

**STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
GRANT WORK PLAN
DEP AGREEMENT NO.: R2110**

ATTACHMENT 3

I. TITLE PAGE

1. PROJECT TITLE: Coastal Vulnerability, Risk & Adaptation Analysis

2. GRANTEE Contact Information:

Organization Name: Town of Lake Park

Name of Authorized Signer: John D'Agostino

Title: Town Manager

Address: 535 Park Avenue

City: Lake Park

Zip Code: 33403

Area Code and Telephone Number: 561-881-3304

E-mail Address: jdagostino@lakeparkflorida.gov

3. GRANT MANAGER Contact Information:

Organization Name: Town of Lake Park

Name: Richard Scherle

Title: Director of Public Works

Address: 535 Park Avenue

City: Lake Park

Zip Code: 33403

Area Code and Telephone Number: 561-881-3345

E-mail Address: rscherle@lakeparkflorida.gov

4. FISCAL AGENT Contact Information:

Organization Name: Town of Lake Park

Name: Lourdes Cariseo

Title: Finance Director

Address: 535 Park Avenue

City: Lake Park

Zip Code: 33403

Area Code and Telephone Number: 561-881-3351

E-mail Address: lcariseo@lakeparkflorida.gov

5. FEID No. (a.k.a. Tax ID#): F59-6000355-001 Seq No. 001

6. WORK PERFORMED BY: (Select only one)

 Grantee ONLY
 X Subcontractor ONLY
 BOTH the Grantee & Sub-Contractor
 To Be Determined

7. SUBCONTRACTORS CONTACT INFORMATION: *(If applicable & known)*

Organization Name: Water Resources Management Associates, Inc. (WRMA)

Name: Raul Mercado

Title: Principal Engineer

Address: 250 Tequesta Drive, Suite 302

City: Tequesta

Zip Code: 33469

Area Code and Telephone Number: 561-529-2075

E-mail Address: raul.mercado@wrmaeng.com

8. PROJECT LOCATION:

A. List of County(ies): Palm Beach County

B. List of City(ies)/Town(s)/Village(s): Town of Lake Park

C. State Lands Lease Agreement Number(s): N/A

Provide lease agreement number(s) for any work that will be performed on State Lands. If work will not be on any state lands, please indicate N/A.

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II. WORK PLAN

9. **PROJECT SUMMARY:** A previous grant from the FRCP Program was issued to Lake Park to partially fund Task 5 of the Stormwater Master Plan (SWMP). Task 5 entails a sea level rise (SLR) assessment vulnerability and adaptation analysis intended to be completed using generally available SLR projections for Palm Beach County and identifying vulnerable areas. This grant will result in a more specific SWMP deliverable, including a detailed survey and structural assessment of the existing seawall, a GIS-based modeling of the SLR projected tides overlaid with the FEMA DFIRM elevations, and a cultural and infrastructure overlay for impact and adaptation analysis.
10. **PROJECT DESCRIPTION:** The Town of Lake Park, originally named Kelsey City, became the first zoned municipality in Florida in 1923. With an area of 2.5 square miles and a population of approximately 9,000 residents, the Town of Lake Park (the Town) is located in Palm Beach County, less than 10 miles north of West Palm Beach. The Town's eastern boundary has a waterfront along the Lake Worth Lagoon (LWL), which is part of the Intracoastal Waterway and subject to tide fluctuations.

Lake Shore Drive, as well as residential and commercial properties along the waterfront, have experienced recurring historical flooding as a result of storm surges, king tides and climate change. It has been predicted by the United States Army Corps of Engineers (USACE) that the change in SLR from 2019 to 2060 will be approximately 26 inches. The 2018 king tide was recorded at 3.76 feet NAVD along the waterfront. An existing seawall along the waterfront with an average top elevation of 4 feet NAVD has been frequently overtopped by storm events influenced by SLR-enhanced high tides.

There is a need to ascertain the height and internal structural condition of the existing seawall constructed throughout the Town's various development periods. There is also a need to determine the impact that an increasing sea level rise prediction will have on the Town's residential and commercial waterfront and associated municipal infrastructure. In order to better understand that the impact of rising SLR along the town waterfront and Lake Worth Lagoon, a seawall structural assessment is proposed together with GIS modeling using LiDAR elevation data to map the extent of predicted future inundation and flooding, and to identify potential natural and cultural features at risk in the affected areas.

High tide inundation and floodplain GIS modeling will be implemented using historical recorded tide gauge data, FEMA floodplain DFIRM elevation data, and 2017 Palm Beach County LiDAR data. The results will include maps of the SLR-impacted coastal flood elevations at 6-inch increments.

A cultural and infrastructure GIS overlay analysis will be performed using the geographic extent of that data, and potential natural and cultural resources at risk will be identified for each of those steps based on the impacts of sea level rise.

Outreach meetings will be conducted to obtain feedback for the proposed project and the level of understanding of climate change/SLR impacts in the community. These public meetings will take place via the Floodplain Management Planning Committee already established by the Town via Ordinance for the Stormwater Management Plan Implementation.

Summary

A GIS model will use high resolution LiDAR data, current datum information, sea level rise projections, and overlays with natural and cultural resources to identify the Town's resources at risk by the year 2060 based on sea level rise. Results will indicate important resources and infrastructure at risk. A vulnerability, risk and adaptation assessment will be performed using the results of the filed investigations and inundation mapping. With this data, the Town can begin to assess the extent of these risks and plan for options in coastal resiliency and adaptation. The costs of seawall bulkhead replacement options will also be presented.

11. PROJECT NEED AND BENEFIT:

- A. Explain the demonstrated need, which the project addresses.** The Town of Lake Park has a 0.8-mile waterfront along the Lake Worth Lagoon (part of the Intracoastal Waterway in Palm Beach County) that is affected by tides (Attachment 1). A seawall, built incrementally beginning in the 1970s and having an average top elevation of 4 feet NAVD (Attachment 2), is located along the waterfront. The 2017 Federal Emergency Management Agency (FEMA) maps show a special flood hazard area (SFHA) with a base flood elevation (BFE) of 5 feet NAVD along most of the Town's waterfront (Attachment 3) and the November 2018 king tide at the Town was measured at 3.76 feet NAVD. The shoreline section of the Town exhibits low topographic elevations in the range of 2 to 5 feet NAVD (Attachment 4) and has frequently been affected by inundation from these tides and other subtropical storm events. The predicted USACE SLR for Palm Beach County (which includes the Town) is approximately 26 inches by 2060 (Attachment 5). Therefore, the Town's roadways, utilities, residential and commercial infrastructure are very susceptible to current and future damage ensuing from coastal flooding exacerbated by increasing SLR (Attachment 6). There is a need to ascertain the degree of the current and future coastal flooding by the implementation of a detailed climate change-based vulnerability, risk and adaptation analysis.
- B. Explain how the proposed project meets the purpose of one or more of the Goals and Priorities for FRCP.** The proposed project will meet the purposes of Priority Area 1 and Priority Area 3.

Under Priority 1, coastal communities with a coastal management element in their comprehensive plan can receive assistance in gaining compliance with the 2015 "Peril of Flood" requirements of Sec. 163.3178(2)(f)F.S. The Town is a coastal community with a coastal management element in its comprehensive plan; participates in the National Flood Insurance Program (NFIP); and has mapped special flood hazard areas. The Town also participates in the FEMA community rating system (CRS), and is implementing a climate change/sea level rise vulnerability risk and adaptation assessment through the implementation of its Stormwater Master Plan (SWMP) Task #5.

The SWMP Task #5 vulnerability assessment was scoped to be conducted using publicly available, reliable data to identify coastal areas that are vulnerable to current and future flooding resulting from high-tide events, storm surges, flash floods, stormwater runoff, and the related impacts of sea level rise.

A floodplain management planning committee formed by Town Ordinance is currently performing public outreach and holding community meetings to present the findings of the SWMP Task 5 vulnerability assessment and to gather additional information and comments.

The proposed project will allow for the acquisition of project-specific site data along the Town waterfront for the preparation of a much more robust SWMP Task 5 deliverable as desired in Priority Area 1 goals.

In Priority Area 3, communities that have already complied with the 2015 Peril of Flood statute can receive assistance for continuing resiliency planning. Vulnerability assessments consist of measuring the impact of sea level rise on a community or portion of a community and identifying the people, infrastructure and land uses that may be affected. The proposed project falls entirely within this priority area.

The proposed project includes three tasks that will quantify the peril provided by climate change-induced sea level rise along the Town of Lake Park. The data to be obtained by the physical surveying and structural assessment of the Town's seawall will be applied in the enhanced vulnerability assessment to measure the impact of SLR and identify the people, infrastructure and

land uses that may be affected. This will be accomplished through GIS-based LiDAR modeling of tide, FEMA floodplains, and SLR along the Town's waterfront.

- C. Discuss how the project is feasible and can be completed by the grant period deadline.** Task 5 of the Town of Lake Park Stormwater Master Plan is scheduled to be completed by July of 2020. If the Town is awarded funding within this time frame, the project can be completed within 90 days of the notice to proceed.
- D. Explain how this project is addressing social vulnerability or vulnerability of historic resources or stormwater management systems.** The Town of Lake Park, then known as Kelsey City, became the first zoned community in South Florida in 1923. Kelsey Park, located along the waterfront, is a historic site and cultural resource that is at risk of being impacted by sea level rise.

The Town is currently developing mixed-use districts for 800 acres of the Federal Highway corridor. The study area incorporates the east and west sides of Federal Highway between Silver Beach Road (to the south), Palmetto Drive (to the north), Second Street (to the west) and Lake Shore Drive (to the east). Both sides of the corridor require the creation of land development regulations, and the Town has adopted changes to the Comprehensive Plan for the corridor's east side to establish the Federal Highway/Intracoastal Mixed-Use District.

It is expected that the redevelopment area will attract high-end residential condominiums and commercial establishments that will require extensive utility infrastructure investments. The redevelopment area is immediately adjacent and parallel to the Town's waterfront, and the proposed project will assess the impact of increasing SLR-impacted tides on the proposed redevelopment area. The project will also provide adaptation methodologies to be adopted by the Town for the redevelopment process.

- 12. DESCRIPTION OF PROJECT OUTCOMES:** The project outputs will provide the technical and financial information necessary for the Mayor, the Town Manager and the Town Commission to plan for sustainable solutions to replace the existing aging seawall and perform hardening of utility and transportation infrastructure along the waterfront. The Town is already contemplating the possibility of participating in a joint pilot living shoreline project with Palm Beach County to be located along the Town's seawall. The project adaptation component will address the options to be contemplated for seawall replacement, including a combination gabion wall and living shoreline project.

- 13. BUDGET SUMMARY:** Allowable budget categories and form of payment with the costs for this project are listed in the table below.

BUDGET SUMMARY BREAKDOWN

Budget Categories	Payment	Task 1	Task 2	Task 3	Grant Amount Awarded
Salaries & Fringe	Fixed Price	\$0	\$0	\$0	\$0
Contractual Services*	Fixed Price	\$10,000	\$45,000	\$20,000	\$75,000
GRANT AGREEMENT TOTAL		\$10,000	\$45,000	\$20,000	\$75,000

- A. Describe how the project costs was determined:** The project costs were determined via a field survey costs estimate and an engineering analysis cost estimate.
- B. Contractual Services Selection*:** Upon a selected Sub-Contractor(s) (if applicable), the Grantee will Provide a signed certification statement giving a description of the procurement process that was utilized for the selection of the sub-contractors. The description must include:
- What procurement process was utilized
 - Justification as to how & why you made your final selection.

- c. For competitively obtained Sub-Contractor also include:
 - i. A list of all entities that you received bids/quotes from,
 - ii. Names and addresses of those entities that provided bids/quotes,
 - iii. Actual amounts of the bids/quotes that were submitted.

14. PROJECT TIMELINE: All tasks are to be completed and submitted no later than the task/deliverable due date listed in the table below. Requests for any change must be submitted prior to the current task/deliverable due date listed in the project timeline. Requests are to be sent via separate email to the Department's Grant Manager, with the details of the request being made and the reason for the request.

PROJECT TIMELINE

Task No.	Task Title	Deliverable Due Date	Task Amount
1	Seawall/Bulkhead Topographic Survey	08/21/2020	\$10,000
2	Seawall Structural Assessment	09/30/2020	\$45,000
3	Inundation Modeling and Vulnerability/Risk/Adaptation Assessment	10/31/2020	\$20,000
Total			\$75,000

15. PERFORMANCE MEASURES: The Grantee will submit all deliverables for each task via **one pdf document** to the Department's Grant Manager on or before the Task/Deliverable Due Date listed in the Project Timeline. The Department's Grant Manager will review the task/deliverables to verify that they meet the specifications in the Grant Work Plan and this task description, to include any work being performed by any sub-contractor(s). Upon review and written acceptance by the Department's Grant Manager of all deliverables under this task, the Grantee may proceed with payment request submittal.

16. CONSEQUENCES FOR NON-PERFORMANCE: The Department will reduce each Task Funding Amount by 5% for every day that the task/deliverable(s) is not received on the specified due date in the most recent Project Timeline, for the Agreement. Should a Change Order or Amendment be requested on the date of or after the most current task/deliverable due date, the 5% reduction of that Task Funding Amount will be imposed until the date of the requested change is received, via email by the Department.

17. PAYMENT REQUEST SCHEUDLE: Grantee may submit a request for the Task Funding Amount to be paid using the Exhibit C, after all deliverables for that task have been approved by the Department. Request(s) for payment must include the Exhibit A showing 100% completion of that task and must be submitted within 45 days of the task/deliverable due date. Please refer to the [website Grants page](#) for "How to Request Payment", and "Checklist for Requesting Payment"

Or

Grantee may submit one request for the Grant Amount Awarded, by using the Exhibit C, after the project is 100% completed. The request for the Grant Amount Awarded, must include an Exhibit A showing 100% completion for all tasks, and must be submitted within 45 days of the last task/deliverable due date.

18. FUNDING SOURCE: Grantee agrees to include on all publications, printed reports, audiovisuals (including videos, slides, and websites except that unless required under special terms of this Agreement, this requirement does not apply to audiovisuals produced as research instruments or for documenting experimentation or findings and which are not intended for presentation to the general public) or similar materials must include the DEP logo (which can be found on the Department's website at

<https://floridadep.gov/resilience> or by contacting the Department's Grant Manager for a copy) and the following statement on, the following language.

"This work was funded in part through a grant agreement from the Florida Department of Environmental Protection, Florida Resilient Coastlines Program, by a grant provided by the Office of Resilience and Coastal Protection. The views, statements, findings, conclusions and recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida or any of its subagencies."

The next printed line shall identify the month and year of the publication.

III. TASKS & DELIVERABLES

Task #1

- A. Title:** Seawall/Bulkhead Topographic Survey
- B. Goal:** To establish a seawall top elevation baseline for approximately 5,400 linear feet as well as cross-sectional dimensions spaced at approximately 500-foot intervals.
- C. Description:** The Seawall/Bulkhead Topographic Survey will be conducted by Betsy Lindsay, Inc. using dynamic GPS surveying techniques (RTK) to obtain elevations along approximately 5,400 linear feet of seawall along the Town's waterfront. Ten (10) cross-sections of the bulkhead will also be obtained at approximately 540-foot intervals. The project will entail establishing vertical and horizontal control, measuring the top of the seawall at 100-foot intervals, and obtaining cross-sections of the seawall at 540-foot intervals using RTK 5 feet east of seawall to natural ground to the west.
- D. Deliverable(s):** The Grantee will submit all deliverables for each task via **one pdf document** to the Department's Grant Manager on or before the Task/Deliverable Due Date listed in the Project Timeline.
 - 1) An AutoCAD version 2015 file, a .pdf of the Final As Built and six (6) Final As Built surveys for the entire project site

Task #2

- A. Title:** Seawall Structural Assessment
- B. Goal:** To establish the structural integrity of the external and internal seawall or bulkhead structure at the cross-sectional locations surveyed and along the base of approximately 5,400 linear feet of seawall
- C. Description:** Coastal Systems International (CSI) will conduct the assessment as follows:
Field Investigation
Above- and below-water assessment of the existing bulkhead. CSI will mobilize a team led by an engineer to conduct an above- and below-water assessment of the existing bulkhead and structures at the project site. The existing bulkhead is approximately 5,400 linear feet. The assessment will be conducted to evaluate the condition of the structures and the requirements for repair and/or replacement. Outfalls along the bulkhead will be documented. The investigation will be conducted by a two-person team using snorkel equipment and completed in accordance with the American Society of Civil Engineers (ASCE) Underwater Investigations Standard Practice Manual.

Photographs will be obtained to document the investigation; field notes will be recorded referenced to stationing established along the bulkhead; and soundings along the base of the wall will be obtained with respect to the top of the bulkhead cap.

Probing, coring, testing and excavating and inspection of the bulkhead tieback system. CSI will perform an invasive assessment of the selected location established by the topographic survey.

D. Deliverable(s): The Grantee will submit all deliverables for each task via **one pdf document** to the Department's Grant Manager on or before the Task/Deliverable Due Date listed in the Project Timeline.

- 1) Report on the structural assessment and remaining useful life of the existing bulkhead, to include:
 - a. a structural assessment and remaining useful life of the existing bulkhead
 - b. Recommendations for repairs and/or replacements to meet long-term sustainability goals and adapt to changing conditions due to increased loads associated with sea level rise and climate change
 - c. Alternative designs, such as gabion walls and living shorelines
 - d. Recommendations for improvements or replacements of the outfalls along the bulkhead
 - e. Condition of the structure rating in accordance with ASCE Underwater Investigation Manual including the investigation plans and copies of photographs to illustrate the observed conditions.
 - f. A construction cost estimate for both repair and replacement options.
 - g. Report will be signed/sealed by a Florida Professional Engineer.

Task #3

A. Title: Inundation Modeling and Vulnerability/Risk/Adaptation Assessment

B. Goal: Establish a baseline for future resiliency for the Town of Lake Park building and municipal infrastructure along the Town's Lake Worth Lagoon waterfront to prepare for projected sea level rise-induced and climate change-induced hydrologic changes and establish inundation and flood plain modeling for cultural and infrastructure impact mapping and quantification.

C. Description:

High Tide Inundation Mapping. Water Resources Management Associates will perform inundation modeling applying ArcGIS software. Inundation zones will be created by creating a continuous surface for MHHW elevation; overlaying MHHW surface with high resolution LiDAR data to map the current extent of MHHW; and modeling each 12-inch increase above MHHW to an elevation of 60 inches (FEMA DFIRM elevations for the Town of Lake Park or 5 feet NAVD)

Floodplain Modeling. Beyond the risk of permanent inundation, the Town also faces risk of increased coastal flooding associated with sea level rise. A flood layer will be created to model the current and potential future 1% risk (100 year) floodplain zones matching corresponding levels of inundation predicted due to sea level rise. The model will identify the current extent of flooding using 2017 FEMA Base Flood Elevations (BFEs) and models the extent of each 6-inch vertical increase up to a level that would correspond with 60 inches of inundation (5 feet NAVD).

Potential flood zones will be modeled by creating a continuous elevation surface of current FEMA Base Flood Elevations (BFEs); overlaying BFE continuous surface with high resolution LiDAR data to map the current extent of flooding; and modeling each 12-inch increase above current BFEs to an elevation of 60 inches.

A continuous Lake Worth Lagoon BFE elevation surface will be created by interpolating elevations between the combined BFE data points from FEMA flood data. Those modeled values will then be reclassified to represent each six-inch incremental flood level up to 60 inches. The result will be a series of 1% risk zones that correspond with each 6-inch incremental step in inundation due to predicted sea level rise.

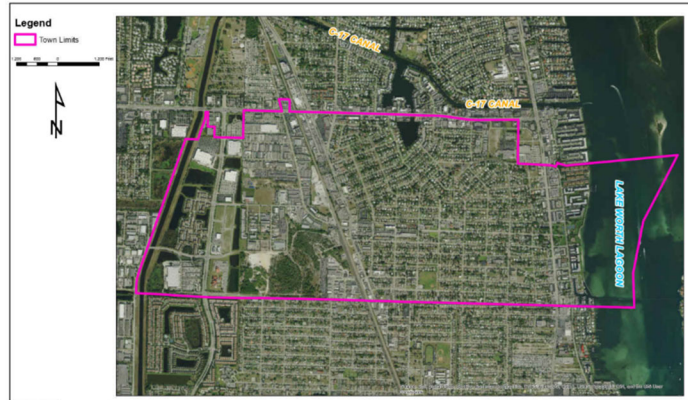
Cultural and Infrastructure Overlays. Using the geographic extent of the model-produced data, potential natural and cultural resources at risk will be identified for each of those steps based on the impacts of sea level rise.

D. **Deliverable(s):** The Grantee will submit all deliverables for each task via **one pdf document** to the Department's Grant Manager on or before the Task/Deliverable Due Date listed in the Project Timeline.

- 1) Sea level rise vulnerability assessment risk and adaptation analysis to include:
 - a. Physical bulkhead data
 - b. Inundation mapping
 - c. Cultural GIS overlay
 - d. Adaptation bulkhead replacement options identified with cost estimates

Attachments

Attachment 1



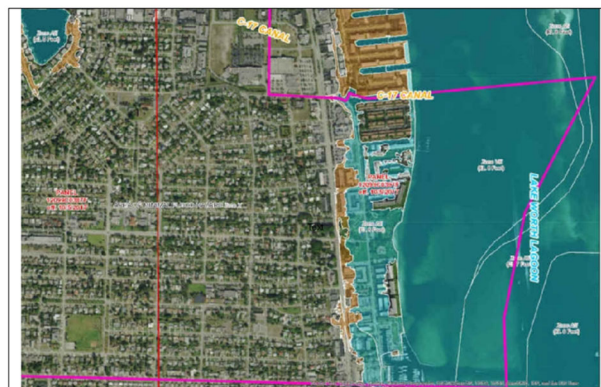
Attachment 2

TOWN OF LAKE PARK, FLORIDA PROJECT LOCATION



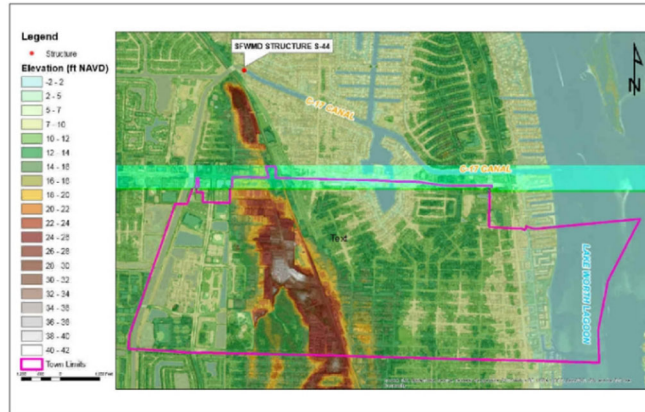
Attachment 3

TOWN OF LAKE PARK STORMWATER MASTERPLAN FEMA FLOODPLAINS (EASTERN)

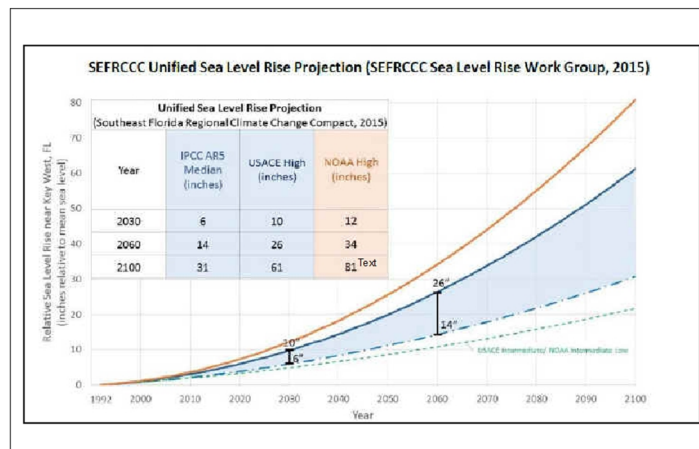


Attachment 3, DEP Agreement #: R2110
10 of 11

Attachment 4
TOWN OF LAKE PARK STORMWATER MASTERPLAN
TOPOGRAPHIC GRADIENT



Attachment 5
US ARMY CORPS OF ENGINEERS
2060 SEA LEVEL RISE PROJECTION



Attachment 6
TOWN OF LAKE PARK
HISTORICAL FLOODING ALONG LAKE SHORE DRIVE (2004-2005 HURRICANE SEASON)

