



# VILLAGE OF KEY BISCAYNE

## Office of the Village Manager

*Village Council*

### MEMORANDUM

**Michael W. Davey, Mayor**  
**Allison McCormick, Vice Mayor**

DATE: August 27, 2019

**Luis Lauredo**  
**Edward London**  
**Brett Moss**

TO: Honorable Mayor and Council Members

**Katie Petros**  
**Ignacio J. Seguro**

FROM: Andrea M. Agha, Village Manager *AMA*

*Village Manager*

RE: Update on US Army Corp Federal Shore Protection Program

**Andrea M. Agha**

### RECOMMENDATION

Verbal report on Village progress per Strategic Goal: Resilience, Objective: Inclusion in Federal Shore Protection from beach consultants Spencer Crowley, Akerman LLC and Tim Blankenship, Coastal Engineer, Moffatt and Nichols.



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August 12, 2019

**Village of Key Biscayne**

Attn: Mr. Jake Ozyman, PE  
88 West McIntyre Street  
Key Biscayne, Florida 33149

*via email: jozyman@keybiscayne.fl.gov*

**Subject: KEY BISCAYNE BEACH MANAGEMENT – MIAMI-DADE COUNTY FEDERAL SHORE PROTECTION PROJECT, JACKSONVILLE DISTRICT, U.S. ARMY CORPS OF ENGINEERS**

Dear Mr. Ozyman:

Moffatt & Nichol (M&N) attended a coordination meeting with the U.S. Army Corps of Engineers (Corps) in Jacksonville on August 6, 2019 to discuss the status of the Miami-Dade County Federal Shore Protection Coastal Storm Risk Management (CSRМ) feasibility study (CSRМ Study). The meeting was attended by phone by representatives of the Village of Key Biscayne (Village) along with the Village beach management team (including Jim Davenport of Thorn Run Partners and T. Spencer Crowley, III of Akerman, LLP). The purpose of the meeting was to evaluate the steps required to add Key Biscayne to the CSRМ Study. This letter summarizes the background, outlines studies for Key Biscayne, and provide recommendations and comments for moving forward along with a schedule.

The CSRМ Study is a three (3) year feasibility study to evaluate extension of the 50-year federal shore protection project that extends from Sunny Isles Beach south to Government Cut. Miami-Dade County is the local sponsor, and the Corps is providing 100% of the funding. This shore protection project is expiring in 2025 time frame, and this ongoing CSRМ Study will provide justification for proposed re-authorization (ore extension) of the Project. The Village's beach management team has been working diligently to have the Village added to this CSRМ Study being conducted by the Corps. Earlier this year, the Corps indicated the CSRМ Study is funded at \$2M for what is typically a \$3M study. During the meeting, the Corps confirmed the CSRМ Study extended from Bakers Haulover Inlet south to Government Cut (approximately 9.3 miles), and Key Biscayne had been screened-out due to budget limitations.

During the meeting, the Corps reviewed the status of the CSRМ Study that commenced in October 2018. The CSRМ is being conducted by the Corps (no consultants). The steps and scope of services for M&N to conduct the CSRМ Study on behalf of the Village were reviewed with the

Corps. The Village would need to fund this effort, and the CSRSM Study would need to be conducted with the tools and methods as outlined by the Corps in a collaborative approach. M&N compiled the following scope items summarize the approach for Key Biscayne to be added to the CSRSM Study:

- a. **Data Collection:** data for input into the coastal zone models needs to be compiled with data inputs to include the following:
  - Establish northern and southern boundary conditions; likely the boundaries of the key so that the suspected benefits of the project to the adjacent parks can be investigated and documented as well.
  - Determine delineation of westward (landward) extent of coastal zone impacts from the design storms – likely between oceanfront properties and Crandon Blvd.
  - Geographic Information System (GIS) parcel data for all infrastructure and private properties in this area to include building types, property values, finished floor elevations and other relevant data for model input
  - Summary of beach management projects and costs for the non-federal beach management projects that have been conducted by the Village since 2000.
  - Compilation of upland topographic (LIDAR remote sensing data) and nearshore/offshore bathymetry
  - Compilation of available shoreline change and profile data within study area
  - Review of current USACE CSHORE and Beach-fx models, inputs and results to help guide modelling efforts for the Village
  
- b. **Storm Suites:** The Corps is currently utilizing Ocean Weather (OWI) data points for winds and waves. These data sets are 30+ years of coastal storm data. Limited numerical modelling may be required to transform waves to the nearshore area for input into the storm suite models. Numerical models utilized for the coastal structure study will be updated and re-run for this coastal engineering analysis.
  
- c. **CSHORE Modeling:** This is the cross-shore profile storm response model used by the USACE to estimate storm effects on the planform beach to document the levels of inundation, wave heights, and erosion for individual beach profiles for a number of storm events. Based upon a review of the profile data and the localized/regional behavior of profile changes seen in that data, representative profiles for the study area will first need to be selected. It is expected that 3-5 representative profiles will be selected for study within the village and that 2-4 additional representative profiles will be selected for the adjacent parks. The CSHORE model will then need to be calibrated/verified for each of these representative profiles and once that is completed, the storm suite from the USACE can be run for each profile under a range of with and without project conditions and the results tabulated to be input within the Beach-fX model. With project conditions will likely need to include various beach fill templates as well as breakwaters.

- d. Analytical Shoreline Change Analysis:** As is currently being completed by the Corps for the Miami-Dade portion of the study area, the available shoreline and profile data for the village study area will be reviewed and an analysis completed to document shoreline change during the time period that data is available. Discussions will be conducted with the Corps to verify that our analysis procedures and time period are identical to those followed by the Corps to date. These analyses along with the CSHORE modeling outlined above form the backbone of the coastal engineering analysis needed to feed within the Beach-*fx* modeling. Various analyses will need to be completed to provide estimates of shoreline change under both with- and without project conditions. With project conditions will likely need to include various beach fill templates as well as breakwaters.
- e. Beach-Fx Modeling:** This is the model utilized by the Corps to document with and without project conditions to guide in the selection of the optimal beach protection plan as well as document its benefits and costs, and this model will have to be also utilized for the study along Key Biscayne. Beach-*fx* is a comprehensive innovative analytical framework for more accurately evaluating the physical performance and economic benefits and costs of shore protection projects. The Beach-*fx* modeling software employs an event-based Monte Carlo life cycle simulation integrating shoreline change and storm-induced profile changes (from CSHORE in this case). Beach-*fx* uses an event-driven approach Geographic Information System (GIS) framework and a database of plausible storms which:
- Evaluates shoreline changes and economic consequences
  - Categorizes three damage drivers: inundation, wave-attack and erosion
  - Tracks individual damage drivers to allow for evaluation of alternative plans and responses
  - Illustrates shoreline changes and resulting damages graphically
  - Facilitates evaluation and communication of findings

The analyses that Beach-*fx* makes are a combination of meteorology, coastal engineering and economic evaluations which trigger an action based on the occurrence of previous events. As a data-driven transparent model, its technical framework incorporates:

- Inherent risk and uncertainty associated with shore protection
- Represented coastal processes
- Combination of engineering and economic behavior

Beach-*fx* predicts morphology evolution and the associated damages caused by coastal storm events. The system also predicts the costs of shore protection alternatives with risk and uncertainty over multiple project life cycles. The steps for Key Biscayne would include the following:

- Set-up and establish model for “without project conditions”
- Simulate with project conditions to include enhanced beach/dune widths/heights

- Simulate with project conditions accounting for sea level rise (SLR) scenarios
  - Simulate with project conditions with coastal structures; likely to include nearshore (shore-parallel) breakwaters as outlined in M&N's coastal structure report.
- f. **Economics:** Working with the results of the Beach-Fx modelling, the impacts of the various iterations will be correlated with oceanfront property and infrastructure damage. The benefit-cost ratio (BCR) specifically for the Village's project will be estimated and provided to the corps for inclusion into the overall CSRSM Study report. The Beach-Fx economics links the predictive capability of coastal evolution models with project area infrastructure information (structure inventory), structural damage functions and economic valuations to estimate the costs and benefits of alternative project designs. This enables Beach-fx to provide a more realistic treatment of shore protection project evolution and optimize commonly applied approaches, including:
- User-populated databases that describe the coastal area under study
  - Suite of historically-based plausible storm events (environmental forcing) that can impact the area
  - Inventory of infrastructure that can be damaged
  - Estimates of morphology response to each storm in the plausible storm suite
  - Damage driving parameters for erosion, inundation, and wave impact damages
- g. **Reporting:** M&N will compile the Village's section of the CSRSM Study report. These efforts will include compiling text and supporting technical appendices.
- h. **Coordination & Meetings:** Since this CSRSM Study would be a joint effort, the Corps will need to carefully review the data input and model results for the Village. M&N will need to conduct the study on behalf of the Corps, and therefore extensive coordination is essential. Bi-weekly meetings/calls are anticipated:
- WebEx meetings with the Corps - bi-weekly
  - In-person meetings - monthly

## Schedule

The CSRSM schedule for the Corps is as follows:

- Initial Scoping Meeting: 2 October 2018
- Public Scoping Meeting: 5 Dec 2018
- Vertical Team Meeting: 22 July 2019
- Policy Exception Memo – (\$2M) 10 July 2019
- TSP Milestone: 9 Apr 2020
- Agency Decision: 9 Oct 2020
- Final Report: 23 June 2021

- Chief's Report: 8 Oct 2021

M&N estimates a level of effort of 6-8 months to complete the CSRSM Study for Key Biscayne. The Corps has completed much of the data collection as well as the storm suites, and the Corps anticipates running Beach-*fx* “without project” conditions this month for the current project study area which does not include Key Biscayne. Therefore, extensive efforts are required to catch-up to meet the next main milestone of April 2020. Since M&N has much of the background data and familiarity with the coastal processes on Key Biscayne, M&N is able to initiate efforts efficiently. Furthermore, the Beach-*fx* model input will benefit from M&N's extensive local knowledge.

### **Professional Fees**

A detailed scope of work and schedule has not been developed. Based on the scope outlined above and feedback from the Corps, the fees would be in the range of \$400K - \$600K.

### **General Comments**

- The Village has prioritized the federal shore protection for ongoing beach management and resiliency planning. The Corps indicated that this would likely be the only opportunity for Key Biscayne to be analysed as part of this particular feasibility study for beach nourishment. If this approach is not successful, Key Biscayne is not likely to be included in this iteration of the Federal Project. However, it is possible that Congress could authorize a separate study in the future which would analyse a “Key Biscayne” segment to the Project, and there is precedent for such an approach from Sunny Isles Beach.
- Additional federal funding - Jim Davenport will continue efforts to have the additional \$1M in funding, but re-allocation of this funding would not occur until after April 2020. The Corps indicated there are funding constraints with other CSRSM Study projects.
- The Corps indicated even with the CSRSM Study completed on behalf of the Village, they will not be able to guarantee the Key Biscayne segment would be justified for inclusion in the project even if current public access/parking hurdles can be overcome.
- Extension/Renewal of federal shore protection projects – the Corps indicated there is somewhat of a learning curve with these shore protection projects, as Miami-Dade County is one of the first projects in Florida coming up for renewal in Florida. Pinellas County is the only other county currently undergoing a similar CSRSM Study. The requirements and guidelines have changed significantly since the shore protection project was established in the 1970's.

After the Village has reviewed this outline approach to the CSRSM Study for Key Biscayne, M&N would like to schedule a follow-up meeting with the Village to discuss the approach in more

detail. In the meantime, should you have any questions, please do not hesitate to contact me at (786) 725-4180 or [tblankenship@moffattnichol.com](mailto:tblankenship@moffattnichol.com).

Sincerely,  
**Moffatt & Nichol, Inc.**

A handwritten signature in black ink, appearing to read 'T. K. Blankenship', written in a cursive style.

T. K. Blankenship, P.E.  
Business Unit Leader

TKB:JM