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January 9, 2019
Carissa Agnese
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Norfolk, VA 23510
Carissa.R.Agnese@usace.army.mil

Re: NEPA Scoping Document for the Miami-Dade Back Bay Coastal Storm Risk Management Feasibility Study

Dear Ms. Agnese,

Thank you for the opportunity to submit scoping comments on the National Environmental Policy Act ("NEPA") analysis and Miami-Dade Back Bay Coastal Storm Risk Management Feasibility Study to be carried out by the U.S. Army Corps of Engineers ("Corps"). The Corps is examining possible ways to reduce the risk from coastal storms and the resulting flooding on the Back Bay portion of Biscayne Bay, much of which is densely populated and at low elevation.

Miami-Dade County is at significant risk from coastal flooding from hurricanes and other storms, containing some of the most vulnerable areas in the country to sea level rise. We applaud the Corps for examining how best to protect Miami-Dade's residents and visitors from flood events through this feasibility study.

That said, many of the traditional methods considered in such feasibility studies may be less effective in Miami-Dade County due to the area's unique physical and cultural characteristics. Alternatives that take into account these characteristics would lead to a more resilient and successful study, and we urge the Corps to conduct a full Environmental Impact Study (EIS) rather than limit itself to an Environmental Assessment in order to comprehensively examine the unique conditions of the region.

We also urge the Corps to develop risk mitigation alternatives that:

(1) Prioritize natural and nature-based features (NNBF) as part of any risk reduction strategy; and

(2) measure potential benefits in an equitable way that is not simply based on real estate values.

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We address these two areas in more detail below.

1. Prioritize Natural and Nature-Based Features (NNBF)

We urge the Corps to pay particular attention to the benefits of natural and nature-based features (NNBF) in mitigating coastal storm risks, as these features may be particularly effective in Miami. Not only do these kinds of projects tend to be less expensive to build and maintain, but they also are dynamic and have the potential to adapt with climate change.[1] Unlike grey infrastructure or artificial structures like seawalls, pumps, and berms, which must be consistently maintained, many types of NNBF can be self-sustaining when developed properly.

Prior to the rapid development of urban Miami-Dade County, the South Florida coastline was largely made up of mangroves forests, coastal wetlands, and was protected by patch reefs in Biscayne Bay and by the Florida Reef Tract. These natural systems provided significant coastal protection, but those benefits have largely been lost through urbanization. Most of the mangroves in the northern and central Back Bay area have been replaced by seawalls and other artificial structures. The Florida Reef Tract – the only offshore coral reef in the continental United States – has been reduced by more than 80% since the 1970s, and quite possibly far more.[2]

NNBF like restored coastal wetlands, mangroves, and coral reefs offer an innovative, effective, and inexpensive way to protect coastal areas from storm risks. Indeed, the United States Congress has also held that such tools should be incorporated into Corps projects; Section 1149(c) of America's Water Infrastructure Act of 2018, signed into law last month, mandates that the Corps consider green infrastructure and nature-based features when carrying out, among other things, flood risk management feasibility studies. We ask that the Corps not only consider or incorporate but *prioritize* NNBF alternatives over traditional grey infrastructure for the reasons set forth below.

A. Miami-Dade County's Unique Geology Reduces the Efficacy of Grey Infrastructure

Traditional storm risk reduction features include features like seawalls designed to blunt the impact of storm surge and prevent inundation of coastal regions. However, the porous limestone underlying Miami-Dade County makes seawalls and other grey infrastructure artificial barriers far less effective in preventing flooding, as rising waters can seep up through the pores in the ground, potentially bypassing the seawalls entirely.[3] Given the depth of coastal limestone,

[1] Morris et al. 2017. From grey to green: Efficacy of eco-engineering solutions for nature-based coastal defence. *Global Change Biology* 24:1827-1842.

[2] Gardener et al. 2003. Long-term region-wide declines in Caribbean corals. *Science* 301(5635):958-960.

[3] Cjakowski et al. 2018. Economic impacts of urban flooding in south Florida: Potential consequences of managing groundwater to prevent salt water intrusion. *Science of the Total Environmment* 621: 465-478; Sukop et al. 2018.

truly effective walls would have to be drilled down past coastal limestone, a process which would be economically and logistically impossible. Furthermore, this kind of seepage will increase in the face of rising seas, making such grey infrastructure features steadily less effective.

Furthermore, any storm risk mitigation strategy must also consider the impacts of floodwaters on the County's subsurface water assets. Saltwater intrusion is a serious problem for the County; in the face of rapid population growth, Miami-Dade County's aquifers are a quantifiable economic asset that must be incorporated into any evaluation of the benefits provided by storm risk management features. Seawalls, berms, and other physical barriers would do little to protect our aquifers from saltwater intrusion and could even exacerbate the problem if they replace coastal wetlands that *do* protect those aquifers. Miami-Dade County already suffers from significant saltwater intrusion into the aquifers supplying its drinking water, including not only the near the shoreline but also near canals and drainage ditches further inland.[4]

Under guidance issued by the Department of the Army, Office of the Assistant Secretary, Public Works (and described in more detail in section D below), the Corps study teams "must also consider the geophysical setting, effectiveness, and compatibility of the features" evaluated. The geophysical setting in Miami-Dade County is such that grey infrastructure will, in many cases, be far less effective than it would in other parts of the country. Miami-Dade County currently relies heavily on gravity-based drainage infrastructure for stormwater and wastewater management. Many of these systems have already lost functioning due to sea level rise— problem that will continue to intensify in the future.

B. NNBF Like Coastal Restoration and Coral Replantation Have Proven Highly Effective in Reducing Damage Caused by Storms

In a comprehensive study of the efficacy of NNBF, Narayan et al. examined 52 restoration projects across the globe designed specifically to provide coastal protection, analyzing the degree of protection offered, costs, and benefits of each project. [5] They found not only did coastal habitats have significant potential to reduce wave heights and provide shoreline protection, but also that they could be significantly more cost-effective than similar grey infrastructure features like breakwaters. In terms of coastal protection efficacy, they found that coral reefs reduced wave heights by an average of 70%, salt marshes by 72%, mangroves by 31%, and seagrass/kelp beds

High temporal resolution of the impact of rain, tides, and sea level rise on water table flooding in the Arch Creek basin, Miami-Dade County Florida USA. *Science of the Total Environment* 616-617:1668-1688.

[4] Fitterman. 2014. Mapping saltwater intrusion in the Biscayne Aquifer, Miami-Dade County, Florida using transient electromagnetic sounding. *Journal of Environmental & Engineering Geophysics* 19(1):33-43.

[5] Narayan et al. 2016. The effectiveness, costs and coastal protection benefits of natural and nature-based defences. *PLoS ONE* 11(5):1-17.

by 36%. The attached fig. 1 was taken from the Narayan et al. article and provides a schematic overview of wave reduction processes from NNBF.

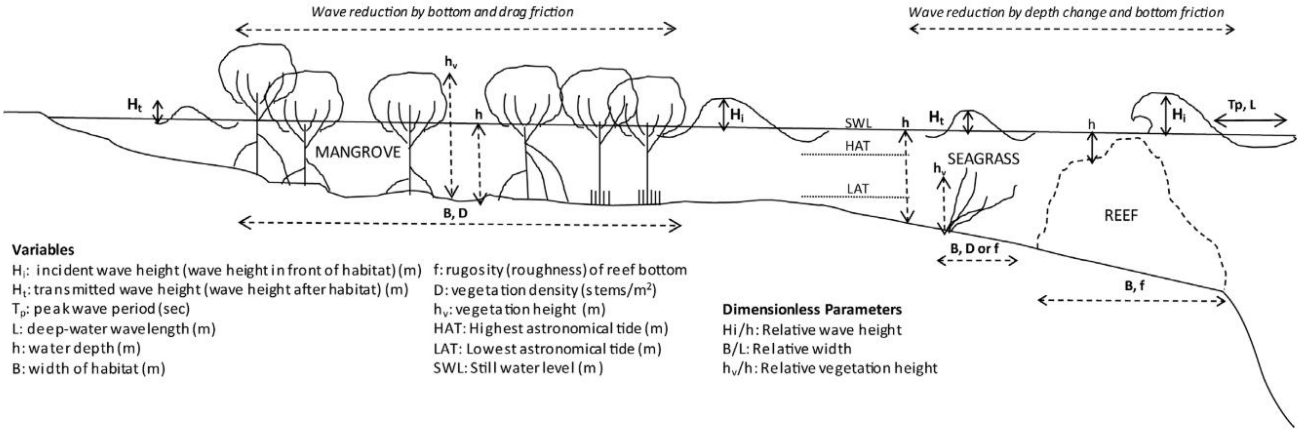

Fig 1. Schematic of wave height reduction across coastal habitats. Schematic showing general mechanics of wave height reduction through habitats, using the examples of coral reefs, seagrass beds and mangroves.

(Fig. 1 taken from Narayan et al. (2016))

We note that Biscayne Bay and its coastline, unlike most other coastal areas in the United States, can support each of the NNBF types shown. For Miami-Dade County, coral restoration projects could build upon work already being done; the National Science Foundation has already funded University of Miami researchers working on designing and implementing coral-related storm surge protection, which would allow the Corps to leverage other federal funding.

C. Local Stakeholders Prefer NNBF and Green Infrastructure

NNBF and green infrastructure have been increasingly recognized by local politicians, environmental managers, scientists, and other stakeholders in the region as a promising and desirable tool for protecting Miami-Dade County's coasts. Indeed, when the Corps and Miami-Dade County convened a November 8 workshop for local planners, researchers, and citizens, participants – many of whom are experts on storm risk management in Miami-Dade County – this group of stakeholders overwhelmingly prioritized NNBF. County and municipal partners in the Southeast Florida Regional Climate Compact, including Miami-Dade County, have developed a Regional Action Plan that explicitly promotes protecting coastal natural systems and the creation of living shorelines,[7] and the protection of coral reefs[8] developed under it.

[7] www.southeastfloridaclimatecompact.org/recommendations/ns-7/
[8] http://www.southeastfloridaclimatecompact.org/recommendations/ns-8/

D. NNBF Offer Additional Benefits Beyond Storm Risk Mitigation Which the Corps is Required to Account For in its Study

In addition to the direct coastal defense benefits provided by NNBF, those features also produce substantial additional quantifiable benefits in the form of ecosystem services such as fisheries habitat, recreational value, carbon sequestration, and water quality improvements.[9] The Corps' 2015 report on NNBF notes that "[c]onsiderations of the full spectrum of functions, services, and benefits potentially produced by these coastal recovery initiatives are critical to managing coastal resilience of the long-term."[10]

Given Miami's status as one of the world's major tourist destination for fishers, kayakers, and swimmers, the recreational value added from NNBF could be especially significant. A 2005 study estimated that Biscayne Bay-related uses accounted for over 10% of income in the County, and contributed nearly $4 billion dollars in economic input to the region.[11] Since then, recreational use of the Bay has largely increased.[12] NNBF features like mangroves, coral reefs, and wetlands are attractive to kayakers and wildlife observers, provide nurseries for gamefish, and increase recreational value of the Bay through improved water quality.

These ecosystem services benefits should be accounted for when evaluating alternatives in the feasibility study. Section 1184 of the Water Resources Development Act of 2016 requires that:

> [i]in studying the feasibility if projects for flood risk management, hurricane and storm damage reduction, and ecosystem restoration the Secretary shall, with the consent of the non-Federal sponsor of the feasibility study, consider, as appropriate . . . natural features [and] nature-based features."[13]

The Department of the Army Office of the Assistant Secretary, Civil Works, has issued guidance in interpreting Section 1184. Under this guidance, study teams "must consider natural and nature-based features alone and in combination with other nonstructural and structural

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[9] Barbier et al. 2011. The value of estuarine and coastal ecosystem services. *Ecological Monographs* 81(2):169-193.
[10] US Army Corps of Engineers, *Use of Natural and Nature-Based Features (NNBF) for Coastal Resilience*, https://apps.dtic.mil/dtic/tr/fulltext/u2/a613224.pdf (page 22)
[11] Hazen & Sawyer Environmental Engineers and Scientists and Planning Economics Group. 2005. *Biscayne Bay Economic Study, Task 3 Report – Final Biscayne Bay economic baseline and trend report*. http://www.kirklandpress.com/MRMG/Baseline_and_Trend_Report.pdf
[12] See Shivlani & Dowdell. 2016. Socioeconomic characterization of Biscayne Bay and its uses and activities – Follow-up to the 2005 Biscayne Bay valuation: Characterization study of Biscayne Bay and its uses and activities. https://miami.app.box.com/s/gvdk35bbps2djdzjvpk8ihs47gi6keis
[13] Title I of America's Water Infrastructure Act of 2018, passed into law in October, amends Section 1184 of the 2016 Act by expanding the definition of "nature-based features," but otherwise leaves that section intact.

measures." Furthermore, this guidance requires study teams to incorporate potential ecosystem service benefits beyond storm protection as appropriate:

> Evaluation of natural and nature-based features will be at the same level of detail and consistent with existing policies regarding the evaluation of alternatives. In doing so, study teams will utilize all four accounts (NED, Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE)), as appropriate. **For example, in addition to coastal storm damage reduction benefits, salt marshes could provide nursery habitat for fish species, ecosystem diversification, recreation, and water quality regulation benefits. An ecosystem restoration project that restores a wetland may also provide natural floodwater storage.**[14] [emphasis added]

As per this implementation guidance, the Corps should incorporate not only coastal defense benefits of NNBF in evaluating alternatives, but also ecosystem services benefits.

2. Measure Potential Benefits in an Equitable Way

Traditional feasibility study approaches include examining the costs and benefits of alternative plans based to a large extent on real estate values, or the National Flood Insurance Program categories. Higher-value properties are more likely to be the beneficiaries of protection features, often at the expense of historically vulnerable communities. We urge the Corps to take into account these vulnerabilities when evaluating alternatives, especially given that Executive Order 12898, 59 F.R. 7629, requires agencies like the Corps to "identify[] and address[], as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. . ."[15]

[14] https://planning.erdc.dren.mil/toolbox/library/WRDA/WRDA16IGSection1184_16Nov17.pdf
[15] https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

A number of tools exist that could assist the Corps here; for example, the Centers for Disease Control have developed a Social Vulnerability Index (SVI) score for each census tract in the United States.[16] The SVI allows emergency response planners and other officials to identify communities that are particularly vulnerable to hazardous events, and provides a useful tool for identifying communities at particular risk for coastal storm events, independent of simple property values. As shown in the map, there are some higher-vulnerability census tracts on the ocean side of the barrier island. Given the future impacts of climate change, and the likelihood that phenomena like climate gentrification may push lower income communities into more at-risk and lower elevation areas, it is critically important that storm risk mitigation features are sited equitably. Flooding risk has a significant public health impact as well, particularly for communities that suffer from lack of access to adequate medical care.

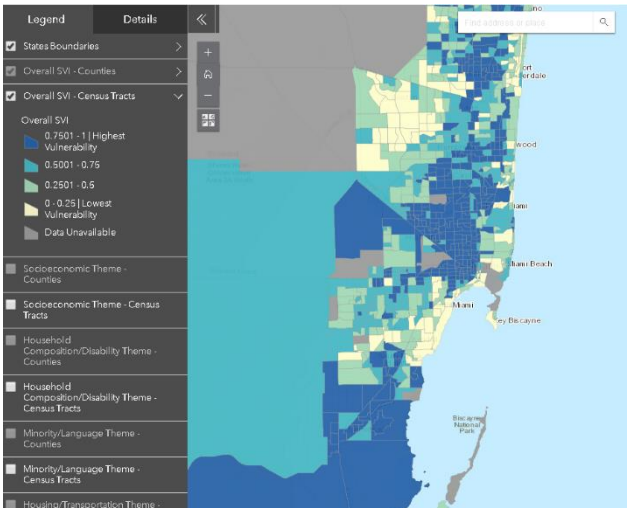

Fig. 2: SVI map for census tracts in Miami-Dade County.

The Corps should also take into account the unique geological and hydrological characteristics of the area. Due to the porous ground and comparatively flat elevation, coastal flooding can have wide-ranging impacts beyond just direct storm damage near the shoreline. Evaluating flooding risk must take into account our interconnected aquifers, stormwater, and our canal system, and the wide-ranging impacts coastal storm flooding can have well beyond the shoreline.

Thank you for your consideration,

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[16] https://svi.cdc.gov/