

SEVENTH AMENDMENT TO THE AGREEMENT BETWEEN BROWARD COUNTY AND THE FIRMS OF OLSEN ASSOCIATES, INC. AND APTIM COASTAL PLANNING & ENGINEERING, LLC (F/K/A CB&I COASTAL PLANNING & ENGINEERING, INC.), OPERATING AS A JOINT VENTURE FOR CONSULTANT SERVICES FOR THE BROWARD COUNTY SHORE PROTECTION PROJECT IN BROWARD COUNTY, FLORIDA, RLI #040897-RB

This Seventh Amendment ("Seventh Amendment") to the Agreement (hereinafter defined) is made and entered into by and between Broward County, a political subdivision of the State of Florida ("County"), and OLSEN ASSOCIATES, INC., a Florida corporation, and APTIM COASTAL PLANNING & ENGINEERING, LLC, a Florida limited liability company f/k/a CB&I COASTAL PLANNING & ENGINEERING, INC., operating as a joint venture, ("Consultant") (each a "Party," collectively referred to as the "Parties").

RECITALS:

A. On December 8, 1998, County and Consultant entered into an Agreement for the performance of Phase I and Phase II of the consultant services for the Broward County Shore Protection Project ("Agreement").

B. On June 26, 2001, County and Consultant entered into the First Amendment to the Agreement to provide for additional services and compensation related to Phases I and II of the Agreement.

C. On June 22, 2004, County and Consultant entered into the Second Amendment to the Agreement to provide for additional services and compensation related to Phase III of the Project, including pre-construction, construction, and post-construction services related to Segment III beach nourishment.

D. On May 20, 2008, County and Consultant entered into the Third Amendment to the Agreement to provide additional services and compensation related to Phase IV of the Project, including post-construction monitoring services related to Segment III beach nourishment and preliminary sand search and pre-engineering services related to Segment II beach nourishment.

E. On September 28, 2010, County and Consultant entered into the Fourth Amendment to the Agreement to provide Phase V services for the Project, consisting of pre-design surveys, design, Federal document reformulation, permitting, construction documents, and bidding services related to Segment II beach nourishment.

F. On June 3, 2014, County and Consultant entered into the Fifth Amendment to the Agreement to provide for amendments to Phase V services for the Project, consisting of permit modification processing, NEPA documentation, preparation of plans and specifications, preconstruction monitoring, and construction contractor bid support related to Segment II beach nourishment.

G. On December 31, 2015, County and Consultant entered into the Sixth Amendment to the Agreement to provide for coastal engineering consultant services during the pre-construction, construction, and post-construction timeframe of the Project.

H. In response to the damage caused to the Broward County shore by Hurricane Irma in 2017, County initiated a separate competitive bid to have a consultant provide engineering, environmental, and specialty consulting services to assist County with the future management of the Segment III shoreline ("Bid").

I. The Bid resulted in a separate agreement for consultant services related to Segment III dated June 12, 2018. Consultant services for Segment II remain governed by the Agreement, as amended.

J. The Parties agree it is in the best interests of each Party to enter into this Seventh Amendment to provide for coastal engineering consulting services related to post-construction physical and environmental monitoring for the 2021-22 Broward County Shore Protection Project – Segment II FCCE Post-Irma Reparation Project being conducted by the United States Army Corps of Engineers. This Seventh Amendment also provides for services related to regulatory permit compliance activities, future Federal project reauthorization activities for the Segment II Project, and deletion of local requirements related to federal funding eligibility.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree to amend the Agreement as follows:

1. Section 1.10 is hereby deleted in its entirety.
2. Section 3.1 is hereby deleted in its entirety and replaced with the following:
 - 3.1 County and Consultant have requested permission from the Florida Department of Environmental Protection ("FDEP") to consolidate the Project to a single plan (the "Consolidation"). If FDEP does not approve the Consolidation, then Option A of Exhibit A-7 shall be deemed selected, and Consultant's services shall consist of the services outlined in Option A of Exhibit A-7. If Option A of Exhibit A-7 is deemed selected, Option B of Exhibit A-7 shall have no force or effect. If FDEP does approve the Consolidation, then Option B of Exhibit A-7 shall be deemed selected, and Consultant's services shall consist of the services outlined in Option B of Exhibit A-7. If Option B of Exhibit A-7 is deemed selected, Option A of Exhibit A-7 shall have no force or effect. Consultant shall provide all services as set forth in Exhibit A-7 including all necessary, incidental, and related activities and services required by the Scope of Services and contemplated in Consultant's level of effort, except for the services outlined in Option A or Option B that are deemed to be without force or effect as a result of FDEP's approval or disapproval of the Consolidation.

3. Section 3.3 is hereby deleted in its entirety and replaced with the following:

3.3 County and Consultant acknowledge that Exhibit A-7 is for the completion of certain services and for Post-Irma Reparation Project services related to the Project and that additional negotiations will be required for subsequent phases. County and Consultant also acknowledge that the nature, extent, and timing of certain tasks within each phase are dependent upon Federal and State requirements with respect to design, permitting, and funding, and may be reduced in scope, changed in nature, or eliminated. It is the intent of this Agreement that the Consultant shall perform only those tasks within each phase which are determined by the Contract Administrator, in consultation with regulatory and funding entities and Consultant, to be necessary for completion of each phase. Initiation of each phase shall be authorized by a separate Notice to Proceed. County and Consultant may negotiate additional scopes of services, compensation, time of performance, and other related matters for future phases of the Project. If County and Consultant cannot contractually agree, County shall have the right to immediately terminate negotiations at no cost to County and procure services for future Project phases from another source.

4. Section 3.4 is hereby deleted in its entirety and replaced with the following:

3.4 Consultant shall pay its subconsultants, subcontractors, and suppliers, including its subcontractors and suppliers, within thirty (30) days following receipt of payment from the County for such subcontracted work or supplies. Consultant agrees that if it withholds an amount as retainage from such subconsultants, subcontractors or suppliers, that it will release such retainage and pay same within thirty (30) days following receipt of payment of retained amounts from County.

5. Section 4.1 is hereby deleted in its entirety and replaced with the following:

4.1 Consultant shall perform the services described in Exhibit A-7 within the time periods specified in the timelines outlined in Exhibit A-7; said time periods shall commence from the date of the Notice to Proceed for such services or, as applicable, from the date of receipt by Consultant and/or County of responses from those Federal and State regulatory and funding agencies whose approvals are necessary for completion of certain Project tasks.

6. Section 5.1.1 is hereby deleted in its entirety and replaced with the following:

5.1.1 Lump Sum Compensation.

If FDEP does not approve the Consolidation, then compensation to Consultant for the services outlined in Option A of Exhibit A-7 shall be a "Lump Sum" payment of a total of Four Million Three Hundred Eleven Thousand Seven Hundred Twenty-six and 00/100 Dollars (\$4,311,726.00). If FDEP does approve the Consolidation, then compensation to Consultant for the services outlined in Option B of Exhibit A-7 shall be a "Lump Sum" payment of a total of Three Million Nine Hundred Thirty-six Thousand Sixty-four and 00/100 Dollars (\$3,936,064.00).

7. Section 5.2.2 is hereby deleted in its entirety and replaced with the following:
 - 5.2.2 The maximum hourly rates shown on Exhibit B-7 are subject to change annually beginning on the first anniversary of the contract execution date and on each contract year thereafter upon written request thirty (30) days prior to the anniversary date by Consultant and approval by the Contract Administrator. Any increase in these rates shall be limited to the lesser of the change in cost of living or three percent (3%). The increase or decrease in CPI shall be calculated as follows: the difference of CPI current period less CPI previous period, divided by CPI previous period, times 100. The CPI current period shall mean the most recent published monthly index prior to the contract anniversary. The CPI previous period shall mean the same month of the prior year. All CPI indices shall be obtained from the U.S. Department of Labor Table for Consumer Price Index – All Urban Consumers (Series ID CUURA320SA0) for the area of Miami-Fort Lauderdale, FL (all items), with a base period of 1982-84 = 100. Any changes to the hourly rates shall be set forth in an amended Exhibit B executed by the Contract Administrator and the Consultant.
8. Section 5.4.1 is hereby deleted in its entirety and replaced with the following:
 - 5.4.1 Consultant shall submit billings that are identified by the specific project number on a monthly basis in a timely manner. These billings shall identify the nature of the work performed, the phase of work, and the estimated percent of work accomplished. Billings for each phase shall not exceed the amounts allocated to said phase. The statement shall show a summary of fees with accrual of the total and credits for portions paid previously. When requested, Consultant shall provide backup for past and current invoices that record hours, salary costs, and expense costs on a task basis, so that total hours and costs by task may be determined.
9. Section 6.3 is hereby deleted in its entirety.
10. Section 8.3 is hereby deleted in its entirety and replaced with the following:

- 8.3 Audit Rights and Retention of Records. County shall have the right to audit the books, records, and accounts of Contractor and its Subcontractors that are related to this Agreement. Contractor and its Subcontractors shall keep such books, records, and accounts as may be necessary to record complete and correct entries related to this Agreement and performance under this Agreement. All such books, records, and accounts shall be kept in written form, or in a form capable of conversion into written form within a reasonable time, and upon request to do so, Contractor or its Subcontractor(s) shall make same available in written form at no cost to County.

Contractor and its Subcontractors shall preserve and make available, at reasonable times within Broward County, Florida, for examination and audit, all financial records, supporting documents, statistical records, and any other documents pertinent to this Agreement for at least three (3) years after expiration or termination of this Agreement or until resolution of any audit findings, whichever is longer. Any audit or inspection pursuant to this section may be performed by any County representative (including any outside representative engaged by County). Contractor hereby grants County the right to conduct such audit or review at Contractor's place of business, if deemed appropriate by County, with seventy-two (72) hours' advance notice.

Any incomplete or incorrect entry in such books, records, and accounts shall be a basis for County's disallowance and recovery of any payment upon such entry. If an audit or inspection in accordance with this section discloses overpricing or overcharges to County of any nature by Contractor in excess of five percent (5%) of the total contract billings reviewed by County, in addition to making adjustments for the overcharges, Contractor shall pay the actual cost of County's audit or, if the actual cost is unreasonably high, the reasonable cost. Any adjustments or payments due as a result of such audit or inspection shall be made within thirty (30) days after presentation of County's findings to Contractor.

Contractor shall ensure that the requirements of this section are included in all agreements with its Subcontractor(s).

11. Section 8.9 is hereby deleted in its entirety and replaced with the following:

- 8.9 Contractor shall indemnify, hold harmless, and defend County and all of County's current, past, and future officers, agents, and employees (collectively, "Indemnified Party") from and against any and all causes of action, demands, claims, losses, liabilities, and expenditures of any kind, including attorneys' fees, court costs, and expenses, including through the conclusion of any appellate proceedings, raised or asserted by any person

or entity not a party to this Agreement, and caused or alleged to be caused, in whole or in part, by any intentional, reckless, or negligent act or omission of Contractor, its officers, employees, or agents, arising from, relating to, or in connection with this Agreement (collectively, a "Claim"). If any Claim is brought against an Indemnified Party, Contractor shall, upon written notice from County, defend each Indemnified Party with counsel satisfactory to County or, at County's option, pay for an attorney selected by the County Attorney to defend the Indemnified Party. The obligations of this section shall survive the expiration or earlier termination of this Agreement. If considered necessary by the Contract Administrator and the County Attorney, any sums due Contractor under this Agreement may be retained by County until all Claims subject to this indemnification obligation have been settled or otherwise resolved. Any amount withheld shall not be subject to payment of interest by County.

12. Section 8.13 is hereby deleted in its entirety and replaced with the following:

8.13 Notices. In order for a notice to a Party to be effective under this Agreement, notice must be sent via U.S. first-class mail, hand delivery, or commercial overnight delivery, each with a contemporaneous copy via e-mail, to the addresses listed below and shall be effective upon mailing or hand delivery (provided the contemporaneous email is also sent). Addresses may be changed by the applicable Party providing notice of such change in accordance with this section.

FOR COUNTY:

County Administrator
Broward County Governmental Center, Room 409
115 S. Andrews Avenue
Fort Lauderdale, FL 33301

With a copy to:

Broward County Attorney's Office
Broward County Governmental Center, Suite 423
115 South Andrews Avenue
Fort Lauderdale, FL 33301

FOR CONSULTANT:

Christopher G. Creed, P.E., D.CE
Principal, Vice President
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, Florida 32204 USA
Office: (904) 387-6114 ext. 312
Email: c Creed@olsen-associates.com

With a copy to:
Nicole Sharp, P.E.
APTIM, Coastal, Ports & Marine
6401 Congress Avenue, Suite 140
Boca Raton, FL 33487
Office: (561) 361-3148
Email address: nicole.sharp@aptim.com

13. Section 8.28 is hereby deleted in its entirety and replaced with the following:

8.28 Law, Jurisdiction, Venue, Waiver of Jury Trial. This Agreement shall be interpreted and construed in accordance with and governed by the laws of the State of Florida. The exclusive venue for any lawsuit arising from, related to, or in connection with this Agreement shall be in the state courts of the Seventeenth Judicial Circuit in and for Broward County, Florida. If any claim arising from, related to, or in connection with this Agreement must be litigated in Federal court, the exclusive venue for any such lawsuit shall be in the United States District Court or United States Bankruptcy Court for the Southern District of Florida. **EACH PARTY HEREBY EXPRESSLY WAIVES ANY RIGHTS IT MAY HAVE TO A TRIAL BY JURY OF ANY CIVIL LITIGATION RELATED TO THIS AGREEMENT. IF A PARTY FAILS TO WITHDRAW A DEMAND FOR A JURY TRIAL AFTER WRITTEN NOTICE BY THE OTHER PARTY, THE PARTY MAKING THE DEMAND FOR JURY TRIAL SHALL BE LIABLE FOR REASONABLE ATTORNEYS' FEES AND COSTS OF THE OTHER PARTY TO CONTEST THE DEMAND FOR JURY TRIAL, AND SUCH AMOUNTS SHALL BE AWARDED BY THE COURT IN ADJUDICATING THE MOTION.**

14. Article 9 is hereby deleted in its entirety and replaced with the following:

ARTICLE 9. EQUAL EMPLOYMENT OPPORTUNITY.

No Party may discriminate on the basis of race, color, sex, religion, national origin, disability, age, marital status, political affiliation, sexual orientation, pregnancy, or gender identity and expression in the performance of this Agreement. Consultant

shall include the foregoing or similar language in its contracts with any Subconsultants, except that any project assisted by the U.S. Department of Transportation funds shall comply with the nondiscrimination requirements in 49 C.F.R. Parts 23 and 26.

15. Verification of Employment Eligibility. Consultant represents that Consultant and each Subcontractor have registered with and use the E-Verify system maintained by the United States Department of Homeland Security to verify the work authorization status of all newly hired employees in compliance with the requirements of Section 448.095, Florida Statutes, and that entry into this Agreement will not violate that statute. If Consultant violates this section, County may immediately terminate this Agreement for cause and Consultant shall be liable for all costs incurred by County due to the termination.
16. Prohibited Telecommunications Equipment. Consultant represents and certifies that it and its Subcontractors do not use any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, as such terms are used in 48 CFR §§ 52.204-24 through 52.204-26. Consultant represents and certifies that Consultant and its Subcontractors shall not provide or use such covered telecommunications equipment, system, or services for the duration of this Agreement.
17. Exhibit A-6, is hereby deleted in its entirety and replaced by Exhibit A-7, attached hereto and incorporated herein. All other references to Exhibit A, Exhibit A-1, Exhibit A-2, Exhibit A-3, Exhibit A-4, Exhibit A-5, and Exhibit A-6, are hereby replaced with Exhibit A-7.
18. Exhibit B-6, is hereby deleted in its entirety and replaced by Exhibit B-7, that is attached hereto and incorporated herein. All other references to Exhibit B, Exhibit B-1, Exhibit B-2, Exhibit B-3, Exhibit B-4, Exhibit B-5, and Exhibit B-6, are hereby replaced with Exhibit B-7.
19. Exhibit C, Exhibit C-1, Exhibit C-2, Exhibit C-3, and Exhibit C-4 are hereby deleted in their entirety.
20. Except to the extent amended, the Agreement shall remain in full force and effect. In the event of any conflict between the terms of this Seventh Amendment and the Agreement as amended, the Parties hereby agree that this document shall control.
21. All other terms and conditions not amended herein shall remain in full force and effect.

IN WITNESS WHEREOF, the Parties have made and executed this Seventh Amendment on the respective dates under each signature: Broward County, through its Board of County Commissioners, signing by and through its Mayor or Vice-Mayor, authorized to execute same by Board action on the ____ day of _____, 20__, and OLSEN ASSOCIATES, INC. AND APTIM COASTAL PLANNING & ENGINEERING, LLC (F/K/A CB&I COASTAL PLANNING & ENGINEERING, INC.), OPERATING AS A JOINT VENTURE, signing by and through its _____, duly authorized to execute same.

COUNTY

ATTEST:

BROWARD COUNTY, by and through
its Board of County Commissioners

Broward County Administrator, as
ex officio Clerk of the Broward County Board of
County Commissioners

By _____
Mayor
____ day of _____, 20__

Approved as to form by
Andrew J. Meyers
Broward County Attorney
115 South Andrews Avenue, Suite 423
Fort Lauderdale, Florida 33301
Telephone: (954) 357-7600

By _____
Alexis I. Marrero Koratich (Date)
Assistant County Attorney

By _____
Maite Azcoitia (Date)
Deputy County Attorney

SEVENTH AMENDMENT TO THE AGREEMENT BETWEEN BROWARD COUNTY AND THE FIRMS OF OLSEN ASSOCIATES, INC. AND APTIM COASTAL PLANNING & ENGINEERING, LLC (F/K/A CB&I COASTAL PLANNING & ENGINEERING, INC.), OPERATING AS A JOINT VENTURE FOR CONSULTANT SERVICES FOR THE BROWARD COUNTY SHORE PROTECTION PROJECT IN BROWARD COUNTY, FLORIDA, RLI #040897-RB

Consultant

Witnesses: OLSEN ASSOCIATES, INC., a Florida corporation

(Signature)
Print name: _____

By: _____
(Signature)
Print name: _____
Title: _____
Address: _____

(Signature)
Print name: _____

____ day of _____, 2022

STATE OF)
) SS.
COUNTY OF)

The foregoing instrument was acknowledged before me by means of physical presence or online notarization this ____ day of _____, 20__, by _____, the _____, a _____, on behalf of the _____. He/She is personally known to me, or produced identification. Type of identification produced _____.

(Seal)

(Signature)
Printed Name: _____
Notary Title/Rank: _____
Notary Serial Number, if any: _____

My commission expires:

SEVENTH AMENDMENT TO THE AGREEMENT BETWEEN BROWARD COUNTY AND THE FIRMS OF OLSEN ASSOCIATES, INC. AND APTIM COASTAL PLANNING & ENGINEERING, LLC (F/K/A CB&I COASTAL PLANNING & ENGINEERING, INC.), OPERATING AS A JOINT VENTURE FOR CONSULTANT SERVICES FOR THE BROWARD COUNTY SHORE PROTECTION PROJECT IN BROWARD COUNTY, FLORIDA, RLI #040897-RB

Consultant

Witnesses:

APTIM COASTAL PLANNING & ENGINEERING, LLC, a Florida limited liability company (f/k/a CB&I COASTAL PLANNING & ENGINEERING, INC.)

(Signature)
Print name: _____

By: _____
(Signature)
Print name: _____
Title: _____
Address: _____

(Signature)
Print name: _____

____ day of _____, 2022

STATE OF)
) SS.
COUNTY OF)

The foregoing instrument was acknowledged before me by means of physical presence or online notarization this ____ day of _____, 20__, by _____, the _____, a _____, on behalf of the _____. He/She is personally known to me, or produced identification. Type of identification produced _____.

(Seal)

(Signature)
Printed Name: _____
Notary Title/Rank: _____
Notary Serial Number, if any: _____

My commission expires:

Exhibit A-7

Prepared by Olsen Associates, Inc./APTIM, Joint Venture

PREAMBLE: It is the intent of this Amendment to provide for Coastal Engineering Consulting Services to post-construction physical and environmental monitoring for the 2021-22 Broward County Shore Protection Project – Segment II FCCE Post-Irma Reparation Project. This Amendment also provides for services related regulatory permit compliance activities and future Federal project reauthorization activities for the Segment II project.

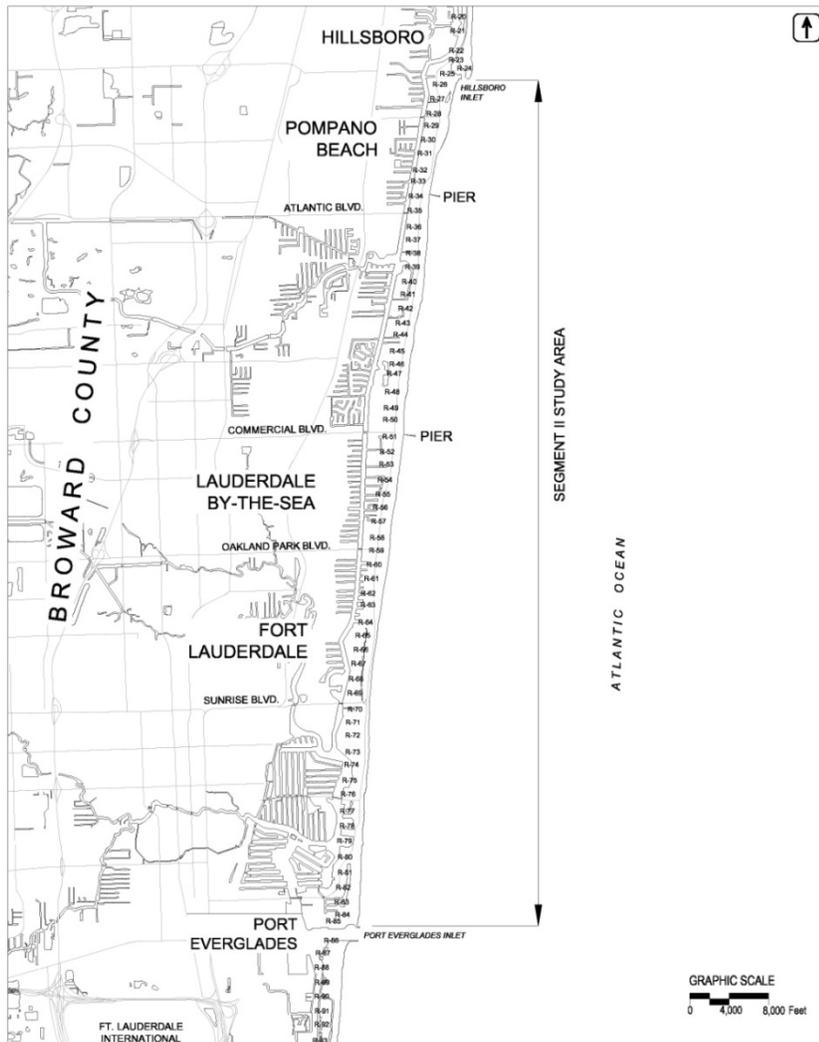


Figure 1: Location of Segment II study and project area.

1. **POST CONSTRUCTION ENGINEERING REPORT**

The CONSULTANT shall prepare a post-construction engineering report which addresses physical aspects of the constructed project. The purpose of the report is to document relevant aspects of the work which will be beneficial in the design, planning, and construction of future renourishment efforts. Items of interest will include documentation of US Army Corps of Engineer's construction contractor ("Contractor") fill productivity, weather conditions during execution of the work, factors affecting the Contractor's productivity, etc. Additionally, the report will summarize elements of the total cost to construct, permit, and public interest issues occurring during the period of construction and other factors potentially affecting future projects. The CONSULTANT shall access, analyze, and summarize Contractor related data obtained from daily reports, project specific reporting submittals, internal reports, etc. If appropriate, such databases will be formulated in a graphic format for visual interpretation by the layman. Documentation of spatial variations of fill placement based upon both Contractor and CONSULTANT surveys will be included.

Deliverable. Deliverables to the COUNTY and FDEP shall be one (1) PDF copy of the report with all attachments suitable for posting online and appropriate electronic sharing. The PDF copy will be provided on electronic media (CD, thumb drive, ftp site, etc.) suitable for distribution as may be necessary. All PDF copies will be ADA compliant.

PHYSICAL MONITORING SERVICES

2. **PHYSICAL MONITORING: IMMEDIATE POST-CONSTRUCTION (2022)**

The CONSULTANT shall conduct this task in 2022 following completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022. The FDEP Beaches, Inlets and Ports Program has provided a set of technical specifications for the collection and submittal of coastal monitoring data (FDEP, 2001). The CONSULTANT shall apply these technical specifications in the planning, collection, processing, and submittal of the physical monitoring data described herein. More specifically, additional guidelines have been established by FDEP for Beach Erosion Control Projects. The physical monitoring described herein meets or exceeds those requirements. The Physical Monitoring Plan includes three (3) basic elements:

- a. Comprehensive surveys of the beach by a certified Hydrographic Surveyor and Professional Surveyor and Mapper;
- b. Analysis of annual beach changes and development of a cumulative comparative database; and
- c. The formulation of a detailed Annual Report of Findings for consideration by the COUNTY, State and Federal agencies, and the general public.

2.1. Beach Profile Survey

The CONSULTANT shall conduct beach profile surveys along the Segment II shoreline to support the physical monitoring of the constructed project. The schedule and occurrence of the surveys shall follow the approved FDEP Physical Monitoring Plan. The pre-construction survey will be conducted by the USACE Jacksonville District and made available to COUNTY. All other required surveys will be conducted by COUNTY through this Agreement.

The beach profile surveys shall include all of Segment II from approximately R-25 to R-85, including all established intermediate monuments located north of Port Everglades north jetty. Beach profiles shall extend approximately 2,000 feet from the control monument or to -30 feet NAVD, whichever is greater.

As per the requirements listed in the FDEP Beaches, Inlets and Ports Program Monitoring Plan Technical Specifications, the CONSULTANT shall certify the horizontal and vertical position of all found and used monuments. Survey control information to be used shall be provided to and concurred with by FDEP before survey work proceeds. The CONSULTANT shall provide all necessary materials and equipment to perform the required work activity. The CONSULTANT shall also supply the supervisory, professional, and technical services personnel required to manage, document, and process all data associated with the acquisition and processing of the survey data.

All required data shall be provided in the following datum: HARN, NAD 83/90 State Plane Coordinates in feet, plus NAVD88 elevations in U.S. survey feet. Alternative datums will be considered, but must be agreed upon by FDEP prior to commencing survey work. All deliverables shall be in accordance with the FDEP Monitoring Plan Technical Specifications 02000.

Deliverable. Deliverables to the COUNTY and FDEP shall be one (1) PDF copy of the report with all attachments suitable for posting online and appropriate electronic sharing. The PDF copy will be provided on electronic media (CD, thumb drive, ftp site, etc.) suitable for distribution as may be necessary. All PDF copies will be ADA compliant.

- a. Survey report from the Florida licensed surveyor certifying to the Department that the survey meets the technical standards of Chapter 61G17-6, FAC.
- b. Copies of all checked, standard survey field books, computation and reduction files, and abstracted final positions.
- c. Monument Information Report (Given/Used/Found Report) with regard to monumentation that includes a list of provided, found, and used monuments and TBM identification, stamping, coordinates, elevations, and profile azimuths.

- d. A quality control/quality assurance report detailing a QA/QC procedure and any findings, corrections, and results of that procedure, including cross-sectional plots of each profile and plan view plot of the data with an approximate mean high water (MHW) contour.

Deliverables to the COUNTY and FDEP shall also include two (2) copies of the following digital products:

- a. ASCII file containing raw x, y, z profile data points.
- b. ASCII files containing the profile data processed into the FDEP x, y, z format, if x, y, z data is collected, and the DEP distance and depth format. The DEP format includes data as well as header records.
- c. ASCII file containing the monument identification, stamping, coordinates and elevations.
- d. Digital copy of cross-section and plan view data plots.
- e. Complete Federally-compliant metadata file including methodology of the data collection and processing procedures used in accordance with standards set forth by the Federal Geographic Data Committee. Metadata shall include all QA/QC procedures utilized to ensure the quality of the data and shall be delivered digitally on CD.
- f. Field books shall be scanned and pages amassed into a PDF document for digital submittal on CD.
- g. Data will be provided to FDEP in NAVD88 datum.

2.2. Analyses/Reporting

Consistent with the approved Physical Monitoring Plan, the CONSULTANT shall prepare a post-construction memo report based upon on-site review of conditions at the time of the post-construction survey and comparison of the pre-and post-construction surveys. The purpose of the memo will be to summarize baseline beach conditions associated with the construction of the Segment II project. The results will serve at the baseline for comparison of future project performance. The memo will include graphic presentations of cumulative beach volume changes associated with the beach fill project as represented by comparison of the pre- and post-construction survey. Volumetric changes at each survey profile and along the Segment II shoreline including the fill limits shall be computed and presented in tabular and graphic forms. Aerial photography (to be provided by the COUNTY) will be utilized to further establish project related baseline conditions. The memo will be submitted approximately 90 days following the immediate post-construction survey.

Deliverable. Deliverables to the COUNTY for and FDEP shall be one (1) PDF copy of the report with all attachments suitable for posting online and appropriate electronic sharing. The PDF copy will be provided on electronic media (CD, thumb

drive, ftp site, etc.) suitable for distribution as may be necessary. All PDF copies will be ADA compliant.

3. PHYSICAL MONITORING: 1-YEAR POST-CONSTRUCTION (2023)

The CONSULTANT shall conduct the surveys and analyses and provide the deliverable described in Task 2.0. The CONSULTANT shall conduct this task in 2023, one year after completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022.

4. PHYSICAL MONITORING: 2-YEAR POST-CONSTRUCTION (2024)

The CONSULTANT shall conduct the surveys and analyses and provide the deliverable described in Task 2.0. The CONSULTANT shall conduct this task in 2024, two years after completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022.

5. PHYSICAL MONITORING: 3-YEAR POST-CONSTRUCTION (2025)

The CONSULTANT shall conduct the surveys and analyses and provide the deliverable described in Task 2.0. The CONSULTANT shall conduct this task in 2025, three years after completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022.

6. PHYSICAL MONITORING: 4-YEAR POST-CONSTRUCTION (2026)

The CONSULTANT shall conduct the surveys and analyses and provide the deliverable described in Task 2.0. The CONSULTANT shall conduct this task in 2026, four years after completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022.

7. PHYSICAL MONITORING: 5-YEAR POST-CONSTRUCTION (2027)

The CONSULTANT shall conduct the surveys and analyses and provide the deliverable described in Task 2.0. The CONSULTANT shall conduct this task in 2027, five years after completion of project construction. It is assumed that project construction will be complete on or before April 30, 2022.

ENVIRONMENTAL MONITORING SERVICES – OPTION A

OPTION A: SEGMENT II - REACHES II AND IV

EXISTING BIOLOGICAL MONITORING PLANS (BMP) & PERMITS

FDEP PERMIT NO. 0314535-001-JC & USACE PERMIT NO. SAJ-1999-05545 (SP-GGL)

The CONSULTANT, through its qualified SUBCONSULTANT (CEG), shall monitor the nearshore hardbottom habitat east (seaward) of the established and permitted equilibrium toe of fill (ETOF), as well as north and south of the constructed project footprint, to document potential project-related secondary impacts to nearshore hardbottom that may occur within the post-construction timeframe. The CONSULTANT shall implement the nearshore hardbottom monitoring portion of the Broward County Shore Protection Project Segment II BMP dated April 2015 as approved by the FDEP (Permit No. 0314535-001-JC) and USACE (Permit No. SAJ-1999-05545). Nearshore hardbottom monitoring includes benthic and sediment monitoring at previously established permanent cross-shore transects and detailed diver mapping of the nearshore hardbottom edge.

The CONSULTANT shall conduct the nearshore environmental monitoring tasks annually during the summer months (May through September) starting one year after completion of construction and for at least three years and possibly up to five years after construction. Again, it is assumed that construction will be complete on or before April 30, 2022.

The 2022 immediate post-construction monitoring event for the 2021/22 Segment II project also represents the Year 5 post-construction monitoring event for the 2016 Segment II project. The Year 5 post-construction monitoring event/report is required by the existing BMP if mandated by FDEP following their review of the 2020 Year 3 post-construction survey results. The 2022 immediate post-construction/Year 5 post-construction monitoring for the 2016 project (field survey and annual report) will be conducted under a separate contract for marine biological monitoring between the County and Nova Southeastern University (NSU) (RLI #050797). Therefore, the description and costs for the 2022 monitoring event and report for the 2016 Segment II project area (Reaches II/IV) are not included in this scope of work. If required, the 2022 immediate post-construction monitoring report/Year 5 post-construction report to be prepared under the NSU contract will evaluate the summer 2022 monitoring data for cumulative effects of the 2016 Segment II project by comparison to the 2015 pre-construction monitoring data as described in the BMP.

Statistical treatment of all post-construction monitoring data for the 2021/22 Segment II project shall follow the analyses described in detail in the existing BMP for the Segment II project and summarized in Task 9 below. Each survey will include data collection along 57

transects (29 Project and 28 Outside Project) and detailed mapping of the nearshore hardbottom edge along the entire Segment II shoreline (Hillsboro Inlet south jetty to Port Everglades Inlet north jetty). Additionally, the CONSULTANT shall conduct two surveys, one at 3-months and one at 6-months post-construction, to monitor sedimentation at a subsample of 10 transects (see Tasks 15 and 16).

8. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A): YEAR 1 POST-CONSTRUCTION (2023)

8.1 Nearshore Hardbottom Edge Mapping

The CONSULTANT shall map the nearshore hardbottom edge along all of Segment II project area (Hillsboro Inlet to Port Everglades Inlet). The CONSULTANT shall follow the inshore contour of the most prominent hardbottom-sand border. A buoy with a Differential Global Positioning System (DGPS) antenna, linked wirelessly to a topside computer via radio/receiver, shall be towed along this boundary to record the position of the nearshore hardbottom edge. The topside computer shall run Trimble Penmap hydrographic software which stores edge data as a line feature to be exported as an ArcGIS shape file at the end of each field day.

8.2 Permanent 150-m Shore Perpendicular Transects

The CONSULTANT shall monitor the 57 permanent cross-shore transects within the project area and adjacent shoreline. The transects were permanently established and monitored for the 2016 Segment II project. Maximum transect length is 150 m.

Along each permanent transect, the CONSULTANT shall apply multiple methods including quadrat-based benthic ecological assessments, line-intercept for sediment, sediment depth measurements, and video transects.

8.2.1 Permanent benthic quadrats

The CONSULTANT shall monitor the same permanent quadrats east of the ETOF as monitored for the 2016 Segment II Project. Forty-two (42) transects have thirteen (13) permanent quadrats east of the ETOF; the remaining fifteen (15) transects have between four (4) and twelve (12) quadrats. The CONSULTANT shall collect the benthic samples using the quadrat-based Benthic Ecological Assessment for Marginal Reefs (BEAMR) method.

8.2.2 Sediment line intercept

The CONSULTANT shall document the location of hardbottom boundaries interrupted by sand patches larger than 0.5 m in length (by the transect interception) to determine change in sand cover along each shore-perpendicular transect.

8.2.3 Sediment depth interval measurements

The CONSULTANT shall measure sediment depth (cm) at 1-m intervals along each shore-perpendicular transect to provide a snapshot of the cross-shore sand distribution across and in between the nearshore hardbottom patches at each sampling event.

8.2.4 Video Transects

The CONSULTANT shall conduct video documentation along the length of each shore-perpendicular transect. A close-up of the transect name clearly written on a waterproof slate shall be recorded for each video transect. The video shall be recorded at a height of 40 cm above the substrate and a speed of approximately 4-5 meters per minute so that it is acceptable for video analysis, if required at a later date. Landscape panoramic views (360°) shall be recorded at the start and end of each transect. Additionally, a panoramic view shall be recorded at the start and end of each interruption of the benthos by a sand gap that extends for more than 10 m.

Deliverable. All field datasheets shall be reviewed and scanned to PDF for submittal to the COUNTY and FDEP within 30 days after completion of field data collection for the 2023 Year 1 post-construction monitoring event. The PDF file of the raw field datasheets shall also be included in the final data deliverable provided to the COUNTY and FDEP under Task 8.3 below. All PDF copies will be ADA compliant.

8.3 2023 Year 1 Post-Construction Data Analyses/Reporting

Consistent with the existing permitted BMP for the 2016 project, the CONSULTANT shall prepare the 2023 Year 1 post-construction monitoring data deliverable, conduct statistical analyses, and prepare the annual biological monitoring report according to the FDEP Standard Operation Procedures for Nearshore Hardbottom Monitoring. Hardbottom monitoring data shall be entered into a Microsoft Access database for data management, and two rounds of QA-QC review shall be conducted to ensure accuracy of monitoring data prior to submittal to the COUNTY and FDEP. Individual datasets shall be exported as Microsoft Excel workbooks.

The Year 1 post-construction biological monitoring report shall compare the pre-construction dataset from the 2020 monitoring survey to the 2023 Year 1 post-construction dataset. The report shall analyze and discuss changes in the benthic community, observed burial and sedimentation on nearshore hardbottom that may occur due the project, and results of the hardbottom edge mapping surveys.

Annual biological monitoring reports shall be provided to the COUNTY in digital format. These reports shall include:

- a. A map including the project area and adjacent hardbottom resources and monitoring transects overlaid onto recent, clear aerial photographs (in digital format);
- b. Analysis of sedimentation on the transect outside the ETOF (including the updrift and downdrift hardbottom monitoring sites) based on line-intercept data, interval sediment depth measurements and data from quadrats;
- c. Multivariate analysis of quantitative data with subsequent analysis of benthic biological components on the transects east of the ETOF (*e.g.*, percent cover and density by corals, octocorals, sponges and algae);
- d. A comparison of post-construction monitoring results to pre-construction monitoring results;
- e. A figure comparing the most recent annual hardbottom delineation and all previous hardbottom delineations;
- f. Calculation of buried and exposed hardbottom acreage and comparison to previous hardbottom acreages;
- g. Trends or notable differences between transects located seaward of the ETOF (designated P-transects) compared to transects located updrift and downdrift of the project limits (designated OP-transects);
- h. An analysis of biological and physical monitoring data to identify the location and extent of the project-related influence to the coastal system. This will include an interpretation of non-project related impacts caused by background conditions. Consideration will be given to the amount of change to hardbottom areas proportioned between with and without project conditions if impacts are identified above background; and
- i. A comparison of benthic community conditions to the physical (beach profile) surveys to assist in understanding regional or local coastal processes.

Deliverable. Within 45 days after completion of field data collection for the 2023 Year 1 post-construction survey, the CONSULTANT shall submit all data, including still photo transect images, digital video transects, digital video of the nearshore hardbottom edge, GIS shape files of the permanent transects and nearshore hardbottom edge, PDF of scanned field datasheets, and Microsoft Excel worksheets of quadrat and sediment data, directly and concurrently (simultaneously) to the COUNTY and FDEP in electronic format. Data shall be submitted either on a single portable hard drive or via an FTP site. All PDF copies will be ADA compliant.

Within 90 days after completion of field data collection, the CONSULTANT shall submit the final Year 1 post-construction biological monitoring report in digital (PDF) format with all attachments suitable for posting online (and appropriate electronic sharing to the COUNTY, FDEP, and USACE). All PDF copies will be ADA compliant. The PDF file will be provided on electronic media (USB flash drive, ftp site, etc.) suitable for distribution as may be necessary. The report shall contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as

needed. The CONSULTANT shall also coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT shall attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

**9. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
YEAR 2 POST-CONSTRUCTION (2024)**

The CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 8.0 for the Year 1 post-construction monitoring survey. The Year 2 post-construction monitoring survey shall be conducted in summer 2024, and the same reporting timeline outlined in Task 8.3 shall apply. The Year 2 post-construction report shall be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report shall contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed. The CONSULTANT shall also coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT shall attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

**10. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
YEAR 3 POST-CONSTRUCTION (2025)**

The CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 8.0. The Year 3 post-construction biological monitoring survey shall be conducted in summer 2025, and the same reporting timeline outlined in Task 8.3 shall apply. The Year 3 post-construction report shall be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report shall contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed.

The Year 3 post-construction report shall provide a final assessment of the need for surveys in Years 4 and 5 post-construction based on the results of the three annual post-construction surveys. The CONSULTANT shall coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT shall attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

**11. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
YEAR 4 POST-CONSTRUCTION (2026) (AUTHORIZATION WITHHELD)**

The Year 4 post-construction survey would occur if the project is constructed over two seasons and would serve as the Year 3 post-construction monitoring for the portion of the project constructed during the second season. If this task is authorized by the COUNTY, the CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 8.0. The Year 4 post-construction biological

monitoring survey would be conducted in summer 2026, and the same reporting timeline outlined in Task 8.3 would apply.

The Year 4 post-construction report would be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report would also contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed. The CONSULTANT would coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT would also attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

**12. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
YEAR 5 POST-CONSTRUCTION (2027) (AUTHORIZATION WITHHELD)**

The Year 5 post-construction survey would only be required by the regulatory agencies based on review of the Year 3 post-construction monitoring data and report described in Task 10 above. If directed by the FDEP and COUNTY, the CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 8.0. The Year 5 post-construction biological monitoring survey would be conducted in summer 2027 if mandated by FDEP, and the Year 5 monitoring report would contain a cumulative effects analysis for the 2021/22 project.

The Year 5 post-construction report would be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The CONSULTANT would coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT would also attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

Deliverable. The CONSULTANT shall provide the same data and report deliverables as detailed in Task 10.0 with a final cumulative project-effects analysis.

**13. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
THREE-MONTH POST-CONSTRUCTION SEDIMENT ONLY TRANSECT MONITORING
(10 TRANSECTS) (AUTHORIZATION WITHHELD)**

The CONSULTANT shall monitor five (5) project transects and five (5) outside project transects to document short-term sediment dynamics following project construction. If a named storm event proximate to or substantially affecting the coastline of Broward County occurs within 0 to 3 months following completion of project construction, this survey shall occur immediately following the storm as soon as conditions allow. Again, project construction is expected to be complete on or before April 30, 2022. If a storm event does not occur within this timeframe, monitoring shall occur 3-months post-construction regardless, unless this corresponds to the immediate post-construction survey of the 57 transects. The CONSULTANT shall collect line-intercept for sediment,

sediment depth measurements, and video documentation along the ten (10) designated shore-perpendicular transects.

Deliverable. The CONSULTANT shall prepare a summary report that documents short-term sediment dynamics following project construction and/or a named storm event. This report shall compare sediment conditions to the 2020 pre-construction dataset. The summary report shall be submitted as an appendix to the Immediate post-construction report. The same reporting timeline outlined in Task 8.3 shall apply.

**14. HARDBOTTOM MONITORING FOR REACHES II/IV (OPTION A):
SIX-MONTH POST-CONSTRUCTION SEDIMENT ONLY TRANSECT MONITORING
(10 TRANSECTS) (AUTHORIZATION WITHHELD)**

The CONSULTANT shall conduct the same methods and provide the same deliverable as detailed in Task 13. The CONSULTANT shall conduct this task if a named storm occurs between 3 to 6-months post-construction; otherwise, it shall be conducted 6-months post-construction.

**15. LISTED CORAL MONITORING FOR REACHES II/IV - YEAR 1 POST-CONSTRUCTION
(OPTION A) (AUTHORIZATION WITHHELD)**

In compliance with the existing BMP for the 2016 Segment II project, the CONSULTANT shall monitor, three times/year for five (5) years post-construction, eight (8) permanent sites with Federally listed stony coral colonies. Site selection, establishment, and the pre-construction monitoring survey are the responsibility of the USACE. Monitoring station locations and pre-construction monitoring data shall be provided to the CONSULTANT by the COUNTY prior to the first monitoring event in Year 1 post-construction.

This task assumes that listed coral monitoring shall continue at eight new sites with colonies of *Acropora cervicornis* and possibly other listed coral species. Additionally, known colonies of *A. palmata* in the nearshore or colonies of *A. palmata* located during the USACE pre-construction survey shall be monitored. Each monitoring site shall include three (3) 7-m radial plots. The NMFS Acroporid demographic monitoring protocol used for the 2016 project monitoring shall be followed; the protocol includes data on colony abundance, size distribution, and conditions which drive mortality (predation, disease, fragmentation, and sedimentation). Line intercept for sediment shall be conducted and sediment depth measurements shall be taken every meter along two perpendicular transects that intersect each radial plot. This shall provide ninety (90) sediment depth measurements at each site (15 per transect, 30 per plot). A colony assessment will be conducted on the first ten (10) colonies encountered within each plot.

Deliverable. Within 45 days after completion of the third monitoring event for each annual cycle, the CONSULTANT shall submit all raw data (PDF of scanned field sheets and Microsoft Excel spreadsheets containing monitoring data), still photographs, and GIS shape files of the listed coral monitoring sites. The data deliverable shall be submitted

directly and concurrently (simultaneously) to the COUNTY and FDEP in electronic format. Data shall be submitted either on a single portable hard drive or via an FTP site.

Within 90 days after completion of the third monitoring event for each annual cycle, the CONSULTANT will submit an annual monitoring report concurrently to the COUNTY, FDEP, and the USACE. The report shall compare the pre-construction dataset to each of the three (3) annual datasets and shall be cumulative in nature. The report shall also analyze and discuss changes in condition of *Acropora* colonies by analyzing percent cover (live tissue and dead skeleton), disease (White Band Disease, Rapid Tissue Loss), predation (*Hermodice carunculata*, *Stegasts planifrons*, and *Coralliophila abbreviata*), severity of bleaching, masses, numbers of colonies, and numbers of fragments. Colony mapping results shall be included with discussion of changes over time. The data for Acroporid corals shall be submitted to the central Acroporid geodatabase maintained by the Florida Fish and Wildlife Conservation Commission (FWC).

16. LISTED CORAL MONITORING FOR REACHES II/IV (OPTION A):

YEAR 2 POST-CONSTRUCTION (AUTHORIZATION WITHHELD) (2024/2025)

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 15.0. The three Year 2 post-construction listed coral surveys shall be conducted in 2024/2025, and the same reporting timeline as outlined in Task 15.0 shall apply.

17. LISTED CORAL MONITORING FOR REACHES II/IV (OPTION A):

YEAR 3 POST-CONSTRUCTION (AUTHORIZATION WITHHELD) (2025/2026)

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 15.0. The three Year 3 post-construction listed coral surveys shall be conducted in 2025/2026, and the same reporting timeline as outlined in Task 15.0 shall apply.

18. LISTED CORAL MONITORING FOR REACHES II/IV (OPTION A):

YEAR 4 POST-CONSTRUCTION (AUTHORIZATION WITHHELD) (2026/2027)

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 15.0. The three Year 4 post-construction listed coral surveys shall be conducted in 2026/2027, and the same reporting timeline as outlined in Task 15.0 shall apply.

19. LISTED CORAL MONITORING FOR REACHES II/IV (OPTION A):

YEAR 5 POST-CONSTRUCTION (AUTHORIZATION WITHHELD) (2027/2028)

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 15.0. The three Year 5 post-construction listed coral surveys shall be conducted in 2027/2028, and the same reporting timeline as outlined in

Task 15.0 shall apply.

OPTION A: SEGMENT II - REACHES I AND III

EXISTING BMP & PERMIT

FDEP PERMIT NO. 0394925-001-JC

In conjunction with the monitoring and reporting required under the BMP for the 2016 Segment II project, the CONSULTANT shall implement the nearshore hardbottom monitoring described in the permitted BMP for the Broward County Segment II Reaches I and III Beach Nourishment Project. Twenty-six (26) of the thirty (30) permanent monitoring transects required by the Reaches I and III BMP are being monitored under the 2016 Segment II BMP described in Task 8.2. Additionally, the nearshore hardbottom edge between Hillsboro Inlet and Port Everglades Inlet is being mapped under Task 8.1.

The CONSULTANT shall conduct the nearshore environmental monitoring tasks specific to the Reaches I and III BMP annually during the summer months (May through September) immediately following construction in summer 2022 and for three years after construction. Each survey will include the four (4) transects unique to the Reaches I/III BMP; three (3) of the transects are 100 m in length (TR-29, TR-30, and TR-31 (offshore of R-29, R-30, and R-31) and one (1) transect is 75 m (TR-31.5 at R-31.5) and monitoring of two listed coral colonies documented in surveys conducted in 2020.

20. POST-CONSTRUCTION HARDBOTTOM MONITORING FOR REACHES I/III – IMMEDIATE POST-CONSTRUCTION (OPTION A):

20.1. Permanent 100-m Shore Perpendicular Transects

The CONSULTANT shall monitor four (4) permanent cross-shore transects within the Reach I project area. The transects were permanently established, and the pre-construction survey of these transects was conducted by the USACE in October 2020. Three (3) of the transects are 100 m in length (TR-29, TR-30, and TR-31 (offshore of R-29, R-30, and R-31) and one (1) transect is 75 m (TR-31.5 at R-31.5)

Along each permanent transect, the CONSULTANT shall apply several methods including quadrat-based benthic ecological assessments, line-intercept for sediment, sediment depth measurements, and video transects.

20.2. Permanent benthic quadrats

The CONSULTANT shall monitor the same permanent quadrats east of the ETOF as monitored during the 2020 pre-construction survey. There are eleven (11) 1-m² quadrats along each 100-m transect and ten (10) quadrats along the 75-m transect (TR-31.5). The CONSULTANT shall assess benthic samples using the quadrat-based Benthic Ecological Assessment for Marginal Reefs (BEAMR) methodology.

20.3. Sediment line intercept

The CONSULTANT shall document the location of hardbottom boundaries interrupted by sand patches larger than 0.5 m in length (by the transect interception) to determine change in sand cover along each shore-perpendicular transect.

20.4. Sediment depth interval measurements

The CONSULTANT shall measure sediment depth (cm) at 1-m intervals along each shore-perpendicular transect to provide a snapshot of the cross-shore sand distribution across and in between the nearshore hardbottom patches at each sampling event.

20.5. Video Transects

The CONSULTANT shall conduct video documentation along the length of each shore-perpendicular transect. A close-up of the transect name clearly written on a waterproof slate shall be recorded for each video transect. The video shall be recorded at a height of 40 cm above the substrate and a speed of approximately 4-5 meters per minute so that it is acceptable for video analysis, if required at a later date. Landscape panoramic views (360°) shall be recorded at the start and end of each transect. Additionally, a panoramic view shall be recorded at the start and end of each interruption of the benthos by a sand gap that extends for more than 10 m.

20.6. Listed Coral Monitoring

The *Orbicella faveolata* colony at Transect TR-32a and the *A. cervicornis* colony identified near R-39 during hardbottom edge mapping in 2020 shall be monitored in conjunction with the permanent transect survey. Each colony shall be measured (colony diameter) and have its condition assessed and recorded. The following shall be noted for colony condition: percent old and recent mortality (respectively); percent bleaching; and presence of disease, obvious signs of predation, and signs of sedimentation (burial of colony base, etc.). Photographs of each colony shall be taken from the same orientation during each monitoring event.

Deliverable. All field datasheets shall be reviewed and scanned to PDF for submittal to the COUNTY and FDEP within 30 days after survey completion. The PDF file of the raw field data shall also be included in the final data deliverable provided to the COUNTY and FDEP described under Task 8.3 above.

20.7. Data Analyses/Reporting

Consistent with the permitted BMP for the Reaches I/III project, the CONSULTANT shall prepare the annual monitoring data deliverable, conduct statistical analyses, and prepare post-construction biological monitoring reports according to the FDEP Standard Operation Procedures for Nearshore Hardbottom Monitoring. Hardbottom

monitoring data shall be entered into a Microsoft Access database for data management, and two rounds of QA-QC review shall be conducted to ensure accuracy of monitoring data prior to submittal to the COUNTY and FDEP. Individual datasets shall be exported as Microsoft Excel workbooks.

The report shall compare the pre-construction dataset from the 2020 monitoring survey to the respective post-construction dataset for the monitoring event. The CONSULTANT shall analyze and discuss changes in benthic community, observed burial and sedimentation on the nearshore hardbottom that may occur due the project, and the results of the hardbottom edge mapping surveys.

Deliverable. Within 45 days after completion of each annual monitoring event, the CONSULTANT shall submit all hardbottom data, including still photo transect images, digital video transects, digital video of the nearshore hardbottom edge, GIS shape files of the permanent transects and nearshore hardbottom edge, PDF of scanned field datasheets, and Microsoft Excel worksheets of quadrat and sediment data, directly and concurrently (simultaneously) to the COUNTY and FDEP in electronic format. GIS shape files of the permanent transects monitored under the 2015 BMP shall be clipped to the lengths specified in the Reaches I/III BMP and transects shall be renamed according to the nomenclature of the Reaches I/III BMP. Data shall be submitted either on a single portable hard drive or via an FTP site.

Within 90 days after completion of the data collection event, the CONSULTANT shall submit the final report specific to the Reaches I/III BMP in digital (PDF) format with all attachments suitable for posting online and appropriate electronic sharing to the COUNTY, FDEP, and USACE. The PDF copy will be provided on electronic media (USB flash drive, ftp site, etc.) suitable for distribution as may be necessary. All PDF copies will be ADA compliant.

**21. HARDBOTTOM MONITORING FOR REACHES I/III (OPTION A):
YEAR 1 POST-CONSTRUCTION (2023)**

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 20 above. The Year 1 post-construction monitoring survey shall be conducted in summer 2023, and the same reporting timeline as outlined in Task 20 shall apply.

**22. HARDBOTTOM MONITORING FOR REACHES I/III (OPTION A):
YEAR 2 POST-CONSTRUCTION (2024)**

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed in Task 20 above. The Year 2 post-construction monitoring survey shall be conducted in summer 2024, and the same reporting timeline as outlined in Task

20 shall apply.

**23. HARDBOTTOM MONITORING FOR REACHES I/III (OPTION A):
YEAR 3 POST-CONSTRUCTION (2025)**

The CONSULTANT shall conduct the field methods and provide the data and report deliverables as detailed above in Task 20. The Year 3 post-construction monitoring survey shall be conducted in summer 2025, and the same reporting timeline as outlined in Task 20 shall apply.

ENVIRONMENTAL MONITORING SERVICES – OPTION B

OPTION B: BIOLOGICAL MONITORING PLAN (BMP) MODIFICATION and CONSOLIDATION OF ENVIRONMENTAL MONITORING INTO ONE COMPREHENSIVE BMP FOR THE ENTIRE SEGMENT II SHORELINE REACHES I & III (FDEP PERMIT NO. 0394925-001-JC) AND REACHES II AND IV (FDEP PERMIT NO. 0314535-001-JC)

It is anticipated that FDEP and the Federal agencies may seek to merge the two existing permitted BMPs for Segment II into one comprehensive BMP for all four reaches following completion of the 2021/22 FCCE beach restoration project for Reaches I, II, III, and IV. The following scope has been developed for the possibility that the BMPs will be combined, and tasks have been developed based on the reduced transect lengths and methods of the more recent BMP for Reaches I/III dated January 2021. A contingency task has been included in the event that additional tasks are required by the State and Federal agencies in excess of the tasks specifically described in the permitted BMPs.

The 2022 immediate post-construction monitoring event for the 2021/22 Segment II Project represents the Year 5 post-construction monitoring event for the 2016 Segment II Project. The Year 5 post-construction monitoring event/report is required by the existing BMP if mandated by FDEP following their review of the 2020 Year 3 post-construction survey results. The 2022 immediate post-construction/Year 5 post-construction monitoring for the 2016 Segment II Project (field survey and annual report) will be conducted under a separate contract for marine biological monitoring between the County and Nova Southeastern University (NSU) (RLI #050797). Therefore, the description and costs for the 2022 monitoring event and report for the 2016 Segment II project area (Reaches II/IV) are not included in this scope of work. If required, the 2022 immediate post-construction monitoring report/Year 5 post-construction report to be prepared under the NSU contract will evaluate the summer 2022 monitoring data for cumulative effects of the 2016 Segment II project by comparison to the 2015 pre-construction monitoring data as described in the BMP.

In the event that a permit/BMP modification is issued prior to June 2022, the 2022 immediate post-construction monitoring under this scope would be limited to the four Reach I transects established in 2020 (see Task 25 below). Monitoring, data treatment/analyses, and report preparation would be conducted according to the conditions and timelines listed under Task 25. A single report would be prepared in accordance with the combined BMP for the entire Segment II project area (all four reaches) rather than two separate reports. As described above, the combined immediate

post-construction report will be prepared under a separate County contract, and the Reach I transect discussion/analyses conducted under this scope of work shall be added to the combined report.

24. PERMIT/BMP MODIFICATION TO MERGE REACHES II/IV AND REACHES I/III BMPS INTO ONE COMPREHENSIVE BMP (AUTHORIZATION WITHHELD)

Should the COUNTY decide to pursue one consolidated BMP to replace the two currently authorized BMPs for the Segment II (Reaches I through III and 2016 Project- Reaches II/IV), the CONSULTANT shall prepare, submit, and work to gain approval from FDEP and USACE of a modification to existing permits and BMPs to combine the BMPs. The scope of the modification request shall be developed through coordination with the COUNTY, FDEP, and USACE. The CONSULTANT shall review the efficacy of monitoring methods in the existing Segment II permits and recommendations for adjustments to the protocol as needed.

Deliverables. Deliverables for this task include an electronic copy of the formal request to FDEP and USACE and one electronic copy of the BMP with tracked changes to identify the new language and language to be deleted from the BMP.

25. 2022 IMMEDIATE POST-CONSTRUCTION HARDBOTTOM MONITORING FOR REACH I (OPTION B- COMBINED BMP FOR REACHES I THROUGH IV) (AUTHORIZATION WITHHELD):

25.1. Permanent 100-m Shore Perpendicular Transects

The CONSULTANT shall monitor four (4) permanent cross-shore transects within the Reach I project area. The transects were permanently established, and the pre-construction survey of these transects was conducted by the USACE in October 2020. Three (3) of the transects are 100 m in length (TR-29, TR-30, and TR-31 (offshore of R-29, R-30, and R-31) and one (1) transect is 75 m (TR-31.5 at R-31.5)

Along each permanent transect, the CONSULTANT shall apply multiple methods including quadrat-based benthic ecological assessments, line-intercept for sediment, sediment depth measurements, and video transects.

25.2. Permanent benthic quadrats

The CONSULTANT shall monitor the same permanent quadrats east of the ETOF as monitored during the 2020 pre-construction survey. There are eleven (11) 1-m² quadrats along each 100-m transect and ten (10) quadrats along the 75-m transect (TR-31.5). The CONSULTANT shall assess benthic samples using the quadrat-based Benthic Ecological Assessment for Marginal Reefs (BEAMR) methodology.

25.3. Sediment line intercept

The CONSULTANT shall document the location of hardbottom boundaries interrupted by sand patches larger than 0.5 m in length (by the transect interception) to determine change in sand cover along each shore-perpendicular transect.

25.4. Sediment depth interval measurements

The CONSULTANT shall measure sediment depth (cm) at 1-m intervals along each shore-perpendicular transect to provide a snapshot of the cross-shore sand distribution across and in between the nearshore hardbottom patches at each sampling event.

25.5. Video Transects

The CONSULTANT shall conduct video documentation along the length of each shore-perpendicular transect. A close-up of the transect name clearly written on a waterproof slate shall be recorded for each video transect. The video shall be recorded at a height of 40 cm above the substrate and a speed of approximately 4-5 meters per minute so that it is acceptable for video analysis, if required at a later date. Landscape panoramic views (360°) shall be recorded at the start and end of each transect. Additionally, a panoramic view shall be recorded at the start and end of each interruption of the benthos by a sand gap that extends for more than 10 m.

25.6. Listed Coral Monitoring

The *Orbicella faveolata* colony at Transect TR-32a and the *A. cervicornis* colony identified near R-39 during hardbottom edge mapping in 2020 shall be monitored in conjunction with the permanent transect survey. Each colony shall be measured (colony diameter) and have its condition assessed and recorded. The following shall be noted for colony condition: percent old and recent mortality (respectively); percent bleaching; and presence of disease, obvious signs of predation, and signs of sedimentation (burial of colony base, etc.). Photographs of each colony shall be taken from the same orientation during each monitoring event.

25.7. Data Analyses/Reporting

Consistent with the permitted BMP for the Reaches I/III project, the CONSULTANT shall prepare the annual monitoring data deliverable and conduct statistical analyses according to the FDEP Standard Operation Procedures for Nearshore Hardbottom Monitoring. Hardbottom monitoring data shall be entered into a Microsoft Access database for data management, and two rounds of QA-QC review shall be conducted to ensure accuracy of monitoring data prior to submittal to the COUNTY and FDEP. Individual datasets shall be exported as Microsoft Excel workbooks.

The 2022 immediate post-construction monitoring data analyses for the four Reach

I transects shall be added to the 2022 immediate post-construction monitoring report that is being prepared under the County contract with NSU. The CONSULTANT shall analyze and discuss changes in benthic community, observed burial and sedimentation on the nearshore hardbottom that may occur due the project, and the results of the hardbottom edge mapping surveys.

Deliverable. Within 45 days after completion of the 2022 immediate post-construction monitoring event, the CONSULTANT shall submit all hardbottom data, including still photo transect images, digital video transects, digital video of the nearshore hardbottom edge, GIS shape files of the permanent transects and nearshore hardbottom edge, PDF of scanned field datasheets, and Microsoft Excel worksheets of quadrat and sediment data, directly and concurrently (simultaneously) to the COUNTY and FDEP in electronic format. GIS shape files of the permanent transects monitored under the 2015 BMP shall be clipped to the lengths specified in the Reaches I/III BMP, and transects shall be renamed according to the nomenclature of the Reaches I/III BMP. Data shall be submitted either on a single portable hard drive or via an FTP site.

Within 75 days after completion of the 2022 immediate post-construction monitoring event of the four Reach I transects, the CONSULTANT shall submit the final report sections specific to the Reaches I/III BMP in digital (Microsoft Word) format to the COUNTY for incorporation into the final comprehensive Segment II report.

26. HARDBOTTOM MONITORING FOR SEGMENT II (OPTION B- COMBINED BMP FOR REACHES I THROUGH IV)- YEAR 1 POST-CONSTRUCTION (2023) (AUTHORIZATION WITHHELD)

26.1. Nearshore Hardbottom Edge Mapping

The CONSULTANT shall map the nearshore hardbottom edge along all of Segment II (Hillsboro Inlet to Port Everglades Inlet). The CONSULTANT shall follow the inshore contour of the most prominent hardbottom-sand border. A buoy with a Differential Global Positioning System (DGPS) antenna, linked wirelessly to a topside computer via radio/receiver, shall be towed along this boundary to record the position of the nearshore hardbottom edge. The topside computer shall run Trimble Penmap hydrographic software which stores edge data as a line feature to be exported as an ArcGIS shape file at the end of each field day.

26.2. Permanent Shore Perpendicular Transects

The CONSULTANT shall monitor a maximum of 61 permanent cross-shore transects within the project area: 57 transects were permanently established and monitored for the 2016 Segment II Project and four (4) transects were added and monitored during the pre-construction survey for Reach I in 2020. Maximum transect length is expected to be 100 m. Based on the BMP for Reaches I/III authorized in January 2021, it is expected that the combined BMP would require

monitoring of permanent transects to a distance of 3,000 ft. south of the Reach IV south fill limit at R-72 (Transects OP-72, OP-73, and OP-74 in the 2016 Segment II Project Reaches II/IV BMP).

Transect nomenclature and treatment are expected to follow the design of the Reaches I/III BMP (transects between R-72 and R-75 shall be considered downdrift transects). The CONSULTANT shall also monitor the eight (8) transects south of R-75 from the 2016 Project Reaches II/IV BMP as Outside Project (OP) transects to serve as reference transects to assess natural variability in nearshore hardbottom exposure and benthic community cover/composition). The eight (8) OP transects shall also be monitored to a maximum offshore distance of 100 m.

Along each permanent transect, the CONSULTANT shall apply multiple methods including quadrat-based benthic ecological assessments, line-intercept for sediment, sediment depth measurements, and video transects.

26.2.1. Permanent benthic quadrats

For transects which extend 100 m offshore, the CONSULTANT shall monitor eleven (11) 1-m² permanent quadrats east of the ETOF. Transects shorter than 100 m will have fewer quadrats but will have a minimum of eight (8) 1-m² quadrats. The CONSULTANT shall collect the benthic samples using the quadrat-based Benthic Ecological Assessment for Marginal Reefs (BEAMR) method.

26.2.2. Sediment line intercept

The CONSULTANT shall document the location of hardbottom boundaries interrupted by sand patches larger than 0.5 m in length (by the transect interception) to determine change in sand cover along each shore-perpendicular transect.

26.2.3. Sediment depth interval measurements

The CONSULTANT shall measure sediment depth (cm) at 1-m intervals along each shore-perpendicular transect to provide a snapshot of the cross-shore sand distribution across and in between the nearshore hardbottom patches at each sampling event.

26.2.4. Video Transects

The CONSULTANT shall conduct video documentation along the length of each shore-perpendicular transect. A close-up of the transect name clearly written on a waterproof slate shall be recorded for each video transect. The video shall be recorded at a height of 40 cm above the substrate and a speed of approximately 4-5 meters per minute so that it is acceptable for video analysis, if required at a later date. Landscape

panoramic views (360°) shall be recorded at the start and end of each transect. Additionally, a panoramic view shall be recorded at the start and end of each interruption of the benthos by a sand gap that extends for more than 10 m.

26.2.5. Listed Coral Monitoring

The *Orbicella faveolata* colony at Transect TR-32a and the *A. cervicornis* colony identified near R-39 during hardbottom edge mapping in 2020 shall be monitored in conjunction with the permanent transect survey. Each colony shall be measured (colony diameter) and have its condition assessed and recorded. The following shall be noted for colony condition: percent old and recent mortality (respectively); percent bleaching; and presence of disease, obvious signs of predation, and signs of sedimentation (burial of colony base, etc.). Photographs of each colony shall be taken from the same orientation during each monitoring event.

Deliverable. All field datasheets shall be reviewed and scanned to PDF for submittal to the COUNTY and FDEP within 30 days after completion of the Year 1 post-construction monitoring event. The PDF file of the raw field data shall also be included in the final data deliverable provided to the COUNTY and FDEP under Task 26.3 below.

26.3. Year 1 Post-construction Data Analyses/Reporting

The CONSULTANT shall prepare the annual monitoring data deliverable, conduct statistical analyses, and prepare the 2023 Year 1 post-construction biological monitoring reports according to the FDEP Standard Operation Procedures for Nearshore Hardbottom Monitoring and combined BMP for the entire Segment II project area. Hardbottom monitoring data shall be entered into a Microsoft Access database for data management, and two rounds of QA-QC review shall be conducted to ensure accuracy of monitoring data prior to submittal to the COUNTY and FDEP. Individual datasets shall be exported as Microsoft Excel workbooks.

The report shall compare the 2020 pre-construction dataset (or 2015 pre-construction dataset for the 2016 Segment II Project where appropriate), to the 2023 Year 1 post-construction dataset. The CONSULTANT shall analyze and discuss changes in benthic community, observed burial and sedimentation on the nearshore hardbottom, and the results of the hardbottom edge mapping survey.

Annual post-construction monitoring reports shall be provided to the COUNTY in digital format. These reports shall include:

- a. A map including the project area and adjacent hardbottom resources and monitoring transects overlaid onto recent, clear aerial photographs (in digital format);
- b. Analysis of sedimentation on the transect outside the ETOF (including the updrift and downdrift hardbottom monitoring sites) based on line-intercept data, interval sediment depth measurements and data from quadrats;
- c. Multivariate analysis of quantitative data with subsequent analysis of benthic biological components on the transects east of the ETOF (*e.g.*, percent cover and density by corals, octocorals, sponges and algae);
- d. A comparison of post-construction monitoring results to pre-construction monitoring results;
- e. A figure comparing the most recent annual hardbottom delineation and all previous hardbottom delineations;
- f. Calculation of buried and exposed hardbottom acreage and comparison to previous hardbottom acreages;
- g. Trends or notable differences between transects located seaward of the ETOF (designated P-transects) compared to transects located updrift and downdrift of the project limits (designated OP-transects);
- h. An analysis of biological and physical monitoring data to identify the location and extent of the project-related influence to the coastal system. This will include an interpretation of a non-project related impacts caused by a background condition. Consideration will be given to the amount of change to hardbottom areas proportioned between with and without project conditions if impacts are identified above background; and
- i. A comparison of benthic community conditions to the physical (beach profile) surveys to assist in understanding regional or local coastal processes.

Deliverable. Within 45 days after completion of the Year 1 post-construction monitoring of the comprehensive Segment II project shoreline (all four reaches), the CONSULTANT shall submit all hardbottom data, including still photo transect images, digital video transects, digital video of the nearshore hardbottom edge, GIS shape files of the permanent transects and nearshore hardbottom edge, PDF of scanned field datasheets, and Microsoft Excel worksheets of quadrat and sediment data, directly and concurrently (simultaneously) to the COUNTY and FDEP in electronic format. Data shall be submitted either on a single portable hard drive or via an FTP site.

Within 90 days after completion of the immediate post-construction monitoring event, the CONSULTANT shall submit the final comprehensive Segment II monitoring report in digital (PDF) format with all attachments suitable for posting online and appropriate electronic sharing to the COUNTY, FDEP, and USACE. The PDF copy will be provided on electronic media (USB flash drive, ftp site, etc.) suitable for distribution as may be necessary. All PDF copies will be ADA compliant.

27. HARDBOTTOM MONITORING FOR SEGMENT II (OPTION B- COMBINED BMP FOR REACHES I THROUGH IV):

YEAR 2 POST-CONSTRUCTION (2024) (AUTHORIZATION WITHHELD)

The CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 26. The Year 2 post-construction monitoring survey shall be conducted in summer 2024, and the same reporting timeline outlined in Task 26.3 shall apply. The Year 2 post-construction report shall be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report shall contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed. The CONSULTANT shall also coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT shall attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

28. HARDBOTTOM MONITORING FOR SEGMENT II (OPTION B- COMBINED BMP FOR REACHES I THROUGH IV):

YEAR 3 POST-CONSTRUCTION (2025) (AUTHORIZATION WITHHELD)

The CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 26.0. The Year 3 post-construction biological monitoring survey shall be conducted in summer 2025, and the same reporting timeline outlined in Task 26.3 shall apply. The Year 3 post-construction report shall be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report shall contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed.

The Year 3 post-construction report shall provide a final assessment of the need for surveys in Years 4 and 5 post-construction based on the results of the three annual post-construction surveys. The CONSULTANT shall coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT shall attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

29. HARDBOTTOM MONITORING FOR SEGMENT II (OPTION B- COMBINED BMP FOR REACHES I THROUGH IV):

YEAR 4 POST-CONSTRUCTION (2026) (AUTHORIZATION WITHHELD)

The Year 4 post-construction survey would occur if the project is constructed over two seasons and would serve as the Year 3 post-construction monitoring for the portion of the project constructed during the second season. If this task is authorized by the COUNTY, the CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 26.0. The Year 4 post-construction biological monitoring survey would be conducted in summer 2026, and the same reporting timeline outlined in Task 26.3 would apply.

The Year 4 post-construction report would be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The report would also contain a review of the efficacy of monitoring methods and recommendations for adjustments to the protocol as needed. The CONSULTANT would coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT would also attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

30. HARDBOTTOM MONITORING FOR SEGMENT II (OPTION B):

YEAR 5 POST-CONSTRUCTION (2027) (CONTINGENCY/AUTHORIZATION WITHHELD)

The Year 5 post-construction survey would only be required by the regulatory agencies based on review of the Year 3 post-construction monitoring data and report described in Task 26 above. If directed by the FDEP and COUNTY, the CONSULTANT shall conduct the same field methods and provide the same data and report deliverables as detailed above in Task 26.0. The Year 5 post-construction biological monitoring survey would be conducted in summer 2027 if mandated by FDEP, and the Year 5 monitoring report would contain a cumulative effects analysis for the 2021/22 project.

The Year 5 post-construction report would be cumulative and compare the 2020 pre-construction dataset to each subsequent post-construction monitoring survey. The CONSULTANT would coordinate with FDEP and USACE and submit all notifications and deliverables according to the conditions of the BMP and permits. The CONSULTANT would also attend up to two meetings/year during review of the annual monitoring report to discuss the findings with FDEP staff.

**31. LISTED SPECIES MONITORING FOR SEGMENT II (OPTION B):
(CONTINGENCY/AUTHORIZATION WITHHELD)**

This task provides for up to an additional ten (10) field days during each annual field survey (Years 1 through Year 5 post-construction) for an overall total of fifty (50) field days in the event that monitoring of listed coral stations is required or additional tasks are included in the consolidated BMP that have not been considered in this scope of work.

2016 PROJECT - NEARSHORE EDGE IMPACT ANALYSIS

32. 2016 SEGMENT II PROJECT IMPACT EVALUATION and COORDINATION WITH STATE AND FEDERAL AGENCIES (CONTINGENCY/AUTHORIZATION WITHHELD)

If directed by the COUNTY, the CONSULTANT shall work with the COUNTY and State and Federal regulatory and resource protection agencies on the 2016 Segment II Project impact evaluation. The CONSULTANT shall respond to agency requests for additional information and other project-related documents and attend up to five (5) meetings with agency and COUNTY staff to review the findings of the post-construction monitoring and monitoring reports for the 2016 Segment II Project. Additional engineering and environmental desktop analyses, GIS analyses, and numerical model studies and supporting data collection may be conducted and/or reviewed to better quantify the extent of natural variability and separate natural variability from potential project-related effects.

Deliverables. Relevant deliverables will be prepared as required and provided to the COUNTY.

33. 2016 SEGMENT II PROJECT IMPACT EVALUATION- BIOLOGICAL ASSESSMENT OF IMPACT AREA LANDWARD OF THE ETOF (CONTINGENCY/AUTHORIZATION WITHHELD)

If directed by the COUNTY, the CONSULTANT shall conduct a benthic survey within the hardbottom impact area landward of the ETOF from R-36 to R-41.3 and R-51 to R-72. The survey shall follow the same field methods as the 2016 pre-construction baseline survey of the hardbottom impact areas. Post-construction hardbottom edge mapping of the 2016 Segment II Project suggested increased hardbottom exposure in some of the areas that were predicted to be completely buried following beach project construction. The purpose of this survey would be to evaluate the benthic community and conduct a similarity analysis to the pre-construction baseline survey in order to accurately quantify changes in benthic habitat functions prior to and following beach nourishment.

The CONSULTANT shall repeat the twenty (20) temporary 30-m transects that were surveyed during the baseline survey in the same locations. The 30-m transects shall be sampled with the BEAMR method in six (6) 1-m² quadrats spaced at the same intervals as the pre-construction baseline survey. Video documentation shall be collected along the length of each 30-m transect. The video shall be recorded at a height of 40 cm above bottom and a speed of approximately 4-5 meters per minute so that it is acceptable for video analysis. Landscape panoramic views (360°) shall be recorded at the start and end of each transect. Additionally, a panoramic view shall be recorded at the start and end of each interruption of the benthos by a sand gap that extends for more than 10 m.

Representative photographs shall be taken along the entire length of each transect for documentation purposes.

Deliverable. All field datasheets shall be reviewed and scanned to PDF for submittal to the COUNTY within 30 days after survey completion. The CONSULTANT shall prepare a complete summary data deliverable with all Excel spreadsheets, photo and video libraries, and GIS shape files within 45 days after survey completion. Within 90 days after survey completion, the CONSULTANT shall submit a draft summary letter report to the COUNTY which describes the results of the benthic community similarity analysis and project effects assessment. A final summary report shall be submitted to the COUNTY within 14 days after receipt of County comments.

SEGMENT II FEDERAL PROJECT REAUTHORIZATION SERVICES

34. FEDERAL PROJECT REAUTHORIZATION STUDY PLANNING and SUPPORT (AUTHORIZATION WITHHELD)

The CONSULTANT shall be available for coordination with the USACE to develop the scope and Project Review Plan for the required Feasibility Study (FS) and related environmental documents to support the reauthorization of the Segment II project. It is anticipated that this effort will require online and in-person meetings with County and USACE staff to develop the framework for the FS, the distribution of work between the COUNTY and the USACE, the approval process, and the eventual authorization of a new 50-year Federal project for the Segment II shoreline. The CONSULTANT shall also be available to support the COUNTY and USACE with data collection, engineering and economic analyses, environmental analyses and documentation, report preparation, public, regulatory, and resource agency coordination, and document review processes. The CONSULTANT shall also assist the COUNTY with other associated tasks as may be required by the USACE, which are consistent with this scope and budget, to assist the COUNTY with the initiation, execution, and approval of a reauthorization study for the Broward County Federal Shore Protection Project – Segment II.

Deliverables. Relevant deliverables will be prepared as required and provided to the COUNTY.

SEGMENT II NEARSHORE MITIGATION PROJECT

**35. CONTINUED SERVICES FOR SEGMENT II MITIGATION
(AUTHORIZATION WITHHELD)**

This task provides for continued consulting services to support the COUNTY with the completion of the Broward County Shore Protection Project – Segment II nearshore mitigation reef project. These services may include, but not be limited to, contract administration and management and construction observations. Some of these services may be provided by qualified subcontractors, particularly for on-site representation and oversight during fabrication and placement of the mitigation reef units.

GENERAL COASTAL ENGINEERING AND ENVIRONMENTAL CONSULTING

36. GENERAL CONSULTING (T&M) (AUTHORIZATION WITHHELD)

This task provides for general coastal engineering and environmental consulting services on an as needed basis for the CONSULANT to assist the COUNTY and COUNTY staff with matters related to the COUNTY's Segment II beach management program.

Exhibit B-7

Broward County Shore Protection Project
RLI #040897-RB
(Amendment 7)

TOTAL COST SUMMARY

Task	Olsen	APTIM	Subconsult		Total	Total
	Lump Sum	Lump Sum	Lump Sum	Reimb (NTE)	Lump Sum	
1.0 Post-Construction Engineering Report	\$ 47,364.00	\$ -	\$ -	\$ -	\$ 47,364.00	\$ 47,364.00
Physical Monitoring						
2.0 Physical Monitoring: Immediate Post-Construction (2022)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
3.0 Physical Monitoring: 1-Year Construction (2023)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
4.0 Physical Monitoring: 2-Year Construction (2024)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
5.0 Physical Monitoring: 3-Year Construction (2025)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
6.0 Physical Monitoring: 4-Year Construction (2026)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
7.0 Physical Monitoring: 5-Year Construction (2027)	\$ 68,910.00	\$ 58,000.00	\$ -	\$ 3,600.00	\$ 126,910.00	\$ 130,510.00
subtotal	\$ 413,460.00	\$ 348,000.00	\$ -	\$ 21,600.00	\$ 761,460.00	\$ 783,060.00
Environmental Services - Option A						
8.0 Hardbottom Monitoring for Reaches II/IV: Year 1 Post-Construction (2023) - (Option A)	\$ 10,720.00	\$ 53,124.00	\$ 155,652.00	\$ -	\$ 219,496.00	\$ 219,496.00
9.0 Hardbottom Monitoring for Reaches II/IV: Year 2 Post-Construction (2024) - (Option A)	\$ 10,720.00	\$ 53,124.00	\$ 163,454.00	\$ -	\$ 227,298.00	\$ 227,298.00
10.0 Hardbottom Monitoring for Reaches II/IV: Year 3 Post-Construction (2025) - (Option A)	\$ 10,720.00	\$ 53,124.00	\$ 172,511.00	\$ -	\$ 236,355.00	\$ 236,355.00
11.0 Hardbottom Monitoring for Reaches II/IV: Year 4 Post-Construction (2026) - (Option A)	\$ 10,720.00	\$ 53,124.00	\$ 182,594.00	\$ -	\$ 246,438.00	\$ 246,438.00
12.0 Hardbottom Monitoring for Reaches II/IV: Year 5 Post-Construction (2027) - (Option A)	\$ 10,720.00	\$ 53,124.00	\$ 192,304.00	\$ -	\$ 256,148.00	\$ 256,148.00
13.0 Hardbottom Monitoring for Reaches II/IV: Three-Month Post-Const Sediment Only (2023) - (Option A)	\$ 10,720.00	\$ -	\$ 19,463.00	\$ -	\$ 30,183.00	\$ 30,183.00
14.0 Hardbottom Monitoring for Reaches II/IV: Six-Month Post-Const Sediment Only (2023) - (Option A)	\$ 10,720.00	\$ -	\$ 19,463.00	\$ -	\$ 30,183.00	\$ 30,183.00
15.0 Listed Coral Monitoring for Reaches II/IV - Year 1 Post-Const (2023/24) - (Option A)	\$ 10,720.00	\$ -	\$ 48,674.00	\$ -	\$ 59,394.00	\$ 59,394.00
16.0 Listed Coral Monitoring for Reaches II/IV - Year 2 Post-Const (2024/25) - (Option A)	\$ 10,720.00	\$ -	\$ 48,674.00	\$ -	\$ 59,394.00	\$ 59,394.00
17.0 Listed Coral Monitoring for Reaches II/IV - Year 3 Post-Const (2025/26) - (Option A)	\$ 10,720.00	\$ -	\$ 48,674.00	\$ -	\$ 59,394.00	\$ 59,394.00
18.0 Listed Coral Monitoring for Reaches II/IV - Year 4 Post-Const (2026/27) - (Option A)	\$ 10,720.00	\$ -	\$ 48,674.00	\$ -	\$ 59,394.00	\$ 59,394.00
19.0 Listed Coral Monitoring for Reaches II/IV - Year 5 Post-Const (2027/28) - (Option A)	\$ 10,720.00	\$ -	\$ 48,674.00	\$ -	\$ 59,394.00	\$ 59,394.00
20.0 Hardbottom Monitoring for Reaches III/III - Immediate Post-Construction (2022) - (Option A)	\$ 10,720.00	\$ -	\$ 42,011.00	\$ -	\$ 52,731.00	\$ 52,731.00
21.0 Hardbottom Monitoring for Reaches III/III - Year 1 Post-Construction (2023) - (Option A)	\$ 10,720.00	\$ -	\$ 46,450.00	\$ -	\$ 57,170.00	\$ 57,170.00
22.0 Hardbottom Monitoring for Reaches III/III - Year 2 Post-Construction (2024) - (Option A)	\$ 10,720.00	\$ -	\$ 49,502.00	\$ -	\$ 60,222.00	\$ 60,222.00
23.0 Hardbottom Monitoring for Reaches III/III - Year 3 Post-Construction (2025) - (Option A)	\$ 10,720.00	\$ -	\$ 59,406.00	\$ -	\$ 70,126.00	\$ 70,126.00
Option A - subtotal	\$ 171,520.00	\$ 265,620.00	\$ 1,346,180.00	\$ -	\$ 1,783,320.00	\$ 1,783,320.00
Environmental Services - Option B						
24.0 Permit/BMP Modification to Merge Reaches II/IV and Reaches III/III - (Option B)	\$ 25,074.00	\$ -	\$ 47,290.00	\$ 3,600.00	\$ 72,364.00	\$ 75,964.00
25.0 Hardbottom Monitoring for Reaches III/III Immediate Post-Construction (2022) - (Option B)	\$ 10,720.00	\$ -	\$ 25,246.00	\$ -	\$ 35,966.00	\$ 35,966.00
26.0 Hardbottom Monitoring for Reaches I through IV: Year 1 Post-Construction (2023) - (Option B)	\$ 10,720.00	\$ 53,124.00	\$ 155,741.00	\$ -	\$ 219,585.00	\$ 219,585.00
27.0 Hardbottom Monitoring for Reaches I through IV: Year 2 Post-Construction (2024) - (Option B)	\$ 10,720.00	\$ 53,124.00	\$ 164,361.00	\$ -	\$ 228,205.00	\$ 228,205.00
28.0 Hardbottom Monitoring for Reaches I through IV: Year 3 Post-Construction (2025) - (Option B)	\$ 10,720.00	\$ 53,124.00	\$ 174,420.00	\$ -	\$ 238,264.00	\$ 238,264.00
29.0 Hardbottom Monitoring for Reaches I through IV: Year 4 Post-Construction (2026) - (Option B)	\$ 10,720.00	\$ 53,124.00	\$ 174,420.00	\$ -	\$ 238,264.00	\$ 238,264.00
30.0 Hardbottom Monitoring for Reaches I through IV: Year 5 Post-Construction (2027) - (Option B)	\$ 10,720.00	\$ 53,124.00	\$ 184,652.00	\$ -	\$ 248,496.00	\$ 248,496.00
31.0 Listed Species Monitoring for Segment II (Option B)	\$ 10,720.00	\$ -	\$ 115,794.00	\$ -	\$ 126,514.00	\$ 126,514.00
Option B - subtotal	\$ 100,114.00	\$ 265,620.00	\$ 1,041,924.00	\$ 3,600.00	\$ 1,407,858.00	\$ 1,411,258.00
2016 Project - Nearshore Edge Impact Analysis						
32.0 2016 Segment II Project Impact Evaluation and Agency Coordination (AW)**	\$ 400,000.00	\$ -	\$ 55,037.00	\$ 25,000.00	\$ 455,037.00	\$ 480,037.00
33.0 2016 Segment II Project Impact Evaluation - Biological Assessment of Impact Area Landward of ETOF (AW)	\$ 10,720.00	\$ 4,000.00	\$ 49,825.00	\$ -	\$ 64,545.00	\$ 64,545.00
subtotal	\$ 410,720.00	\$ 4,000.00	\$ 104,862.00	\$ 25,000.00	\$ 519,882.00	\$ 544,882.00
Segment II Federal Project Reauthorization Services						
34.0 Federal Project Reauthorization Study Planning and Support (AW)**	\$ 850,000.00	\$ -	\$ -	\$ 50,000.00	\$ 850,000.00	\$ 900,000.00
Segment II Mitigation Project						
35.0 Continued Services for Segment II Mitigation Project (AW)**	\$ 250,000.00	\$ -	\$ -	\$ -	\$ 250,000.00	\$ 250,000.00
General Consulting						
36.0 General Consulting (AW)**	\$ 100,000.00	\$ -	\$ -	\$ -	\$ 100,000.00	\$ 100,000.00
Totals						
Post Construction Engineering Report	\$ 47,364.00	\$ -	\$ -	\$ -	\$ 47,364.00	\$ 47,364.00
Physical Monitoring	\$ 413,460.00	\$ 348,000.00	\$ -	\$ 21,600.00	\$ 761,460.00	\$ 783,060.00
Environmental Services - Option A	\$ 171,520.00	\$ 265,620.00	\$ 1,346,180.00	\$ -	\$ 1,783,320.00	\$ 1,783,320.00
Environmental Services - Option B	\$ 100,114.00	\$ 265,620.00	\$ 1,041,924.00	\$ 3,600.00	\$ 1,407,858.00	\$ 1,411,258.00
2016 Project - Nearshore Edge Impact Analysis	\$ 410,720.00	\$ 4,000.00	\$ 104,862.00	\$ 25,000.00	\$ 519,882.00	\$ 544,882.00
Segment II Federal Project Reauthorization Services	\$ 850,000.00	\$ -	\$ -	\$ 50,000.00	\$ 850,000.00	\$ 900,000.00
Segment II Mitigation Project	\$ 250,000.00	\$ -	\$ -	\$ -	\$ 250,000.00	\$ 250,000.00
General Consulting	\$ 100,000.00	\$ -	\$ -	\$ -	\$ 100,000.00	\$ 100,000.00
Total - Option A	\$ 2,243,064	\$ 617,620	\$ 1,451,042	\$ 96,600	\$ 4,311,726	\$ 4,408,326
Total - Option B	\$ 2,171,658	\$ 617,620	\$ 1,146,786	\$ 100,200	\$ 3,936,064	\$ 4,036,264
** Engineering services will be conducted by Olsen Associates, Inc. and APTIM. Division of services TBD.						

Aptim Environmental & Infrastructure, LLC
 Broward County Amendment 7 Billable Rates

APTIM Employee	Labor Pool	Actual Labor Rate	Escalation	Actual Labor Rate with Escalation	Fringe/Overhead/G & A HOME (See Note 1)	Fringe/Overhead/G & A FIELD (See Note 1)	Total Less Fee	Fee/Profit	Total with Fee/Profit	Multiplier Less Fee	Multiplier with Fee
Employee		2022	0.00%		136.91%	90.18%		10.00%			
Z-001 - Principal Engineer	Home	125.01	125.01	125.01	\$ 171.15		\$ 296.16	\$ 29.62	\$ 325.78	\$ 2.37	\$ 2.61
Z-002 - Program Director	Home	83.37	83.37	83.37	\$ 114.14		\$ 197.51	\$ 19.75	\$ 217.26	\$ 2.37	\$ 2.61
Z-003 - Program Manager	Home	60.86	60.86	60.86	\$ 83.33		\$ 144.19	\$ 14.42	\$ 158.61	\$ 2.37	\$ 2.61
Z-004 - Senior Project Manager	Home	91.48	91.48	91.48	\$ 125.25		\$ 216.73	\$ 21.67	\$ 238.40	\$ 2.37	\$ 2.61
Z-005 - Project Manager	Home	58.00	58.00	58.00	\$ 79.41		\$ 137.41	\$ 13.74	\$ 151.15	\$ 2.37	\$ 2.61
Z-006 - Senior Coastal Engineer	Home	68.23	68.23	68.23	\$ 93.42		\$ 161.65	\$ 16.17	\$ 177.82	\$ 2.37	\$ 2.61
Z-007 - Coastal Engineer III	Field	58.00	58.00	58.00	\$ -	\$ 52.30	\$ 110.30	\$ 11.03	\$ 121.33	\$ 1.90	\$ 2.09
Z-008 - Coastal Engineer II	Home	42.71	42.71	42.71	\$ 58.48		\$ 101.19	\$ 10.12	\$ 111.31	\$ 2.37	\$ 2.61
Z-009 - Coastal Engineer I	Home	32.69	32.69	32.69	\$ 44.76		\$ 77.45	\$ 7.75	\$ 85.20	\$ 2.37	\$ 2.61
Z-010 - Coastal Modeler II	Home	40.88	40.88	40.88	\$ 55.97		\$ 96.85	\$ 9.69	\$ 106.54	\$ 2.37	\$ 2.61
Z-011 - Coastal Modeler I	Home	35.00	35.00	35.00	\$ 47.92		\$ 82.92	\$ 8.29	\$ 91.21	\$ 2.37	\$ 2.61
Z-012 - Professional Geologist	Home	54.56	54.56	54.56	\$ 74.70		\$ 129.26	\$ 12.93	\$ 142.19	\$ 2.37	\$ 2.61
Z-013 - Geologist III	Home	30.95	30.95	30.95	\$ 42.37		\$ 73.32	\$ 7.33	\$ 80.65	\$ 2.37	\$ 2.61
Z-014 - Geologist II	Home	29.24	29.24	29.24	\$ 40.03		\$ 69.27	\$ 6.93	\$ 76.20	\$ 2.37	\$ 2.61
Z-015 - Geologist I	Home	23.71	23.71	23.71	\$ 32.46		\$ 56.17	\$ 5.62	\$ 61.79	\$ 2.37	\$ 2.61
Z-016 - Senior Marine Biologist	Home	54.00	54.00	54.00	\$ 73.93		\$ 127.93	\$ 12.79	\$ 140.72	\$ 2.37	\$ 2.61
Z-017 - Marine Biologist II	Field	34.88	34.88	34.88		\$ 31.45	\$ 66.33	\$ 6.63	\$ 72.96	\$ 1.90	\$ 2.09
Z-018 - Marine Biologist I	Field	28.78	28.78	28.78		\$ 25.95	\$ 54.73	\$ 5.47	\$ 60.20	\$ 1.90	\$ 2.09
Z-019 - Professional Surveyor & Mapper	Home	52.11	52.11	52.11	\$ 71.35		\$ 123.46	\$ 12.35	\$ 135.81	\$ 2.37	\$ 2.61
Z-020 - Hydrographer	Home	43.00	43.00	43.00	\$ 58.87		\$ 101.87	\$ 10.19	\$ 112.06	\$ 2.37	\$ 2.61
Z-021 - Surveyor	Field	29.32	29.32	29.32		\$ 26.44	\$ 55.76	\$ 5.58	\$ 61.34	\$ 1.90	\$ 2.09
Z-022 - Survey Technician	Field	24.62	24.62	24.62		\$ 22.20	\$ 46.82	\$ 4.68	\$ 51.50	\$ 1.90	\$ 2.09
Z-023 - Senior CAD Operator	Home	62.53	62.53	62.53	\$ 85.61		\$ 148.14	\$ 14.81	\$ 162.95	\$ 2.37	\$ 2.61
Z-024 - CAD Operator	Home	32.00	32.00	32.00	\$ 43.81		\$ 75.81	\$ 7.58	\$ 83.39	\$ 2.37	\$ 2.61
Z-025 - GIS Operator	Home	39.86	39.86	39.86	\$ 54.57	\$ 35.94	\$ 130.38	\$ 13.04	\$ 143.42	\$ 3.27	\$ 3.60
Z-026 - Boat Captain	Field	26.91	26.91	26.91		\$ 24.27	\$ 51.18	\$ 5.12	\$ 56.30	\$ 1.90	\$ 2.09
Z-027 - Bookkeeper	Home	29.86	29.86	29.86	\$ 40.88		\$ 70.74	\$ 7.07	\$ 77.81	\$ 2.37	\$ 2.61
Z-028 - Clerical	Home	29.30	29.30	29.30	\$ 40.12		\$ 69.42	\$ 6.94	\$ 76.36	\$ 2.37	\$ 2.61
Z-029 - Technician	Field	22.51	22.51	22.51		\$ 20.30	\$ 42.81	\$ 4.28	\$ 47.09	\$ 1.90	\$ 2.09

Note 1

Derived from audit.

MAXIMUM BILLING RATES

Project No: RLI #040897
 Project Title: Segment II Post-Construction Monitoring Services
 Consultant/ Coastal Eco-Group Inc.
 Subconsultant Name:

TITLE	MAXIMUM HOURLY RATE (\$/HR)	X	MULTIPLIER	=	MAXIMUM BILLING RATE
			Safe Harbor		(\$/HR)
President, Principal Scientist	\$54.64		2.35		\$128.40
Senior Scientist	\$43.08		2.35		\$101.23
Staff Scientist	\$29.50		2.35		\$69.33
Boat Captain	\$27.32		2.35		\$64.20

Multipier of X.XX is calculated as follows:

OVERHEAD = HOURLY RATE X OVERHEAD (X.XX)%

FRINGE = HOURLY RATE X FRINGE (X.XX) %

OPERATING MARGIN = (HOURLY RATE + OVERHEAD + FRINGE) X OPERATING MARGIN (X.XX)%

MULTIPLIER = (HOURLY RATE + OVERHEAD + FRINGE + OPERATING MARGIN) / HOURLY RATE

*Notes: Consultant has elected to use "Safe Harbor" combined fringe benefit and overhead rate of 110% in accordance with Section 5.2.5.

*1.00 1.10 2.10 x 12% operating margin = 0.25 2.35 OH Factor

Maximum Billing Rates

2022



Project No: RLI#040897_Amendment 7
 Project Title: Coastal Engineering Consultant Services for Segment II Shore Protection Project
 Consultant/Subconsultant Name: Olsen Associates, Inc. (Prime)

TITLE	MAXIMUM HOURLY RATE (\$/HR)	*	MULTIPLIER	=	MAXIMUM BILLING RATE (\$/HR)
Principal	\$ 76.55		2.90		\$ 222.00
Senior Engineer	\$ 56.41		2.90		\$ 163.59
Coastal Engineer III	\$ 39.65		2.90		\$ 114.99
Coastal Engineer II	\$ 37.89		2.90		\$ 109.88
Coastal Engineer I	\$ 35.47		2.90		\$ 102.86
CADD Technician	\$ 29.52		2.90		\$ 85.61
Administrative Assistant	\$ 31.16		2.90		\$ 90.36

OVERHEAD (\$/HR) = HOURLY RATE X OVERHEAD%⁽¹⁾ 103.33%
 FRINGE (\$/HR) = HOURLY RATE X FRINGE%⁽¹⁾ 59.96%
 PROFIT (\$/HR) = HOURLY RATE+ OVERHEAD+ FRINGE) X PROFIT% 10.00%

⁽¹⁾ Based upon FAR compliant audit for Olsen (attached).