



APPROVED

Ft. Pierce QA/QC Plan
Permit #: **0269646-001-JC**
Approval: **December 29, 2006**

Bureau of Beaches and Coastal Systems

**Ft. Pierce Shore Protection Project
2007 Beach Renourishment
Sand Quality Control and Quality Assurance Plan**

A. Introduction and Background

The 2007 beach renourishment of the Ft. Pierce Shore Protection Project will place approximately 500,000 cubic yards of sand along 1.3 miles of beach between FDEP reference monuments R-34 and R-41 in St. Lucie County. A hopper dredge will be used for the dredge and fill operations. The purpose of the Sand Quality Control (QC) and Quality Assurance (QA) Plan, required by paragraph 62B-41.008 (1) (k) (4b) FAC, is to ensure that the sediment from the permitted borrow area will meet the standards outlined in the permit. In-depth geotechnical investigations for the project have verified that the sediment located within the spatial limits of the permitted borrow area meets the requirements stated in paragraph 62B-41.007 (2) (j). The QC Plan for the subject project will outline requirements placed on the Contractor to ensure that all work occurs within the horizontal and vertical limits of the permitted borrow area and that the Contractor takes appropriate remedial actions for unsuitable material, if necessary. The Quality Assurance Plan outlines the steps taken by the permittee (St. Lucie County) and the United States Army Corps of Engineers (USACE) to observe, sample, and test the placed sediments to assure compliance with the permit. These plans are described below.

B. Quality Control Plan

The following technical requirements address the location of dredging, sediment quality monitoring on the beach, and remedial actions if necessary. The County and USACE will enforce these contract requirements during the prosecution of work.

1. Electronic Positioning and Dredge Depth Monitoring Equipment. The Contractor shall continuously operate Dredgepack or similar electronic positioning equipment approved by the USACE to monitor the precise positioning of the excavation device location(s) and depth(s). A Differential Global Positioning System (DGPS) or equivalent shall be used to determine the horizontal position and shall be interfaced with an appropriate depth measuring device to determine the vertical position of the bottom of the excavation device. The horizontal positioning equipment shall maintain an accuracy of +/-3 feet. The vertical positioning equipment shall maintain a vertical accuracy of +/-0.1 feet with continuous applicable tidal corrections measured by the Contractor at the project site.
2. Dredge Location Control. The Contractor is required to have, in continuous operation on the dredge, electronic positioning equipment that will accurately compute and plot the position of the dredge. Such fixes and the accompanying plots shall be furnished to the USACE daily as part of the Quality Control Reports. The electronic positioning equipment shall be installed on the dredge so as to monitor, as closely as possible, the actual location of the excavation device(s). The location of the master antenna on the dredge and the distance and direction from the master antenna to the bottom of the excavation device shall be reported on the Daily Reports. A printout of the excavation device positions in State Plane coordinates and the excavation device depths corrected for tide elevation and referenced to NGVD and time shall be maintained using an interval of 5 minutes for each printed fix. A printed and computer file (in ASCII format) copy of the position data shall be provided to the USACE as part of the daily report. The Contractor shall prepare a plot of the data that includes the State Plane Coordinate grid system and

the borrow area limits. The format of the plot shall be subject to approval by the USACE. No dredging shall take place outside of the borrow area limits (horizontal and vertical limits) as shown on the drawings.

3. Contingency Plan. The Contractor shall be responsible for establishing such control as may be necessary to insure that the allowable excavation depths and spatial limits are not exceeded. If the Contractor encounters unacceptable materials during dredging, the Contractor shall immediately cease dredging and verbally notify the USACE of the time, location, and source of the unsatisfactory material. The Contractor shall also report, in the Quality Control Report, any encounters with trash, rock, rubble, silt, or debris and provide the location in State Plane Coordinates of the area of said materials. The USACE shall use the dredge positioning records, plans, and vibracore descriptions to determine the area containing unacceptable materials and will instruct the Contractor to adjust his or her construction operation to avoid the unacceptable material. The Contractor shall visually monitor the material being placed on the beach. This includes materials such as rock ($d > \frac{3}{4}$ "), debris, and very silty materials (i.e. silt content $> 5\%$). If occasional debris, trash, rocks ($d > \frac{3}{4}$ "), or silty materials (i.e.: 5% silt) appear on the beach during dredging operations, the Contractor shall remove them.
4. Other Excavation Requirements. The Contractor shall excavate within the borrow areas in a uniform and continuous manner. If directed by the USACE, the Contractor shall change the location and/or depth of excavation with the borrow limits.
5. Vibracore Logs and Grain Size Data. The Contractor will be provided all descriptions of sediment vibracore borings collected within the borrow site and will assert that he is aware of the quality of the sediment as described in the sediment vibracore logs. These logs and grain size data will be presented in the construction specifications.
6. Contractor's QC Plan. The contract documents require the Contractor to produce and follow a quality control plan that is reviewed by the County and USACE prior to the pre-construction conference. The plan covers all of the Contractor's operations including dredging and sand placement. The plan is the Contractor's means and methods of assuring himself that the work is in conformance with the plans, specifications, and permits. Results of the Contractor's efforts will be recorded in his daily quality control report.
7. Beach Fill Elevations. The Contractor will place all fill in the beach fill area in accordance with the Plans, specifications, and permit conditions. The Contractor will provide as-built surveys of the constructed beach.

C. Quality Assurance Plan

The County and USACE will seek to enforce the construction contract and FDEP permits related to sediment quality and quantity. In order to do so, the following steps will followed:

1. The USACE will perform construction observation to reasonably assure that the Contractor's work will be in conformance with the required contract and permit conditions. Construction observation and contract administration will be performed 7 days a week, 24 hours a day. Daily reports will describe the sediment placed from each hopper dredge load.

2. The USACE shall provide onsite observation by an individual with training or experience in beach nourishment and construction inspection and testing and knowledgeable of the project design and permit conditions.
3. The project Quality Control Plan to be implemented by the Contractor shall be discussed as a matter of importance at the pre-construction meeting. The Contractor shall be required to acknowledge the goals and intent of the above described QC Plan in writing prior to the issuance of a Notice to Proceed.
4. The USACE will review the Contractor's daily reports which characterize the nature of the sediments encountered at the borrow area and placed along the project shoreline with specific reference to moist sand color and the occurrence of rock, rubble, shell, silt or debris that exceeds acceptable limits. The daily reports must characterize the sediment placed from each hopper dredge load.
5. Any addendum or change order to the Contract between the USACE, County, and the Contractor shall determine whether or not the change in scope will potentially affect the above described QC Plan.
6. To assure that the fill material placed on the beach is in compliance with the permit, the USACE shall conduct assessments of the sediment as follows:
 - a. The USACE will collect grab sediment samples from each hopper dredge load of dredged material placed on the beach to visually assess grain size, moist Munsell color, shell content, and silt content. The hopper loads will vary in volume from approximately 2,000 – 6,000 cubic yards. Each sample will be archived with the date, time, and location of the sample. The sample will be visually compared to the acceptable sand criteria provided in Table 1. If determined necessary by the USACE, quantitative assessments of the sand will be conducted for grain size, shell content, and moist Munsell color. A record of each sand evaluation will be provided within the USACE's daily inspection reports, which shall be made available to FDEP upon request. All samples will be stored until project completion.
 - b. If the USACE determines that the grain size, moist Munsell color, shell content, and silt content do not comply with the quality requirements outlined in the Quality Control Plan, the USACE will immediately instruct the Contractor to cease material excavation operations and take whatever actions necessary to avoid further discharge of unsuitable material. The USACE shall use the dredge positioning records, plans, and vibracore descriptions to determine the area containing unacceptable materials and will instruct the Contractor to adjust his or her construction operation to avoid the unacceptable material. The USACE shall determine if remediation is necessary. Remediation efforts may include beach tilling or blending of unacceptable beach fill material with adjacent material or moving the unacceptable material seaward of the mean high water line. Additional sediment testing shall be conducted following any remediation effort. The USACE shall immediately notify FDEP of any remediation efforts and report the sediment inspection results. The USACE may consult FDEP when necessary.
 - c. Upon completion of an acceptance section of constructed beach, the USACE will collect a representative sand sample and replicate sample at each FDEP beach profile line to quantitatively assess the grain size distribution, moist Munsell color, shell

content, and silt content for compliance. The samples shall be collected approximately 12 inches below the surface within the limits of the constructed berm. The USACE shall note the existence of any layering or rocks while collecting the sample. Each sand sample shall be mixed in a container (e.g., bucket or similar) to a homogeneous consistency. One replicate sample (a minimum of one half pound sample) shall be collected at each sampling location. One of the sediment samples collected shall be sent for laboratory analysis while the other sample shall be archived. All samples and laboratory test results shall be labeled with the Project name, FDEP Monument Profile Line designation, State Plane (X,Y) coordinate location, date of obtaining the sample, and "Construction Berm Sample." All laboratory testing shall be performed by a Certified Testing Laboratory. All samples shall be sieved in accordance with the applicable sections of ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), ASTM D1140 (Standard Test Method for Amount of Material in Soils Finer than No. 200 Sieve), and ASTM D2487 (Classification of Soils for Engineering Purposes). The samples shall be sieved using the following U.S. Standard Sieve Numbers: 3/4", 5/8", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, and 230. The results shall be tabulated and each parameter averaged to keep a running total average. Each sample results shall state whether the sample MEETS or FAILED the DEP Sand Rule requirement. The County will submit sediment testing results to the FDEP following beach construction. In the unlikely event that a section of beach contains sediment that is not in compliance with the permit, then the FDEP will be notified. Notification will indicate the volume, aerial extent and location of any unacceptable beach areas and remediation planned. Additional testing may be required to delineate the area of unacceptable material. The results of any remediation will be reported to FDEP following construction. Remediation efforts, subject to approval by the FDEP, may include beach tilling or blending of unacceptable beach fill material with adjacent material or moving the unacceptable material seaward of the mean high water line. Additional sediment testing shall be conducted following any remediation effort.

7. The USACE will review the Contractor's as-built surveys to verify that the elevations of the constructed beach adhere to the requirements of the Plans and specifications.

D. Sand Criteria

The native beach and borrow area are characterized by fine to medium quartz sand. Table 1 summarizes the native beach characteristics and the expected borrow area characteristics, determined from sieve analysis and visual inspection of sand samples. The borrow area characteristics describe a composite of samples from 41 core borings, and the native beach characteristics describe a composite of samples from the dune, berm, intertidal zone, and -10 ft NGVD. Materials which differ from the specifications provided in Table 1 will be considered unacceptable materials. Unacceptable materials also include debris, trash, and rocks or rubble larger than three-fourths (3/4) inch in diameter. Note that silt is defined as any material finer than 0.063 mm (Sieve No. 230)

Table 1 Sediment Characteristics

Sediment Parameter		Borrow Area Acceptable Material Limits
Silt Content	0 – 3%	0 – 5%
Shell Content	0 – 60%	0 – 60%
Mean Grain Size	0.35 – 0.48 mm	0.35 – 0.66 mm
Allowable Moist Munsell Color	5Y 5/4 or lighter	2.5Y 4/2 or lighter