ERDC/RSM-TN-17
August 2005

Regional Sediment Management Opportunities within Intracoastal Waterway (IWW) Dredging Program in the State of Florida

INTRODUCTION: The topic of this Regional Sediment Management (RSM) Technical Note serves as an example of opportunities for implementation of RSM practices within the U.S. Army Engineer District, Jacksonville's Operations and Maintenance (O&M) Program, in dredging of the Intracoastal Waterway (IWW) within the state of Florida, authorized from the St. Johns River in Jacksonville to Key West. Inclusive of the eastern coast, the Atlantic Intracoastal Waterway (AIWW) is a canalized inland water-course that runs on the eastern coast of the United States, from Key West, Florida, to Boston, Massachusetts. The Federal authorized project for the AIWW is from Norfolk, Virginia, to the St. Johns River in Jacksonville, Florida.

The IWW's extension, the Gulf Intracoastal Waterway (GIWW), runs from Apalachee Bay, Florida, in northwestern Florida (along the panhandle), to Brownsville, Texas, the southernmost tip of Texas, and from San Carlos Bay, Fort Myers, Florida to Anclote River (north of Clearwater Beach) along the southern Gulf Coast. For more than 4,023.4, km (2,500 miles) along the Atlantic and Gulf of Mexico coasts, the system affords a channel for barges and other light-draft vessels. It is a navigable interconnected thread of passages running between the mainland and offshore islands, along rivers, through coastal sounds, lakes, lagoons, bays, and canals with a minimum depth of 3.7 m (12 ft) throughout most of its length and a maintained depth of only 2.4 m (8 ft) in some sections. The AIWW is subject to numerous dredging efforts under the O&M Dredging Program and is a source of dredged material that has opportunities for many beneficial uses.

WATERWAY EXTENT AND LINKAGE IN FLORIDA: The IWW within the state of Florida is authorized to be maintained under three segments: Segment 1: Fernandina Harbor to St. Johns River, 35.2 km (21.9 miles), authorized at a depth of 3.7 m (12 ft); Segment 2, Jacksonville to Miami, 561.l7 km (349 miles), authorized at 3.0 m (10 ft), and Segment 3, Miami to Key West, 254.3 km (158 miles), authorized at 2.1 m (7 ft). The IWW connects to the GIWW via Lake Okeechobee through South Florida through the Okeechobee Waterway (OWW). This waterway is about 225.3 km (140 miles) in length. The activity along this connective waterway system and the proximity of the IWW system along the coastline presents opportunities for placement of quality material for economic and environmental purposes.

IWW AND CANAL HISTORY IN FLORIDA: The Florida Coast Line Canal and Transportation Company, which received Letters Patent under the Laws of Florida on May 23, 1881, constructed the canal that existed prior to the creation of the Florida Inland Navigation District in 1927. The work, which began in 1883, was finally completed in 1912. The completion of the canal did not solve the problem of inland water transportation from Jacksonville to Miami, even to the extent that a canal of the minimum width of 15.2 m (50 ft)

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 2005	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Regional Sediment Management Opportunities Within Intracoastal Waterway (IWW) Dredging Program in the State of Florida	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Army Corps of Engineers Washington, DC 20314-1000**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**8**	

and a minimum depth of 1.5 m (5 ft) at mean low water (mlw) could solve it. There was the difficult task of maintaining the minimum depth. Like most pioneers, the Canal Company had its troubles. Default was made in the terms of a trust deed or mortgage securing an issue of bonds and covering the canal property, and at the instance of the Rhode Island Hospital Trust Company, as trustees, the trust deed or mortgage was foreclosed in the Circuit Court of St. Johns County, Florida, and the property sold on September 3, 1923, to satisfy a debt of $937,931.31 to Florida Canal and Transportation Company. The growth and development of the east coast of Florida had brought about during the past 20 years or more, a general demand for adequate inland water transportation. Repeatedly during that period, attempts had been made by public bodies to induce the Federal government under some terms and circumstances to provide that inland transportation either by the so-called coastal route, via: by the canal along the east coast, or by the so-called St. Johns River route via Sanford then to Titusville - thence by the coastal route to Miami.

Finally, a survey of the two projects was ordered by the River and Harbors Act of Congress, approved June 5, 1920. After an investigation running over more than 6 years, a voluminous report on that survey was made by the Secretary of War to Congress, December 14, 1926. The contents of the report are summed up in a brief letter directed by the Chief of Engineers of the U.S. Army to the Secretary of War, wherein he summarized the benefits to accrue to the inhabitants of the east coast of Florida, including a saving on transportation charges, under improved conditions, of an amount estimated variously from $400,000 per year to $1,600,000 per year. He also pointed out the importance of completing this great length of the inland waterway extending between New England and Key West. He concluded his report by declaring that an inland waterway in general 22.9 m (75 ft) wide and 2.4 m (8 ft) deep at mlw, following the coastal route from Jacksonville to Miami, was deemed advisable at an estimated cost of $4,220,000 and with $125,000 annually for maintenance. The River and Harbor Act, approved January 21, 1927, authorized the establishment and maintenance of an inland waterway in general, 22.9 m (75 ft) wide and 2.4 m (8 ft) deep at mlw, following the coastal route from Jacksonville, Florida. (http://www.aicw.org/findhistory.htm)

DREDGING AUTHORIZATION: There are numerous authorizations that address the opportunity to place beach quality dredged material onto beaches. Section 145 of the Water Development Act of 1976 authorizes the placement of beach quality sand obtained from dredging operations on adjacent beaches if requested by the interested state government and in the public interest. Under this authority the state was responsible for 100 percent increased cost of placement. It was modified by Section 933 of WRDA 1986 which allows 50/50 cost-sharing of increased cost of placement, and Section 207 of WRDA 1992 allowing political subdivisions of the state to participate in placement of dredged material; under this provision the increased cost shared by non-Federal sponsors is under current non-Federal cost-sharing provisions of 35 percent. Section 207 of the Water Resources Development Act of 1996, Beneficial Use of Dredged Material" (addressed in Policy Guidance Letter No. 56) allows Federal interest in a disposal method that is not the least cost (NED) option with the stipulation that the Secretary must determine that the incremental costs of the selected disposal method are reasonable in relation to environmental benefits to be realized. In this case the non-Federal interests pay 25 percent of the incremental cost in excess of the NED disposal option.

It should be noted that Section 933 is a navigation authority, not a storm damage authority. This dredging authority applies to material being dredged from channels for navigation purposes not for the purposes of beach placement. The justification for navigation purposes is demonstrated in conjunction with the construction or maintenance of a navigation channel. The placement of material is dealt as an inherent component to the justification. Given the proximity of the IWW within the state of Florida to nearby beaches, there are opportunities for beach placement as an NED option.

The Jacksonville District recognizes that dredged material is a resource that should not be wasted. However, when the placement of quality dredged material onto beaches stemming from the justification of a navigation interest is not the NED option (weather it be incrementally justified on the basis of either additional economic or environmental benefits), consideration needs to be given to the willingness of the non-Federal sponsor to participate in such an endeavor. There may not always be a willingness on the part of the non-Federal sponsor to cost-share for an incremental benefit that requires additional cost-sharing beyond the NED option for placement of the dredged material. However, it is within the long-term interest of both the Federal and non-Federal entities to keep quality beach material within the littoral system.

FLORIDA CRITICAL BEACH EROSION DESIGNATED AREAS AND INLETS: The state of Florida has a tremendous need for beach quality sand. More than 658.2 km (409 miles), or approximately 50 percent of the state's beaches, are experiencing erosion. At present, about 482.8 km (300 miles) of the state's 1,327.7 km (825 miles) of sandy beaches are experiencing critical erosion, a level of erosion which threatens property, recreational, cultural, or environmental interests. While some of this erosion is due to natural forces and imprudent coastal development, a significant amount of coastal erosion in Florida is directly attributable to the construction and maintenance of navigation inlets. Florida has more than 60 inlets around the state. Many have been artificially deepened to accommodate commercial and recreational vessels and employ jetties to prevent sand from depositing in the channels. A by-product of this practice is that the jetties and the inlet channels have interrupted the natural flow of sand along the beach causing an accumulation of sand in the inlet channel and at the jetty on one side of the inlet, and a loss of sand to the beaches on the other side of the inlet.

One effective way to restore eroded beaches is through beach nourishment. In a typical beach nourishment project, sand is collected from an offshore location by a dredge and is piped onto the beach. A slurry of sand and water exits the pipe on the beach and once the water drains away, only sand is left behind. Bulldozers move this new sand on the beach until the beach matches the design profile. Beach nourishment is a preferred way to add sand to a system, which has been starved by the altered inlets because it provides a significant level of storm protection, benefits for upland properties and is the least impacting to the coastal system. An additional benefit of beach restoration projects is that they quickly restore shorebird and marine turtle habitat. (http://www.dep.state.fl.us/beaches/programs/bcherosn.htm).

The IWW is a source for beach quality sand that is harvested during maintenance dredging. However, its dredging activity may not neatly coincide with opportunities for beach placement, given the environmental windows and Federal and non-Federal coordination required prior to placement, even during circumstances whereas such placement is an NED option.

SIGNIFICANCE OF REGIONAL SEDIMENT MANAGEMENT: The concept of regional sediment management, its background and application within the Corps is well documented in IWR Report 02-PS-2, "Regional Sediment Management: Background and Overview of Initial Implementation" (Martin 2002). WRDA 96 Section 516 authorizes the implementation of RSM. RSM supports the Corps' Environmental Operating Principles that bring a holistic perspective to all projects.

RSM practitioners have identified significant cost-savings among other benefits. These cost-savings and benefits are related to navigation maintenance, beach nourishment, ecosystem restoration, as well as other needs and opportunities raised by sediment stakeholders in a region. Benefits associated with RSM are evaluated across regions larger than individual projects and thus are unique to this approach. Following are examples of benefits to be realized from coastal RSM actions:

- Cost savings result from reduced rehandling of material; extended dredging cycles; sharing equipment in linked projects; shared information; and avoided duplication of data collection.
- Improved environmental conditions based on reintroduction of sediment into sand starved littoral systems reduce the requirement for beach nourishment and sustain habitat for threatened and endangered species. Shared regional-scale data management systems, models, and other tools improve project-level decisions and help achieve greater consistency in analytical results among studies and projects within a region.
- Improved interagency and stakeholder relationships produce opportunities for collaboratively leveraging financial and manpower resources in data collection and analysis, tool development, and project implementation. Additionally, intergovernmental collaboration and coordination streamlines regulatory processes.

In order for RSM to be successful, the concept must also be embraced on the state level. Florida has implemented a statewide strategic beach management plan that makes use of subregions chosen for their coastal uniqueness and continuity as the basic planning unit and provides over-all direction to the state program. The state's long-range budget plan implements the strategic plan.

In its 1998/99 fiscal year, the state initiated long-range budget planning in order to move away from beach management focused on local short-term needs. The state is currently assisting local governments in developing their long-range beach management plans. Once developed, these plans will emphasize a regional approach to beach management, which will encourage coordination among local governments, lower costs, and provide long-term solutions to beach erosion. The long-range planning time is 10 years.

NON-FEDERAL SPONSORSHIP FOR IWW DREDGING: The non-Federal sponsor for the AIWW within the state of Florida is the Florida Inland Navigation District (FIND), a special state-taxing district for the continued management and maintenance of the AIWW within the state. FIND is also the local navigation sponsor for the Okeechobee Waterway in Palm Beach and Martin counties, responsible for providing dredged material management areas for this

waterway channel that connects the east and west coast Intracoastal Waterways. The role of FIND is critical in implementing good RSM practices as they play a major role in the placement of dredged material.

During the early 1980s it became apparent to FIND and the U.S. Army Corps of Engineers that the inventory of existing dredged-material disposal sites did not meet the current or future maintenance needs of the waterway. The majority of the existing sites were found to be unusable because of their environmental sensitivity or their small size. FIND, through coordination with the Corps, Department of Environmental Regulation, and the Department of National Resources, formulated a plan for a pilot study to determine the dredged disposal needs of the waterway in Nassau and Duval counties for a 50-year period and to provide a permanent infrastructure of sites to manage this material for potential reuse. Additional sites have been identified to manage handling of future material. This was done in two phases:

- Phase I – FIND identified parcels of property to be acquired to manage material dredged for the next 50 years.
- Phase II – focuses on land acquisition and construction.

The study was completed in September of 1986 and resulted in the identification of seven parcels of property to be acquired. These parcels along with one existing site will be able to manage all material dredged from this 61.2-km (38-mile) stretch of waterway for an analytical period of 50 years. Phase II of this project has led to the acquisition of these parcels and the engineering, geotechnical studies, environmental analysis and boundary surveys of all sites.

FIND has committed to evaluating and updating the inventory of dredged material management sites throughout the waterway to meet 50-year dredging needs. A comprehensive plan was developed to perform these additional studies and implement the necessary land acquisitions over a 15-year period. To date, in addition to Nassau and Duval Counties, Phase I Long Range Dredged Material Management studies have been completed in St. Johns, Flagler, Volusia, Brevard, Indian River, Martin, St. Lucie, Brevard, and Palm Beach Counties. These studies have identified 47 sites to manage approximately 41.5 million cu yd[1] of dredged material from 453.8 km (282 miles) of waterway channel for a 50-year period. This includes 21.5 million cu yd of material to be placed on six beach areas to serve as feeder beaches on the Atlantic Coast.

JACKSONVILLE DISTRICT IWW DREDGED MATERIAL ACTIVITY: Ideally, the optimal placement for beach quality material is the berm area of the beach. To qualify for direct beach placement composition of material cannot be more than 10 percent fines; the state allows up to 20 percent fines for nearshore placement. Since 1997, approximately 3.3 million cu yd of material was placed on Florida beaches for seven placement events and approximately 129,000 cu yd for five nearshore placement events in association with Federal contracts. An additional direct beach placement of approximately 2.4 million cu yd for eight events and about 200,000 cu yd for two events is anticipated for the next 5 years. This is a significant accomplishment considering that the IWW is a shallow-draft project with a budget that must be spread over 724.2 km (450 miles) of waterway, and only one project sponsor.

[1] To convert cubic yards to cubic meters, multiply number of cubic yards by 0.76.

Figure 1 displays upland, direct, and nearshore placement volumes since 1997 and anticipated for the next 5 years. The future increase in upland placement from about 1.3 million cu yd to 4.5 million cu yd is due to a large backlog of dredging for nonbeach quality materials and the recent construction of several containment areas to hold the materials. In several instances, the beach quality sand from multiple dredging events is placed upland for an immediate cost-savings and later offloaded all at once to the beach. Over the long term, this method is much less expensive than direct beach placement on every event. The upland containment areas that hold beach quality material can be considered a temporary holding area until such time it is economically efficient to offload to a nearby critically eroded beach in need of material.

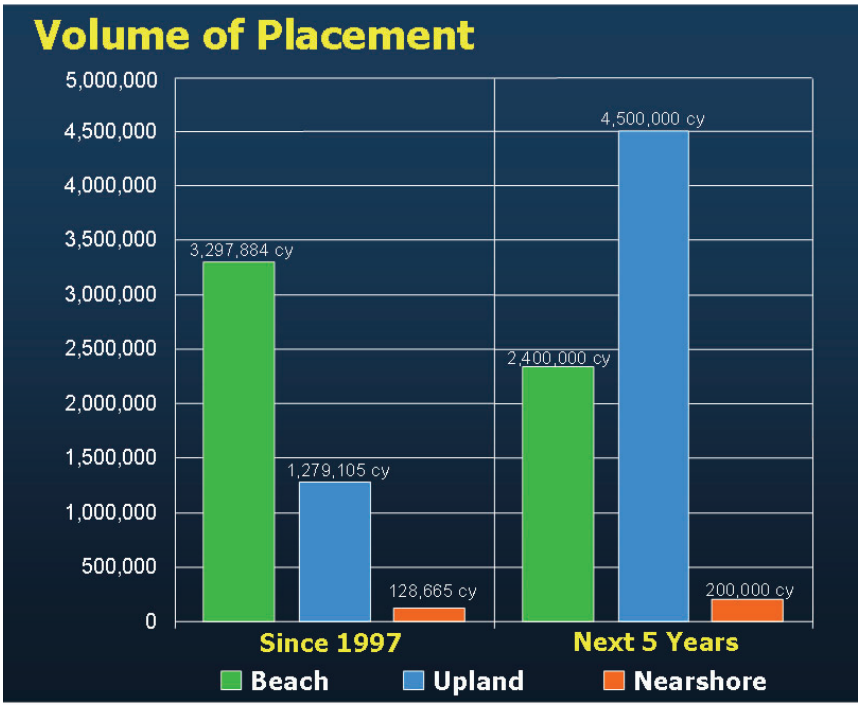

Figure 1. Volume of placement

During the 8 years from 1997-2004, approximately $40 million was spent on maintenance dredging and construction of upland containment areas. For FY05, about $13 million will be spent on dredging, of which $2 million will be for upland disposal. Of the $13 million dredging about $2.5 million will be allocated for beach placement.

Figure 2 displays recent projects that involved beach placement during maintenance dredging or offloading. SJ-1 is offloaded to the beach every 10-12 years (or whenever it becomes full) as an economy of scale for the project, as it is cheaper to offload when capacity is achieved rather than to acquire land and construct a site of a similar size.

IWW Project	County	Type	Freq. (yrs)
Vic. Nassau Sound	Nassau	MD	3
Vic. St. Augustine Inlet	St. Johns	MD	5
Vic. Matanzas Inlet	St. Johns	MD	4
SJ-1	St. Johns	OL	12
Vic. Marineland	Flagler	MD	8
Vic. Jupiter Inlet	Palm Beach	MD	3
Vic. Bakers Haulover	Dade	MD	2

Figure 2. Recent projects that involved beach placement during maintenance dredging (MD) or offloading of upland containment areas (OL)

There are other containment areas within the IWW system that hold beach placement material that would qualify for offloading to the beach.

Figure 3 displays recent projects that involved nearshore placement during maintenance dredging. There are cases where the suitability of dredged material qualifies for direct beach placement but is negated by other overriding factors such as type of dredge most economical for the job. If for example, a small quantity of material needs to be dredged, a cutterhead dredge would be used and placement would be nearshore. Environmental windows can also be a factor that would favor nearshore placement over direct beach placement. For large dredging quantities, a suction dredge may be used and material may be placed in upland sites if it is cheaper to do so until a significant quantity is contained and so that offloading large quantities makes economic sense.

IWW Project	County	Type	Freq. (yrs)
Vic. St. Augustine	St. Johns	MD	5
Vic. Ponce de Leon	Volusia	MD	3
Vic. Cross-roads	Martin	MD	4
Vic. Bakers Haulover	Dade	MD	2

Figure 3. Recent projects that involved nearshore placement during maintenance dredging (MD)

The state of Florida has a need for beach quality sand and has identified areas of critical erosion that would benefit from that sand. The IWW maintenance program provides a source of beach quality sand that has placement advantages over offshore borrow areas due to its parallel length with Florida beaches and provides opportunities of keeping sand in the littoral system. There are opportunities in dredged material placement strategies in consideration of initial beach or nearshore placement versus temporary upland containment (until a time it is economically feasible to offload for direct beach placement). The Corps is in a position to be the lead agency to develop and recommend effective solutions and strategies that are outside the individual boundaries of navigation and shore protection interests but yet are within the collective benefits of both the Federal and non-Federal sponsorship.

LOOKING TOWARD THE FUTURE: With cutbacks in Federal programs, there is a need for RSM coordination among Federal and non-Federal entities involved in the development and maintenance of waterways and shore protection on both the economic and environmental levels. The commitment of FIND to the implementation the Long Range Dredged Material Management Program is critical to the maintenance of the IWW. Its assistance in waterway improvement projects and programs is expected to increase as state and Federal funding sources decline. The state's assistance to local governments in developing long-range beach management plans recognizes the need for regional sediment management. It is also recognized that dredging practices at inlets have interrupted the natural flow of sand along the littoral system. The availability of potential beach quality material in the IWW maintenance system, a system that is subject to periodic dredging, must also be recognized to make use of opportunities whereby proper assessment would need to be made as to the viability and tradeoffs of beach placement versus nearshore placement versus upland placement.

In the case of the IWW and the state's regional nourishment programs, such partnership will be important in the future to maintain navigation and cost-effective shoreline protection. The ability of the Federal government to initiate such studies and identify opportunities that do not present themselves on the project level would result in long-term efficiencies and cost-savings to both Federal and non-Federal interests.

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