CITY OF DELRAY BEACH
CONSULTING SERVICE AUTHORIZATION

DATE: October 24, 2018

SERVICE AUTHORIZATION NO. 5 FOR CONSULTING SERVICES

CITY P.O. NO. _____ CITY EXPENSE CODE: _____

CITY PROJECT NO. _____ CONSULTANTS PROJECT NO. _____

TITLE: Coastal Services for 2018/2019

This Service Authorization, when executed, shall be incorporated in and shall become an integral part of the Contract.

TITLE: Coastal Engineering Consulting Services (dated August 26, 2015)

I. PROJECT DESCRIPTION

The City has one of the most successful beach maintenance and preservation programs in the United States. Prior to 1973, beach erosion was so severe that portions of State Road A1A had collapsed into the Atlantic Ocean. In 1973, the City embarked on a program, supplemented by Federal, State and County funding, to nourish and maintain the eroded beach. Since 1973, the beach has been successfully maintained by the City. Currently, the City is in the planning stages for the next renourishment event, continuing post-construction monitoring of the 2013 and 2014 projects, and is in need of a sand search to identify and permit offshore sand sources for future projects.

II. SCOPE OF SERVICES

Task 1 – Sand Search Investigation

In summary, the sand search investigation will include:
1A Investigation Planning & Permitting
1B Reconnaissance Geophysical Survey
1C Reconnaissance Geotechnical Survey
1D Design Level Geophysical Survey & Cultural Resource Survey
1E Design Level Geotechnical Survey
1F Borrow Area Development, Compatibility Analysis, Product and Report Development

1A – Investigation Planning & Permitting
Prior to conducting field investigations, a desktop study will be conducted to identify potential sand sources that would meet Delray Beach's project needs. Historic datasets available for the study area (bathymetry, seismic, sidescan, bottom samples, vibracores, *etc.*), ROSS datasets, NOAA bathymetry datasets and morphologic maps will be reevaluated and analyzed in a GIS (Geographical Information System) framework in order to provide background information in addition to the findings from previous sand search investigations conducted for the City and the county. APTIM will locate and review existing pipelines, outfalls, proposed underwater cable routes, cultural resources (i.e. shipwrecks) and hardbottom/reefs to identify avoidance areas. The desktop study will focus on areas to the north and south of Delray's previously dredged borrow

areas as well as areas between existing borrow areas that have not been dredged. APTIM will also evaluate existing borrow areas to determine the feasibility of re-dredging areas that have been previously dredged. The information gathered during this phase will be evaluated and incorporated into a GIS database that, in turn, will be used to develop the reconnaissance survey plan.

Prior to conducting the field operations a permit/de minimus exemption must be obtained. In order to do this, a Joint Environmental Resource Permit Application (ERP) application must be submitted to Florida Department of Environmental Protection (FDEP) for review. This application requires a general project description and a map outlining the area of deployment. FDEP has ninety (90) days to review the permit application. The application is also forwarded to the Bureau of Survey and Mapping, Division of State Lands for title determination. Existing easements must be avoided during deployment or title holders must be notified of the proposed activity. The ERP application is also forwarded to USACE, Florida Division of Historical Resources (SHPO) and to Fish and Wildlife Services (FWS) for review and comment. APTIM will assist in applying for the necessary permit/de minimus exemption by completing and submitting the required forms, as well as reasonable coordination with the regulatory agencies.

Prior to completing the permit request forms, APTIM will meet with the City to discuss the results of the desktop study and the proposed reconnaissance survey plan. This task also includes early permitting discussions with regulatory agencies with regard to borrow area identification and development.

1B – Reconnaissance Geophysical Survey

Two (2) days of geophysical data will be collected during the reconnaissance geophysical survey. The joint geophysical survey includes seismic reflection profiling, sidescan sonar, magnetometer, and bathymetric surveys. The survey control and accuracy standards will be consistent with FDEP specifications, and a report from the surveyor will be submitted certifying that the survey meets Bureau of Beaches and Coastal Systems (BBCS) Technical Standards established in Part II.A of section 01200 in the *BBCS Monitoring Standards for Beach Erosion Control Projects, 2014* and Standard of Practice of Chapter 5J-17, Florida Administrative Code.

<u>Geophysical Survey Equipment</u>

Vessel

APTIM will use the R/V James K Goodwin, a USCG inspected and certified vessel, or similar for all phases of this project (Figure 1). The R/V James K. Goodwin is a 110 ft. (33.5 m) steel hulled vessel, acquired with the sole purpose of geophysical, geotechnical and biological surveys. It comes equipped with twin 1692 Detroit diesel main engines, twin 471 Detroit diesel generators (40 Amp), one 18,000 lb capacity deck winch, a 4 inch down pole with variable mounting brackets, and a 10 ton capacity hydraulic a-frame. The James K. Goodwin is equipped with crew and client quarters as well as a full galley with two heads including showers. As a USCG inspected vessel, the James K. Goodwin safety features include fire extinguishers, life vests/survival suits, 50 man life raft, first aid kits, radar, VHF radios, and an EPIRB with GPS and more. These safety features and the level of experience and expertise from the captain and crew allows the R/V James K. Goodwin to operate safely and efficiently, providing proficient geophysical and geotechnical support throughout project operations.

Figure 1. Image of proposed vessel for survey operations, R/V James K. Goodwin

Navigation System

A Trimble Real Time Kinematic Global Positioning System (RTK GPS) will be used on board the survey vessel to provide high-precision navigation and instantaneous water level corrections. In order to maintain the vessel navigation along the profile lines, Hypack 2015® will be used. This software merges RTK GPS vertical and horizontal positioning with the sounding data, allowing real time review of the profile data in plan view or cross section format. It also provides navigation to the helm to control the deviation from the online azimuth.

Seismic Reflection Profile Surveys

An EdgeTech X-STAR 512i seismic sub-bottom system or equivalent will be used to conduct the seismic reflection profile surveys. The X-STAR SB-512i Full Spectrum Sonar is a versatile wideband FM sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges. This instrumentation generates cross-sectional images of the seabed (to a depth of up to 50 ft). The X-STAR SB-512i transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called a "chirp pulse"). The tapered waveform spectrum results in images that have virtually constant resolution with depth.

Throughout the offshore seismic reflection survey, selection of the chirp pulse will be modified in real time to obtain the best possible resolution of geological features and the sequence stratigraphy (i.e. vertical sequence and lateral distribution of sediment bodies comprised by different grain sizes and sediment composition) that in turn optimizes data quality and enhances subsequent interpretation. High frequency and/or short duration pulses are, for example, used to obtain highest resolution (clearest reflector image) in near surface (or find-grained sediment) situations; low frequency or longer duration pulses are used with coarse-grained sediments and/or where deeper penetration is required.

The main interpretive goal of the sub-bottom data will be to interpret the presence of sand as well as identify subsurface rock or reef material.

Bathymetric Survey

The Odom Hydrographic Systems, Inc.'s Hydrotrac, a single frequency portable hydrographic echo sounder, will be used to perform the bathymetric survey. The Hydrotrac will be set to operate at a frequency of 200kHz and is a digital, survey-grade sounder. Horizontal and Vertical

positioning checks will be conducted at the beginning and end of each day using known positions located in the project area. The sounder will be calibrated via bar-checks and a sound velocity probe at the beginning and end of each day, or when there is a known variation in the water column. The DIGIBAR PRO sound velocity meter offers a fast calibration for sound velocity as compared to the traditional bar-check. Bar-checks will also be performed to verify speed of sound measurements and transducer draft.

Sidescan Sonar Survey

An EdgeTech 4200 sidescan sonar system will be used to collect sidescan sonar data over the entire area of investigation. The 4200 sidescan sonar system uses full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and superb signal to noise ratio echo data. The portable sidescan package includes a laptop computer running the Discover® acquisition software and a 300/600 kHz dual frequency towfish running in high definition mode.

Magnetometer Survey

A Geometrics G-882 Digital Cesium Marine Magnetometer (or equivalent) will be used to perform a cursory investigation of magnetic anomalies throughout the survey areas. The purpose of the magnetometer survey is to establish the presence of any potential underwater wrecks, submerged hazards, infrastructure, or any other features of interest. The Hypack software will record magnetic anomalies directly from the Geometrics magnetometer at a sufficient distance away from the survey vessel to not record magnetic signatures from the survey vessel.

Geophysical Data Analysis

The EdgeTech Discover data acquisition system collects and stores geophysical survey data in a digital format. EdgeTech's Discover is a modular acquisition and processing software package that is compatible with all of EdgeTech's systems. It serves as the digital image processing, display, storage, and surface control station for the EdgeTech sub-bottom profiler (chirp sonar system). This data acquisition system digitizes, stores, and processes seismic signals and combines the seismic imagery with navigational inputs to georeference data in real-time.

The digital sidescan data will be merged with positioning data (RTK GPS via Hypack), video displayed, and recorded to the acquisition computer's hard disk for post processing and/or replay. The position of the sensor relative to the RTK GPS antenna will be documented to ensure proper positioning of the data.

All sidescan sonar and seismic reflection data will be processed using the SonarWiz.MAP software package developed by Chesapeake Technologies Inc. This software package allows for advanced processing, interpretation, and digital mosaic output and can produce georeferenced HTML's viewable in generic web-browser software programs. SonarWiz.MAP also produces digital geographic information for both sub-bottom and sidescan data that are exportable for incorporation into a GIS database. All sidescan sonar, sub-bottom profile, magnetometer and bathymetric data will be processed and interpreted by APTIM personnel.

1C – Reconnaissance Geotechnical Survey

A reconnaissance geotechnical survey plan will be developed based on the results of the

reconnaissance geophysical survey. The geotechnical survey includes vibracoring to investigate promising locations identified during the initial geophysical survey and beach sampling to characterized the existing beach. Vibracore operations will be conducted over a period of two (2) days, resulting in the collection of up to 10 vibracores.

At each target location a vibracore will be taken. If field measurements indicate that less than 80% recovery has been achieved, then up to two additional cores will be taken, or a hydraulic jetting technique will be used to facilitate sampling below previously retained material. In the event a jet is used, the recovery of the original vibracore and additional vibracore sections will be combined to determine total recovery. Should the above procedures not result in 80% or more recovery, then this drilling effort will be considered a completed core for purposes of payment under this contract.

Beach samples and nearshore sediment samples will be collected from 7 transects, at monuments R-177, R-180, R-181, R-184 and T-187 as well as 5,000 ft. to the north of R-177 and 5,000 ft. to the south of T-187, to characterize the existing beach. Along these transects, samples will be collected from Toe of Dune, Midberm, Mean High Water (MHW), Mean Tide Level (MTL), Mean Low Water (MLW), -4 ft., -8 ft., -12 ft., -16 ft. and -20 ft. Samples will also be collected from the bar and trough locations along each profile.

Geotechnical Survey Equipment

APTIM will utilize the Seas VC-700 Vibracoring System (Figure 2) or similar, configured to collect undisturbed sediment cores up to 20 ft. in length. The VC-700 is a single core electric vibracoring system operational to depths of 1,000 m (3,281 ft.). The electric vibracore is the most versatile of vibracore systems, with the ability to retrieve deep core samples with no pressure constraints as found with pneumatic vibracores. The self-contained, free-standing electronically operated vibracore unit contains a VC-700 vibrator head (4.4 kW) configured to 415 vAC or 220 vAC 3-phase power, allowing for a user to operate the vibracorer at fluctuating vibration frequencies to penetrate through otherwise unyielding strata. A 210 m long 4-core Hydrofirm sea cable provides power to the drive unit of the vibracore from the surface control system, located on vessel.

The vibracore unit is winch and A-Frame deployed and retrieved from the R/V Jamie Hanna. The vibracore's light weight modular construction, allows for a safe and efficient deployment and retrieval to and from the survey vessel. The vessel will attempt to "live boat" at all geologic sample locations; however, if environmental conditions prove too problematic, anchoring methods will be conducted during the investigations to further the vessel's stability for vibracore operations.

Figure 2. Seas VC-700 vibracoring system.

Geotechnical Data Analysis

Sediment Sample Analysis

Upon completion of field operations, all vibracores will be transported to APTIM's Boca Raton office. There, the vibracores will be logged by describing sedimentary properties by layer in terms of layer thickness, color, texture (grain size), composition and presence of clay, silt, gravel, or any other identifying features. The vibracores will be photographed in 2.0 ft. intervals. Sediment samples will be extracted from the vibracores at irregular intervals based on distinct stratigraphic layers in the sediment sequence. The vibracores will then be wrapped and archived. Cores will be stored for a period of up to one (1) year. After this time, APTIM will contact the City to determine options for transporting the cores to the City or continuing to store them within APTIM storage facilities for an additional cost not included in this scope.

Mechanical Sieve Analysis

The sediment samples will be analyzed to determine color and grain size distribution. During sieve analysis, the wet, dry and washed Munsell colors will be noted. Sieve analysis of the sediment samples will be performed in accordance with the American Society for Testing and Materials (ASTM) Standard Methods Designation D 422-63 for particle size analysis of soils. This method covers the quantitative determination of the distribution of sand size particles. For sediment finer than the No. 230 sieve (4.0 phi) the ASTM Standard Test Method, Designation D 1140-00 will be followed. The sieve stack used for mechanical analysis will conform to the BBCS guidelines provided in Table 1.

Table 1. *Mesh sizes to be used for granularmetric analysis.*

Sieve No.	Size (phi)	Size (mm)
3/4	-4.25	19.00
5/8	-4.0	16.00
7/16	-3.5	11.20
5/16	-3.0	8.00
3 ½	-2.5	5.60
4	-2.25	4.75
5	-2.0	4.00
7	-1.5	2.80
10	-1.0	2.00
14	-0.5	1.40
18	0.0	1.00
25	0.5	0.71
35	1.0	0.50
45	1.5	0.36
60	2.0	0.25
80	2.5	0.18
120	3.0	0.13
170	3.5	0.09
200	3.75	0.08
230	4.0	0.06

Weights retained on each sieve will be recorded cumulatively. Grain size results will be entered into the gINT® software program, which computes the mean and median grain size, sorting, silt/clay percentages for each sample using the moment method.

Carbonate Testing

Carbonate content will be determined by percent weight using the acid leaching methodology described in Twenhofel, W.H. and Tyler, S.A., 1941. Methods of Study of Sediments. New York: McGraw-Hill, 183p.

APTIM will meet with the City to discuss the findings of the reconnaissance level geophysical and geotechnical investigations, and propose the plan for continuing onto the design level investigations.

1D – Design Level Geophysical Survey & Cultural Resource Survey

After the collection and analysis of reconnaissance vibracores, a four (4) day design level geophysical/cultural resource investigation will be conducted. The investigation will be comprised of a joint seismic, sidescan sonar, magnetometer and bathymetric survey (using the equipment described in Task 2) and will focus on the area(s) identified for borrow area development. The data acquired during this investigation will supplement the reconnaissance geophysical data in order to obtain the 30 meter line spacing required to perform the cultural resource assessment. A cultural resources report will be prepared and sent to SHPO for review and approval.

The survey control and accuracy standards will be consistent with FDEP specifications, and a report will be submitted certifying that the survey meets Bureau of Beaches and Coastal Systems (BBCS) Technical Standards established in Part II.A of section 01200 in the *BBCS Monitoring Standards for Beach Erosion Control Projects, 2014* and Standard of Practice of Chapter 5J-17, Florida Administrative Code.

1E – Design Level Geotechnical Survey

Following completion of the design level geophysical/cultural resource investigation, a seven (7) day vibracore operation will be conducted. Up to 40 design level vibracores will be collected and analyzed using the methods and equipment described in Task 3.

Once the field work is completed, the vibracores will be photographed, logged and sampled within APTIM's Boca Raton office. Mechanical sieve analyses will be conducted by APTIM's CMEC accredited geotechnical laboratory. These results will be incorporated into the geotechnical report and used in support of borrow area development and permitting.

1F – Borrow Area Development, Compatibility Analysis, Product and Report Development

A compatibility analysis will be conducted to match the borrow area(s) and the existing beach for optimum project performance. During Task 1C beach samples and nearshore sediment samples will be collected and analyzed from selected transects to characterize the existing beach. The results of the existing beach sand samples along with the compatibility analysis will be included as part of the final geotechnical report.

The draft geotechnical report will be submitted to the City for review and comment. A final report summarizing the results of the geotechnical investigation, including City input, will be prepared and submitted to FDEP and the City. This report will include project results, including bathymetric and isopachous (sediment thickness) maps, sub-bottom (seismic) survey profiles, vibracore logs, vibracore photographs, granularmetric reports and grain size distribution curves.

APTIM will provide all geotechnical information in an electronic format suitable for input to the FDEP Regional Offshore Sand Source Inventory (ROSSI) database. The data will be submitted in Access or gINT files. The submission will include shapefiles (with the associated FGDC compliant metadata) of borrow area boundaries and seismic tracklines. Seismic data will be provided in HTML format. Seismic timestamps and shot points are not recorded as HTML formatting embeds all navigation data, making timestamps and shot points obsolete.

Task 2 – Design & Permitting

APTIM will perform the professional services needed to prepare for the next beach renourishment event as detailed in this section. These services shall include: project design and coordination, biological investigations, preparation of a supplemental environmental assessment, submittal of a permit modification request, and construction plans and technical specifications.

2A Project Design and Coordination
2B Biological Investigations
2C Supplemental Environmental Assessment
2D Permit Modification Request

2E Construction Plans & Technical Specifications

2A – Project Design and Coordination

APTIM engineers will assist the City in coordinating amongst project sponsors and permitting agencies related to the next renourishment event. Engineers will review the project design, Hurricane Irma impacts, and permitted template to evaluate that project goals are being met and proper state and federal permits are in place. Evaluation of the project design will include estimates of project volume, costs, and timeline for planning purposes. This phase includes services to support USACE's evaluation of the project and it is assumed that a General Design Memorandum and Limited Reevaluation Report are not required at this time.

At the time of this proposal, the next renourishment event is planned to be a Flood Control and Coastal Emergency (FCCE) Shore Protection Project. It is assumed that USACE will prepare the construction documents and bid the project. On behalf of the City, APTIM will be available to review technical specifications and construction plans prepared by USACE engineers. Coordination with USACE and review of the construction documents prior to advertising for bid, will ensure the documents contain all permit requirements needed for compliance with state permits held by the City, and that local knowledge from past successful projects is applied as appropriate. APTIM will support the City as needed through USACE's bidding and procurement of a dredge contractor. If requested by USACE or the City, APTIM can participate in the preparation of construction plans and technical specifications under Task 2E.

2B - Biological Investigation

A biological investigation of the offshore reef resources will provide updated information on the current conditions of the reef in support of the City's upcoming nourishment project. In summary, the biological investigation will include:

2Bi. Reef Edge Survey and Video Documentation
2Bii. *Acropora* spp. Survey

2Bi. – Reef Edge Survey and Video Documentation

APTIM marine biologists will document the condition of the western (inshore) reef edge located east of the project borrow areas. The survey will include the length of the currently permitted borrow areas plus the proposed sand search investigation area (approximately 10,000 feet beyond the existing borrow areas). It is anticipated that this area can be surveyed in 5 field days of good conditions. A buoy with a Differential Global Positioning System (DGPS) antenna linked to a topside laptop running HYPACK navigational software will be towed by divers along the reef edge to record the position of the divers during the survey. Video will be recorded in conjunction with the hardbottom edge survey using an underwater video camera. An observation report of the reef edge survey and associated video and photo-documentation will be provided to the City to support project permitting.

2Bii. – Acropora spp. Survey

No nearshore hardbottom is present in the project area; however, the Outer Reef is located east of the currently permitted borrow areas and the proposed sand search investigation area. In support of Section 7 Consultation with NMFS, APTIM will survey the reef for the presence of *Acropora* species based on a modified version of the NMFS 2007 Recommended Survey Protocol for *Acropora* spp. (NMFS, 2007).

The reef east of the borrow areas is considered an "intermediate to large" project area (>0.1

hectare or 0.25 acre). The NOAA/NMFS recommended survey protocol for *Acropora* spp. for intermediate to large project areas (> 0.1 hectare or 0.25 acre), is as follows:

Survey personnel are to record:

1. Species
2. Single largest linear dimension of the colony or length, height, and width (mm)
3. Rank of percent live tissue (i.e., > or < 50%)
4. GPS coordinate of each colony or each survey site (decimal degrees and state datum)
5. Site map with locations of each colony

Data is to be collected at one (1) sampling site per every 10,000 m^2 (1 ha) of hardbottom/reef resource. At each sampling site, a 2-tiered survey shall be conducted.

1. 1st tier survey requires a structured 20-min timed swim from a referenced center point (i.e., downline). If five (5) or fewer colonies are encountered, collect the required data on those colonies and proceed to next sampling site. If more than five (5) colonies are encountered, proceed to 2nd tier.

2. 2nd tier survey requires that three (3) belt transects be extended from the referenced center point at three (3) random bearings. Each belt transect should measure 4 m x 50 m, for a total of 200 m^2 sampled per transect (600 m^2 per site). All required data for all colonies encountered along each transect will be recorded.

A modified protocol was conducted in 2011 for the Delray Beach reef in order to create smaller survey areas since the distance between the borrow areas and the reef is greater than 900 feet at the closest point and because no impacts are anticipated to occur to the reef from dredging activities. Even including a 150-m mixing zone surrounding each borrow area, turbidity is not anticipated to reach the offshore reef under normal sea conditions. It is assumed that a modified protocol will again be acceptable to NMFS.

The modified version of the *Acropora* survey will extend along the length of the reef mapped in Task 2Bi (approximately 7,000 m – this distance does not include gaps in the reef) and approximately 30 m wide from the western boundary of the reef, or the extent that can be covered in up to 6 field days. Three APTIM biologists will conduct the *Acropora* survey within the designated survey area and will record the parameters listed above for each colony located. Based on the results of the 2011 survey where no colonies of *Acropora* were located, only 1st Tier surveys are included in this proposal. If colonies are encountered, APTIM will coordinate with the City and NMFS to determine if 2nd Tier surveys are needed, at which point APTIM is available to perform additional field investigations for biological characterization under a separate service authorization or change order, if the efforts exceed the proposed 5 field days. The results of the survey will be submitted with the documentation for the permit modification to provide the regulatory agencies with updated information of the reef resources in the vicinity of the proposed borrow areas.

2C – Supplemental Environmental Assessment

The National Environmental Policy Act (NEPA) requires federal agencies to consider environmental impacts during their decision-making process for major federal actions. Since an Environmental Assessment (EA) was prepared for the Fifth Periodic Renourishment, NEPA regulations encourage a tiered approach to avoid repetition of issues and to focus on the actual issues apt for decision at each level of environmental review. Therefore, APTIM will tier off the existing EA to include any updates to the project design, updated physical conditions of the project area, natural resources present, wildlife survey data, ESA listed species that utilize the

project area, sediment characteristics of offshore sand sources, and pertinent data collected since the completion of the original EA. Several coral species and red knots will also be included, as they were not yet designated as listed species at the time of the original EA development. The EA will include a description of the proposed action and alternatives, affected environments, and environmental consequences.
APTIM will provide the County an electronic version of the draft Supplemental EA for the City's review and comments. Once finalized, APTIM will provide the City with an electronic version of the final Supplemental EA. The final version will be submitted as part of the State and Federal permitting.

2D – Permit Modification Request
Once the sand search investigation has been completed and additional sand resources have been identified, a permit modification will be needed to include these sand sources into the existing permits. APTIM will perform tasks as needed to prepare and submit the permit modification package.

Permit sketches will be developed using the borrow area designs developed in Task 1 and incorporate the latest engineered beach design and reef edge. Permit sketches will include a plan-view design with corresponding beach profile cross-sections along with borrow area design.

APTIM will coordinate with FDEP to develop an updated QA/QC sediment plan that incorporates the newly identified offshore sand resources. In addition, updated information generated from Task 2B will be submitted along with updated environmental data (e.g. sea turtle nesting data, shorebirds). APTIM will provide additional information to USACE that may be required for consultation with USFWS and NMFS, such as the NMFS Section 7 Consultation Checklist.

APTIM will prepare responses to up to two (2) Requests for Additional Information (RAI) from FDEP and/or USACE. We will attend meetings and/or participate in teleconferences with agencies as needed. APTIM will compile and submit all pertinent information in support of the permit modification requests to FDEP and USACE.

2E – Construction Plans & Technical Specifications
If USACE requires support to expedite the project for construction, the City may supply USACE with documents to assist with the development of construction plans and technical specifications for the next renourishment event. If requested, APTIM will prepare these documents in a suitable format for USACE to use in their bidding of the project under this task.

The plans will provide project plan views and cross-sections of the beach fill through the development of individual fill templates. Plan view charts will include items such as bathymetric data and an isopach chart providing detailed geotechnical information. Periodically spaced profile lines will be detailed showing the templates for the beach fill from north to south. The plans will also include information related to construction access to the beach, equipment storage areas, staging areas, baseline and control data, pipeline corridors, hardbottom areas to be avoided, cultural resource areas to be avoided and other information required for construction of the beach project. Borrow area plan view details and borrow area excavation cross-sections will also be incorporated into the plans.

APTIM will also assist USACE with preparation of the technical specifications for incorporation into USACE bidding documents. The technical specifications will include Technical Provisions, and language to require Environmental Compliance with the permits. The project permits will be

incorporated as appendices in the specifications requiring contractor compliance with permit conditions. Also incorporated into the specifications will be the geotechnical analysis for the borrow areas, and the sediment QA/QC plan required by the FDEP.

Task 3 – 2019 Physical Monitoring

The City completed its fifth beach renourishment project in 2013, and a Hurricane Sandy storm repair beach renourishment project was completed in 2014 for the north end of the City, outside of the 2013 project area. The State of Florida project permit requires that a comprehensive post-construction physical beach monitoring study be conducted as a permit condition, including an engineering evaluation of the monitoring results with a report. Annual physical monitoring provides consistency in data collection for performance assessment and reporting to support the engineering and design of future renourishment projects. Furthermore, the annual data becomes highly valuable in the event of a storm, and can be used for quantifying storm impacts as a basis to qualify for funding in the wake of a coastal disaster. The 2019 Physical Monitoring will be considered the 5-Year Post-Construction Monitoring Event by FDEP and is eligible for cost sharing. We will also assist the City with post-construction efforts related to project administration and performance evaluation.

3A – Project Administration

Project administration includes assistance with State and Federal agency coordination, quarterly reporting, and the annual Local Government Funding Request. APTIM will also attend City meetings as required, and other associated assistance specific to the renourishment program.

3B – Beach Profile Surveys R-171 to R-192

In accordance with the Bureau of Beaches and Coastal Systems (BBCS) Monitoring Standards for Beach Erosion Control Projects, topographic (onshore) and bathymetric (offshore) surveys of the beach and offshore in Delray Beach will be conducted during the summer of 2019. The monitoring data will be used to assess, with quantitative measurements, the performance of the beach replenishment projects. The monitoring data will provide the City, FDEP, and USACE information necessary to continue planning for the next renourishment project, and evaluate the beach performance.

The 2019 post-construction monitoring event will consist of topographic and bathymetric surveys of the beach to include both the 2013 and 2014 beach renourishment areas, and to approximately one mile north and south of the combined project limits as required by the physical monitoring plan. The monitoring surveys will include twenty-two (22) FDEP profile lines from R-171 to R-192. All profile surveys will extend offshore a minimum of 3,000 ft. or to the -30 ft. (NAVD) contour. All work activities and deliverables shall be conducted in accordance with the *March 2014 BBCS Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100.*

3C – Engineering Evaluation and Monitoring Report

We will develop and submit the post-construction engineering report to the FDEP within 90 days following completion of the 2019 post-construction survey. The engineering report will address the 2019 physical monitoring results, will summarize and discuss the project performance since completion of the beach renourishment projects, and will be a useful tool for project planning.

ASSUMPTIONS

Work described herein is based upon the assumptions specified and caveats described below. If conditions differ from those assumed in a manner that will affect schedule of Scope of Work, Consultant shall advise City in writing of the magnitude of the required adjustments. Changes in completion schedule or compensation to Consultant will be negotiated with City.

APTIM proposes to perform the Delray Sand Search Investigation to the industry standard of care and will coordinate the investigations with FDEP as required. Even though the FDEP may agree with the scope of the investigations, beach compatible sand may not be located, FDEP may not approve the sand source(s) located, or FDEP may impose a sand placement QA/QC requirement that would be difficult to meet. If any of these events occur, it may be necessary to locate additional beach compatible sand sources at additional cost. APTIM will also make reasonable attempts to determine if other entities are exploring the same sand sources or have a permit to use the same sand we intend to investigate. Despite these efforts, it is possible that others may claim the sand that we find, and negotiations and/or further exploration may be required if that occurs. Lastly, cultural or environmental resources may exist in or near the investigated borrow area that would limit or preclude a portion or all of its use.

In the case that a vibracore (Tasks 1C and 1E) does not have 80% retention, the agencies may not approve its use for design purposes.

APTIM will attempt to avoid these issues and restrictions, but there may be adverse circumstances that cannot be avoided or mitigated. All of the listed potential outcomes may be beyond the control of APTIM and may result in the need for additional services. The client herein recognizes the above referenced risks and agrees to work with APTIM to complete the work, which may include additional services for sand investigations, permitting, biological investigations, or engineering as needed. APTIM is working exclusively on your behalf and will attempt to limit the risks as described above to the greatest extent practicable.

III. TIME OF PERFORMANCE

APTIM will proceed with the project as soon as notice to proceed is obtained from the City. 2019 Physical Monitoring, described in Task 3 is expected to be completed by January 2020. Based on available data related to the timing of the potential FCCE USACE renourishment event, it is anticipated that the majority of these services will be completed within 24 months of receipt of notice to proceed.

VI. COMPENSATION

The compensation for the services provided shall be billed on an ongoing basis including reimbursable expenses for each task of work up to the following not to exceed cost for each phase.

Coastal Services 2018/2019	Estimated Fees
Task 1 – Sand Search Investigation	$ 673,613.50
Task 2 – Design & Permitting	$ 237,272.13
Task 3 – 2019 Physical Monitoring	$ 78,541.90
TOTAL PROJECT COST (LUMP SUM)	**$989,427.53**

This Service Authorization is approved contingent upon the City's acceptance of and satisfaction of the completion of the services rendered in the previous phase whereas encompassed by the previous Service Authorization. If the City in its sole discretion is unsatisfied with the services provided in the previous phase or Service Authorization, the City may terminate the contract without incurring any further liability. The Consultant shall commence work upon City Commission approval and this Service Authorization to be included as part of the contract without any further notice to proceed.

Approved by:

CITY OF DELRAY BEACH:

Date _____

_____
Shelly Petrolia
Mayor

Attest:

_____
R. Max Lohman, City Attorney

_____
Katerri Johnson, City Clerk

CONSULTANT: Aptim Environmental & Infrastructure Inc.

Date 11/6/2018

_____
NAME (Signature)

NAME (Printed) Thomas Pierro

_____
Witness (Signature)

Tara Brenner
Witness (Printed)

STATE OF FLORIDA
COUNTY OF PALM BEACH

The foregoing instrument was acknowledged before me this 6th day of November, 2018, was acknowledged by Tom Pierro on behalf of the Corporation APTIM, and said person executed the same free and voluntarily for the purpose there-in expressed. This person is personally known to me.

_____
Notary Public
State of Florida

Notary Public State of Florida
Beth Forrest
My Commission GG 179917
Expires 01/28/2022

My Commission Expires: 01/28/2022

CITY OF DELRAY BEACH
2018/2019 COASTAL SERVICES
FEE PROPOSAL FOR

SAND SEARCH, PRELIMINARY ENGINEERING, AND PHYSICAL MONITORING

LABOR, EQUIPMENT & DIRECT COST RATES

PREPARED BY: APTIM ENVIRONMENTAL & INFRASTRUCTURE, INC.

LABOR RATES (HOURLY)	
Principal Engineer	$230
Expert Witness (Testimony)	$230
Senior Project Manager	$215
Senior Coastal Engineer	$185
Program Manager	$165
Coastal Engineer III	$150
Coastal Engineer II	$125
Coastal Engineer I	$110
Coastal Modeler II	$130
Coastal Modeler I	$110
Professional Surveyor & Mapper	$130
Hydrographer	$125
Surveyor	$95
Survey Technician	$80
Senior Marine Biologist	$140
Marine Biologist II	$95
Marine Biologist I	$72
Professional Geologist	$130
Geologist III	$130
Geologist II	$95
Geologist I	$80
Senior CAD Operator	$150
CAD Operator	$110
GIS Operator	$110
Boat Captain	$80
Bookkeeper	$80
Clerical	$72
Technician	$57
EQUIPMENT RATES (DAILY)	
Survey Boat 24'	$790
Truck (Road Use per mile)	$0.565
Trimble RTK GPS	$495
GPS Integrated Underwater Video Camera	$435
SCUBA Tanks (Nitrox)	$19
Dive Equipment and Insurance per diver per day in addition to normal hourly rates for personnel	$75
Heave, Pitch & Roll Compensator	$215
Speed of Sound Velocity Meter	$63
Hypack/DredgePack Navigation System	$260
Odom Hydrotrack Sounder	$165
X-Star Chirp 512i Seismic Profiling System	$1,150
Seismic Profiler Thermal Printer	$130
Edgetech 4200 FS Sidescan Sonar System	$695
Geometric G-881 Magnetometer	$215
Enclosed 18' Trailer	$78
Nikon Level/Tripod/Rod	$65
Digital Camera	$10
All Terrain Vehicle	$105
Sonar Wizard Map Seismic Data Processing Package	$155
Sieve Analysis	$70
Carbonate Analysis	$60
SEAS V700 Vibracore System	$3,750
Jet Probe with Pump	$35
Generator	$45
Ponar Grab Sampler	$25
DIRECT COSTS - Actual Cost plus 10%	
Actual Cost plus 10%	1.10

CITY OF DELRAY BEACH, FL

FEE PROPOSAL FOR

2018/2019 COASTAL SERVICES
SAND SEARCH, PRELIMINARY ENGINEERING, AND PHYSICAL MONITORING

PREPARED BY: APTIM ENVIRONMENTAL & INFRASTRUCTURE, INC.

	Total Labor Cost Per Sub Task	LABOR COSTS																	
		Principal Engineer	Senior Project Manager	Program Manager	Coastal Engineer II	Professional Surveyor and Mapper	Surveyor	Survey Technician	Professional Geologist	Geologist II	Geologist I	Senior CAD Operator	CAD Operator	GIS Operator	Senior Marine Biologist	Marine Biologist II	Technician	Boat Captain	Clerical
		(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)	(Hours)
1. Sand Search																			
1A Investigation Planning & Permitting	$44,866		8	80		13		13	100	84	44			20			4		4
1B Reconnaissance Geophysical Survey	$33,343		3	4		20		96	6	96	96			10			54		
1C Reconnaissance Geotechnical Survey	$32,773		6	4		12		88	16	95	95			4			54		
1D Design Level Geophysical Survey & CR Survey	$48,160		3	5		37		140	6	140	140			18			60		
1E Design Level Geotechnical Survey	$52,038		4	16		20		178	40	120	120			22			54		
1F Borrow Area Development and Report	$36,296		8	40		8		16	110	40	40			24			20		8
2. Preliminary Engineering																			
2A Project Design and Coordination	$32,100	16		84	80	4	8		4			4	12		6				
2B Biological Investigation																			
2Bi. Reef Edge Mapping (5 days)	$26,820		2				60	5				1		4	20	124		64	
2Bii. Acropora Survey (6 days)	$42,140		2				72	6				1		4	84	168		76	
2C Supplemental EA	$21,324		2	4	10							2		14	40	120			2
2D Permit Modification Request	$36,820	4		80	24	8			16		10	4	40	6	56	24			
2E Construction Plans & Technical Specifications	$54,392	8	4	96	132	8			16	8		8	80	12	16	8			16
3. 2019 Physical Monitoring																			
3A Project Administration	$21,436	8		60	40							4	18	14					8
3B Beach Profile Surveys R-171 to R-192	$22,764	2		16	8	16	100	24				2		24				26	2
3C Engineering Evaluation and Monitoring Report	$29,992	8		80	96							8	12						6
	Total Hours =	46	42	569	390	146	240	566	314	583	545	34	162	176	222	444	246	166	46
	Rate =	$230	$215	$165	$125	$130	$95	$80	$130	$95	$80	$150	$110	$110	$140	$95	$57	$80	$72
	Cost =	$10,580	$9,030	$93,885	$48,750	$18,980	$22,800	$45,280	$40,820	$55,385	$43,600	$5,100	$17,820	$19,360	$31,080	$42,180	$14,022	$13,280	$3,312

TOTAL LABOR COSTS =	**$535,264.00**
TOTALEQUIPMENT COSTS =	**$144,773.13**
TOTAL REIMBURSEABLE COSTS =	**$39,890.40**
TOTAL SUBCONSULTANT COSTS =	**$269,500.00**
TOTAL COSTS =	**$989,427.53**