*e.g.*, to achieve socio-economic equity); unfortunately, limited discussion of managed retreat was included in the report.

We recognize that the TSP, land acquisition, and other potential tools also have considerable potential to "interact" or variously impact the application or implementation of other federal, state, and local laws, regulations, and policies. What is the relationship between the TSP, the National Flood Insurance Program, and relevant state programs (*e.g.*, Flood Hazard designations, *etc*.) We strongly recommend that USACE identify jurisdictional areas of overlap across all levels of government.

Impacts to Critical Habitats and Species

The aquatic resources in the vicinity of the Barnegat Inlet are among the bay's most diverse, and as noted above, both the direct and indirect impacts to bay habitats and species around the inlet

are likely substantial and extend more broadly. Recent submerged aquatic vegetation surveys conducted by the BBP and Stockton University have documented relatively robust eelgrass beds (*Zostera marina*) around the islands and channels in this portion of the bay (Lacey 2020, BBP unpublished data). With eelgrass bed area and density in the bay at substantially reduced levels compared to previous decades (Barnegat Bay Partnership, 2016), it is of critical importance that these beds not be negatively impacted by any potential measures. It does not appear that potential impacts to this critical aquatic resource, and the species that depend on it (*e.g.*, blue crabs, one of the bay's most valuable fishery resources) have been considered.

Hydraulic and Ecological Modeling

We have previously expressed concerns with the details of some modeling activities that were being used to evaluate the effects of the TSP on the BB-LEH. The USACE report specifically states that the New York Bight Ecological Model (NYBEM), an ecosystem model that USACE is developing, will be used to assess "all key aspects of marine, estuarine, and freshwater aquatic habitats within the affected area." While we appreciate the intent and scope of the NYBEM, it is unlikely to represent "all key aspects" of estuarine habitats at the scale necessary to assess the TSP's many possible impacts on the study area. Additionally, this model is not yet completed, and thus would be assessing impacts "after the fact" rather than being used to help make decisions between potential alternatives. The USACE NYBEM model should also undergo a rigorous external review and model evaluation, so that everyone can have more confidence in its consideration of the TSP and various alternatives.

Cost/Benefit Calculations, Including Ecosystems Goods and Services

Perhaps a greater concern is the apparent failure of this USACE project to appropriately identify and recognize the costs and benefits of the BB-LEH and other coastal ecosystems. For example, the Barnegat Bay watershed contributes more than $2.3+ billion in goods and ecosystem services to the regional economy (Kaufman and Cruz-Ortiz 2012). Not including those values when calculating the benefit to costs of various alternatives is likely to lead to selection of less than desirable alternatives and outcomes. For example, coastal ecosystems are under similar threats (*i.e.*, coastal storms and sea level rise) as the built infrastructure. This project does not identify the potential environmental and economic savings (*e.g.*, flood and storm-surge protection, primary production of the aquatic environment, habitats for trust resources) that non-structural elements and NNBFs could provide to the TSP. The existing aquatic resources and the important ecosystem services they provide should be considered in deliberation of the TSP and any alternatives. It must be noted that thousands of acres of wetlands in New Jersey were filled (Dahl 1990) to develop properties that are now at risk, further highlighting USACE's obligations to acknowledge the direct and indirect economic benefits (*e.g.,* flood control, hotel stays, wildlife viewing) these habitats provide to the BB-LEH and other coastal ecosystems.

It is our understanding, based on comments made in the public hearings for this project, that the NJDEP has requested that USACE accept responsibility for operations and maintenance costs (as USACE has accepted for other local sponsors). This would add an additional $10 billion to the federal costs. Because the USACE report acknowledges that many decisions regarding

components for this project have not been decided, we have serious reservations for supporting the implementation of a project with uncertain costs and benefits.

Data Gaps

USACE acknowledges numerous data gaps in engineering, hydrology, geology, biology, and economics which must be addressed to fully assess the impacts of the TSP on the human environment. While USACE has committed to performing analyses to address these data gaps, advancing any decision-making process for a project of this magnitude without a better understanding of the above-listed data gaps is premature. The BBP Science and Technical Advisory Committee will be identifying and separately submitting a list of studies which we believe are critical to assessing project alternatives and further decision-making.

SUMMARY

We have a number of significant concerns about the report and the TSP. The report is not written in a clear and concise manner that is easily understood by the general public; the public has not been given sufficient time or information to consider the TSP, alternatives, and their costs and benefits. We do not believe that the TSP meets the stated goals of this effort. This entire effort, including the TSP, does not appear to "Improve coastal resilience by pursuing a systems approach that incorporates natural, social, and built systems as a whole." We are unsure if the TSP provides much protection from future storm events (we are equally unsure what, if any impacts from Sandy would have been avoided or minimized by this project). The TSP has high costs due to its reliance on considerable "hard" infrastructure, and also has substantial direct and indirect impacts on aquatic habitats. Cost efficient NNBFs and NSMs do not appear to have been adequately identified or considered. Cost-benefit analyses do not appear to recognize the costs and benefits of ecological goods and services and thus are biased as used to justify the selection of the TSP. We have questions about the TSP potentially contributing to socioeconomic inequity. There are numerous data gaps; thus, the TSP is incomplete and its costs and benefits and impacts cannot be fully considered.

We remain concerned about the potential for unwise development and/or redevelopment incentives that the TSP may create in some back-bay communities. The back-bay study should explore ways (*e.g.*, relocation incentives or requirements, perhaps in coordination with state or local governments) to ultimately reduce future risks apart from any potential back-bay projects. Without such considerations, we are concerned that planning and implementation of resilience projects in some areas may simply encourage irresponsible redevelopment in high risk areas, which then results in additional publicly funded mitigation measures, with the cycle continuing to repeat itself at increasing costs and even higher risks into the future. This cycle needs to be addressed within the context of flood risk management on a broader scale with more engagement across all levels of government and the public.

We hope that you find our comments to be constructive during the formulation of the tentatively selected plan, and we welcome the opportunity to discuss these comments in more detail. If you

have any questions, please feel free to contact me or Dr. Jim Vasslides, our Program Scientist, at 732-255-0472.

Sincerely,

L. Stanton Hales, Jr., Ph.D.
Director

Attachments:
BBP October 26, 2018 letter regarding N.J. Back Bays Flood Risk Management Feasibility Study

BBP March 29, 2019 letter regarding N.J. Back Bays Coastal Storm Risk Management Interim Feasibility Study

cc: Ms. Karen Greene, NOAA-NMFS, Advisory Committee Co-Chair
Dr. Elizabeth Lacey, Stockton Univ., STAC Chair
Mr. Gregg Sakowicz, Jacques Cousteau NERR, Rutgers Univ., STAC Vice-Chair
ALL BBP Committee Members

CITATIONS

Balzano, S., A. Ertman, L. Brancheau, and B. Smejkal. 2002. Creating an indicator of wetland status (quantity and quality): Freshwater wetland mitigation in New Jersey. New Jersey Department of Environmental Protection. Trenton, NJ.

Barbier, E.B., Georgiou, I.Y., Enchelmeyer, B., Reed, D.J. 2013. The value of wetlands in protecting southeast Louisiana from hurricane storm surges. *PLoS ONE* 8(3).

Barnegat Bay Partnership. 2016. State of the Bay Report. Barnegat Bay Partnership, Toms River, NJ. 80 pp.

Costanza, R., Perez-Maqueo, O., Martinez, M.L., Sutton, P., Anderson, S.J., Mulder, K. 2008. The value of coastal wetlands for hurricane protection. *Ambio* 37, 241-249.

Dahl , T.E. 1990. Wetland losses in the United States 1780's to 1980's. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C. 13 pp.

Defne, Z., and N.K. Ganju. 2014. Quantifying the Residence Time and Flushing Characteristics of a Shallow, Back-Barrier Estuary: Application of Hydrodynamic and Particle Tracking Models. *Estuaries and Coasts* 38: 1719-1734.

Ganju, N.K., Defne, Z., Kirwan, M.L., Fagherazzi, S., D'Alpaos, A., Carniello, L. 2017. Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. *Nature Communications* 8, 14156.

Gehman, A.-L.M., N.A. McLenaghan, J.E. Byers, C.R. Alexander, S.C. Pennings, and M. Alber. 2018. Effects of Small-Scale Armoring and Residential Development on the Salt Marsh-Upland Ecotone. *Estuaries and Coasts* 41: 54-67.

Kauffman, G.J., Cruz-Ortiz, C. 2012. Economic Value of the Barnegat Bay Watershed. Institute for Public Administration Water Resource Agency, University of Delaware, Newark.

Koch, E.W., Sanford, L.P., Chen, S.-N., Shafer, D.J., McKee Smith, J., 2006. Waves in seagrass systems: Review and technical recommendations, Engineering Research and Development Center. U.S. Army Corps of Engineers, Vicksburg, MS, p. 92.

Lacey, Elizabeth. 2020. Barnegat Bay Submerged Aquatic Vegetation 2019 Monitoring Program Final Report. Stockton University, Galloway, NJ, p.16.

Narayan, S., M.W. Beck, P. Wilson, C.J. Thomas, A. Guerrero, C.C. Shepard, B.G. Reguero, G. Franco, J.C. Ingram, and D. Trespalacios. 2017. The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. *Scientific Reports* 7: 9463.

New Jersey Department of Environmental Protection. 2007. Valuing New Jersey's Natural Capital: An Assessment of the Economic Value of the State's Natural Resources. Trenton, New Jersey. 98 pp. https://www.New Jersey.gov/dep/dsr/publications/Natural_Capital_Full%20Report.pdf.

Stutz, M.L., Pilkey, O.H. 2005. The relative influence of humans on barrier islands: Humans versus geomorphology, *in* Ehlen, J., Haneberg, W.C., and Larson, R.A., eds., Humans as Geologic Agents. Boulder, CO. Geological Society of America Reviews in Engineering Geology, v.XVI, p. 137-147. Doi:10.1130/2005.4016(12).

Wamsley, T., Cialone, M., Smith, J., Atkinson, J., Rosati, J. (2010). The Potential of Wetlands in Reducing Storm Surge. Ocean Engineering. 37. 59-68. 10.1016/j.oceaneng.2009.07.018.

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I am submitting these comments to the U.S. Army Corps of Engineers regarding the New Jersey Back Bays Flood Risk Management Feasibility Study on behalf of the Barnegat Bay Partnership (BBP), which comprises federal, state, and local government agencies, academic institutions, nongovernmental organizations, and businesses working together to restore and protect a nationally significant estuary, the Barnegat Bay.

AUTHORITY

The BBP submits these comments pursuant to Section 320 of the Clean Water Act (33 U.S.C. 1330; as amended by P.L. 100-4 *et seq*.), which identifies one purpose of our management conference is to recommend "… corrective actions and compliance schedules addressing point and nonpoint sources of pollution, … and assure that the designated uses of the estuary are protected; …" In accordance with the BBP's Memorandum of Understanding Regarding the Roles and Responsibilities of Partners and its attendant charters and policies, the Environmental Protection Agency, New Jersey Department of Environmental Protection, and the U.S. Army Corps of Engineers (Corps) neither participated in the development of these comments nor reviewed them for endorsement.

GENERAL COMMENTS

The BBP commends the Corps for holding two public meetings (September 12 and 13, 2018), both of which were well attended and highly informative, to share information about the Feasibility Study and receive public comment. The format of the meetings, with Corps personnel and informational displays on the four main categories of potential measures available

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to the public first, followed by presentations and a Q&A session, provided diverse opportunities for interaction with local stakeholders.

As the information provided by the Corps at these meetings was scaled with respect to the types of projects being considered versus site specific solutions, our comments are similarly scaled in nature. We anticipate providing more detailed comments once the Interim Feasibility Report/Environmental Scoping Document is released. To that end, we are requesting to be involved as an interested party during the EIS development process.

Storm Surge Barriers

Within the Barnegat Bay watershed, the Feasibility study is investigating the placement of a storm surge barrier across the Barnegat Inlet. The BBP and our partners have a number of concerns with this potential measure. As currently depicted, the barrier would tie into an existing jetty structure on the southern side of the inlet at the north end of Long Beach Island. On the northern side of the inlet, the structure would tie into a jetty within Island Beach State Park (IBSP), an undeveloped section of the barrier island. Even with jetties along both sides of the inlet, the topography and bathymetry in the vicinity of the inlet have been highly dynamic. Previous Corps engineering solutions along the bayside of IBSP (*i.e.*, including geotubes) in the immediate vicinity have failed to reduce erosion; moreover, it is not clear how the proposed storm surge barrier would affect and/or be affected by this erosion. Furthermore, it remains unclear if the potential for erosion/flooding around the barrier has been considered.

Barrier islands, such as those under consideration, are highly dynamic landforms affected by natural and anthropogenic activities (Stutz and Pilkey 2005). In their natural condition they migrate landward due to storm overwash and erosion, and inlets open and close due to storms and sand movement associated with longshore transport and other oceanographic processes. Cranberry Inlet, a historic inlet in the vicinity of the Toms River, opened and closed in various locations multiple times in the eighteenth and nineteenth centuries, and an inlet opened in the northern portion of Barnegat Bay as a result of Superstorm Sandy, though it was quickly filled. If storm surge barriers are selected as a preferred method, will new storm surge barriers be required to be constructed at any future inlet in order to maintain the level of flood risk mitigation calculated now?

Lastly, while the current study investigated the effects of a storm surge barrier at the Barnegat Inlet, recent hydrodynamic modelling by the US Geological Survey has documented that most of the tidal flow into Barnegat Bay enters through Little Egg Inlet (Defne and Ganju 2014). It is not clear if water flow through Little Egg Inlet was taken into account during the current analysis, or how the proposed surge barrier at Barnegat Inlet interacts with that flow.

Impacts to Critical Habitats

The aquatic resources in the vicinity of the Barnegat Inlet are among the bay's most diverse, and recent submerged aquatic vegetation surveys conducted by the BBP and Stockton University have documented relatively robust eelgrass beds (*Zostera marina*) around the islands and channels in this portion of the bay (Lacey 2018, BBP unpublished data). With eelgrass bed area and density in the bay at substantially reduced levels compared to previous decades (Barnegat

Bay Partnership, 2016), it is of critical importance that these beds not be negatively impacted by any potential measures. It does not appear that potential impacts to this critical aquatic resource, and the species that depend on it (*e.g.*, blue crabs, the bay's most valuable fishery resource) have been considered.

Lastly, we have concerns with the models being used to evaluate the effects of this potential measure on flooding and flood risk. One of the displays available for viewing at the meetings appeared to show Great Bay Boulevard, which bisects the Tuckerton Peninsula, not impacted by flooding under a moderate degree of storm surge. As any of the residents and visitors to that area can attest, that roadway floods and is impassable during astronomic high tides, nor'easters, and generally any time of "nuisance" flooding (McKenna *et al.*, 2018). If the model outputs are unable to capture this well-documented phenomenon, the model design (input parameters, assumptions, *etc*.) should be revisited before the results are used to justify selecting measures for further investigation.

Perimeter Plan

The conceptual plans provided at the meeting did not appear to include floodwalls, levees, or other perimeter structural measures in the Barnegat Bay watershed. Many of the BBP's partners agree that these types of structural solutions are not appropriate for our watershed, and based on the recent scientific literature appear to have more adverse effects than benefits. Structural perimeter solutions severely curtail the ability of coastal marshes to receive sediment deposition needed to keep up with sea level rise (Ganju 2017) and prohibit their landward migration as water level rise (Gehman *et al*. 2018). Further, studies from Barnegat Bay and elsewhere have clearly documented a reduction in benthic infauna and epifauna associated with hard structures at the water's edge as compared to natural shorelines (Gittman *et al.* 2016), particularly for recreationally and commercially important species (Jivoff 2005).

Non-structural Measures

We are encouraged by the inclusion of non-structural measures in this feasibility study, as they are often overlooked during the discussion of how to practically manage flood risk. In particular, we feel that acquisition in areas that suffer from repetitive losses is a particularly useful strategy, especially if it can be implemented at an appropriate spatial scale. This approach has been effective in the Raritan River and Delaware River watersheds, and merits consideration as a solution, especially for back bays sites with low elevations and other risk factors which increase their vulnerability to sea level rise (*e.g.*, wind and wave fetch; vegetation).

Nature-based Features

Based on our own and others' experiences during and post significant storms, we strongly recommend that nature-based features be a prominent component of the tentatively selected plan. Human infrastructure with robust coastal wetlands and dune features between them and a water body typically fare far better than those without during storms (Barbier *et al.* 2013; Narayan *et al.* 2017). A growing body of literature has shown that wetlands, seagrass beds, oyster reefs, living shorelines, and other biogenic structures attenuate wave energy and ameliorate flood impacts effectively (Wamsley *et al.* 2010, Costanza *et al.*2008, Koch *et al.* 2006). As an added bonus, when properly implemented, these features are likely to be robust to sea level rise, which increases their longevity. While not feasible to implement everywhere in the watershed, there are

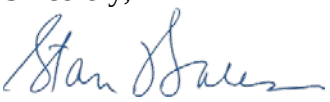
substantial areas of shoreline that would benefit from these treatments, with the added benefit of the additional ecosystem services, including water quality benefits, they provide.

Benefit/cost Calculations
It is not clear if the benefit/cost calculations include the $2.3+ billion in ecosystem services provided by the Barnegat Bay watershed to the regional economy (Kaufman and Cruz-Ortiz 2012). Not including those values when calculating the benefit to costs of various alternatives is likely to lead to selection of less than desirable alternatives and outcomes.

Finally, we feel we would be remiss if we did not comment on the potential for questionable development and/or redevelopment incentives that some potential "resilience" projects may create in some back-bay communities. We believe that the back-bay study should explore ways (*e.g.*, relocation incentives or requirements) to ultimately reduce future risks apart from any potential back-bay projects. Without such considerations, we are concerned that planning and implementation of resilience projects in some areas may simply encourage irresponsible redevelopment in high risk areas, which then results in additional publicly funded mitigation measures, with the cycle continuing to repeat itself at increasing costs and even higher risks into the future. This cycle needs to be addressed within the context of flood risk management on the broadest scale, as it is not unique to New Jersey's back bays, but is playing out here as seen in the construction activities along our shorelines.

We hope that you find our comments to be constructive during the formulation of the tentatively selected plan, and we welcome the opportunity to discuss these comments in more detail. If you have any questions, please feel free to contact me or Dr. Jim Vasslides, our Program Scientist, at 732-255-0472.

Sincerely,



L. Stanton Hales, Jr., Ph.D.
Director

cc: Mr. Rob Karl, Brick Township MUA, STAC Chair
Dr. Steven Yergeau, Rutgers Cooperative Extension, STAC Vice-Chair
Ms. Karen Green, NOAA-NMFS, Advisory Committee Co-Chair

CITATIONS

Barbier, E.B., Georgiou, I.Y., Enchelmeyer, B., Reed, D.J. 2013. The value of wetlands in protecting southeast Louisiana from hurricane storm surges. *PLoS ONE* 8(3).

Barnegat Bay Partnership. 2016. State of the Bay Report. Barnegat Bay Partnership, Toms River, NJ. 80pp.

Costanza, R., Perez-Maqueo, O., Martinez, M.L., Sutton, P., Anderson, S.J., Mulder, K. 2008. The value of coastal wetlands for hurricane protection. *Ambio* 37, 241-249.

Defne, Z., and N.K. Ganju. 2014. Quantifying the Residence Time and Flushing Characteristics of a Shallow, Back-Barrier Estuary: Application of Hydrodynamic and Particle Tracking Models. *Estuaries and Coasts* 38: 1719-1734.

Ganju, N.K., Defne, Z., Kirwan, M.L., Fagherazzi, S., D'Alpaos, A., Carniello, L. 2017. Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. *Nature Communications* 8, 14156.

Gehman, A.-L.M., N.A. McLenaghan, J.E. Byers, C.R. Alexander, S.C. Pennings, and M. Alber. 2018. Effects of Small-Scale Armoring and Residential Development on the Salt Marsh-Upland Ecotone. *Estuaries and Coasts* 41: 54-67.

Gittman, R.K., Peterson, C.H., Currin, C.A., Fodrie, F.J., Piehler, M.F., Bruno, J.F. 2016. Living shorelines can enhance the nursery role of threatened estuarine habitats. *Ecological Applications* 26, 249-263.

Jivoff, P. 2005. The Effect of Artificial Shoreline on Habitat Quality and Mortality of Blue Crabs, Callinectes sapidus. Rider University, pp. 1-12.

Kauffman, G.J., Cruz-Ortiz, C. 2012. Economic Value of the Barnegat Bay Watershed. Institute for Public Administration Water Resource Agency, University of Delaware, Newark.

Koch, E.W., Sanford, L.P., Chen, S.-N., Shafer, D.J., McKee Smith, J., 2006. Waves in seagrass systems: Review and technical recommendations, Engineering Research and Development Center. U.S. Army Corps of Engineers, Vicksburg, MS, p. 92.

McKenna, K., DiCosmo, N., Greenfield, B., Gebert, J., Jensen, H., 2018. Quantification of Flood Event Forcing and the Impact of Natural Wetland Systems: Great Bay Boulevard, Ocean County, New Jersey. US Army Corps of Engineers, Institute for Water Resources, Alexandria, Virginia, p. 46.

Narayan, S., M.W. Beck, P. Wilson, C.J. Thomas, A. Guerrero, C.C. Shepard, B.G. Reguero, G. Franco, J.C. Ingram, and D. Trespalacios. 2017. The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. *Scientific Reports* 7: 9463.

Stutz, M.L., Pilkey, O.H. 2005. The relative influence of humans on barrier islands: Humans versus geomorphology, *in* Ehlen, J., Haneberg, W.C., and Larson, R.A., eds., Humans as Geologic Agents. Boulder, CO. Geological Society of America Reviews in Engineering Geology, v.XVI, p. 137-147. Doi:10.1130/2005.4016(12).

BARNEGAT BAY PARTNERSHIP
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March 29, 2019

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Philadelphia, PA 19107
VIA EMAIL PDPA-NAP@usace.army.mil

Re: New Jersey Back Bays Coastal Storm Risk Management Interim Feasibility Study

Dear Mr. Blum:

I am submitting these comments to the U.S. Army Corps of Engineers regarding the New Jersey Back Bays Coastal Storm Risk Management Interim Feasibility Study on behalf of the Barnegat Bay Partnership (BBP), which comprises federal, state, and local government agencies, academic institutions, nongovernmental organizations, and businesses working together to restore and protect a nationally significant estuary, the Barnegat Bay.

AUTHORITY

The BBP submits these comments pursuant to Section 320 of the Clean Water Act (33 U.S.C. 1330; as amended by P.L. 100-4 *et seq*.), which established the Barnegat Bay as an estuary of national significance. Section 320 further identifies important purposes of our management conference: addressing point and nonpoint sources of pollution, maintaining sustainable populations of fishes and wildlife, protecting their habitats, and assuring that the designated uses of the estuary are protected. In accordance with the BBP's Memorandum of Understanding Regarding the Roles and Responsibilities of Partners and its attendant charters and policies, the Environmental Protection Agency, New Jersey Department of

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Environmental Protection, and the U.S. Army Corps of Engineers (USACE) neither participated in the development of these comments nor reviewed them for endorsement.

INTRODUCTION

The New Jersey Back Bays Coastal Storm Risk Management Interim Feasibility Study and Environmental Scoping Document (Back Bays Study) is a substantial undertaking, which involved a great deal of preparation and effort. We commend the USACE for clearly identifying the effects of sea level rise and climate change in your planning; the BBP shares your concerns about the importance of these challenges to living on the coast. Furthermore, the BBP and our partners note that the Back Bays Study specifically recognizes the following: the importance of avoiding degradation of water quality as a universal constraint in selecting among project alternatives, and that natural ecological systems help mitigate flooding.

After reviewing the main report and accompanying appendices, the BBP and its partners are concerned about the project's direct impacts to critically important habitats (*i.e.*, intertidal wetlands, beds of submerged aquatic vegetation, and bay shorelines) and indirect effects more broadly throughout the back bays (and Barnegat Bay in particular). While the document attempts to be comprehensive in scope, there are a number of recognized major data gaps (hydrodynamic and water quality modeling around storm surge barriers (SSBs), perimeter structures effects on recreation, etc.) resulting in some decisions being based on little information and/or a limited understanding.

Strikingly, the No Action alternatives described in the Environmental Considerations of the Focused Array (Appendix F) clearly demonstrate the potential substantial negative effects (increased nuisance flooding, tidal marsh loss, SAV bed loss, wildlife habitat loss) that sea level rise will have on the natural resources of the region if current trends continue. Unfortunately, none of the proposed alternatives discussed in this document will ameliorate these effects. The vulnerability of the coast (especially the back bays that are the focus of this study) to inundation over the next 30-50 years should be emphasized to all stakeholders. Furthermore, it should be clearly stated that significant action at the regional (and larger) scale is needed to stave off periodic flooding at best or total inundation of the lowest lying and more vulnerable areas.

The following comments are organized in a manner similar to the Back Bays Study itself; we first address any concerns associated with the initial screening processes,

then concerns with non-structural measures, and lastly those with structural measures. While many of our non-structural and structural comments are related to the Preliminary Focused Array in the North Region, they are also broadly applicable across the study area.

Planning and Process

The section on National Economic Development Criteria Screening (Section 9.5.1.1) is missing a discussion of the North Region.

It is not clear if the benefit/cost calculations include the $2.3+ billion in ecosystem services provided by the Barnegat Bay watershed to the regional economy (Kaufman and Cruz-Ortiz 2012). Not including those values when calculating the benefit to costs of various alternatives is likely to lead to selection of less than desirable alternatives and outcomes.

The Environmental Quality Criteria Screening Index scores found in the main report (Section 9.5.1.2) for the North Region (page 181) are different (and higher) than those reported in the Plan Formulation Appendix A Table 6. Which are the correct scores? Where are the data used to develop the scores? Because the indirect impacts associated with SSBs were not modeled and indirect effects were poorly recognized, providing the data used to develop the scores is important. The USACE Environmental Quality Criteria Screening scoring process involves considerable subjectivity. Without seeing the data it is not clear if additional alternatives should have failed, given that they are all so low (<2). The score currently suggests a very high risk endeavor, which is likely to increase to extreme once the modeling is completed.

Because of our own and others' similar experiences during and after significant storms, we strongly recommend that nature-based features be a prominent component of any tentatively selected plan(s). Human infrastructure with robust coastal wetlands and dune features between them and a water body typically fare far better during storms than infrastructure without such natural protective features (Barbier *et al.* 2013; Narayan *et al.* 2017). A growing body of literature has shown that wetlands, seagrass beds, oyster reefs, living shorelines, and other biogenic structures attenuate wave energy and ameliorate flood impacts effectively (Wamsley *et al.* 2010; Costanza *et al.* 2008; Koch *et al.* 2006). As an added bonus, when properly implemented, these features are likely to be robust against sea level rise, which increases their longevity and presumably their benefits. While not feasible to implement everywhere in the watershed, there are substantial areas of

shoreline that would benefit from the natural and nature-based treatments described above, with the added benefit of the additional ecosystem services, including water quality benefits, they provide.

Non-structural Measures

While refinement of the National Flood Insurance Program (NFIP) is discussed as one of the Nonstructural measures in the CSRM Measure Inventory and Screening (Section 9.2.2.4, pg. 107), it is limited to increasing participation of individuals and communities. While increased participation would benefit some communities along the bay, the USACE should use the North Atlantic Coast Comprehensive Study (NACCS) and the regional studies to promote larger conversation with other agencies (especially those involved in the National Disaster Recovery Framework and associated federal programs) about how to prevent the NFIP from incentivizing development and/or redevelopment in high risk areas, which then results in additional publicly funded mitigation measures, with the cycle continuing to repeat itself at increasing costs and even higher risks into the future.

We were pleased to see that managed retreat and relocation are mentioned prominently in the Back Bays Study, as those approaches are far too often left out of discussions on coastal storm risk reduction; however, we are concerned about some inconsistencies and potential bias apparent in the Management Measures Screening Process (Section 9.3). For example, some Structural Measures received generous Acceptability scores (1 for levees) in Cycle 2, whereas non-structural measures were given artificially low scores (0 for managed retreat). Upon careful review of the USACE definition of Acceptability, *i.e.*, "the workability and viability of the alternative plan with respect to compatibility with existing laws, regulations, and public policies," it is unclear why managed retreat was not scored a 0.5 or 1, as we are unaware of existing laws, regulations, or public policies discouraging this practice. Similarly, levees should score 0.5, the same as barriers and permanent floodwalls, as the NJ Rules on Coastal Zone Management and other land use regulations actively discourage those types of development. These inconsistencies appear to bias upward the rankings of structural components. As mentioned in our comments during the Feasibility Study, acquisition in areas that suffer from repetitive losses is a particularly useful and cost-effective strategy, especially when implemented at an appropriate spatial scale. This approach has been effective in the Raritan River and Delaware River watersheds, and merits consideration as a solution, especially for back-bay sites with low elevations and other risk factors which increase their vulnerability to sea level rise (*e.g.*, wind and wave fetch, vegetation).

The Preliminary Focused Array Description for the North Region (10.3.4) Alternative 3D (p202) states that non-structural solutions are proposed for "15,565 residential structures for the municipalities on the mainland adjacent to Great Bay and Mullica River Embayment, Little Egg Harbor and portions of Manahawkin Bay, and associated tributaries and canals." However, Figure 10-4 shows non-structural solutions associated with the mainland and barrier island communities for the entire region, similar to Alternative 3A (minus Point Pleasant Area). Which is correct, the text or the map?

Structural Measures

General Impacts

The document acknowledges that the structural components of the proposed alternatives will have moderate to significant impacts to coastal wetlands and other aquatic habitats that will necessitate mitigation. The USACE has indicated that they are contemplating using the New England Salt Marsh Model to assess wetland impacts and mitigation needs. While this model is suitable for assessing the use of coastal marshes for *terrestrial* wildlife, it ignores the high value of coastal marshes for fishes and other aquatic species (recognized in Appendix F, Fisheries Resources section). The use of salt marshes by commercially and recreationally important fish species in New Jersey is well documented (Able 1999; Able *et al.* 2007; Grothues and Able 2003; Hagan *et al.* 2007; Miller *et al.* 2003; Nemerson and Able 2003; Nemerson and Able 2004; Roundtree and Able 1992a,b) and should be taken into account when assessing wetland impacts and mitigation needs.

It is also not clear how the USACE will identify, account, and mitigate for significant impacts to wildlife species outside of wetlands, essential fish habitat, and the Migratory Birds Act. Birds, fishes, and reptiles are likely to lose access to critical feeding, resting, and nesting habitats, as well as food sources (Focused Array, Appendix F, Section F-2 Environmental Considerations); however the mechanisms for assessing the significance of, and subsequently mitigating for, the habitat losses is unclear.

The USACE indicates that SAV surveys will be completed in all locations and waterways with perimeter structures and SSBs (Appendix F, Section F-2 Environmental Considerations of the Focused Array – SAV). Indirect impacts associated with these activities can occur outside of the immediate construction area; however the SAV mapping that is available in Barnegat Bay is over 10 years

old, and SAV bed extent and shoot densities in beds can change significantly over the course of a few years. The true estimate of impacts (direct and indirect) may be substantially different than your methods would recognize, especially in Barnegat Bay, which has 75% of the remaining SAV within NJ State waters (BBP 2016). You would not calculate the net benefits of the project with old, inaccurate data, why would you do so for the net impacts? Therefore, the Corps should extend the proposed SAV surveys (both bed extent and density) to the entire study area.

In Section 10.7 Environmental Mitigation, the authors indicate that several preliminary alternatives were screened out as they would have induced significant impacts on critical fish and wildlife resources. SAV in Barnegat Bay is a critical fish and wildlife resource, yet alternatives 3E(2) and 3E(3) propose significant direct impacts and potential indirect significant impacts (as described in Appendix F) and were not removed from consideration. How were "critical fish and wildlife resources" defined?

The direct permanent loss of 11 acres of SAV beds (Habitat Areas of Particular Concern for summer flounder) under 3E(3) represents the loss of almost 0.2% of previously mapped SAV bed extent, and 21 acres of tidal marsh loss would be equal to 10% of what was lost naturally during 2007-2012 (BBP 2016). Considering these tidal marshes are an identified priority under the Emergency Wetlands Resources Act of 1986 (Appendix F) because of their national ecological significance, it would seem that a loss of this magnitude would be unacceptable. It is unclear how the USACE determines how to classify losses (*i.e.*, slight, moderate, significant, *etc*.). For example, the permanent loss of eight acres of subtidal bottom habitat for the placement of SSBs would be considered more than "moderate" by most ecologists (Table 10.2, p235).

Perimeter Structure Impacts
Studies from Barnegat Bay and elsewhere have clearly documented a reduction in benthic infauna and epifauna associated with hard structures at the water's edge as compared to natural shorelines (Gittman *et al.* 2016), particularly for recreationally and commercially important species (Jivoff 2005). It is not clear if these impacts will be assessed within the Benthic Index of Biotic Integrity. If not, they should be quantified given the amount of perimeter structures included in the various alternatives.

In Appendix F, Section F-2 Environmental Considerations of the Focused Array – Floodplains, the impacts discussed are on the effects on the human communities/structures within the floodplains, rather than the effects of the

alternatives on the floodplains themselves. Erecting permanent perimeter flood-control structures adjacent to natural areas is likely to have a significant adverse effect on the hydrology and natural communities within the floodplains, and should be assessed.

In Appendix F, Section F-2 Environmental Considerations of the Focused Array – Geology and Soils, the No Action alternative correctly points out that rates of sea level rise may also exceed normal sediment accretion rates in the saltmarshes and resulting in increased inundation and subsidence (*i.e.*, "marsh drowning"). Perimeter structures are likely to cut off soil and sediment sources which further reduce sediment deposition on the saltmarshes (Ganju 2017) and also prevent their landward migration as water level rises (Gehman *et al*. 2018); however, discussion of those effects is lacking. The effects of the perimeter structures on sediment transport into the wetlands should be described and quantified here so that there is a fuller understanding of the impacts of the proposed alternatives.

Re-suspension of sediments containing nutrients and a decrease of transitional uplands areas that act as filter for non-point source runoff are identified as indirect impacts of perimeter walls in Appendix F, Section F-2 Environmental Considerations of the Focused Array – Plankton. These are also water quality impacts, and as such should be identified and discussed in the Water Quality section.

The description of the impacts of structural perimeter measures on recreation (Appendix F, Section F-2) significantly downplays the extent to which a 5–10 foot-high barrier will alter recreational access to coastal waterways. Most homeowners who have property along the bays do so to have direct waterfront access for recreational activities, primarily boating. To suggest that the "potential effect would require further evaluation to determine the extent of this impact" is to ignore the obvious fact that the impact may be significant.

Storm Surge Barrier Impacts

The Back Bays Study makes clear that the quantification of some environmental impacts associated with SSBs has not been performed, since hydrodynamic environmental circulation and water quality modeling have not yet been completed. We understand that studies of those magnitude take considerable effort and are expensive to complete, and therefore are limited to only the most feasible alternatives. However, it is difficult to assess the suitability of certain alternatives, particularly those including the Barnegat Inlet SSB, when potentially significant impacts would be derived from changes to hydrodynamic circulation and water

quality. Our comments regarding the potential impacts of the Barnegat Inlet SSB (and the Manasquan Canal SSB), can only be based on limited information.

As currently depicted, the SSB at Barnegat Inlet would tie into an existing jetty structure on the southern side of the inlet at the north end of Long Beach Island. On the northern side of the inlet, the structure would tie into a jetty and existing sand dunes within Island Beach State Park (IBSP), an undeveloped section of the barrier island. Even with jetties along both sides of the inlet, the topography and bathymetry in the vicinity of the inlet have been highly dynamic. Previous USACE engineering solutions along the bayside of IBSP (*i.e.*, including geotubes) in the immediate vicinity of the proposed barrier have failed to reduce erosion. Conversely, the inlet itself has required dredging repeatedly, as has the ICW and state channels immediately to the south of the inlet. It is not clear how the proposed SSB would affect and/or be affected by the different bathymetry that would undoubtedly be created by the installation of any SSB. This should be included in any consideration of the suitability of a SSB at this location.

The Environmental Considerations of the Preliminary Focused Array (Section 10.6) concludes that inlet SSBs would have moderate to significant direct impacts on aquatic habitats, and that there may be more potential indirect impacts on hydrodynamics, water quality, and shifts in flora and fauna abundance, distributions and migrations (page 218, Table 10.2). Furthermore, it concludes on page 219 that "it is likely that substantial compensatory mitigation would be required." Recent research (BBP 2016) has shown that the healthiest eelgrass beds in the bay are located in the immediate vicinity of the Barnegat Inlet, across which a SSB is proposed under Alternatives 3E(2) and 3E(3). Given that consistently successful mitigation methodology for seagrass beds in Barnegat Bay has yet to be developed, and impacts to this critical habitat appear likely, Alternatives 3E(2) and 3E(3) should be dropped from consideration.

Miscellaneous Comments

In Figure 10-18, in the Key Outcomes box, Commercially/recreationally valuable species, the listed example is oysters. We would be remiss if we did not point out that hard clams are currently the most valuable commercially harvested aquatic species in the bay, though recent oyster aquaculture farms, particular in the immediate vicinity of the Barnegat Inlet (across which an SSB is proposed), are increasingly productive.

It is not clear which protected lands/areas are impacted by which feature associated with each project alternative in Table 11 in Appendix F. Some gridlines would be helpful to separate each alternative-feature group.

Reference is made to sea nettle (*Chrysaora quinquecirrha*) throughout Appendix F. Recent investigations have revealed that this species is actually bay nettle (*Chrysaora chesapeakei*), a close relative of the sea nettle (Bayha *et. al* 2017).

We hope that you find our comments to be constructive during the formulation of the tentatively selected plan, and we welcome the opportunity to discuss these comments in more detail. If you have any questions, please feel free to contact me or Dr. Jim Vasslides, our Program Scientist, at 732-255-0472.

Sincerely,

L. Stanton Hales, Jr., Ph.D.
Director

cc: Mr. Rob Karl, Brick Township MUA, STAC Chair
Dr. Steven Yergeau, Rutgers Cooperative Extension, STAC Vice-Chair
Ms. Karen Greene, NOAA-NMFS, Advisory Committee Co-Chair

CITATIONS

Able, K.W. 1999. Measures of Juvenile Fish Habitat Quality: Examples from a National Research Reserve. In American Fisheries Society Symposium 22: American Fisheries Society.

Able, K.W., S.M. Hagan, K. Kovitvongsa, S.A. Brown, and J.C. Lamonaca. 2007. Piscivory by the mummichog (Fundulus heteroclitus): Evidence from the laboratory and salt marshes. *Journal of Experimental Marine Biology and Ecology* 345: 26-37.

Bayha, K.M., A.G. Collins, and P.M. Gaffney. 2017. Multigene phylogeny of the scyphozoan jellyfish family Pelagiidae reveals that the common U.S. Atlantic sea nettle comprises two distinct species (Chrysaora quinquecirrha and C. chesapeakei). *PeerJ* 5: e3863.

Barbier, E.B., Georgiou, I.Y., Enchelmeyer, B., Reed, D.J. 2013. The value of wetlands in protecting southeast Louisiana from hurricane storm surges. *PLoS ONE* 8(3).

Barnegat Bay Partnership. 2016. State of the Bay Report. Barnegat Bay Partnership, Toms River, NJ. 80pp.

Costanza, R., Perez-Maqueo, O., Martinez, M.L., Sutton, P., Anderson, S.J., Mulder, K. 2008. The value of coastal wetlands for hurricane protection. *Ambio* 37, 241-249.

Ganju, N.K., Defne, Z., Kirwan, M.L., Fagherazzi, S., D'Alpaos, A., Carniello, L. 2017. Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. *Nature Communications* 8, 14156.

Gehman, A.-L.M., N.A. McLenaghan, J.E. Byers, C.R. Alexander, S.C. Pennings, and M. Alber. 2018. Effects of Small-Scale Armoring and Residential Development on the Salt Marsh-Upland Ecotone. *Estuaries and Coasts* 41: 54-67.

Gittman, R.K., Peterson, C.H., Currin, C.A., Fodrie, F.J., Piehler, M.F., Bruno, J.F. 2016. Living shorelines can enhance the nursery role of threatened estuarine habitats. *Ecological Applications* 26, 249-263.

Grothues, T.M., and K.W. Able. 2003. Discerning vegetation and environmental correlates with subtidal marsh fish assemblage dynamics during *Phragmites* eradication efforts: interannual trend measures. *Estuaries* 26: 574-586.

Hagan, S.M., S.A. Brown, and K.W. Able. 2007. Production of mummichog (*Funduls heteroclitus*): Response in marshes treated for common reed (*Phragmites australis*) removal. *Wetlands* 27: 54-67.

Miller, M.J., D.M. Nemerson, and K. Able. 2003. Seasonal distribution, abundance, and growth of young-of-the-year Atlantic coraker (*Micropogonias undulatus*) in Delaware Bay and adjacent marshes. *Fishery Bulletin* 101: 100-115.

Jivoff, P. 2005. The Effect of Artificial Shoreline on Habitat Quality and Mortality of Blue Crabs, Callinectes sapidus. Rider University, pp. 1-12.

Kauffman, G.J., Cruz-Ortiz, C. 2012. Economic Value of the Barnegat Bay Watershed. Institute for Public Administration Water Resource Agency, University of Delaware, Newark.

Koch, E.W., Sanford, L.P., Chen, S.-N., Shafer, D.J., McKee Smith, J., 2006. Waves in seagrass systems: Review and technical recommendations, Engineering Research and Development Center. U.S. Army Corps of Engineers, Vicksburg, MS, p. 92.

Narayan, S., M.W. Beck, P. Wilson, C.J. Thomas, A. Guerrero, C.C. Shepard, B.G. Reguero, G. Franco, J.C. Ingram, and D. Trespalacios. 2017. The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. *Scientific Reports* 7: 9463.

Nemerson, D.M., and K. Able. 2003. Spatial and temporal patterns in the distribution and feeding habits of *Morone saxatilis* in marsh creeks of Delaware Bay, USA. *Fisheries Management and Ecology* 10: 337-348.

Nemerson, D.M., and K. Able. 2004. Spatial patterns in diet and distribution of juveniles of four fish species in Delaware Bay marsh creeks: factors influencing fish abundance. *Marine Ecology Progress Series* 276: 249-262.

Roundtree, R.A., and K.W. Able. 1992a. Foraging Habits, Growth, and Temporal Patterns of Salt-Marsh Creek Habitat Use By Young-of-Year Summer Flounder in New Jersey. *Transactions of the American Fisheries Society* 121: 765-776.

Rountree, R.A., and K. Able. 1992b. Fauna of Polyhaline Subtidal Marsh Creeks in Southern New Jersey: Composition, Abundance and Biomass. *Estuaries* 15: 171-185.