



APPROVED

Sediment QA/QC Plan
Permit #: **0262913-001-JC**
Approval: **September 7, 2007**

Bureau of Beaches and Coastal Systems

**U.S. Army Corps of Engineers Jacksonville District
Sediment Quality Control/Quality Assurance Plan
For
Maintenance Dredging with Beach Placement**

Name of Project: Maintenance Dredging AIWW Vicinity Jupiter Inlet

DEP Permit No. 0262913-001-JC, Palm Beach County

Date: September 7, 2007

A. Purpose and Objectives

The Maintenance Dredging of the Intracoastal Waterway, Vicinity of Jupiter Inlet project will place an estimate 160,000 cubic yards of sand from Cuts P1 to P4 along approximately 5,500 feet of beach between FDEP reference monuments R-13 and R-19. A cutterhead/pipeline dredge will most likely be used for the dredge and fill operations. The maximum design excavation depth of the channel dredging varies from 12 feet to 16 feet (mean low water datum), including all advance maintenance, as shown in the project drawings.

AREA	REQUIRED DEPTH (FT)	ALLOWABLE OVERDEPTH (FT)	MAXIMUM PAY DEPTH (FT)
CUT P-1	11	1	12
CUT P-2	11	1	12
CUT P-3	15	1	16
CUT P-4	15	1	16
SETTLING BASIN RANGE 125-250	15	1	16
SETTLING BASIN RANGE 250-450	11	1	12

Depths in table are based on Mean Low Water Datum

The purpose of the Sediment Quality Control (QC) and Quality Assurance (QA) Plan, required by paragraph 62B-41.008 (1) (k) (4b) F.A.C., is to ensure that the sediment from the permitted channel cut(s) will meet the standards contained in the permit. Geotechnical investigations and/or historical data for the project have indicated that the sediment located within the spatial limits of the permitted channel cut(s) meets State requirements in paragraph 62B-41.007 (2) (j).

The QC provisions of the Plan reiterate the contract requirements placed on the selected contractor to perform all work within the horizontal and vertical limits of the permitted channel cut(s), to promptly modify dredging activity should sediments unsuitable for beach placement be encountered, and to take remedial actions should unsuitable material be placed on the beach. Sediment quality specifications are provided for the dredged material within a range of acceptable sand quality values which must be met for final acceptance. The sediment quality specifications take into account the variability of material within the channel and represent values which may reasonably be attained given what is known about the dredge material. The

QA provisions of the Plan outline the steps taken by the USACE Contracting Officer's Representative to observe, sample and test the placed sediments to ensure compliance with the permit. In addition, reporting requirements are provided.

1. Existing Beach Material

The existing beach consists of placement materials from several sources including routine previous maintenance dredging in the project channel. Beach sediments were sampled in June 2006 at the approximate FDEP monuments R-14.5, R-16.5, and R-18. The existing beach materials consisted of poorly graded fine quartz sand with about 15% of visual sand-sized shell fragments. The median size of the sand ranges from 0.35 to 0.4 mm.

2. Navigation Maintenance Dredged Material

Based on 15 historical boring logs and the grab samples collected from the project channel in June 2006, the materials within the dredging depth consist of poorly graded, fine to medium quartz sand with less than 10% of silt. The content of visual shell fragments ranges from 1% to 33%, and the size of shell fragments ranges from sand-sized to fine gravel-sized. No rock was encountered. Occasionally, large sized (3/4") whole shell or shell fragments were encountered.

3. Risk Management

This section outlines the responsibilities of Contractor and the USACE as they relate to the placement of dredged material on the beach. These responsibilities are in response to the acknowledged risk that non-beach compatible sediments may exist within the channel and could be unintentionally placed on the beach.

The USACE has performed geotechnical investigations to the standard of care in the industry and has relied on the linear nature of sedimentary deposits, and a limited number of samples to design the channel cuts. The USACE has the personnel and access to testing facilities to sample and test sediment that has been placed on the beach.

The USACE will be directing that the work be done and has relied on its findings, which are based on remote sensing and limited vibracores, in authorizing the project to go to construction. The USACE has experience with these types of projects, and has the authority to modify the project within the constraints of the permits, and within the constraints of available funding, if non-beach compatible sediments are placed on the beach.

The Contractor will be undertaking the work and will be relying on the USACE's findings in constructing the project. The Contractor will have on-site personnel who can identify obvious changes in sediment quality at the active placement location. The Contractor has or can acquire, the equipment and personnel to remediate the beach if so directed or required by the USACE. Based on the above discussion the Corps proposes this project to be of low risk.

Additionally beach placement of this material has been requested by the local sponsor and the DEP through the most recent DEP Inlet Management Plan (or other).

B. Sediment Quality Specifications

The sediment specifications and guidelines for the channel area material are provided in Table 1. The composite values for the overall placed material should approach the mean values presented for each channel area. Individual material samples will likely vary from these values. The values provided in Table 1 represent the acceptable range of values for placed material that must be met for acceptance of each representative sample and fill section. The specifications proposed take into account the natural variability observed within the channel areas as determined using the existing core database. In these specifications, silt is defined as any material passing the #230 sieve. Materials which fall outside of these ranges will be considered unacceptable materials. Unacceptable materials also include debris, trash, and rocks or rubble larger than three-fourths (3/4) inch in diameter which exceed the natural occurrence of rock or shell on the beach.

Deviations from the specifications are acceptable provided that the spatial extent of the deviations does not exceed 10,000 continuous square feet.

Table 1- Sediment Quality Specifications for Channel Area Material

Sediment Parameter	Compliance Value
Max. Silt Content	10%
Mean Grain Size Range	0.2 mm to 0.35 mm
Allowable shell content	Less than 20%
Sand Color (Moist Munsell)	5 or lighter (10YR)
Maximum Carbonate Content	30%

C. Quality Control Plan.

The contract documents incorporate the following technical requirements, or equivalent language, that address the control of dredging location, sediment quality monitoring and reporting, modification of dredging activity, and remedial actions if necessary. The USACE will seek to enforce these contract requirements during the execution of work.

1. Electronic Positioning and Dredge Depth Monitoring Equipment. The Contractor will continuously operate electronic positioning equipment, approved by the USACE, to monitor the precise positioning of the dredge location(s). A Differential Global Positioning System (DGPS) or equivalent will be used to determine the horizontal position. The horizontal positioning equipment will maintain an accuracy of +/-10 feet. The vertical positioning equipment will maintain a static accuracy of +/-0.5 feet.

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. Tidal corrections should be calculated and applied on continual basis. A printout of the

dredge location in State Plane coordinates, the excavation device depth corrected for tide elevation and referenced to NGVD (or other established datum) and time, shall be maintained using an interval of 2-5 minutes for each printed fix. A printed and a digital file (in ASCII format) copy of the position data shall be provided to the Contracting Officer (CO) or Contracting Officer's Representative (COR) 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 dredge area limits. The format of the plot shall be subject to approval by the CO or COR. No dredging shall take place outside of the dredge area limits as shown on the drawings. The reports shall also be provided to DEP in digital format.

3. Contingency Plan. The Contractor will 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 will immediately notify the USACE verbally, providing the time, location, and source of the unsatisfactory material and proceed in accordance with the contract. The Contractor will also report any encounters with unacceptable material in the QC Report, providing location in State Plane Coordinates of the area of said materials. The USACE will use the dredge positioning records, plans, and sample descriptions to determine where the Contractor may dredge if needed to avoid additional placement of unacceptable materials. The USACE will adjust the construction operation to avoid placement of the unacceptable material on the beach to the greatest extent practicable.

4. Beach Observation. The Contractor will continuously visually monitor the material being placed on the beach for unacceptable material. The material can be deemed unacceptable based on the content of rock, debris, shell, carbonate content, mean grain size, and silty materials. If occasional debris, trash, rocks, or silty materials appear on the beach during dredging operations and exceed background or existing levels, the Contractor will remove them. The Contractor will notify the USACE of any observed non-beach compatible sediment.

5. During construction, the Contractor will collect a random sub-surface (12-18 inches below grade) grab sediment sample from each (length or sampling interval to be determined based on risk) 1,000 foot long section of the constructed beach to visually assess grain size, shell content and characteristics, shell content, and silt content. (Compare to table provided in Section B table 1) Shell characteristics will be classified as follows: shell hash or fragments (guidance from 2.8mm (~0.11 inches) to 0.25 inches), shell fragments or whole shells (guidance > 0.25 inches and less than 0.75 inches), shell fragments or whole shells (guidance > 0.75 inches). Each sample will be archived with the date, time, and location of the sample. Samples will be collected during beach observations, which occur during daylight hours only. Additional information regarding dredge operations (approximate time of fill placement or hopper load number) will also be recorded. The sample will be visually compared to the acceptable sand criteria. A record of sand evaluation regardless of sediment quality will be provided within the USACE's daily inspection reports. IF during independent inspection of the material, it is deemed to be questionable, quantitative analysis of replicate samples representative of the questionable fill material will be done by the Contractor upon request by the CO or COR. All samples will be stored by the USACE for 60 days after project completion (all final samples to be turned over to the Corps after the end of construction, not contract closeout).

6. Following completion of the project (within 30 days), the Contractor will collect sub-surface grab sediment samples from each 1,000 foot long section of the constructed beach, at mid-berm and 8 inches below ground surface. Laboratory analysis shall be performed to assess grain size and grain size distribution, based upon ASTM D 422, using U.S. Standard sieve sizes 3/8, 3/4, 4, 8, 16, 30, 40, 50, 70, 100, 140, 200, 230. Each sample test results shall be graphically represented by a gradation (cumulative frequency distribution) curve and a frequency distribution curve. All distribution curves title information shall be filled out with project name, date, sample number, location sample obtained, Unified Soil Classification, percent silt passing the No. 200 sieve (0.074 mm), percent silt passing the No. 230 sieve (0.063 mm), carbonate content, dry Munsell color, and Mean Grain Size and Phi Standard Deviation (method of moments method to be used). Frequency curves shall show percent retained on vertical axis and grain size, in mm on horizontal axis. Frequency curves shall be identified by sample number and date, matching the corresponding gradation curve. A tabulation, on paper, of the laboratory results of weight retained, percent weight retained and cumulative percent retained on each sieve, shall be provided with each gradation curve. Tabulated grain size laboratory results shall also be reported in digital format in an Excel spreadsheet. The analysis should also include shell content, and Color. Shell characteristics will be classified as follows: shell hash or fragments (guidance from 2.8mm (~0.11 inches) to 0.25 inches), shell fragments or whole shells (guidance > 0.25 inches and less than 0.75 inches), shell fragments or whole shells (guidance > 0.75 inches). Each sample will be archived with the date, time, and location of the sample. All samples will be stored until directed by the CO or COR to dispose of them, or otherwise be turned over to the Corps after the end of construction closeout.

7. Geotechnical Data. The Contractor will be provided with all available descriptions of sediment samples collected within the channel and will acknowledge at the preconstruction conference that he is aware of the quality of the sediment as described in the geotechnical data. This data will be presented in the construction specifications.

D. Quality Assurance Plan. (Edited from Beach Renourishment using Offshore Disposal)

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

1. The USACE will conduct the level of construction observation believed to be required to determine that the Contractor's work will be in conformance with the required contract and permit conditions. Normally observations will be during daylight hours.
2. The USACE (Quality Assurance Representative) will provide oversight. The QAR shall be an individual with training or experience in beach placement and construction inspection and testing, and that is knowledgeable of the project design and permit conditions.
3. The project QC provisions to be implemented by the Contractor will be discussed as a matter of importance at the pre-construction meeting. The Contractor will be required to acknowledge the goals and intent of the above described QC Plan at the preconstruction conference.

4. The USACE will review the Contractor's daily reports which characterize the nature of the sediments encountered at the channel area and placed along the project shoreline with specific reference to the occurrence of rock, rubble, shell, silt or debris that exceeds acceptable limits. The USACE will review the dredge positions on an ongoing basis.

5. The USACE will be continuously on call during the period of construction for the purpose of making decisions regarding issues that involve QA/QC Plan compliance.

6. Any modification to the Contract between the USACE and the Contractor will be evaluated by USACE to determine whether or not the change in scope will potentially adversely affect the above described QC Plan.

7. To assure that the fill material placed on the beach is in compliance with the permit, the USACE will conduct assessments of the sediment as follows based on risk:

a. If the USACE determines that the grain size, silt content, and shell content do not comply with the quality requirements outlined in the QC Plan, the COR will immediately instruct the Contractor to take corrective actions necessary to avoid further discharge of unsuitable material. The USACE will use the dredge positioning records, plans, and core borings 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. If deemed necessary by the USACE, quantitative assessments of the sand will be conducted for grain size, silt content. The USACE's sediment inspection results will be reported to the FDEP. 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 as discussed in Section E below. Additional sediment testing will be conducted following any remediation effort. The results will be reported to the FDEP.

b. In the event that a section of beach (continuous beach area of 10,000 square feet) 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.

E. Remediation Actions (generally by contract modification, separate action, or if due to noncompliance by Contractor.)

1. Remediation actions may include:

a. Excavating the non-specification material and mixing it with specification material to achieve a sand mixture that complies with the sediment criteria.

b. Excavating the non-specification material, transporting the material to an alternate location, and replacing the material with material that complies with the sediment criteria.

c. Excavating the non-specification material, transporting the material to the submerged portion of the profile, and replacing the material with material that complies with the sediment criteria.

d. Other options.

2. The results of any remediation will be reported to FDEP following the remediation action. 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 may be required following any remediation effort.

3. The USACE will have the authority to determine whether the material placed on the beach is acceptable or unacceptable. If placement of unacceptable material occurs, the contractor will be directed on the necessary corrective actions. Should a situation arise that can not be corrected by methods described within this QA/QC document during construction or if rocks or other non-specified material appears on the surface of the filled beach in excess of 50% of background in any 10,000 square foot area, the FDEP will be notified of the occurrence and the corrective action proposed to remediate the placement.

4. In order to determine if an area greater than 10,000 square feet of beach fill is noncompliant, the following procedure will be performed by the USACE, duly authorized representative.

a. Upon determination that the first random surface grab sample is noncompliant, at minimum, five (5) additional random surface grab samples will be taken and analyzed. If the additional samples are non compliant, then additional samples can be taken at appropriate spacing in all directions.

b. Additional samples will be archived and evaluated according to D.7.b. (above).

c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of non-compliant fill.

d. The total square footage will be determined.

e. The site map and analysis will be included in the USACE's daily observation report.