



COASTAL PROTECTION ENGINEERING
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June 19, 2024

Sent via Email

Patricia Strayer, Town Engineer
Town of Palm Beach Public Works Department
951 Old Okeechobee Road
West Palm Beach, Florida 33401
Submitted via email to:

Re: Proposal for the 2024 FDEP Beach Management Agreement Cell-Wide Hardbottom Monitoring and 2024 Hardbottom Map

Dear Mrs. Strayer,

This proposal is being provided to the Town of Palm Beach (Town) for Coastal Protection Engineering LLC (CPE) to provide professional environmental services in support of the Beach Management Agreement (BMA) annual monitoring and reporting. This proposal has been divided into two tasks that will result in the creation of the 2024 BMA Hardbottom Map and production of the 2024 BMA Annual Hardbottom Monitoring Report. Language repeated directly from the BMA is shown in italics.

Scope of Services

The scope of services outlined below will include creation of the 2024 hardbottom map based on delineation of exposed hardbottom in aerial photography and nearshore edge mapping of the entire BMA cell, participation in one public meeting, biological monitoring of transects and offshore stations, data analysis, and reporting required by the BMA. The specific scope of work to be implemented is described in the BMA, Appendix B - Cell-Wide Monitoring and Mitigation Plans.

Task 1. 2024 Hardbottom Mapping and Creation of 2024 BMA Hardbottom Map

Task 1 includes digitization of exposed hardbottom from aerial photographs, in situ hardbottom edge mapping, and development of the 2024 BMA Hardbottom Map. This corresponds to the BMA requirements as presented in Section 1.2.51 Aerial Photograph Survey and 1.2.5.2 Hardbottom Edge Survey of the BMA Appendix B.

Aerial Delineation of Exposed Hardbottom

Exposed hardbottom will be digitized from one set of 2024 aerial photography (Town's boundaries) provided by the Town using ArcGIS, including inter-observer QA-QC, following the standards used to develop the Town's historic hardbottom GIS database in the BMA. The area south of the Town's boundaries will be digitized using aerial imagery from the County-wide aerial photographs, if acceptable.

In situ Nearshore Hardbottom Edge Survey

CPE divers will map the nearshore hardbottom edge from R-76 to R-87 and R-110 to R-151. The hardbottom edge in the Mid-Town Project area between R-87 and R-106 will be mapped by others (under



separate contract) and the resulting shapefiles will be provided to CPE for inclusion in BMA cell-wide maps. The nearshore hardbottom edge is defined as the visible border between sand and hardbottom. A two-person dive team will follow the nearshore edge while towing a buoy with a survey-grade DGPS, which transmits continuous positions to hydrographic survey software on board the survey vessel. The buoy shall be on the shortest possible tether, such that the buoy is directly over the diver. In areas where the nearshore edge is located in the intertidal/subtidal zone, the nearshore edge will be mapped by qualified biologists using a handheld Trimble Geo 7x DGPS (or comparable) system. The biologists will carry the DGPS unit as they walk/wade around the hardbottom features at the sand/rock interface. The DGPS unit shall collect data every second during edge mapping. Photographs will be taken when it is not possible to record video. Survey mapping methods are compliant with the BMA cell-wide monitoring plan for mapping of the nearshore hardbottom edge.

During the edge mapping, divers will take periodic relief measurements or assign a relief category along segments with obvious changes in relief along the hardbottom edge. The coordinates of each relief point will be recorded by signaling to the vessel to take a GPS position. The relief features will be included in the geodatabase and BMA maps. As conditions allow, digital video will be recorded to document the nearshore edge for descriptive analysis of relief, benthic communities, and sediment condition. The final video record will be hyperlinked to the hardbottom edge shapefile in GIS.

2024 BMA Hardbottom Map

The delineation of exposed hardbottom from the 2024 aerial photographs and the in situ hardbottom edge mapping will be used to generate the final 2024 BMA Hardbottom Map. A geodatabase with the hardbottom edge, relief designations, and hyperlinked video files will also be submitted to FDEP and the Town on an external hard drive.

Task 2. BMA Biological Monitoring (Transects and Offshore Stations), Data Analysis and Annual Report Development

Task 2 includes biological monitoring of the BMA transects and offshore stations, along with data analysis and report development of the 2024 Annual Hardbottom Monitoring Report.

BMA Biological Monitoring – Transects, Mid-Town Transect Extensions, and Offshore Stations

CPE will monitor the BMA transects, Mid-Town transect extensions, and offshore stations as listed in Table 1. If exposed hardbottom is observed seaward of the BMA transects listed in Table 1 during the 2024 survey, the transects will be extended to the length of exposed hardbottom, and sediment depth and line intercept monitoring will be performed across the full cross-shore extent of the hardbottom. Transects T-14, T-13, T-9 are sediment only transects and will not be extended if hardbottom is exposed beyond the transect end point. The seaward end of exposure in 2024 will be marked with a 6-inch PK nail, and DGPS coordinates will be recorded.

Table 1. BMA transects, offshore stations, and Mid-Town BMA extensions to be monitored in 2024.

Transect	Length (m)	Date of Installation	Baseline Survey Date
R-83	156.8	6/22/2015	7/16/2015
R-88 ext.	21.5	10/30/2014	12/17/2014
R-90 ext.	132	10/20/2014	12/16/2014
T-14	50	10/3/2014	12/14/2014
T-13	50	10/2/2014	12/15/2014
R-91 ext.	158	10/3/2014	12/16/2014
R-92 ext.	175.6	10/17/2014	12/15/2014
R-93 ext.	53	10/17/2014	12/15/2014
R-94 ext.	131	10/29/2014	12/17/2014
Station R-92	22	6/22/2015	7/16/2015
Station R-94	22	6/22/2015	7/16/2015
T-9	44	10/2/2014	12/14/2014
R-113	2.2	10/30/2014	12/18/2014
R-115	15.5	10/30/2014	12/18/2014
R-116	29.5	10/30/2014	12/18/2014
R-132	117	10/30/2014	12/18/2014
R-133	143	10/30/2014	12/18/2014
R-136	137	6/19/2015	7/16/2015
R-139	67	6/19/2015	7/16/2015
R-142	125.5	6/19/2015	7/15/2015
R-145	157.4	6/19/2015	7/15/2015

Transect Survey Methods

Cell-wide hardbottom monitoring shall occur along non-regulatory biological transects (and, when occurring, along sections of regulatory transects beyond 150 m [see Section 1.2.4.3]). Monitoring of specific projects within the BMA shall occur along regulatory transects of two types — biological and sediment only. All survey methods described below apply to biological transects while only line-intercept, interval sediment depth, and video collection apply to sediment only transects. To obtain the most accurate information on sediment depth and the location of sediment and hardbottom, line-intercept and interval sediment depth shall be the first surveys conducted along each transect. For biological transects, initial surveys (line-intercept, interval sediment depth, video) shall be followed by benthic quadrat and belt transect sampling.

Line-Intercept Survey

In order to document larger areas of uninterrupted sand (physical transitions along the monitoring transects between sand and hardbottom) and to track changes in sediment cover on the hardbottom, line-intercept surveys shall be conducted along all permanent transects. During each monitoring event, the landward and seaward position of each sand patch / trough at least 0.5 m in length shall be recorded along each transect by reference to transect tape meter marks. Meter mark references will be to one

decimal place (e.g., patch from 2.4 to 3.2 m).

Interval Sediment Depth Measurements

In order to track changes in sediment depth associated with changes in sediment cover, each monitoring event will include collection of interval sediment depth measurements along each permanent transect. Sediment depth shall be measured and recorded to the nearest centimeter at two (2) meter intervals (e.g., 0m, 2m, 4m, etc.) along the length of each transect. For each measurement, a ruler graduated in centimeters (0 to 30 cm) shall be pressed through the sediment until the ruler reaches the surface of hard substrata or is totally immersed in sand. Depth measurements shall be rounded to the nearest cm (i.e., sediment thickness of less than 0.5 cm will be recorded as "0 cm", while thickness greater than 0.5 cm but equal or less than 1 cm shall be recorded as "1 cm", etc.). Measurements greater than 30 cm will be recorded as ">30 cm". Measurements may be truncated to the first and last few meters of each trough in areas of Mid-Town known to contain large, deep sand troughs.

Video Survey

Video survey data collected as part of required biological monitoring functions as an archival data set that can be used for general reference purposes or to help resolve potential impacts suggested by quadrat and sediment survey data. As such, video data could be reviewed and compared between surveys and must be of a quality sufficient to allow for post-collection quantitative image analysis using point count procedures.

Video surveys shall be conducted along all permanent monitoring transects using a digital video camera. Video of the seafloor along each transect shall progress no faster than 5 meters per minute over hardbottom and 10 m per minute over large sand patches (troughs). A convergent laser guidance system shall be used to indicate the precise height of the camera at 40 cm from the bottom. The transect line shall be clearly visible in all video so that locations may be accurately referenced. A 360° panoramic view at an angle of roughly 30° to the horizon shall be recorded both at the beginning and end of each transect from an elevation of roughly 1 m above the bottom. At the beginning and end of each transect, a standard underwater display shall also be recorded and integrated directly onto the digital video track. The standard display shall report: 1) the BMA transect number; 2) the survey date (e.g., 06/25/2021); 3) the water depth in meters for both the beginning (transect meter 0) and end (final meter) of the transect (e.g., start depth = 2 m, end depth = 4.5 m); and 4) any pertinent notes (e.g., poor visibility, large swell, etc.). Video data (files) will be supplied to FEDP during raw data submittal. Video shall be reviewed at the end of each transect surveyed to ensure the quality is acceptable for general characterization of the benthos; poor quality video shall be re-filmed.

Quadrat Sampling

Benthic communities and their habitats will be characterized quantitatively using the quadrat method, which samples benthic habitat and assemblages within permanently positioned quadrats along all nonregulatory transects and along each biological regulatory transect. This method ensures the same quadrats (same location, same size) are sampled in each monitoring event in order to document changes in hardbottom/sediment and benthic communities over time. The sampling protocol is similar to that used in the Benthic Ecological Assessment for Marginal Reefs (BEAMR) (Lybolt and Baron, 2006). Similar to all other non-invasive and non-consumptive methods of sampling, the quadrat method is limited to

physical characteristics and organisms that can be visually recorded and identified in the field. As described below, three (3) main benthic characteristics will be assessed in each quadrat during sampling: physical structure, planar percent cover of sessile benthos, and coral (scleractinian and octocoral) size and density. Datasheets have a standardized layout similar to that used in BEAMR (Baron and Lybolt, 2006), and will simplify data collection and entry for statistical treatment.

Physical Structure: Maximum topographic relief and mean sediment depth (average of five [5] depth measurements) shall be measured (in centimeters) within each quadrat to document physical structure.

Cover (Percent) of Functional Groups: The distribution of substrata and composition of the benthic community within each quadrat shall be documented by estimating the planar cover (percent) of functional groups. Specifically, the following 15 major functional groups shall be assessed: sediments, bare hardbottom, macroalgae, turf algae, encrusting red algae, sponges, scleractinian corals, octocorals, zoanthids, hydroids, hydrocorals *Millepora* sp., sessile worms (including wormrock, *Phragmatopoma* spp.), bivalves, bryozoans, and tunicates. Each functional group shall be assigned a cover value (percent) from 0%-100%, with the total of all functional groups in each quadrat equaling 100%. Macroalgae with at least 1% cover shall be identified to genus and the cover (percent) of each genus shall be recorded. Unattached or floating macroalgae shall be disregarded and shall be removed from quadrats prior to sampling. The cover (percent) of cyanobacteria shall also be assessed but will be recorded separately from other cover estimates (i.e., not included with the main 15 functional groups).

Coral Size and Density: Monitoring staff shall also measure and record to the nearest centimeter (cm) the maximum dimension (height or width) of each scleractinian coral and octocoral colony within each quadrat. The smallest size recorded shall be one (1) cm; for colonies less than one (1) cm in size, the measurement recorded shall be "< 1 cm". Each colony within each quadrat shall also be enumerated and identified (by species for scleractinians, by genus for octocorals) to determine coral density and composition. Abnormal colony conditions shall also be recorded (e.g., bleaching, disease, predation, etc.) when encountered.

Offshore Station Survey Methods

The sampling protocol for stations very far offshore will follow the protocol employed by the Southeast Coral Reef Evaluation and Monitoring Project (SECREMP). The monitoring stations will be established with permanent stainless-steel markers and will include permanent, shore-parallel 22-m long photo-transects (N=3 per station), and a 1-m wide belt transect (N=1 per station).

Photo Transects

The three photo-transects will be sampled using a digital camera. Non-overlapping consecutive photographs will be taken along the full length of each transect at a height above the reef substrate to yield images approximately 40 cm wide by 30 cm in height. A constant distance above the substrate will be maintained using an aluminum bar affixed to the bottom of the camera housing or converging lasers which confirm the 40-cm distance. Percent cover of benthic functional groups

is analyzed post-collection by way of image analysis software based on the point-count methodology.

Belt Transects

The 1-m wide belt transect will be surveyed in the field to assess stony coral, octocoral and barrel sponge populations. All scleractinian coral colonies greater than 4 cm in maximum dimension will be identified and counted along the entire 22-m belt transect, maximum height and diameter of each colony will be recorded, and each colony will be visually assessed for the presence of diseases, bleaching and other conditions. Where these conditions result in partial mortality, the percentage will be visually estimated. All octocoral colonies will be counted along the first 10 m of the belt transect to provide an estimate of overall density. Following the octocoral colony count, erect octocorals listed as target species will be identified, measured, and their condition (presence of disease/predation) recorded along the first 10 m of the transect. Target octocoral species are *Eunicea calyculata*, *Antillogorgia americana* (formerly *Pseudopterogorgia americana*), *Eunicea flexuosa* (formerly *Plexaura flexuosa*), *Pseudoplexaura porosa*, and *Gorgonia ventalina*.

Barrel sponge (*Xestospongia muta*) density will be assessed by counting all sponges within the 1 m x 22 m belt transect. For each sponge colony, maximum diameter, maximum base diameter, and maximum height will be measured, and the sponge will be visually assessed for the presence of disease, bleaching and other conditions (i.e. damage/injury, predation). The percent of the sponge affected by injury, disease, and/or bleaching will be recorded.

Raw Data Deliverables, Data Analyses, and Annual Report Development

Raw Data

All raw post-construction monitoring data will be provided to FDEP on portable hard drives or via an FTP site). All data submitted shall be provided in standard formats, as specified below. All transect monitoring data submitted shall have been checked against field datasheets and corrected (if necessary) to ensure accuracy. Raw data provided shall consist of aerial photographs, hardbottom edge survey data, raw transect and quadrat survey data, underwater video and photographs, and field datasheets, and survey logs.

Data Analysis

Descriptive statistics along with univariate and multivariate analyses will be conducted on the data collected based on the list of suggested data treatments and statistical analysis in Section 1.5.3 of the BMA Appendix B. Temporal comparisons by way of univariate and multivariate tests shall be confined to data collected during the most recent monitoring event (current survey) and the baseline survey.

Report

The 2024 BMA Annual Report will include hardbottom distribution maps based on the 2024 aerial delineation and diver-mapped hardbottom edge survey. It will also include a comparative analysis of sediment cover, sediment depth, and benthic community data between the baseline survey and the 2024 survey. The report will provide results in appropriate graphical, tabular and text formats. The



final report will be submitted as a PDF file to the Town and FDEP.

Cost Estimate

CPE proposes to provide these services as detailed in Attachment 1 on a Time and Materials basis with the support of our subcontractor Aptim Environmental & Infrastructure, LLC (APTIM) for an estimated Not-To-Exceed amount \$169,200.14 to be performed in accordance with this proposal and Professional Services Agreement (PSA) 2020-24 between the Town of Palm Beach and CPE. The compensation for services rendered under this proposal will be based on the Rate Schedule of the PSA as shown in Attachment 1. Although this proposal is detailed by separable items and estimated by specific staff and categories, it is anticipated that some work elements will exceed the estimate while others fall below the estimate to complete. Our staff and subconsultant will be used as needed to achieve the scope of services and to meet the stated objectives and timelines within the proposed budget. Should the Town desire additional services beyond this scope, CPE will be available to discuss adjustments as appropriate.

Thank you for the opportunity to serve the Town of Palm Beach. If you have any questions, please feel free to contact me directly at 561-632-1210.

Sincerely,

A handwritten signature in blue ink that reads "Stacy E. Buck".

Stacy Buck
Senior Marine Biologist
Coastal Protection Engineering LLC
Mobile: 561-632-1210
sbuck@coastalprotectioneng.com

Cc: Lindino Benedet, PhD, CPE
Thomas Pierro, PE, D.CE., CPE



Attachment 1

CPE Cost Proposal

Town of Palm Beach
2024 BMA Monitoring

CPE Cost Proposal		LABOR			MATERIALS	SUBCONTRACTOR
		Principal Coastal Scientist Hours	Senior Marine Biologist Hours	Jr. Coastal Scientist Hours	Equipment & Insurance diver/day	APTIM Cost
Task 1	Aerial Delineation		68			\$ 7,260.00
	Hardbottom Edge Mapping		60	36	6	\$ 17,463.40
	Map	1	40			\$ 4,840.00
	Public Meeting	4	24			\$ -
Task 2	Transect Monitoring and Offshore Stations		88	60	11	\$ 28,480.00
	Data Entry and Raw Data Submittal		116	44		\$ 3,762.00
	Data Analysis and Annual Report	2	100	24		\$ 5,412.00
TOTAL		7	496	164	17	\$ 67,217.40
RATE		\$ 279.00	\$ 153.00	\$ 100.00	\$ 60.00	\$ 1.10
COST		\$ 1,953.00	\$ 75,888.00	\$ 16,400.00	\$ 1,020.00	\$ 73,939.14
LABOR			\$ 94,241.00			
MATERIALS			\$ 1,020.00			
SUBCONTRACTOR			\$ 73,939.14			
TOTAL			\$ 169,200.14			