

# **PROPOSAL** **IMPLEMENTATION PLAN DEVELOPMENT** **BASED ON THE COASTAL FLOOD VULNERABILITY ASSESSMENT**

**VER: 9/23/2019**

## **TOWN OF PALM BEACH**

Woods Hole Group is pleased to submit this proposal to assist the Town of Palm Beach (TOPB) with development of an Implementation Plan for coastal resilience. The Implementation Plan will build on the findings of the Coastal Flood Vulnerability Assessment (CFVA) to define specific prioritized actions for the Town to pursue. The actions, policies, and projects will be targeted to protect priority assets identified in the CFVA, including traditional protection methods as well as innovative adaptations where appropriate to build resiliency for the TOPB from future flood events<sup>1</sup>. In the CFVA, certain high priority assets were determined to be at risk from current or future flooding. The Implementation Plan will guide the Town in choosing short-term measures to address today's risk, as well as layout a prospective plan for future projects and recommendations to build lasting resilience for the Town. In this way, the Implementation Plan also will allow the Town to consider present and future risk when designing new public works projects with a long design life (e.g., seawall design, height of lift stations, etc.).

An Implementation Plan leverages information in the CFVA to define specific actions the Town should take (and when) to build resilience for the TOPB community, and how to proceed cost-effectively. This plan serves a central role in translating the vulnerabilities and initial recommendations from the CFVA into an action plan that can be used directly to consider and weigh priorities, set the foundation for future engineering design and construction, and plan future budgets. Recognizing the uncertainty with future climate change, sea level, storm intensity and associated risk, the Implementation Plan will also define specific monitoring parameters and triggers, which if exceeded indicate an increased risk that warrants direct action. As such, the Implementation Plan will include multiple adaptation pathways that depend on observed trigger points and varied distribution of cost over time to identify a cost-effective approach. The Plan will also consider a range of possible adaptations at different scales, such as individual adaptations for a single asset (e.g., Town Hall; a Police or Fire Station), adaptations for a category of assets (e.g., all sewer lift stations), or regional adaptations for areas where key flood pathways are impacting multiple assets. These adaptations are expected to be flexible and modular in nature, and can be adjusted as necessary in the future using an adaptive management approach. Some examples of these were provided in the CFVA; the Implementation Plan will be more comprehensive and specific.

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<sup>1</sup> While certainly the focus will be on the Town-owned assets, the implementation plan will extend beyond just these assets as the actions, policies, and projects may be focused on building overall resilience to the Town of Palm Beach. There will be actions and approaches that may provide co-benefits to other private and/or ecological assets.



## **BACKGROUND**

The CFVA provided a comprehensive analysis of:

- the probability of inundation for present and future scenarios,
- depth of inundation for the same two scenarios,
- identification of over 2,200 Town-owned buildings, streets, parks, beach access ways, sewer pump/lift stations, stormwater basins and stormwater pumps,
- assignment of standardized consequence scores for each asset; and,
- coastal vulnerability indices (CVIs)

With this information, TOPB is positioned to make informed, defensible, efficient and effective decisions for managing risk to public assets during present and future flooding events. The Town has information to identify public assets at most risk now and in the future, which assets are most highly valued, and can identify public works projects to manage this risk. It is important to recognize that if an asset has potential for flooding now or in the future, it does not necessarily warrant action. Some assets are resilient to flooding and can keep operating. Other assets may not function during a flooding event, but this may be acceptable for short durations. The degree to which an asset is affected by flooding may also depend upon the depth of flooding (e.g., 6 inches or 1 foot of water during a storm may be acceptable in some cases). Other assets, however, may be critical enough to Town health and safety or other values, that specific action is warranted at that asset location to minimize flood risk regardless of the depth. Groups of assets may also be subject to flooding from the same source; thereby, warranting a regional solution to block the flood pathway itself.

In the context of the Town's planning cycle, the vulnerability assessment was in the original 10-year plan; our understanding is the implementation plan was incorporated into the updated long-term plan for FY 2020. Adding implementation to the 10-year plan will define specific projects and actions to include in the next planning cycle. Some specific actions in the Implementation Plan will be short-term (i.e., to address today's risk), some will be less urgent (or more complex) within the next 10-year planning horizon, and other longer-term actions will look beyond 10-years and depend upon how the climate evolves. For these longer-term considerations, the Implementation Plan will define the specific areas of future risk, certain monitoring and observations to conduct in the interim to determine whether a potential risk is actually materializing, and trigger points for taking action. The Implementation Plan will also consider costs-benefits for what is recommended (e.g., consequence of not taking action today, compared to waiting).

## **PROPOSED TASKS**

### *Task 1 – Refine Prioritization Process*

This task will advance the prioritized list of vulnerable TOPB assets developed in the CFVA. Although the list establishes priorities based on the value of an asset (using the CFVA scoring criteria and input from the Town) and the probability of inundation, refinement is needed because there are hundreds of individual assets. Specifically, we will develop a process for further refining the CFVA results to

determine, for example, whether an asset requires immediate action or action at various periods in the future, asset-specific action, regional action, or no action. By refining the CFVA prioritization, we will identify opportunities to create efficiencies in the response, such as grouping vulnerable and valued assets so a single adaptation will protect an area and multiple assets within that area. Additionally, there may be some assets that will not be impacted by intermittent flooding. The goal for Task 1 is to develop a process by which to work with the experts in the TOPB to assign vulnerable assets to groupings based on the timing of an adaptation, the need for an adaptation, and the spatial extent required for an adaptation.

**Deliverable:** A process (e.g., a decision-tree) to further categorize vulnerable assets to identify the highest priority projects. WHG will work with the TOPB to process the assets identified in the CFVA. The output of Task 1 will be categories of assets grouped based on (initial list to be refined during this Task with input from the TOPB):

- sensitivity to short-term flooding;
- critical elevations (i.e. assets that are ruined by any water, versus those that are damaged only by water over a certain depth);
- assets located in a particularly vulnerable area within the Town (such that one adaptation could protect many assets); and,
- immediate/current vulnerability versus vulnerability in the future.

#### *Task 2 – Develop Scope for Short-Term Adaptation Projects*

A subset of assets will require a near-term response (or protecting some assets in the near-term will have far-reaching benefits over the longer term). These assets will have been categorized in Task 1. In this Task, specific adaptations will be conceptualized. This will include a catalog of different options for specific assets/asset groupings with attention to develop regional adaptations to protect geographic areas rather than individual assets. The Task will not result in design plans, but will provide sufficient information for decision-makers to establish future budget needs and project timelines and identify the resources needed for permitting. Adaptations and projects developed will likely be flexible and/or modular in nature such that they could easily be adjusted in the future if necessary.

**Deliverable:** For the highest priority assets/geographic asset groupings in the short-term response category: develop a conceptual project narrative including catalog of specific adaptation options; develop maps and conceptualizations of adaptations; provide rationale for why immediate response needed; budget ranges; schedule for implementation.

#### *Task 3 – Develop Scope for Middle-Term and Long-Term Adaptation Projects*

Similar to Task 2, this scope item is designed to identify and describe adaptation projects for asset categories expected to be vulnerable in the future; an immediate response is not required, but adaptations should be built into the Town Planning process now to benefit future development. In this Task, adaptations that can be developed over middle-term and long-term time periods 10-, 25-, 50+



years will be conceptualized. Town staff collaboration will be required to define middle-term and long-term from the Town perspective. For these adaptation projects expected to emerge in the future, greater emphasis will be placed on regional adaptations; identifying opportunities to build adaptations into projects likely to occur in the future (e.g., school replacement, bridge repairs, pump upgrades, beach management plan updates, and building/zoning regulations).

Deliverable: For up to the highest priority assets/geographic asset groupings in the middle-term and long-term response categories: identify opportunities to build adaptation considerations into the existing Town Planning process, develop a conceptual project narratives including catalog of longer term adaptation options, develop maps and conceptualizations of adaptations, provide rationale for why asset groups can be protected over the longer term, budgeting considerations, schedule for implementation.

#### *Task 4 - Development of Implementation Pathways*

This task would consolidate the various adaptations (short-term, middle-term, and long-term) identified in Tasks 2 and 3, and assemble them into a manageable number of clearly defined implementation pathways. The pathways would provide decision guidance for the Town to take action based on aggressive and non-aggressive climate change responses or financial throughput. The basis for developing implementation pathways is that we have an uncertain future. To make a decision on a future decision based on what is predicted today essentially requires that what we predict today will come true. Based on the probabilistic results for Palm Beach in the CFVA, we know different future scenarios are possible at different probabilities. For this reason, there is a need for an Implementation Plan that makes a commitment in the short-term, but that allows for additional actions that can be implemented in the future if, based on what is learned, experienced, or measured in the interim, proves a need for a different action (See Task 5 for collection of data needed for this step). This method is based on a variety of work, including Dynamic Adaptive Policy Pathways (DAPP), first online April 5, 2019 by Haasnoot, Warren and Kwakkel. In taking this approach that accounts for future uncertainty and monitoring into its decision-making process, the Town of Palm Beach is being proactive in planning responsible infrastructure investments.

In short, for Town of Palm Beach assets at risk in the future, a clear set of decision pathways will be identified guided by observations over time, and based on consideration of cost savings. A simple example is for the Town Docks. One could achieve the end objective of protecting against the prediction for 2100 by designing today for that predicted worst-case condition. However, this would be extremely conservative and costly today. Instead, the project can be designed presently for a moderate future condition that provides adequate protection today, and with likelihood to provide lasting protection in the future at less than present day cost. At the same time, today's project can be designed in a way that it can be enhanced in the future if observations prove a more severe climate case evolves. The future enhancement would then achieve the protection goal, but at less cost than rebuilding the project again. This type of rational would be applied overall to the Implementation Plan.

Deliverable: Implementation Plan rationale and graphics

#### *Task 5 – Development of Monitoring Program and Trigger Points*

This task would outline a monitoring program (e.g., real time tide stations, rain gauges, etc.) to provide middle-term and long-term data used to determine trigger points for next actions/steps outlined in the Implementation Plan. This task would also include the development of the actual trigger points for taking next steps.

Deliverable: Outline of data needs, collection options, personnel requirements, timelines for collection and analysis required to support the trigger points in the Implementation Plan.

#### *Task 6 – Reporting*

Technical memos would be provided upon completion of each task, including any recommended refinements to the scope or approach. The primary reporting deliverable, however, would be the Implementation Plan report. Short-term actions to mitigate today's risk would be highlighted. Middle-term and long-term actions also would be identified within the Implementation Plan pathways. The report would include the rationale, the decision points with graphics, the monitoring plan and trigger points, and suggestions for refinements / updates.

#### *Task 7 – Meetings, Presentations and Discussions*

Based on past experience, the proposed Tasks benefit from Town and community input. We also know the value of communicating the process to Town personnel, committees and the public. The format for the communications is difficult to predict, but as a starting point, we include in the proposed budgets the following:

- Provide support in preparation of materials for public outreach (assume 3 presentations given by Town personnel)
- In-Person Presentation and Participation in Town Committee Meetings (Assume 2, 2-day trips, for Bob Hamilton and Kirk Bosma)
- Conference/Video/Remote PC calls with Town personnel (assume 1, hour long call per month for duration of Contract Period)

#### **BUDGET**

The budget for this work is divided into discrete Tasks with each Task providing the Town with an incremental tool for completing the implementation process.



**Table 1. Cost Estimate**

WBS Item	Labor Category and Hourly Rate						Direct Costs	Cost Estimate
	Project Lead	Sr. Coastal Engineer	Lead Scientist/Engineer	Scientist/Engineer	Coastal Sci./Eng.	Pubs & Contracts		
	\$215	\$195	165	\$140	\$100	\$90		
Task 1	4	6	18	6	30	4		\$9,200.00
Tasks 2 and 3	22	32	28	40	128	6		\$34,530.00
Tasks 4 and 5	14	28	28	28	104	8		\$28,130.00
Tasks 6 and 7	43	30.5	41	17	46	16	\$2,487	\$32,864.50
<b>TOTAL</b>	<b>83</b>	<b>96.5</b>	<b>115</b>	<b>91</b>	<b>308</b>	<b>34</b>	<b>\$2,487</b>	<b>\$104,724.50</b>

**SCHEDULE & DELIVERABLES**

The proposed work would be completed over approximately a 9 month period, depending upon time of award / initiation, and availability of Town stakeholders to review, comment, and discuss draft results. This recognizes the seasonality involved in scheduling activities for certain Town boards. A more specific schedule with milestones will be established as part of the kick-off process. Interim deliverables that will be delivered to the Town, and when input will be required from Town staff and appropriate stakeholders include:

- Task 1. Technical memo with refined priorities
- Task 2 and 3. Technical memo with scope for short-, middle-, and long-term adaptation projects
- Task 4 and 5. Technical memo with implementation pathways, monitoring plan and triggers
- Task 6. Draft and Final summary reports

The work would be completed in accordance with the terms of the master contract agreement between Woods Hole Group and The Town of Palm Beach. We appreciate the opportunity to continue this work with the Town. Please contact me (508) 495-6229 or Ted Wickwire (508) 495-6242 directly with any questions.

Sincerely,

The Woods Hole Group, Inc.



Ted Wickwire  
 Team Leader / Sr. Environmental Scientist



Robert P. Hamilton, Jr.  
 President / Coastal Engineer