

PHYSICAL MONITORING PLAN
Charlotte County 10-Year Beach and Inlet Management Plan
CEC File No. 12.001
September 17, 2014

PROJECT DESCRIPTION

Charlotte County proposes a 10-year beach and inlet management plan for the Charlotte County Erosion Control Project. Elements of the Plan include:

- Beach nourishment of Updrift, North, and South beach fills;
- Addition of an erosion control structure (terminal groin) on Manasota Key;
- Utilization of the historical borrow area (inlet) as sand source;
- Utilization of new offshore borrow areas as sand sources;
- Inlet maintenance dredging;
- Adaptive management plan (AMP) activities as authorized in the permit.

INTRODUCTION

Physical monitoring of the Project is required through acquisition of Project-specific data to include, at a minimum, topographic and bathymetric surveys of the beach, offshore, and borrow site areas, aerial photography, and engineering analysis. The monitoring data is necessary in order for both Charlotte County and the Florida Department of Environmental Protection (Department) to regularly observe and assess, with quantitative measurements, the performance of the Project, any adverse effects which have occurred, and the need for any adjustments, modifications, or mitigative response to the Project. The scientific monitoring process also provides the County and the Department information necessary to plan, design, and optimize subsequent follow-up projects, potentially reducing the need for and costs of unnecessary work, as well as potentially reducing any environmental impacts that may have occurred or be expected.

Collection and analyses of the information outlined in this Monitoring Plan will accomplish the following specific objectives:

- 1) Identify erosion and accretion patterns (shoreline and volumetric changes) within the Project;
- 2) Provide data to facilitate an engineering evaluation of the beach renourishment performance;
- 3) Provide data to facilitate an engineering evaluation of the performance of the erosion control structure;
- 4) Identify beach segments that have been eroded in quantities that may require corrective actions and the need for any adjustment, modifications, or mitigation of unexpected adverse effects; and
- 5) Identify ebb and flood shoal changes and navigation channel shoaling and migration.

This Physical Monitoring Plan can be revised at any later time by written request of the County and with the written approval of the Department. For all subsequent inlet dredging or beach nourishment projects following the initial project to be performed under this permit, the Monitoring Plan shall be extended to include the same monitoring components, and monitoring cycle for the beaches and affected borrow site(s) as specified herein. This shall specifically include both pre- and post- construction surveys for each inlet dredging or beach nourishment construction event.

MONITORING PLAN COMPONENTS

The Monitoring Plan shall contain the following components.

a. 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 or inlet dredging event. 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 permittee may request a postponement of the first monitoring survey until the following spring/summer. 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 Department's reference monuments R-8 through R-47 and twelve (12) additional lines near the inlet. The profile alignments shall be identical to the azimuths previously established for each monument. All R-monument beach profiles shall extend seaward 3,000 feet from the Mean High Water (MHW) or to a depth of -30 feet NAVD88, whichever is less, with the exception of R-22 to R-28 which shall be 5,000 feet from MHW to cover the shoal. The beach profile survey control map is presented in Figure 1. All work activities and deliverables shall be conducted in accordance with the latest update of the Department's Monitoring Standards for Beach Erosion Control Projects.

b. Bathymetric surveys of the borrow areas utilized for the Project, e.g. offshore borrow areas A and B, Stump Pass Navigation Channel borrow area, and supplemental 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. Monitoring surveys of the Stump Pass Navigation Channel borrow area shall be conducted annually for a period of three (3) years, then biennially until the next beach nourishment or inlet dredging event. A prior design survey of the borrow areas may be submitted for the pre-construction survey if consistent with the other requirements of this

condition. Monitoring surveys of the offshore borrow areas are not required.

Bathymetric surveys of the offshore and supplemental borrow areas shall be conducted at 200 foot intervals. Bathymetric surveys of the Stump Pass Navigation Channel borrow area shall be conducted along each cross-section at 100 foot intervals and three longitudinal profiles, along the centerline and at 150 foot offsets to either side. The northern and southern limits of the Stump Pass Navigation Channel borrow area shall extend approximately 600 feet beyond the permitted template, or to the limits of the ebb and flood shoals, whichever is greater. In all other aspects, work activities and deliverables shall be consistent with the latest update of the Department's Monitoring Standards for Beach Erosion Control Projects.

c. 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, and during approximate low water tide on that date. The limits of the photography shall include the surveyed monitoring area from the Department's reference monuments R-8 through R-47. The photography shall be color vertical photos with a 30% forward overlap, taken from an elevation of 3,000 feet (1:6,000 negative scale) and centered on the local shoreline. A digital scan of the color photos at a rate of 21 microns with a pixel size of 0.4 feet shall be made and submitted in TIF format (uncompressed) on CD or DVD.

d. Hydraulic Monitoring shall be conducted to provide input to empirical or numerical models for analysis of Project performance and comparisons to design objectives. The monitoring shall be taken concurrently with the post construction survey, and with the year 1, 3 and 5 monitoring surveys required above. The monitoring shall include measuring the tidal amplitudes on Lemon Bay and the Gulf of Mexico and measuring the current velocities in the channel throat for a full spring tidal cycle. The channel throat cross-section, depth and length shall be measured in the field as part of the monitoring. Three (3) channel sections shall be monitored to help bracket the throat recognizing it may not be obvious where the critical section is.

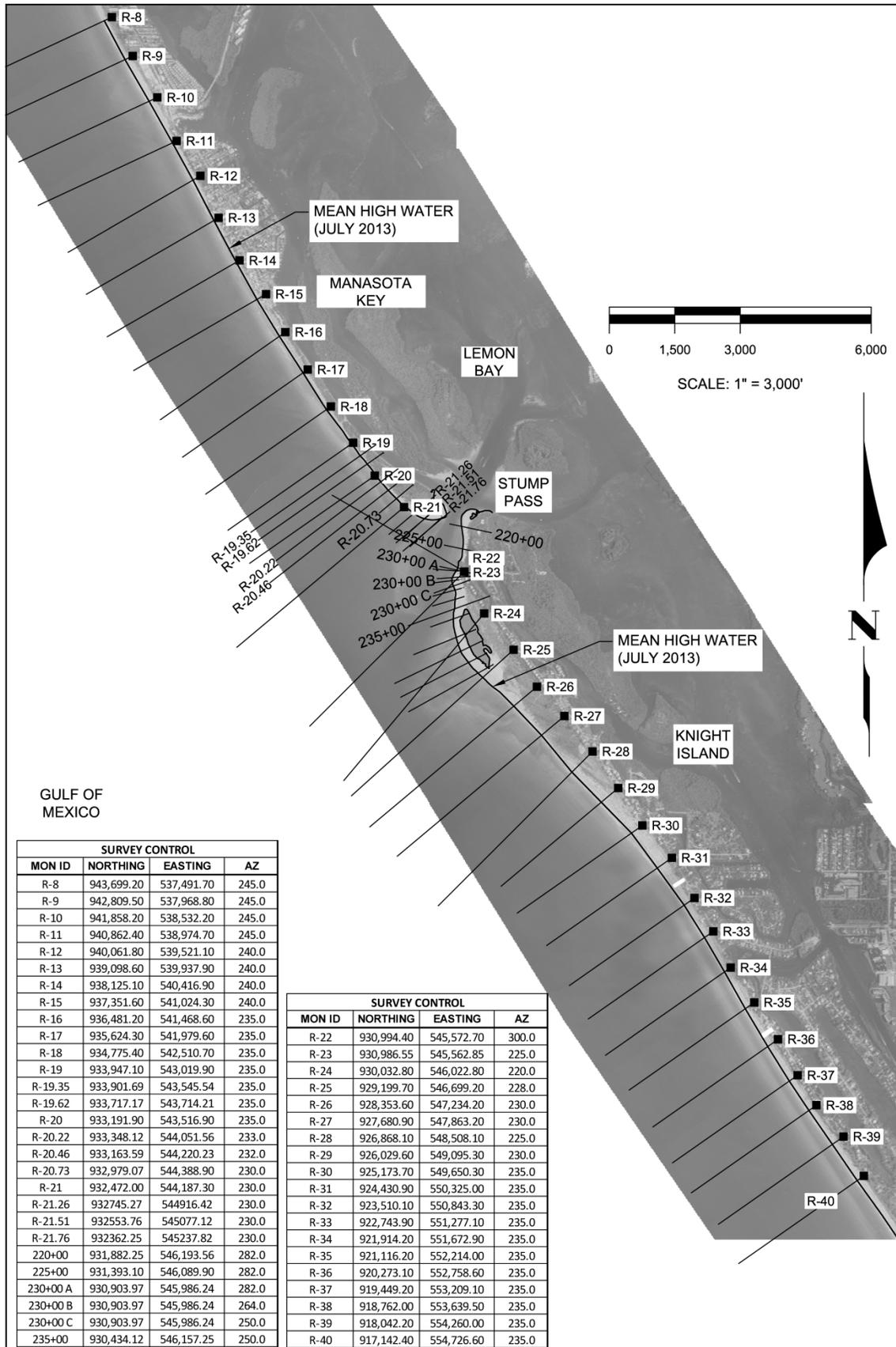


Figure 1. Survey Control Map.

REPORTING

The permittee shall submit an engineering report and the monitoring data to the Department within 90 days following completion of the post-construction and 1-year, 2-year, 3-year, and 5-year monitoring surveys. The report shall include a comparative review of Project performance versus performance expectations and identification of any adverse impacts attributable to the Project.

Monitoring reports will be written following each survey, commencing with the 12-month post-construction survey. The report shall summarize and discuss the data and analyses conducted each year for the 1-year, 2-year, 3-year, and 5-year post-construction time period. In general, each monitoring report will include:

- **Beach and Offshore Profile Surveys:**
 - signed and sealed survey,
 - analysis for patterns, trends, or changes between surveys and for cumulative changes over time since project construction,
 - positions of the most recent MHW shoreline in comparison with the design profile at each individual monument location (tables and graphic illustrations),
 - MHW shoreline changes relative to the pre-construction survey at each individual monument location for all monitoring periods (tables and graphic illustrations),
 - evaluation of the volume and percentage of advance nourishment lost since the last beach nourishment project as measured landward of the MHW of the most recent survey,
 - evaluation of the erosion and accretion rates occurring between the initial post-construction survey and the monitoring surveys, and an assessment of the volume of fill remaining within the Project area (tables and graphic illustrations),
 - evaluation of the adjustment of the beach fill and volume accumulations outside of the Project area, and an assessment of alongshore and cross-shore fill movement (tables and graphic illustrations),
 - evaluation of the total measured remaining volume in comparison with the total predicted remaining volume on an average annual basis based on nourishment cycle
- **Bathymetric Surveys of the Borrow Area:** The borrow area and channel surveys (signed and sealed) shall be analyzed and compared to the post-construction conditions to determine the infilling rate, if any, of the borrow area, and to quantify channel migration and shoal changes within the inlet system.
- **Hydraulic Monitoring Data:** The hydraulic monitoring data collected during each survey shall be compared with the historical data as well as the predicted coastal assessments model results to evaluate:
 - a. if the maximum velocity increases as predicted by the model over the 1999 condition and is comparable to 1983 condition;
 - b. if the tidal range in Lemon Bay increases substantially over the 1999 condition and is comparable to the 1983 condition; and
 - c. if the tidal prism increases substantially over 1999 condition and is comparable

to the 1983 condition.

Cross-sectional plots of surveyed and historical channel throat profiles and plan view plots of their locations shall also be included.

- **Sediment Budget:** The monitoring data shall be used to update the sediment budget (graphic illustration).
- **Appendices:** The report appendices shall include:
 - aerial photographs,
 - two (2) most recent monitoring survey profile lines along beach profiles and across the borrow area(s) superimposed over the design profile and pre- and post-construction beach profiles at each individual monument location,
 - surveyor's report.

Monitoring reports and data shall be submitted to the Department electronically.

MONITORING SUMMARY

Table 1 summarizes the proposed schedule for physical monitoring of the Project.

Table 1 - Monitoring Schedule for the South Marco Island Renourishment Project

Monitoring Requirement	Pre-Con	Post-Construction				
		Immediate (60 days)	1-Yr	2-Yr	3-Yr	5-Yr
Beach and Offshore Profiles	X	X	X	X	X	X
Bathymetric Surveys of Offshore Borrow Areas	X	X				
Bathymetric Surveys of Stump Pass Navigation Channel Borrow Area	X	X	X	X	X	X
Bathymetric Surveys of Supplemental Borrow Area [†]	X	X				
Aerial Photography		X	X	X	X	X
Hydraulic Monitoring		X	X		X	X
Monitoring Reports		X	X	X	X	X

[†] only if utilized