

NASSAU COUNTY - SAISSA
Task Order Memorandum
Contract CM1852

To: Olsen Associates, Inc.
2618 Herschel St.
Jacksonville, FL 32204

Date: 26 January 2016
Contract: Coastal Engineering
Request Made By: Bill Moore, SAISSA Rep.
Request Received By: Albert E. Browder, Ph.D., P.E.
Task Order No: CM1852 TO #16

Task Order: 2016 Year-5 Physical Monitoring of Engineered Beach Nourishment Project
2011 Renourishment: South Amelia Island Shore Stabilization Project

Consultant shall complete the 2016 annual physical monitoring of the South Amelia Island Shore Stabilization Project, as described in the attached Scope-of-Work (Exhibit A).

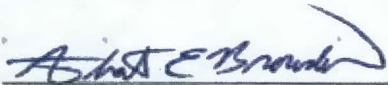
Deliverables shall include a detailed monitoring report documenting the 2016 pre-storm season condition of the engineered beach, including updated analyses of the performance of the beach fill since construction (relative to the 1994 pre-restoration and August 2011 post-renourishment conditions). The current condition and any observed changes in the bathymetry of Nassau Sound and the prior nourishment borrow areas will be described. Any anomalous areas (hot-spots, etc.) observed in the data shall be identified and discussed. Six (6) hardcopies of the report shall be delivered to SAISSA along with an electronic *.PDF copy on CD-ROM disc. A signed/sealed set of the beach profile survey maps shall be provided. Electronic copies of the controlled digital aerial orthophotography shall be provided on CD- or DVD-ROM disc. All work shall be performed on a Lump Sum basis.

Fee: \$ 160,000.00 (Lump Sum)

Requested Completion Date: Four (4) months from receipt of survey.

Olsen Associates, Inc.

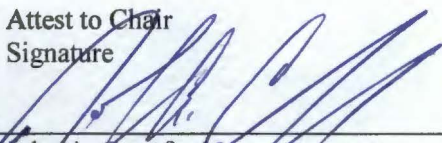
SAISSA

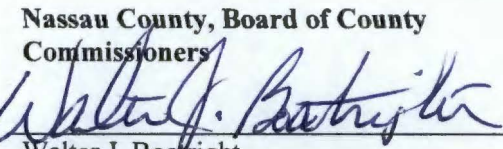

Albert E. Browder, Ph.D., P.E.


Mr. Drew Wallace, SAISSA President

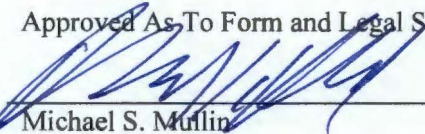
Date: 26 January 2016

Date: 2/10/16

Attest to Chair
Signature

John A. Crawford
It's: Ex-Officio Clerk
Date: 3-22-16

Nassau County, Board of County
Commissioners

Walter J. Boatright
Its: Chair

Date: 3-16-16

Approved As To Form and Legal Sufficiency:

Michael S. Mullin

Date: 3-16-16

ME5
03-18-16

SCOPE OF WORK

**Year-5 Physical Monitoring Survey (Spring/Summer 2016)
2011 Renourishment:
South Amelia Island Shore Stabilization Project
JCP #0187721-010**

January 2016

OVERVIEW

The purpose of the task is to conduct the Year-5 annual physical monitoring of the S. Amelia Island Shore Stabilization Project, as directed by the Florida Department of Environmental Protection Joint Coastal Permit #0187721-010 and its associated physical monitoring plan (attached). The monitored area extends for roughly ten miles, including FDEP R-monuments R-55 to R-82 in Nassau County, FL (**Figure 1**). The survey area likewise includes the offshore borrow site, located roughly one mile offshore in the Atlantic Ocean off R-75 to R-77, approx., and Nassau Sound (surveyed every 3 years). The project was last nourished in May-August 2011.

Task A - Analyses, Mgmt., Engineering, Report & FDEP Documentation –

Task A - Description

“The Permittees shall submit an engineering report and the monitoring data to the BBCS within 90 days following completion of the post-construction survey(s) and each annual monitoring survey. The report shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse impacts attributable to the project. Appendices shall include plots of survey profiles and graphical representations of volumetric and shoreline position changes for the monitoring area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction.”

Consistent with the approved Physical Monitoring Plan, as with all previous monitoring efforts, the Consultant shall prepare a detailed annual (or biennial) project monitoring report. The purpose of each report shall be to summarize the annual as well as cumulative data base and to assess project performance. The report includes graphic presentations of temporal and cumulative changes of selected beach contours over time. Volumetric changes at each survey profile and throughout the limits of fill shall be computed and presented in tabular and graphic forms. Aerial photography (if collected) will be utilized to further analyze shoreline changes that may occur between survey lines (beach cusps, rhythmic bar features, structure effects, etc.). Changes over time within and adjacent to the constructed borrow site shall be quantified and discussed (if surveyed). Analyses shall discuss shoreline change trends, potential cause and effect relationships, building proximity (and vulnerability) to the MHWL, storm impacts, other littoral impacts, and a local sediment budget for the area of interest. Net changes to the adjacent shorelines shall be assessed.

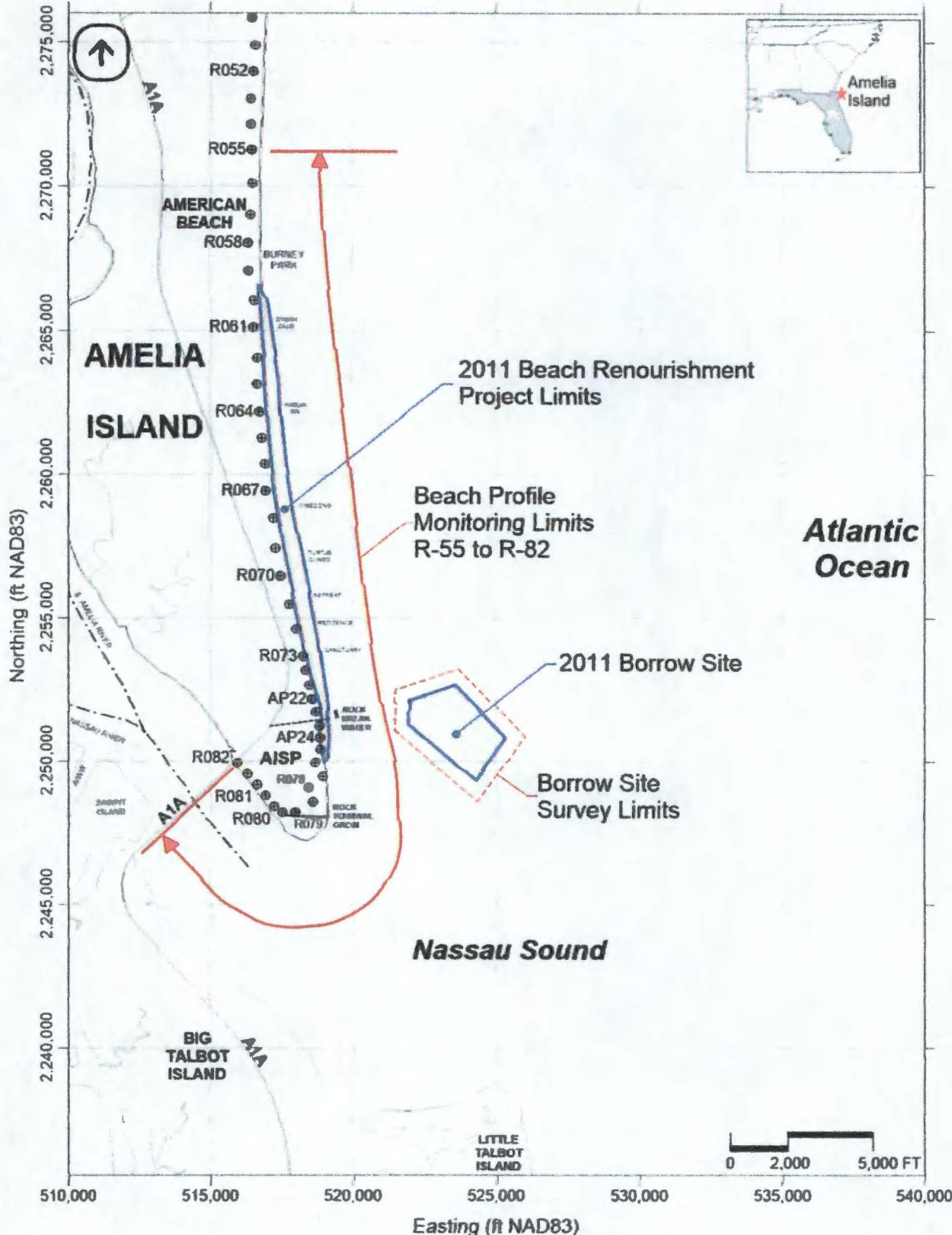


Figure 1 – Location map - physical monitoring plan – South Amelia Island Shore Stabilization Project.

Major report(s) of findings will be submitted annually approximately 90 days subsequent to each major monitoring survey. The surveys, aerials, and reports have proven invaluable for other projects in documenting not only pre-storm conditions for FEMA-declared disasters, but also providing clear information regarding the efforts of SAISSA, Nassau County, and the Florida Park Service (FPS) in maintaining an engineered beach eligible for post-disaster assistance from FEMA. This eligibility is critical for the post-storm restoration of the project.

Sub-tasks include:

- Contract and Subcontractor management,
- Liaison with Park personnel and regulatory agencies,
- Data quality control and quality assurance,
- Data assimilation/formatting per FDEP specifications,
- Update of post-construction history:
 - Overall project history
 - Storms
 - Wave climate for prior year
 - Beach maintenance activities and Other beach impacts
- Update of sea turtle nesting activities upon project shoreline,
- Analysis of shoreline position and beach volume changes:
 - Most recent annual intersurvey period
 - Since renourishment (2011) and since restoration (1994)
 - Interpretation of aerial photography and potential effects of alongshore variations and structures
 - graphical and tabular data created
- Analysis of Sound volume and morphological changes:
 - Most recent intersurvey period (2013-2016)
 - Relative to older surveys where applicable
 - Interpretation of aerial photography and changes in shoal features, channel alignments
- Interpretation and summary of overall project performance
 - Relative to design intent and local sediment budget
 - Relative to particular beach impacts experienced
- Recommendations for Future Activities,
- Preparation of historical beach profile plots, including most recent survey,
- Preparation of shoreline aerial maps (when aerials flown),
- Assembly of data submittals
 - Electronic Data (CD- or DVD-ROM Disc)
 - Subcontractor reports
 - Surveyor and Flight/Camera Calibration Reports (when flown)
 - Aerial photography (DVD-ROM discs – when flown)
- Document preparation, printing, and distribution

Task A – Deliverables

Annually, SAISSA shall receive:

- Six (6) hardcopies of the annual monitoring report,
- one set of DVD-ROM discs containing the digital aerial orthophotos (if flown),
- one CD-ROM disc containing a copy of the report in PDF format, the FDEP-formatted beach profile data (including borrow site and Nassau Sound if surveyed), and survey/flight control reports, with metadata.
- FDEP shall receive electronic copies of all deliverables and data.

Task B – Beach Profile Surveys

Task B - Description

“Topographic and bathymetric profile surveys of the beach and offshore shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project. Thereafter, monitoring surveys shall be conducted annually for a period of three (3) years, then biennially until the next beach nourishment event or the expiration of the project design life, whichever occurs first. The monitoring surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. If the time period between the immediate post-construction survey and the first annual monitoring survey is less than six months, then the Permittees may request a postponement of the first monitoring survey until the following spring/summer. The request should be submitted as part of the cover letter for the post-construction report. A prior design survey of the beach and offshore may be submitted for the pre-construction survey if consistent with the other requirements of this condition.

The monitoring area shall include profile surveys at each of the DEP reference monuments within the bounds of the beach fill area and along at least 5,000 feet of the adjacent shoreline, on both sides of the beach fill area. For those project areas that contain erosion control structures, such as groins or breakwaters, additional profile lines shall be surveyed at a sufficient number of intermediate locations to accurately identify patterns of erosion and accretion within this subarea. All work activities and deliverables shall be conducted in accordance with the latest update of the Bureau of Beaches and Coastal Systems (BBCS) Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100.”

Consistent with the approved Physical Monitoring Plan, as with all previous surveys, a certified hydrographic surveyor will conduct the beach and offshore project surveys for the Year-5 annual monitoring. ARC Surveying and Mapping, Inc., of Jacksonville, FL, shall conduct the surveys, under the direction of Mr. Rick Sawyer, PLS. These data shall be collected in accordance with the FDEP monitoring guidelines for collection of survey data

www.dep.state.fl.us/beaches/publications/pdf/standard.pdf .

Forty (40) beach and offshore profile lines, R-55 to R-82 (plus intermediate stations at tip of island), shall be surveyed and the data provided to the Engineer. Details of the survey plan and schedule can be found in the Physical Monitoring Plan.

Task B – Deliverables Surveyor shall provide electronic copies of the survey data in the prescribed datums to the Engineer for formatting and distribution to the Clients (SAISSA, FPS, FDEP). Surveyor shall likewise provide to Engineer four (4) signed and sealed hardcopies of the survey data, in either planview or beach profile section view format.

Surveyor and Engineer shall develop and submit those portions of the FDEP BBCS data submittal requirements that are the primary responsibility of the Surveyor, including copies of the field book pages from the survey, monument control, QA/QC, surveyor reports, etc. Engineer shall review and approve prior to submittal to FDEP.

Task C – Borrow Site and Nassau Sound Surveys

Task C – Description

"Bathymetric surveys of the borrow area shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project concurrently with the beach and offshore surveys required above. Thereafter, monitoring surveys of the borrow areas shall be at two (2) year intervals concurrently with the beach and offshore surveys required above [revised March 2011]. A prior design survey of the borrow area may be submitted for the pre-construction survey if consistent with the other requirements of this condition.

Survey grid lines across the borrow area(s) shall be spaced to provide sufficient detail for accurate volumetric calculations but spaced not more than a maximum of 500 feet apart, and shall extend a minimum of 500 feet beyond the boundaries of the borrow site. For borrow sites located in tidal inlet shoals, bathymetric surveys of the entire shoal complex, including any attachment bars, shall be conducted unless otherwise specified by the Department based upon the size of the shoal and the potential effects of the dredging on inlet processes. In all other aspects, work activities and deliverables shall be consistent with the BBCS Monitoring Standards for Beach Erosion Control Projects, Section 01200."

The Nassau Sound ebb shoal platform is also surveyed every three years (approx.) to document the conditions of the shoals in the unstabilized inlet and evaluate the condition of the shoals, the coastal structures on Amelia Island, and the position of the major natural channels through the inlet. Consistent with the Physical Monitoring Plan, as with all previous surveys, a certified hydrographic surveyor will conduct the borrow site survey and Nassau Sound ebb shoal complex survey for the required monitoring. ARC Surveying and Mapping, Inc., of Jacksonville, FL, shall conduct the survey, under the direction of Mr. Rick Sawyer, PLS. These data shall be collected in accordance with the FDEP monitoring guidelines for collection of survey data, as published in "*Monitoring Standards for Beach Erosion Control Projects*," (FDEP, October 2014)." At the time of the borrow site survey grab samples of the surface sediments shall be collected at four (4) locations and analyzed.

Task C – Deliverables Surveyor shall provide electronic copies of the survey data in the prescribed datums to the Engineer for formatting and distribution to the Clients (SAISSA, FPS, FDEP). Surveyor shall likewise provide to Engineer four (4) signed and sealed hardcopies of the survey.

Surveyor and Engineer shall develop and submit those portions of the FDEP data submittal requirements that are the primary responsibility of the Surveyor, including copies of the field book pages from the survey, monument control, QA/QC, surveyor reports, etc. Engineer shall review and approve these documents and any geotechnical analysis results prior to submittal to FDEP.

Task D – Digital Aerial Orthoimagery and Oblique Photography

Task D – Description

"Aerial photography of the beach shall be taken concurrently with the post-construction survey and each annual and biennial monitoring survey required above, as close to the date of the beach profile surveys as possible. The limits of the photography shall include the surveyed monitoring area as described above. All work activities and deliverables shall be conducted in accordance with the latest update of the BBCS Monitoring Standards for Beach Erosion Control Projects, Section 02000 – Aerial Photography Acquisition."

Consistent with the approved Physical Monitoring Plan, digital color aerial orthophotography shall be collected by a qualified subcontractor along the monitored shoreline and across Nassau Sound at or about the time of the annual/biennial beach profile surveys. These data shall be collected in accordance with the FDEP monitoring guidelines for collection of

survey data, as published in "*Monitoring Standards for Beach Erosion Control Projects*," (FDEP, October 2014)."

Digital aerial photography shall be collected biannually at strategic times to document any *potential changes in shoreline configuration, structure condition, and changes to the Nassau Sound ebb shoal system* (the "Bird Island Shoals").

Task D – Deliverables

Digital copies of the aerial orthoimagery shall be provided to the Owner group and the FDEP on DVD-ROM disc or flash drive in accordance with the Joint Coastal Permit. Hardcopy prints of the aerials can be provided at additional cost. Digital copies of the oblique aerial images shall be provided to the Owner group on CD-ROM or DVD-ROM disc and can be posted by the FL Division of Recreation and Parks for review by third parties.

Potential FDEP Cost-shared Tasks*
2016 Year-5 Post-Renourishment Physical Monitoring
South Amelia Island Shore Stabilization Project
JCP 0187721-010

January 2016

Task	Total Fee	Potential State Cost-Share* (39.21%)	Local Cost-Share (60.79%)
A. Analyses, Mgmt., Engineering, Report, and FDEP Documentation*	\$87,400.00	\$34,269.54	\$53,130.46
B. Beach Profile / MHWL** Survey	\$22,700.00	\$8,900.67	\$13,799.33
C. Borrow Site/Sound Survey			
C.1 Borrow Site	\$8,700.00	\$3,411.27	\$5,288.73
C.2 Nassau Sound***	\$26,600.00	--	\$26,600.00
D. Digital Orthoimagery	\$14,600.00	\$5,724.66	\$8,875.34
	\$160,000.00	\$52,306.14	\$107,693.86

*At this time, no funds were allotted by FDEP for Year-5 physical monitoring. Future applications to FDEP for these funds *MAY* be approved, assuming funds became available for reimbursement. Table reflects only the schedule of potential cost-sharing, to be submitted for consideration in future funding requests.

** MHWL survey for southern tip of island south of R-79.

***The Nassau Sound survey is no longer viewed by FDEP as a cost-share eligible item.

**South Amelia Island Shore Stabilization Project
Beach Renourishment**

**Physical Monitoring Plan w/
Structure Remediation Contingency**

Prepared for:

Nassau County Board of County Commissioners
&
South Amelia Shore Stabilization Association (SAISSA)
&
Florida DEP Division of Recreation and Parks (FL Park Service)

Prepared By:

Olsen Associates, Inc.
4438 Herschel St.
Jacksonville, FL 32210
904-387-6114

rev. 1 March 2011

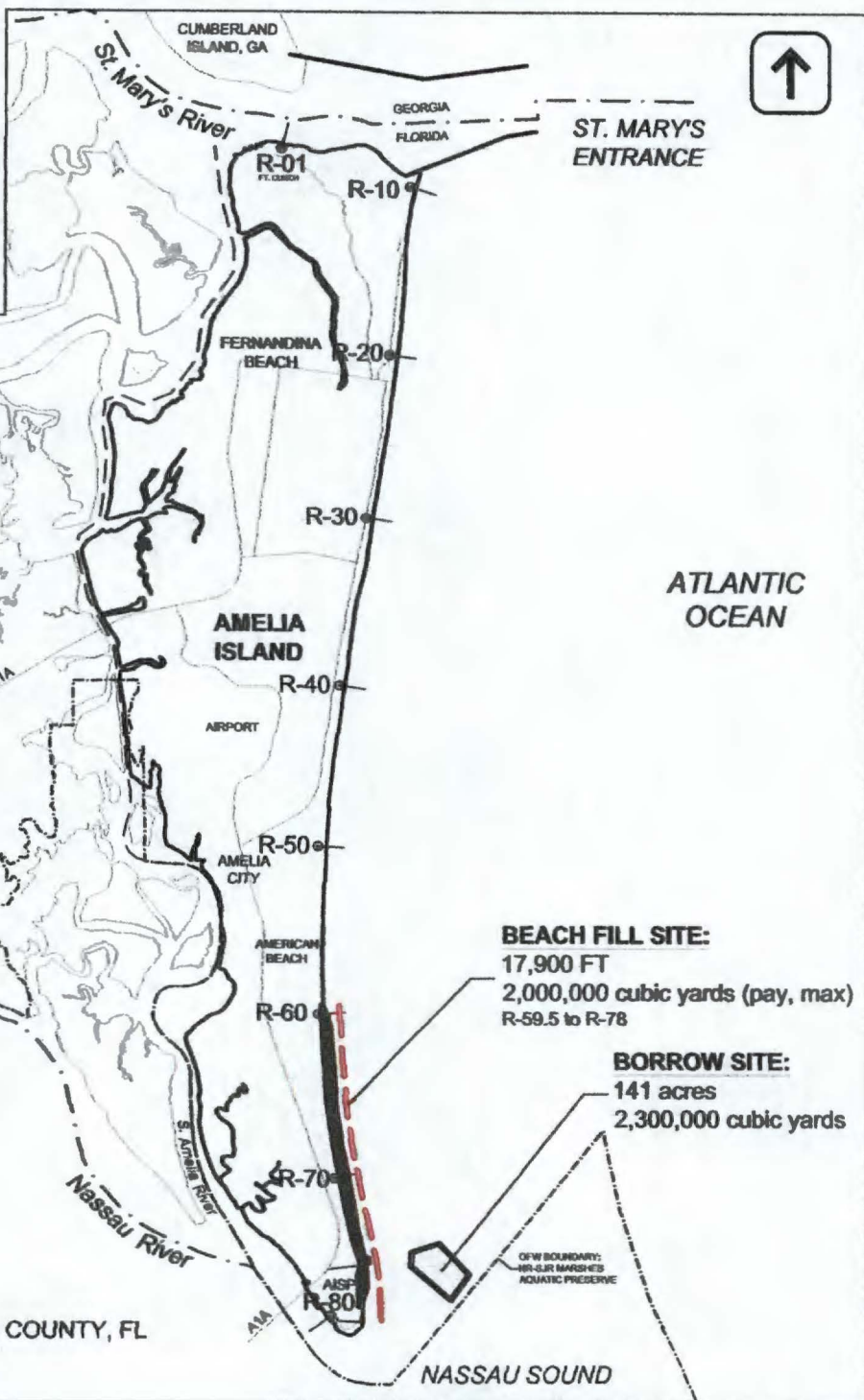
1.0 INTRODUCTION

The purpose of the present maintenance work for the South Amelia Island Shore Stabilization Project is to perform the routine renourishment of the Atlantic Ocean shoreline from R-59.5 southward to R-78, Nassau County, FL (Figure 1). The present project proposes the placement of up to approximately 2.0 million cubic yards (1,529,000 cubic meters) of beach quality sand along 17,900 ft (5.5 km) of the project shoreline from R-59.5 southward to R-78, approximately 900 ft north of the existing rock terminal groin. Work is proposed for Spring/Summer 2011. The project was last renourished in 2002, after which two rock structures were constructed along the project length. A third small rock groin was constructed just west of R-82, outside of the present project limits.

Sand for the renourishment project would be excavated from a 141-acre (57.1-hectare) borrow site located directly offshore of the project limits along the margin of the Nassau Sound ebb shoal. Ambient seabed elevations at the borrow site range from between -16.1 ft to -27.1 ft (-4.9m to -8.3m) NAVD88. The expected excavation depth ranges from between -29.2 to -35.2 ft (-8.9m to -10.7m) NAVD88. The borrow site contains approximately 2.23 million cubic yards (1.705M m³) of sand above the design excavation depth.

To document the performance and impacts of the project, this Physical Monitoring Plan has been prepared pursuant to Pursuant to Rule 62B-41.005(16), F.A.C. Further, the plan includes a remediation contingency plan for the rock breakwater installed in 2004, in the event the breakwater forms a tombolo and subsequently contributes to downdrift erosion.

NASSAU COUNTY, FL



BEACH FILL SITE:
 17,900 FT
 2,000,000 cubic yards (pay, max)
 R-59.5 to R-78

BORROW SITE:
 141 acres
 2,300,000 cubic yards

NOTES:

Sections: 1,8,38,39 Township: 1 North Range: 29 East
 Sections: 18,22 Township: 2 North Range: 28 East
 Latitude: 30° 32' 00" N Longitude: 81° 28' 17" W

Albert E. Browder, P.E. FL #57403

FOR PURPOSES OF PERMIT ONLY
 NOT FOR CONSTRUCTION



olsen
 associates, inc.
 2618 Herschel St.
 Jacksonville, FL 32204
 (904) 387-6114
 (FAX) 384-7368
 COA 00003491

**SOUTH AMELIA ISLAND
 SHORE STABILIZATION PROJECT
 BEACH RENOURISHMENT
 SITE LOCATION**

DATE:	APPR	REVISION	DATE:
23 Nov '08	AEB	DRAWN ONLY SHT IN TOP LEFT CORN.	08/03/2009
31 Mar '10	AEB	ADD SWELLING TO L.S. SHOW ACCESS AREAS	DRAWN BY: AEB
18 Jan '11	AEB	ADD CPW AREA FOR ADJUST CPW ENDRY.	SHEET 1 OF 13
21 Jan '11	AEB	ADJUST CPW ENDRY. RE-GAR MARSHES A.P.	

The physical monitoring plan is implemented by the FL Park Service, the Nassau County Board of County Commissioners, and the South Amelia Island Shore Stabilization Association (SAISSA) as part of the well-established ongoing Long Range Beach Management Plan for South Amelia Island. The project shoreline has been formally monitored since the early 1990's, prior to the initial beach restoration along the SAISSA properties north of Amelia Island State Park. This plan will be a component of the project permits: FDEP Joint Coastal Permit 00187721-010-JC and U.S. Army Corps of Engineers permit SAJ-2001-3870 (SP-PRJ). The physical monitoring plan proposed herein will provide spatially continuous survey coverage for 28,400 ft along the Nassau County Atlantic Ocean and Nassau Sound shoreline from the northern limit of survey at R-55 southward and westward to R-82 at the AIA bridge over the Sound. The physical monitoring plan consists of numerous elements that will seek to describe the performance of the proposed 2011 beach renourishment project and the existing rock stabilization structures. The purpose of the monitoring plan is to:

- meet the regulatory requirements of the permits issued for the proposed beach restoration projects (permit numbers noted above),
- evaluate the post-construction performance of the proposed beach fill project and borrow site, including the continuing performance of the rock breakwater constructed in 2004 near monument R-75.
- function as an important database for purposes of future beachfront development, planning or management activities,
- fulfill the requirements of FEMA with respect to disaster relief eligibility by maintaining the beach and documenting beach conditions prior to a major storm event, and
- provide design guidance for future beach maintenance activities along the South Amelia Island shoreline.

2.0 MONITORING PLAN ELEMENTS

The Monitoring Plan includes four basic elements:

- Comprehensive surveys of the beaches and borrow site by a qualified hydrographic surveyor,
- Vertical digital orthophotography and oblique photography,
- Analysis of annual beach changes and development of a cumulative comparative database, and
- Formulation of a detailed *Annual Report of Findings* for consideration by the FL Park Service, SAISSA, FDEP BBCS, other State and Federal agencies, and the general public.

2.1 Survey - Scope of Work

2.1.1 Beach Profiles - Throughout the continuous 28,400 ft of monitored shoreline, beach profiles will be surveyed on 1,000 ft intervals utilizing the existing FDEP R-monuments (R-55 to R-82). Additional intermediate profiles will be surveyed at 500-ft intervals along the southern portion of the project, beginning at R-73/AP-19 and extending to R-82. At R-79, additional profiles are surveyed at different azimuths to document the shoreline conditions of the sand spit south of the rock terminal groin. In total, 40 beach profiles are to be surveyed. This profile survey plan was instituted with the 2002 beach fill project. R-55 lies approximately 4,700 ft north of the northern limit of the project and 2,300 ft north of the Lewis St. beach access in American Beach. R-82 lies just east of the A1A bridge at the Amelia Island State Park main parking area. The FDEP BBCS standards for survey data collection for beach restoration projects shall be applied.

2.1.2 Beach profiles along the Atlantic Ocean shoreline shall extend a minimum of 3,000 ft offshore (from the MHWL at the time of survey) and shall extend to at least the -30 ft NAVD88 contour (or consistent survey closure depth, whichever is farther offshore). Profiles extending into Nassau Sound shall extend for at least 1,000 ft, unless truncated by an impassable shoal. In addition, a shoreline survey along the approximate MHWL shall be conducted from the south side of the rock terminal groin southward and westward beyond the A1A bridge to the small tidal creek west of the AISP restroom facility.

2.1.3 Beach profile surveys shall be conducted immediately before and after construction, and on an annual¹ post-construction basis throughout the life of the project, typically in the month of June (**Figure 2**). This will assure eligibility for post-storm disaster relief funds from FEMA for this non-federally funded project.

2.1.4 Post-Storm Survey Contingency – The County is advised that in the event of a major storm event, it will be necessary to perform a post-storm survey of the beaches for purposes of evaluating storm losses. The post-storm survey will be compared to the regularly-scheduled annual survey to complete the evaluation and apply to FEMA for reimbursement for project repairs. Historically, the post-storm survey is considered eligible for reimbursement cost-sharing by FEMA for post-disaster recovery.

2.1.5 Rock Breakwater – To characterize shoreline conditions in the lee of the breakwater, at the time of the annual monitoring surveys the rock breakwater shall be surveyed along six transect spacing of less than 100 ft between R-75 and AP-23 (R-75.5) from the dune line in the upland seaward to a point approximately 300 ft seaward of the rock structure. Two of the transects shall also pass immediately north and south of the structure. The six additional transects shall characterize the crest elevation of the rock breakwater, as well as the seabed elevations around the toe of the structure².

2.1.6 Borrow Site – The 141-acre project borrow site (as permitted and designed) shall be surveyed on the basis of transects spaced at 200 ft intervals. All transects shall extend beyond the borrow site limits into a survey buffer zone by a minimum of 500 ft. The borrow site will be surveyed before and after construction and on an approximate biennial schedule thereafter (Year 2, Year 5, Year 7, etc., see **Figure 2**).

2.2 Aerial Photography

2.2.1 Shoreline - Controlled digital color aerial orthophotography at approximately low tide shall be flown immediately subsequent to project construction -- as well as annually at the same approximate time of the annual/biennial beach surveys. The limits of photography shall begin at R-8, Duval County, on Little Talbot Island and shall extend northward beyond R-55, Nassau County, on Amelia Island. The photography shall also include the Nassau Sound shoreline from R-79 westward a distance of 1,000 ft west of the A1A bridge along the Amelia Island shoreline. Per FDEP BBCS specifications, digital orthophotos will be produced, corrected to the State Plane Coordinate System (NAD83, Florida East Zone).

¹ After the third year of monitoring, the FDEP Bureau of Beaches and Coastal Systems will not cost-share on annual surveys, only biennial surveys at years five, seven, nine, etc. The local sponsors plan to survey the beach profiles on the intervening years in order to maintain FEMA eligibility.

² Surveys of the terminal groin – substantially buried as of 1 March 2011 -- were not requested by FDEP BBCS (correspondence dated 4 September 2009 (RAI #1)).

2.2.2 Oblique Aerial Photography [not cost-shared by FDEP BBCS] – To continue to monitor the project shoreline response and the effects associated with the previously constructed rock structures within the project limits, low-altitude oblique aerial photography will be collected semi-annually. Digital copies of the images will be provided to the Owner group and can be posted by the FL Division of Recreation and Parks for review by third parties.

2.3 Geotechnical

Per the project Quality Assurance/Quality Control Plan, sand samples shall be collected along the nourished beach following construction. Sampling stations will include the landward and seaward limits of the dry beach berm and the beachface. Percentage fines and shell content will be estimated and a grain-size distribution curve formulated for each sample in accordance with applicable ASTM standards. Results of the analyses shall be included in the project post-construction report.

Within the borrow site, sand samples shall be obtained during the period of each biennial borrow site survey at four selected sampling stations utilizing a Ponar Grab. Each sand sample shall be appropriately analyzed and the results included in the annual report-of-findings.

2.4 Analyses

An annual engineering report shall be formulated to include graphic presentations of temporal and cumulative changes of selected beach contours over time. Volumetric changes at each survey profile and throughout the limits of fill shall be computed and presented in tabular and graphic forms. Changes over time within and adjacent to the constructed borrow site shall be quantified and discussed. Analyses shall discuss shoreline change trends, potential cause and effect relationships, building proximity (and vulnerability) to the MHWL, storm impacts and a local sediment budget for the area of interest. Any changes in the shoreline in the immediate vicinity of the rock breakwater will be analyzed and described in the report (reference Section 3.0). Borrow site recovery (shoaling) shall be similarly addressed.

Major report(s) of findings will be submitted annually approximately 90 days subsequent to the receipt of each completed major monitoring survey. The purpose of each report shall be to summarize the annual as well as cumulative data base, assess project performance, evaluate potential impacts, etc. The first report shall be the post-construction report (proposed for submittal in 2011).

2.5 Deliverables

After each annual or biennial monitoring effort, the consultant shall provide the Owner group with up to ten (10) bound copies of the Annual Report, paper and digital copies of the survey reporting required by FDEP, two (2) sets of 9" x 9" aerial photographs (each), and a digital copy of the aerial orthophotos (vertical and oblique). If desired, the consultant shall make an annual presentation of the monitoring results at a mutually convenient scheduled date. A copy of any digital presentation media can be transferred to the Owner group.

2.6 Plan Schedule

The overall Monitoring Plan Schedule for the first five years subsequent to construction is summarized by **Figure 2**. It is anticipated that monitoring will continue beyond the five years depicted on the same annual/biennial basis indicated by Years 4 and 5. The continued annual monitoring of the beach profiles will primarily serve to provide the necessary pre-storm data to satisfy FEMA post-storm damage eligibility criteria. The monitoring program is anticipated to continue to be a permanent component of the Long Range Beach Management Plan for the Owner group. It is noted that the longevity of the beach fill may be significantly affected by impacts from severe storms. The collection of beach monitoring data shall assist in the determination by the Owner group and FDEP for the need to initiate renourishment activities in the future.

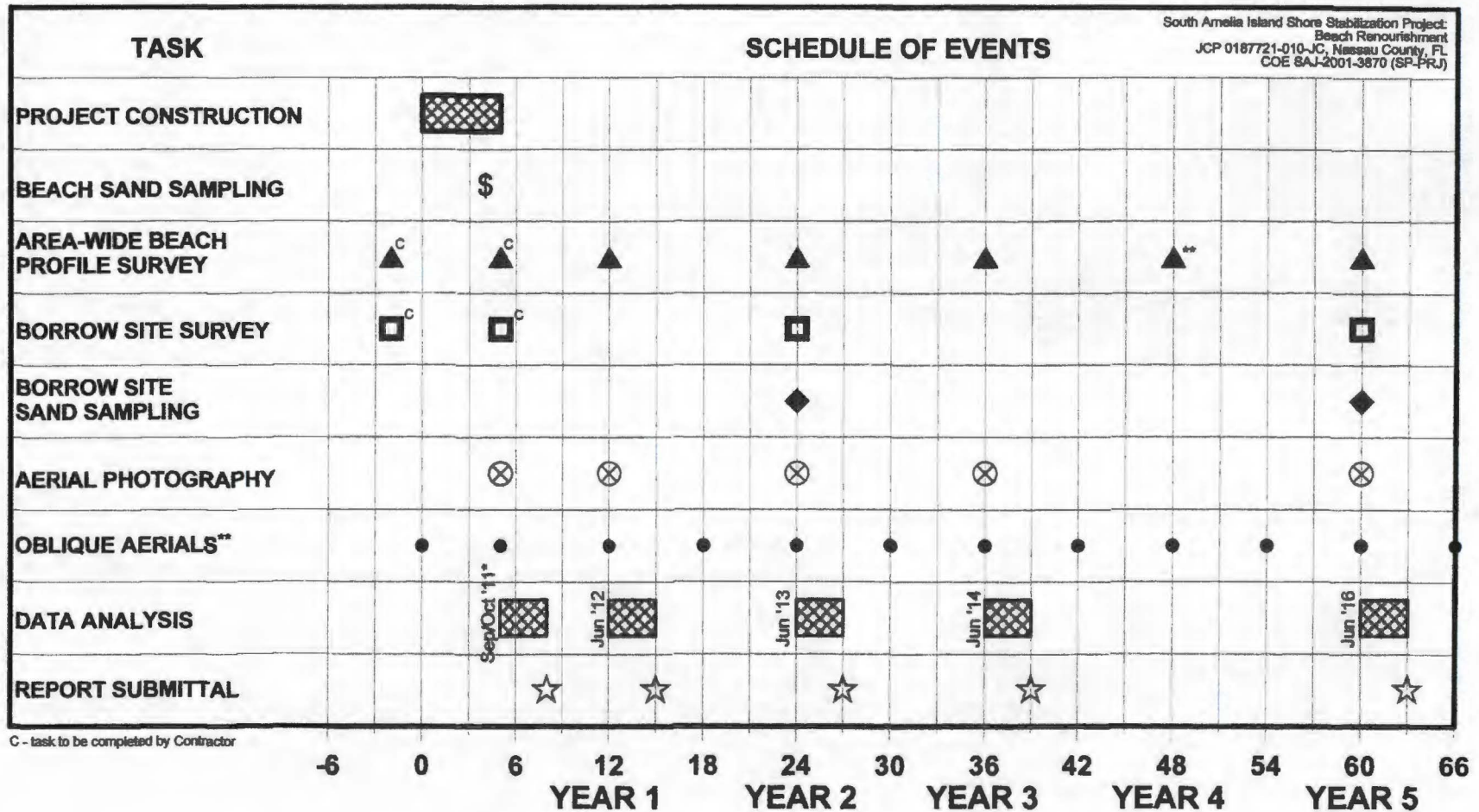


Figure 2 Schedule of monitoring events for the first five years following construction of the South Amelia Island Shore Stabilization Project : 2011 Beach Renourishment. Monitoring elements beyond the 5-yr mark follow the same annual/biennial pattern of years 4 and 5. Monitoring limits extend from R-55 north of Lewis Street in American Beach southward and westward to R-82 at the A1A bridge. Aerial photography shall extend southward across Nassau Sound to Little Talbot Island.
 *Schedule reflects construction in the Summer 2011 timeframe, such that the post-construction survey can be conducted in September/October 2011. Subsequent monitoring surveys will be held in the June pre-tropical storm season time frame (FEMA documentation).
 ** Items not cost-shared by FDEP BBBS

3.0 ROCK BREAKWATER REMEDIATION CONTINGENCY

Construction of the proposed renourishment project will contribute a significant volume of sand to the shorelines north and south of the existing nearshore rock breakwater, located just south of R-75. The rock breakwater is approximately 300 ft in length and was constructed approximately 300 ft from the pre-structure shoreline in 2004. The breakwater has been monitored via annual surveys and more frequent aerial photography to assess the degree to which the breakwater forms a sand salient in its lee and to guard against the formation of a long-lasting tombolo (a condition in which the shoreline in the lee grows seaward and permanently welds to the rock breakwater, thus blocking alongshore littoral flows) -- such that downdrift impacts are documented to occur sufficient to warrant remedial action.

As part of the permits for the installation of the rock breakwater, monitoring triggers were initially put in place to assess the need to take potential remediation actions to eliminate any major tombolos leeward of the breakwater. It is noted that the overall design condition is fairly "tombolo resistant," but does promote salient growth, as intended. Any dominant trend toward tombolo formation is anticipated to be unsuccessful because of (1) the high storm-related currents and large oblique wave angle that is prevalent at the site, and (2) the relatively low elevation of the breakwater crest (+2.5 to +4.0 ft NAVD88 datum, per July 2008 survey). The latter is intended to allow wave overtopping during higher-high tides, or during typical or moderate storms, i.e. nor'easters in the fall or winter months. This will promote southerly sand transport during these events -- which is the principal condition in which the majority of the southward sediment transport naturally occurs. It is likewise noted that the shoreline immediately south and landward of the breakwater lies along the hinge point of the island shoreline, near the northern point of divergence of the Nassau Sound ebb shoal. Consequently the shoreline has historically been highly erosive. While the breakwater has reduced erosion immediately in the lee of the structure and has partially stabilized the shoreline northward thereof, erosion along the Park shoreline south of the breakwater has continued throughout the post-construction period of the breakwater, without the persistent formation of a tombolo leeward of the breakwater. It is also clear that without the breakwater, the line of existing erosion would be in the maritime forest upland of the existing beach. Hence, any major modification of the structure is not an option.

3.1 Breakwater Remediation Triggers

Remediation triggers appropriate for modifying the rock breakwater will be principally based upon shoreline conditions downdrift of the structure. The shoreline of interest would be the Atlantic facing shorefront immediately south of the structure (i.e. R-75.5 -- R-77).

Remedial action at or adjacent to the breakwater will be required if the breakwater creates a persistent and impactful shoreline-attached tombolo landward of the structure and, in consultation with the Bureau of Beaches and Coastal Systems and the FL Park Service, it is mutually agreed that the breakwater/tombolo are creating a severe downdrift impact. The decision by the group to remediate any adverse impacts of the breakwater would be aided by the available monitoring data, with emphasis on the continued performance of the apparent beach width (above the +7 ft NAVD88 contour). Data have been collected for this purpose since 2004, and monitoring will continue post-renourishment (see Section 2.0). Remedial actions must be weighed in the context of the resultant threat of inundation of the adjacent maritime forest.

3.2 Remediation Actions

As described in Section 2.0, above, the breakwater and the adjacent shoreline will be surveyed annually, and aerial photography of the site will be collected semi-annually (oblique and/or controlled photography). In the event that a significant (and consistent) tombolo forms behind the breakwater structure, there are two (2) remedial actions which will be pursued either independently or together:

- A) The tombolo itself may be excavated, with the resultant sand strategically placed to the downdrift side of the structure (i.e. to the south). This activity will utilize conventional land based equipment (i.e. dozer, truck, backhoe, etc) and/or
- B) Assuming persistent attachment of the structure to the beach via tombolo, rock may be removed from the structure crest by land based equipment sufficient to reduce the effective crest elevation. This will allow for more frequent wave overtopping and eventual tombolo erosion. Any stone removed will be placed along the perimeter toe of the structure within the original footprint.

As with the proposed remediation potentially considered for improving the permeability of the terminal structure, the amount of equipment necessary to “break” the tombolo or modify the breakwater elevation is modest. Moreover, the activity would be confined to the vicinity of the breakwater lee. Mobilization of equipment to the site would be through narrow access corridors which parallel the upland dune. All work would be performed out of turtle or tern nesting season, if at all possible. If not, Mark and Avoid conditions would dictate equipment movement and access. No work would occur at night. The duration of the activity should not exceed a week.