Regional Sediment Management:
Background and Overview of Initial Implementation

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Executive Summary

This report describes the concept of "regional sediment management" (RSM), its background and application within the Corps, and issues associated with its implementation in the future. (Application within the Corps is based primarily on district experiences from an ongoing RSM demonstration program). The need for RSM is based on recognition of the regional implications of dredging and other activities in the littoral zone, as well as the appreciation for sand as a resource - much as water is a resource experiencing competing demands, along with both quantity and quality issues. RSM is an approach for managing projects involving sand and other sediments that incorporates many of the principles of integrated watershed resources management, applying them primarily in the context of coastal watersheds[1]. It also supports many of the recommendations identified by interagency working groups on improving dredged material management. Examining RSM implementation through demonstration efforts can provide lessons not only on improved business practices, techniques and tools necessary for managing resources at regional scales, but also on roles and relationships important to integrated water resources management.

Background. The concept of RSM originated in the notion of coordinating dredging activities in the coastal zone for the purposes of retaining sand in the littoral system in order to foster more balanced, natural system processes, and reduce project costs. The Coastal Engineering Research Board (CERB) recommended an RSM approach in 1994, and their support for this approach to coastal sediment management was reinforced at subsequent meetings. They noted that cost-benefit analysis and engineering emphasis treated navigation concerns of coastal engineering separately from the associated impacts of down drift beaches – the result of which was often more expensive and less acceptable repair of the down drift beaches than it would have been to maintain the original natural flow of sand. The CERB advised that a systems approach could reduce adverse impacts to the near shore system, reduce costs (first costs and long-term maintenance costs), and realize other benefits.

RSM Concept. The concept of RSM currently being advocated in the Civil Works program involves:

- Conservation and management of sediments in the littoral zone – viewing sand as a "resource".
- Attempting to "design with nature", utilizing an understanding of sediment movement in a region and the interrelationships of projects and management actions.
- Conceptual and programmatic linkages among Corps projects, studies and activities involving or affecting sediment in a region (navigation channel maintenance, flood and storm damage reduction, ecosystem restoration and protection, beneficial uses of dredged material).
- Linkages between or among operating and new projects to achieve greater efficiency – typically through cost savings.
- Emphasis on improved program effectiveness through collaborative partnerships with other agencies and across levels of government.
- Identifying and overcoming institutional or procedural impediments to more effective and efficient management.

[1] While the initial emphasis of RSM was on sand in coastal systems, the concept has been extended to riverine systems and finer materials to more completely address sources and processes important to sediment management.

- Recognition that this system approach is also important to management of fine grain sediments and riverine systems.

Supporting Authorities. A number of authorities support the concept of RSM, or can facilitate implementation of the concept. These include general and specific authorities that advocate regional approaches or system perspectives to water resources management and problem solving, as well as opportunities and responsibilities for Civil Works activities in coastal areas, or that focus on or include sediment management. These policies and authorities are summarized it tables in this report with additional detail provided in Appendix B.

RSM Demonstration Program. The Corps initiated an RSM Demonstration program to examine, apply and evaluate RSM opportunities, practices and benefits. The program focuses on managing sediment as a regional resource and integrating Corps and other agency programs and activities related to sediment in coastal regions. Lessons from the demonstration program will help advance broader application of RSM within the Corps by sharing information on experiences, innovations and impediments. The RSM demonstration program is being accomplished through leveraging of the demonstration funds with R&D funds, and district project and study funds, along with state and local sponsor funds.

The demonstration program, initiated in 2000 by Mobile District, expanded to a total of six FOA's in 2001 (Jacksonville, Detroit, New York and Philadelphia Districts, and the South Pacific Division). During the first year, the demonstration participants gained greater appreciation for the scientific, engineering and management aspects of the RSM concept, and gained experience building partnerships, and began to link subsystem characteristics and decision making. In a number of instances, the demonstration efforts have resulted in partnerships among the Corps, state, local, and other Federal agencies, some of which are cost-sharing projects identified through RSM discussions. Another benefit of these partnerships is the working relationships that will extend into future studies and project management decisions. Greater integration of environmental concerns with planning for navigation maintenance and beach nourishment projects was initiated in several areas within the demonstration districts. Several tools valuable to RSM have been developed or refined (e.g. RSM GIS, and refinements to coastal process models to foster regional application). Mobile District came close to their goal of getting "sand on the beach", but stakeholder issues, rather than technical or monetary issues held up the project. (Local landowners are reluctant to allow placement of sand on their property for the purposes of benefiting the down drift littoral system and beaches.)

Future demonstration efforts will extend the RSM concept inland to include sediment in riverine systems. Application of RSM in a longer time frame will also be explored. Discussion was initiated with Mobile district regarding a potential target region in which to examine development of a longer-range RSM vision for the year 2020 in collaboration with stakeholders. Additional work on evaluating the benefits of applying the RSM concept will be done across the demonstration efforts. The demonstration efforts will continue to help to shape and deploy the new RSM research program, as well as broader application of RSM within the Corps. The identification of additional policy issues and questions will continue to be an important aspect of the demonstration efforts. Addressing these issues and questions will be important to the successful implementation of the RSM philosophy and approach.

Potential Benefits. Work was initiated within the demonstration efforts to examine the potential benefits of RSM. These benefits can be realized in terms of both cost savings (near-term and long range), improved management and use of sediment resources for a broad range of benefits, as well as in terms of valuable intangible benefits. These benefits can be characterized as "institutional", "programmatic" and "technical".

Institutional

- Stronger partnerships - Partnerships among coastal and watershed stakeholders leading to improved business processes, data sharing, greater cooperation and collaboration among parties.
- Better information – Improved understanding of regional sediment processes and the interrelationships of projects and management actions contributes to improved knowledge about problems, causes and solutions. This in turn contributes to development of more effective and efficient management approaches.
- Identification of institutional obstacles so they can be addressed. – Some issues may be addressable through clarification of policy, or revisions to business practices. Some issues may need to be addressed through multi-agency or other partnership efforts.
- The fragmentation of agency authorities and programs has been identified as a significant impediment to effective watershed management and coastal resources management. The diverse range of missions and roles (e.g. land managers, regulators, water resources developers) create differing perspectives from which agencies view regional needs, opportunities and priorities, along with their motivation for and nature of their participation in regional or watershed initiatives. The RSM approach attempts to better integrate CW projects and programs in a region, helping to better enable the Corps to participate in an integrated manner with other agencies at the Federal, state and local levels.
- Many documents discuss the merits of watershed or regional approaches, but devote little to discussion of the difficulties and alternatives for overcoming them. The RSM demonstration efforts endeavor to apply these approaches, identify and work through the impediments and challenges to successful integrated regional planning and management.

Programmatic

Process efficiencies

- Potential reductions in rehandling of material, improved channel efficiency and associated cost savings - over the longer term.
- Increased disposal site capacity and reduced need to acquire new sites.
- Improved efficiency and effectiveness through linked projects - Synergy derived from coordination of intra- and inter-agency projects and programs. Optimizing mobilization of dredging equipment.

Environmental

- Stabilized habitat for listed species (e.g. beach mice, sea turtles)

Sediment as a resource

- Potential new sources of desirable sediment.

Technical

- New engineering techniques to optimize and conserve sediment - Bypassing of beach quality sand at inlets and implementing regional rather than project scale approaches.
- Foundations for future studies and projects in region – The improved process models, data and information management tools will benefit both current and future studies and projects.

Additional benefit analysis will be included in future years of the RSM demonstration program. An evaluation framework is needed to facilitate development of recommendations based on experiences in the demonstrations.

Potential new evaluation approach for O&M and other investment decisions. Ideas for a new approach to evaluating investment decisions have emerged within the demonstration program. Instead of emphasis on the least-cost means criteria for determining disposal alternatives, consideration would be given to cost efficiencies in the short term, as well as potential longer term costs, liabilities, savings, and best management of resources across projects within a region. Such an approach could help ultimately reduce overall Civil Works expenditures across accounts in a region, better serving the Nation. The actual adaptability of the Corps's administrative and programmatic process to accommodate this approach, however, has yet to be demonstrated. Future efforts within the demonstration efforts could examine and evaluate innovations or impediments to this approach to investment decision-making. Also see recommendations for a pilot initiative below.

A pilot initiative allowing the regional combination of GI, CG and O&M funds may be useful in advancing the implementation of RSM. The project specific nature of funding has been identified as one of the impediments to implementing the RSM concept. A pilot effort has been suggested as a means to more specifically examine how the Corps can implement study, project and program activities in an integrated, regional context. Such an effort would emphasize efficiency in carrying out civil works programs and activities in a region, while addressing the full suite of identified needs and opportunities, and including both economic and environmental objectives. It would integrate consideration of responsibilities for operating existing projects, with new studies and projects, along with other agency activities. The concept for the pilot includes a "vertical team" representing policy, programs management, planning, engineering, operations, real estate and counsel to examine and advise on issues that surface during the course of the pilot initiative. Further development of this pilot concept is underway as part of the discussions with the CERB.

Regional comprehensive studies may provide some of the best opportunities to explore the potential application of different aspects of the RSM concept, and associated planning and evaluation frameworks. Studies scoped to examine a range of regional needs and opportunities in an integrated manner can also potentially include examination of linked application of the various Civil Works authorities and programs. They can integrate examination of alternative approaches to coordinated operation of existing projects (including development of regional DMMPs), and explore the integration of the programs and activities of other agencies. "Watershed" and "comprehensive" studies provide opportunities for these considerations. Funding for numerous watershed or comprehensive studies was authorized in FY 2002. An examination of these efforts may help identify good candidates for exploring the possibilities, merits, detractions and issues

associated with applying the innovative programmatic evaluation framework, and integrated, regional planning and management framework proposed above. Such efforts could also include examination of potential alternative cost sharing arrangements, identifying beneficiaries of new sediment management measures where there may be added costs to achieve the benefits.

Emerging Policy Issues. Included in the objectives of the RSM demonstration program are identification of policy issues and other impediments to implementation of the RSM concept as a standard business practice. A number of issues that have surfaced early in the demonstration efforts are presented in this report as preliminary issues that have the potential to effect the implementation of RSM. Some are policy issues or questions that could potentially be resolved with additional examination or explanation. Others are "challenges" rather than true "obstacles", and have the potential to be addressed through innovation in program management and collaborative processes. Additional identification and examination of issues will continue as the demonstration efforts proceed.

- The "Federal Standard" or "base plan". The most prevalent issue identified was reconciling RSM objectives of keeping sand in the littoral system with the least cost criteria of the Federal Standard or "base plan". Many staff equate the Federal standard with the "least cost plan", applying this criteria to individual projects/locations, considering a limited timeframe, short-term costs, and only navigation maintenance objectives. This view would appear to place less weight on the components of the standard regarding environmental acceptability and engineering feasibility.

- Dredged Material Management Plans. These plans can provide an important vehicle for developing and executing the regional approaches to sediment management, particularly when developed regionally, rather than for individual projects. While little information is readily available on the number and nature of DMMPs developed to date, the sense is that they are primarily project specific, focusing on disposal needs and capacities, including little on regional sediment management opportunities. Plans developed for San Francisco Bay and the Intracoastal Waterway in Florida are examples of DMMPs that link the management of projects in a region, with regional environmental goals, opportunities for beneficial use of sand and sediment, and regulatory requirements.

- Administrative issues. Each district has noted different levels of "buy-in" regarding RSM from their Operations, Project Management, Engineering, Planning and Regulatory elements. A number of process and policy questions are surfacing relating to: working with multiple sponsors, accepting voluntary contributions, constraints of project specific funding (identified as an impediment to regional approaches for managing sediments and assessing benefits). Recommendations were made to explore how to better share information regarding innovations or new approaches (e.g. partner agreement documents "that worked", facilitating multiple districts working on regional issues, MSC roles).

- RSM and the National and regional dredging teams (NDTs, RDTs). A perceived lack of coordination between the National and regional dredging team efforts and the RSM demonstration program has caused confusion within some districts. In reality, the RSM approach supports and builds upon many of the recommendations published in the 1994 report

of the Interagency Working Group on the Dredging Process. This document included an action plan for improving the dredging process, with recommendations for creating or augmenting regional dredged material management plans, and other recommendations for strengthening planning mechanisms for dredging and dredged material management Increased involvement and dialogue among the NDT and RDTs, and with the RSM demonstration program would not only help clear up confusion about the parallel efforts, but also facilitate identification of opportunities for synergy between implementation of RSM and the action plan recommendations.

- Misinterpretation of the RSM provision proposed for WRDA 2002. Acknowledging the difficulty of managing sediment as a system resource under the constraint of individual project funding, language for an RSM provision was drafted for WRDA 2002. The purpose of the legislation is to provide the authority for the Corps to study and implement RSM measures in conjunction with the operation and maintenance of Federal navigation projects for harbors or inland harbors. However, some districts seem to be interpreting this provision as the primary avenue through which to pursue RSM, ignoring the current authorities through which RSM can be implemented, and the opportunities for linking programs and projects and other attributes of the concept. This is symptomatic of the project focus, and broader misunderstanding of the RSM concept and how it can be implemented within existing authorities and programs.

RSM Primer. Efforts are underway to develop and "RSM Primer" to seve as an introduction to the RSM concept and answer some of questions frequently asked about RSM.

RSM and the National Shoreline Management Study (NSMS). The authority for the NSMS (Section 215(c) of WRDA 1999) includes a requirement to include a description of the systematic movement of sand along the shores of the United States, and develop recommendations regarding use of a systems approach to sand management. Initial funding for the NSMS was received in FY 2002. Discussions on how to proceed with this part of the study will include examination of potential input from the RSM demonstration and research programs.

RSM supports the Corps "environmental operating principles" and Corps contributions to sustainability. In March of 2002, the Chief of Engineers issued a set of environmental operating principles to illuminate the ways in which the Corps missions must be integrated with natural resource laws, values, and sound environmental practices. They are meant to give "corporate coherence" to the Corps work, facilitating recognition of the Corps' roles in, and responsibilities for, sustainability in the use, stewardship, and restoration of our Nation's natural resources.

These principles emphasize contributing to sustainability, and improved business practices, and RSM helps support sustainability and improved project and program integration. While the "sustainability concept" remains elusive to some, the emphasis on sustainability and sustainable development has motivated more comprehensive and holistic approaches to resource management as critical components. Application of the RSM concept can help the Corps contribute to sustainability through:

- Fostering system approaches – understanding system characteristics and system effects of actions; linking projects and programs (Including "life cycle - planning, design, construction, O&M);
    - Identifying and linking systems of institutions (agencies, levels of government and the private sector stakeholders);
    - Promoting development of shared visions among stakeholders of the future for the region/system.

- Advocating consideration of longer-term consequences of proposed decisions and actions – e.g. not just short-term costs, but longer-term effects and their associated costs.

- Embracing an "adaptive management mindset" – involving a willingness to proceed in the face of uncertainty, but to learn from experiences and assure feedback for future decisions and actions; contributing to the knowledge base -- being a "learning organization".

- Considering the needs and tradeoffs among economic viability, environmental health, and social well-being objectives.

As a result of discussions at a CERB subgroup meeting on RSM in May 2002, discussions have been initiated to explore broader implementation of the RSM concept beyond the demonstration program. Some of the initial suggestions included:

- Do more "post-evaluation" and assessment of benefits
- Gain input from stakeholders on their experiences with us to date
- Work to share information about engineering tools and R&D products and needs
- Examine additional potential to link programs, DMMP, planning, operations, emergency management planning, other.
- Establish multi-district RSM teams
- Develop the RSM GIS as a corporate enterprise system.

Experience with the RSM demonstration program will be useful in illustrating the application of, and philosophical intent behind the environmental operating principles, the watershed perspective, and the concept of integrated water resources management within the Civil Works program. To advance each of these, it will be important to continue to identify and address the real and perceived technical, policy and institutional issues that surface during the application of RSM in the demonstration program.

Regional Sediment Management

What: The Concept of Regional Sediment Management

Current Concept

"Regional sediment management" (RSM) is an approach for managing projects involving sand and other sediments that incorporates many of the principles of integrated watershed resources management[2], applying them primarily in the context of coastal watersheds. The concept of RSM originated in the notion of coordinating dredging activities in the coastal zone for the purposes of retaining sand in the littoral system in order to foster more balanced, natural system processes, and reduce project costs. RSM applies a system perspective to problem solving, managing sand as a regional resource, and integrating the portfolio of Corps programs and projects related to sediment in a given region. It is intended to advance application of sustainability principles, by

RSM Incorporates:
- System perspectives
- Recognition of sand as a resource
- Principles of sustainability
- Innovative process improvements
- Leveraging and partnerships

- Promoting consideration of the competing demands for sediment resources (ecological and socio-economic),
- Recommending approaches that can reasonably accommodate multiple objectives,
- Considering effects beyond the immediate timeframe, and
- Achieving acceptable tradeoffs and cost efficiencies.

This system perspective is also intended to be applied to the "institutional" aspects of programs and project management through emphasis on and support for better program integration within the Corps, as well as across agencies and levels of government.

Regions - typically defined by littoral cells but are also based on study objectives; they may transcend political boundaries, involving multiple jurisdictions.

Sediment - Sediment (especially sand) is recognized as a resource with competing demands. Contaminated sediments have not been part of the initial RSM efforts as other programs are available to address this issue.) Sediment can originate from freshwater sources, ocean sources, shoreline deposits.

Management - that provides better linkages of: consideration of resources, Corps programs, projects and activities, programs across agencies; programs and activities across levels of government.

[2] PGL 61 provides policy on the *watershed perspective* to be applied to Civil Works programs, and identifies a number of principles. Included among these are: Considering future resource needs; coordinating planning and management; promoting cross-program and interagency cooperation; encouraging public participation, evaluating tradeoffs; applying adaptive management.

Recognizing "sediment as a resource", RSM involves maintaining or promoting the natural exchange of sediment within the boundaries of the physical natural system. Concurrently, RSM involves recognizing the multiple, often competing demands for sediment in a region, and that the systems involved are often modified by multiple factors.

RSM is intended to integrate planning, engineering and operations activities within coastal, estuarine, and riverine systems, and broaden the problem solving perspective from a local, or project-specific scale, to an expanded scale defined by natural sediment processes. It recognizes that the physical system and associated ecological system are modified and respond beyond the limited dimensions and time frames of individual projects. The larger spatial and longer temporal perspectives of RSM require the integration of a broad range of disciplines along with collaborative partnerships among stakeholders.

> Although the term "regional sediment management" may be relatively new, recognition of the regional nature of coastal processes and the regional influence of engineering works is not. The inter-relationship between coastal navigation projects and contiguous beaches was recognized at least as early as the 1930s, with the first sand bypassing systems at navigation projects, designed to reinstate net longshore sand transport to down drift beaches (Santa Barbara, California and South Lake Worth Inlet, Florida). What is new today is that the USACE is pursuing RSM by collaborating with local and state governments to manage sediments over regions encompassing

Regions are defined by large-scale sediment transport boundaries and patterns (see Figure 1 (modified from Rosati, et al 2001a), along with other factors such as political boundaries, and the issues and opportunities important and relevant in the region. RSM can be illustrated with a hierarchy of examples. The simplest involves coordination of dredging activities in the coastal zone for the purposes of establishing regional sediment budgets[3], reducing project costs and protection or restoring environmental resources. Efforts may involve placing maintenance dredged material from an inlet near shore to feed

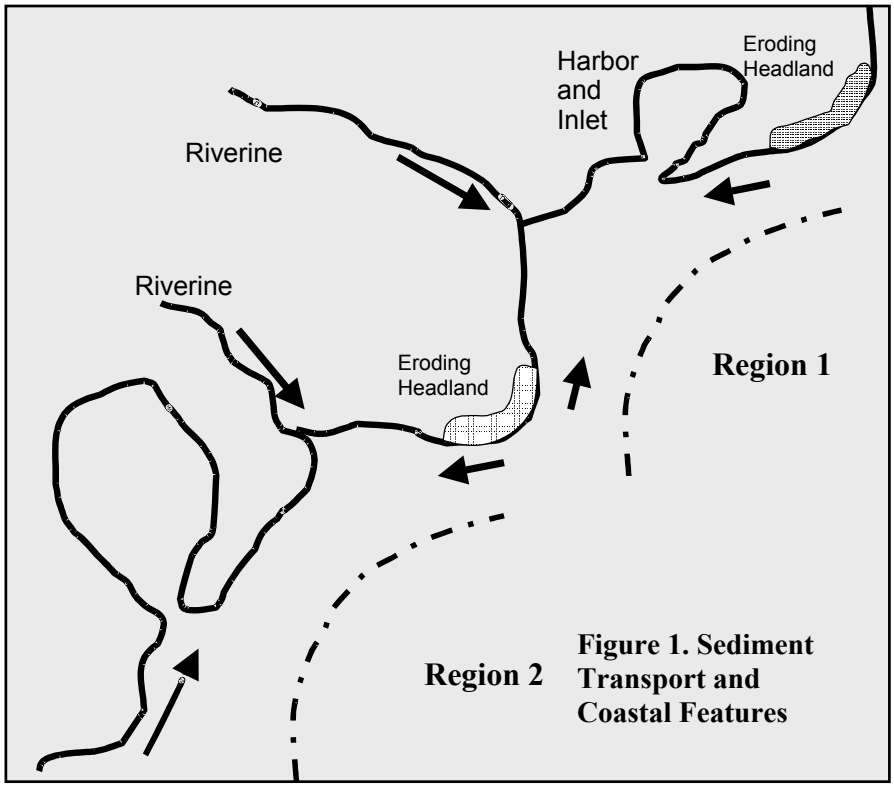

Figure 1. Sediment Transport and Coastal Features

[3] A "sediment budget" is an accounting of the sources and sinks (or gains and losses) of littoral material in a defined area. The regional sediment budget is a quantification of the natural sediment transport processes and anthropogenic activities. These budgets provide information useful in the planning and design of navigation channel maintenance, beach nourishment, and ecological resource restoration and protection.

an eroding beach, rather than disposing of it offshore. Placement of the material near shore could make the material available to the littoral system, potentially enabling natural processes to move it onshore.

Moving beyond an individual project, the "pairing of projects" has the potential to produce economies of scale in planning or construction, along with more effective projects and problem solving due to incorporation of system relationships. "Project pairs" can ultimately produce cost savings, and in theory this savings can involve different Civil Works funding accounts, (e.g. O&M and CG), where the savings is realized at the Civil Works program level. For example, dredging for inlet or navigation channel maintenance could be linked with a beach nourishment project, where, instead of the dredged material being disposed of off-shore and the sand for beach nourishment being obtained from an off -shore source, the dredged material could be used directly in the beach nourishment projects, assuming the material is suitable.

Pairing Projects/Integrating Programs. RSM advocates linking individual projects, as well as the various Corps programs in a region, including: navigation (channel maintenance and deepening); coastal storm damage reduction, environmental protection and restoration, recreation, regulatory.

Examples of broader application would include coordinating all Civil Works projects and studies related to sediment in a region - comprehensive studies with dredged material management plans, new projects and potentially regulatory decisions. At each of these levels benefits may be realized by improved integration of Corps projects and programs with those of other agencies. RSM has the potential to result in not only significant cost savings through coordination of construction activities, but also development of regional data and information that will enhance regional planning and management capabilities.

Example in the Jacksonville District, where linking projects can foster management of sand as a regional resource:

Federal navigation projects generate approximately 10.8 million cubic yards (mcy) of material at a cost of $30 million per year.

Federal shore protection projects require about 13.9 mcy at a cost of approximately $10 million per year.

Of the total amount of Federally dredged material, 26% is put back into the littoral system. Some percentage of the remaining 74% is also suitable for littoral use.

History of the RSM Concept.

RSM originated in the notion of coordinating dredging activities in the coastal zone for the purposes of retaining sand in the littoral system in the interest of promoting more balanced, natural system processes, and reducing project costs. In 1994 the Coastal Engineering Research Board (CERB) was tasked with developing future directions for Civil Works coastal engineering and supporting R&D. Recommendations from the CERB task force included, among other things, that the Corps adopt a "system approach to coastal sediment

The CERB, an advisory board to the Chief of Engineers was established by Public Law in 1963. Originally established as the Beach Erosion Board in 1930, the CERB provides broad policy guidance and review of plans and fund requirements for research and development in consonance with the needs of the coastal engineering field and the objectives of the Chief of Engineers. The Director of Civil Works is President of the Board which has seven members and meets semiannually. Three members are the commanders of Corps coastal divisions, and the three civilian members are outstanding in the broad field of coastal engineering. The Commander of the U.S. Army Engineer Research and Development Center acts as the Executive Secretary of the CERB and is responsible for administrative functions of the Board.

management". As a result, a working group on sediment resources management was formed to develop implementation recommendations. The concept of RSM was later introduced at the Marine Transportation System National Conference in 1998. The theme for the 67th CERB (1998) was "Regional Sediment Management," and the CERB reexamined the concept along with the proposal for an RSM demonstration project within the Mobile District. Recommendations for pursuing RSM were made by the CERB at their 1997 meeting. The CERB recommended taking a "system approach to effective sediment resource management", noting that:

- Current cost-benefit analysis and engineering considerations treated navigation concerns of coastal engineering separately from the associated impacts of down drift beaches, with the result that it was often more expensive, and less acceptable to repair the down drift beaches than it would have been to maintain the original natural flow of sand.

- The challenges of projects in bays and harbors make a systems approach essential to managing sediment in an environmentally sensitive manner.

- Benefits of taking this systems approach could include enhanced public participation and agency collaboration in planning and management, and reduced adverse impacts to the near shore system.

- Costs (first costs and long-term maintenance costs) could be reduced over both the short and long term.

The Director of Civil Works, who chairs the CERB, endorsed RSM as a concept to be implemented throughout the Corps at the 2000 CERB meeting.

While the above summarizes the recent emphasis on RSM, recognition of the need to think of sand and sediment movement in the context of a system or a region has a much longer history. The concept of an idealized model of a "river of sand" with sediment moving parallel to the shoreline in a somewhat continuous manner was discussed in the 1930's, along with the notions that obstructing this movement will ultimately create erosion further "down the river". These concepts along with the idea of sediment moving across a shore were discussed in the 1930's at the Beach Erosion Board (BEB) meetings - the BEB was a predecessor to the current CERB. Sand bypassing systems, which reinstate longshore sand transport to down drift beaches, were included in some projects in the mid-1930s. Rosati et. al, (2001a), provides additional discussion of the evolution of coastal engineering concepts related to RSM.

The Coastal Engineering Research Board established a goal of retaining all suitable quality dredged material in the littoral zone in order to attempt to restore and maintain the national coasts as balanced natural systems.

The CERB's regional sediment management objectives include capitalizing on potential economic benefits, identifying and eliminating bureaucratic obstacles and improving relations with partners.

Dredging History Relevant to RSM

An Interagency Working Group on the Dredging Process (Group) was convened by the Secretary of Transportation, in October 1993 to investigate and recommend methods to improve the dredging project review process. The Group had two major objectives:

- Promote greater certainty and predictability in the dredging project review process and dredged material management, and
- Facilitate effective long-term management strategies for addressing dredging and disposal needs at both the National and local levels.

The Group reviewed the current processes for authorizing Federal and non-Federal dredging projects; for identifying, planning for, and selecting dredged material disposal alternatives; and for funding Federal dredging projects. This review included analyzing the above processes and identifying ways to improve them, including coordination, information gathering, environmental compliance, overall sequencing of approvals, and use of long-term dredged material management planning.

In 1994, the Group published an action plan for improving the dredging process, which included recommendations to improve the regulations and planning procedures that govern dredging and dredged material disposal projects. Among these were recommendations for creating or augmenting regional dredged material management plans, and other recommendations for strengthening planning mechanisms for dredging and dredged material management. Regulatory, procedural, and philosophical obstructions were discussed and the recommendations were intended improve agency communication, gains in scientific research, equitable project funding, and new outreach activities for non-agency groups and individuals.

The regional sediment management approach is consistent with the recommendations from this interagency report and will help advance a number of the recommendations. The recommendations from the 1994 report are summarized in Appendix A. RSM supports five of the recommendations directly (1, 2, 4, 6,16), and has the potential to support three others (3, 11, 12). RSM goals could be enhanced through implementation of Recommendations 13 and 17.

RSM in the Future

Many documents discuss the merits of watershed or regional approaches, but devote little to discussion of the difficulties and alternatives for overcoming them. The RSM demonstration efforts (discussed in a later section of this report) endeavor to apply these approaches, and identify and work through the impediments and challenges to successful integrated regional planning and management. Their lessons should be valuable to a wide range of planning and management activities within the Civil Works program, particularly as integrated water resources management emerges as a theme for the Civil Works strategy.

In the future, the RSM concept will be extended beyond the coastal regions, “upstream” into associated riverine systems in an attempt to more completely incorporate source material and sediment processes, and knowledge about them, with investment decisions and management responsibilities affected by these processes. This broader “watershed” focus is intended to produce more effective and innovative approaches to sediment-related project development and management. The last section of this report discusses integration of the RSM concept into potential future legislation, future Civil Works studies, coastal management policy discussions, and research.

RSM supports the Corps environmental operating principles and can provide illustrations of how to implement them. In March of 2002, the Chief of Engineers issued a set of environmental operating principles (EOP) to identify the ways in which the Corps missions must be integrated with natural resource laws, values, and sound environmental practices. They are meant to give "corporate coherence" to foster Corps roles in, and responsibilities for, sustainable use, stewardship, and restoration of our Nation's natural resources. The EOP emphasize the connection among water resources development and management, protection of environmental health, and the security of our Nation. See: http://www.hq.usace.army.mil/cepa/envprinciples.htm.

The EOP emphasize working to contribute to sustainability, and improved business practices. While the "sustainability concept" remains elusive to some, the emphasis on "sustainability" and "sustainable development" has motivated more widespread advocacy for comprehensive and holistic approaches to resource management as a critical elements of success. Application of the RSM concept can help the Corps contribute to sustainability through:

- Integrating system approaches – understanding system characteristics and system effects of actions; linking projects and programs (Including "life cycle - planning, design, construction, O&M); understanding and linking systems of institutions (agencies, levels of government and the private sector stakeholders); promoting development of shared visions of the region/system among stakeholders.

- Advocating consideration of longer-term consequences of proposed decisions and actions – e.g. not just short-term costs, but longer-term effects and their associated costs.

- Embracing an adaptive management mindset – involving a willingness to proceed in the face of uncertainty, but to learn from our experiences and assure feedback for future actions; contribute to the knowledge base, and being a "learning organization"

- Considering the needs and tradeoffs among economic viability, environmental health, and social well being objectives.

Why Adopt and Pursue RSM?

Sediment Management is Integral to Civil Works Programs.

The Corps has sediment management responsibilities by virtue of its missions and programs. The Corps maintains 925 Federal navigation projects within the Nation's coastal ports and harbors, including 299 deep draft and 626 shallow- draft channels. For the combination of both new construction and maintenance dredging, it spends on average, about $800 million a year dredging 240 to 285 million cubic yards of sediments from coastal and inland navigation channels and moving the dredged sediments to other locations[4]. Most of the material dredged is non-contaminated and acceptable for non-confined use. The Corps spent almost $100 million in FY97 on shore protection and restoration projects, obtaining tens of millions of cubic yards of sand from a variety of locations and placing it on beaches to protect against storm damage. In 1999, ten shore protection projects were under construction (in 10 states, nearly 180 miles of shoreline) and 16 were authorized awaiting initiation of construction (40 miles).

Many Corps' navigation jetty and navigation-channel projects are now more than 50 or even 100 years old, having been constructed without knowledge of potential regional impacts and contemporary needs and values associated with resource management. Advances in understanding of coastal sediment processes, and observation of impacts from earlier projects reveal a number of regional impacts associated with navigation projects. Large jetties, deep channels, and sand management practices that obstruct or otherwise prevent the natural movement of sand along the coast can be detrimental to beaches and other aspects of coastal systems. These effects can extend miles from the project and across many political boundaries.

Corps policy requires the development of dredged material management plans to anticipate and accommodate the sediment it moves (ER 1105-2-100). These analyses and decisions include not only consideration of sediment volumes and disposal site capacities, they also involve consideration of effects and the potential for beneficial use.

Project type	
Beach Nourishment	In FY 2000, 29 contracts awarded – 14 million cubic yards*
Inlets Maintained	63 contracts awarded** - 18 million cubic yards*
Harbors Maintained	>600 contracts awarded** - 440 million cubic yards*
Sand By-Pass Systems	Information not available without a data-call to the field
Beneficial Use Projects	Many instance, however, information not available without a data-call to the field***
DMMP's developed	Information not available without a data-call to the field
* Awarded to be dredged. ** Over last 11 years. *** examples can however be found at: http://www.wes.army.mil/el/dots/budm/budm.html	

[4] The yearly average for total dredging for the 10-year period 1992-2001 is $641 million, to dredge an average of 269 million cubic yards. The average total dredging cost for the last three years was $834 million. The average O&M dredging for the same three-year period is about $559 million and 228 million cubic yards. (These figures are in real dollars, not adjusted for inflation.) Source: Annual Continuing Analysis of Dredging Data and (personal) conversation with M. Pointon, March 2002).

Regional Perspectives Promise Improved Performance

In our typical problem solving approaches, we tend to dissect complex problems and issues into parts for more manageable examination, but don't always reassemble the alternative solutions and management measures to see how they relate to the original goals and problems to be solved.

The Corps has traditionally had a project focus (emphasizing solving a particular problem at a particular site), yet there is increasing emphasis on considering coastal (and other) problems on a regional basis. Section 227(d) of WRDA 1996 amended the 1946 Shore Protection Act, authorizing the Secretary to cooperate with states in preparation of comprehensive state or regional plans for the conservation of coastal resources located within state boundaries (33 USC 426g-1). Regional sediment management approaches enable better understanding of both the problems, as well as the effects and implications of proposed projects or management measures before they are implemented.

There also is increasing recognition that a project focus may hinder effective and efficient business practices. In some cases sand dredged from navigation channels has been disposed offshore beyond the active littoral zone. Coincidentally, separate shore-protection projects restoring sand to beaches were then developed that had to search for sand sources to compensate for the sand lost to the littoral zone through ocean disposal. (Houston, 1996, at: http://bigfoot.wes.army.mil/6714.html.)

RSM Incorporates Emerging Themes on Improved Water Resources Management.

RSM incorporates a number of themes that are emerging in the literature and ongoing discussions on recommended approaches for future water resources development and management, ecosystem management, watershed management and sustainable development. These themes include:

- System thinking and approaches
- Improving performance
- Balance among economic, environmental and social objectives
- Regionally identified priorities
- Sediment as a resource
- Collaborative approaches
- Innovation in technology and process

These resource management discussions are *emphasizing more comprehensive, integrated approach*es that *involve multiple levels of government* and ranges of *stakeholders* in *collaborative efforts*. The emphasis is to deal *not* with problems, issues, and *projects in isolation*; instead, but address them in the *context of a system* of resources, programs and project, etc. and consideration of consequences of decisions or actions over a longer term. These approaches to protecting,

restoring and managing resources require *regional* ***assessment of needs and opportunities***, as well as establishment of *priorities* at the regional levels rather than at the local or National levels.

The Corps' Policy Guidance Letter (PGL) Number 61 (1999) lays out *a watershed perspective* to be applied across all Civil Works programs. It acknowledges the need to apply system thinking to problem solving, project planning and management.

> *... growing recognition that "locally perceived water resources problems" have regional dimensions and are of concern to numerous, diverse interest groups. Many activities occurring in a watershed are inter-related and, therefore, managing water resources has evolved to more of a holistic, collaborative effort. The Corps has developed its own watershed perspective to guide water resources development, protection, and management within the Civil Works program. This watershed perspective accommodates the multi-objective, multi-purpose planning and investigations necessary for exploring these concerns. It is being adopted to help improve performance, customer satisfaction, and overall program efficiency and effectiveness and to assure use of the water resources in a sustainable manner, taking into account environmental protection, economic development, and social well-being.*

This policy identifies a number of principles for application of the watershed perspective, including: considering future resource needs; coordinating planning and management; promoting cross-program and interagency cooperation; encouraging public participation, evaluating tradeoffs; applying adaptive management. See http://www.usace.army.mil/inet/functions/cw/cecwp/branches/guidance_dev/pgls/pdf/pgl61.pdf .

Sediment as a Resource

Sediment, often considered a "by-product" to be disposed of or a "pollutant", "nuisance substance", or "spoil" to be controlled, is increasingly being acknowledged as a "resource" in need of management, much like water. As with water, there are competing societal demands for sediment and the need to manage its quantity, quality and timing of movement. Like water, sediment demands and natural fluctuations can result in shortages of the resource during certain times or at certain locations. Like water, changes in sediment quantity and quality can result in degraded habitat or restricted resource use. Like water, sediment moves in different dimensions. Water moves along gradients upstream to downstream in stream channels, or across the land, or through the surface into underground streams or aquifers. Sediment also moves along gradients, but it also is moved by currents along the shore, on and off shore in coastal zones, or across the shore by wind and waves.

Like water, sediment is managed, regulated or otherwise affected by many agencies and stakeholders. The concept of RSM attempts to foster a regional, multi-objective, multi-agency, multi-stakeholder approach to sediment management, much like the "watershed management

concept" does with water. As such, there are quantity and quality dimensions, as illustrated in the table below.

Like water, sediment is a resource for which there are multiple competing demands. Effective management of sediment, like water, can benefit from a coordinated, system approach that addresses quantity, quality and timing of movement.		
Too Much Sediment:	**Too Little Sediment**:	**Sediment as a Resource:**
▪ Obstruction of channels ▪ Rivers fill and flood ▪ Reefs get smothered ▪ Turbidity	▪ Beaches erode ▪ Riverbanks erode ▪ Wetlands are lost ▪ River profile degradation	▪ Construction material ▪ Sand for beaches ▪ Wetland nourishment ▪ Agriculture soil enrichment

Several states recognize sand as a valuable resource, and they now require beach-quality sediment removed from navigation channels to be deposited on beaches or in the littoral zone. Sediment as a by-product of various activities (e.g. channel maintenance or other dredging) may be valued by others for construction materials (e.g. building roads, making concrete), substrate for habitat (e.g. wetland creation, beach nesting habitat), or soil amendments to enhance agriculture[5]. While some sediment may be viewed as a pollutant (e.g. causing turbidity), this limited view of the resource can preclude consideration of innovative management approaches and options, which maybe be best addressed through system approaches that include consideration and examination of trade offs.

Notion of Sand Rights. The concept of "sand rights" discussed by Stone (1987), in Magoon and Edge (1989), supports the need to consider sand as a "resource". The authors note that particular sections of coastlines or littoral cells, when unimpeded, received sediment naturally. Works of civilization that reduce or modify the supply of sand alter the sediment budget, often resulting in beach loss, erosion or potentially accretion. The major activities include urbanization, dams, navigation projects, shore protection projects, sand extraction and mining. Stone argues for the adoption of a doctrine requiring decision-makers within greater littoral cells to consider the effect of all development projects on the supply of sand to the coast. Magoon and Edge suggest this proposed doctrine for sand rights and sand responsibilities:

> *Man and human induced actions will not interfere, diminish, modify or impede sand and other sediments or materials from being transported to and along beaches, shores or any flowing or eolian (windblown) paths or bodies without appropriate restitution being made. ...*
>
> *Sand, sediments and /or any material artificially introduced to an environment, or resulting from a man or human-induced action, may not diminish, detract from or in anyway impinge upon property or property rights, either public or private, without proper restitution being made. ...*

[5] A summary of beneficial uses of dredged material is available at: http://www.wes.army.mil/el/dots/budm/budm.html

How: Authorities, Policies, and Programs

Authorities and Policies Relevant to RSM

A number of legislative authorities and Civil Works policies support RSM implementation within the Corps. The authorities include both broad authorities that allow and encourage regional or comprehensive studies, approaches, and perspectives, as well authorities specific to sediment and sand management, storm damage reduction, shoreline erosion protection, management of dredged material. A number of Corps Civil Works policies and guidance documents also support regional or comprehensive approaches that consider projects, problem solving, and management in the context of broader systems, and advocate regional coordination of projects and studies within the Corps and with partners and stakeholders. The tables below summarize the existing authorities, policies, and programs that support and can facilitate RSM.

- Table 1 provides an *overview of the authorities, policies, and programs* summarized in Tables 2 and 3, identifying whether they address regional or comprehensive approaches, or whether they are more project focused but address sand, dredged material, coastal or other projects.

- Table 2 provides additional information on the *authorities* that either support the examination of water resources needs and opportunities in a regional context, or authorize Corps studies, projects and work in coastal areas, or include provision regarding sand or dredged material management. These authorities provide advocacy, support and opportunities for RSM.

- Table 3 summarizes a number of Civil Works *policies* that advocate an integrative, regional or watershed perspective in carrying out Civil Works projects and programs. These policies provide a foundation of support for the concept of RSM.

Additional detail on the authorities and policies is presented in Appendix B.

Table 1. Overview of Corps Civil Works Authorities & Policies Relevant to RSM

Authority, Policy, or Program	Overview
General Authorities that Support Watershed, Comprehensive and System Approaches	
• Sec 202 WRDA '00 • Specific Authorizations or Study Resolutions for Watershed and Comprehensive studies	Broad authorizations to address water resources needs and opportunities in a watershed or Region
• Sec 22 WRDA 74 – Planning Assistance to States	Provide assistance with plans for development, use and conservation of water and related land resources of basins, ecosystems and watersheds
• Sec 227(d) WRDA '96 – Regional Planning for Conservation of Coastal Resources	Cooperation in preparation of comprehensive state or regional plans for conservation of coastal resources
• Sec 516, WRDA '96 – Long-term Sediment Management Strategies	Cooperative long-term strategies for controlling sediments at navigation projects
• Sec 5 Rivers & Harbors Act 1935	Consider broader effects in navigation studies; potential effects to adjacent shores; not < 10 miles on either side.
Policy and Guidance that Support Watershed, Comprehensive Approaches, and System Considerations	
• PGL 61 – CW Watershed Perspective	Advocates watershed & systems perspective w/in and across CW programs
Dredged material management Plan (DMMP) Policy Dredging PGL's	DMMPs for all projects, groups of inter-related projects; update periodically; consider opportunities for beneficial use.
• Planning Guidance – system context	Watershed perspective; consider landscape implications of navigation improvements; systems analysis in shoreline studies; beneficial use of dredged material; development of DMMPs.
• Implementation Guidance for Section 202, WRDA 2000, Watershed and river basin assessments	Products can be plans or management documents that identify actions to be taken by partners, stakeholders or the Corps to meet the objectives of the plan.
• Implementation Guidance for Section 107, R&H Act 1962 - Navigation	Coordinate proposed implementation measures with other non-Federal shore protection projects the region; prepare a comprehensive regional product that includes Section 111 projects and shore protection projects pursued under other authorities in the same region.
Authorities Specific to Projects, Sand, Dredged Material Management	
• Sec 216 RHFCA '70 – Review of Completed Projects	Examine and make recommendations for changes to projects or their operations relative to contemporary needs and opportunities, along with new understanding of processes, economic conditions, etc., for improving the environment.
• GI – Specifically authorized projects	Can address a wide range of sediment issues and opportunities and practices depending on authorizing language.
• Sec 111 (RHFCA'68), 940 WRDA'86	Prevention or mitigation of erosion or shoaling damages attributable to navigation projects.
• Sec 103 and 14	CAP- "small" projects for storm damage reduction and shoreline erosion
• Sec 145, 933, 217 – Sand on beaches	Link dredging w/beach nourishment.
• Sec 204, 206, and 1135	CAP – "small" environmental projects, including: Beneficial use of dredged material, Aquatic ecosystem restoration, and Project modifications for improvement of the environment.
Sec 207 WRDA '96 - Selection of dredged material disposal methods	Do not have to use least cost disposal of dredged material for ecosystem restoration and protection.
Programs Potentially Relevant to RSM	
• Regulatory	- Permits for dredge & fill - SAMPs facilitate regional approaches; stakeholder involvement; link to state wetland mgt plans and CZM plans; General permits can help make regulated activities consistent with RSM mgt goals
• Natural Resources Management	- Manage natural resources in accordance with ecosystem management principles, which emphasize integration rather than compartmentalized approaches. - Integrate management of natural and cultural resources with other authorized project activities in a "multiple use concept" that takes into account the total system.

Table 2. Civil Works Authorities that Support RSM

1. Section 202 of WRDA 2000, Watershed and River Basin Assessments. Amends Section 729 of WRDA 1986, providing authority to assess the water resource needs of river basins and watersheds including ecosystem protection and restoration, flood damage reduction, navigation and ports, watershed protection, water supply, and drought preparedness.

2. Basin and Specific Study Authorities. A number of specific study resolutions and studies authorities allow, if not emphasize, comprehensive examinations of water resources needs and opportunities.

3. Planning Assistance to States (Section 22). Section 22, WRDA 1974, as amended, authorizes the cooperation with states and Indian tribes in preparing plans for the development, utilization, and conservation of water and related land resources of drainage basins, ecosystems and watersheds.

4. Section 227(d) of WRDA 1996, State and Regional Plans - amends the 1946 Shore Protection Act, by adding " Section 4, State and Regional Plans" authorizing the Secretary to cooperate with states in preparation of comprehensive state or regional plans for the conservation of coastal resources.

5. Section 516 of WRDA 96, Sediment Management, authorizes the Secretary to enter into cooperative agreements with non-Federal interests with respect to navigation projects, or other appropriate non-Federal entities, for the development of long-term management strategies for controlling sediments at such projects.

6. Section 5 of the River & Harbor Act of 1935 requires consideration of the broader landscape in navigation improvements studies - improvements potentially affecting adjacent shoreline will include analysis of the probable effects on shoreline configurations (not less than ten miles on either side of the improvement).

7. Changes to Completed Projects to Improve the Environment or Examine Changed Economic Conditions (Section 216, River and Harbor and Flood Control Act of 1970) authorizes investigations for modification of completed projects or their operation due to significantly changed physical or economic conditions and for improving the quality of the environment in the overall public interest.

8. Mitigation of Shore Damage Due to Federal Navigation Projects (Section 111, River and Harbor and Flood Control Act of 1968, as amended by **Section 940** of WRDA 1986). Authorizes the investigation and recommendation of structural and non-structural measures to prevent or mitigate erosion or shoaling damages attributable to Federal navigation works; implementation is also authorized if the Federal share of the first cost of construction is $5,000,000 or less.

9. Storm Damage Reduction, Section 103, River and Harbor Act of 1962 (PL 87-874), as amended, authorizes a program for Federal participation in the cost of protecting the shores of publicly owned property and private property where public benefits result.

10. Emergency Streambank and Shoreline Erosion Protection for Public Facilities and Services (Section 14), Flood Control Act of 1946 (PL 79-526), as amended. Authorizes projects to protect public or non-profit public facilities or services threatened by natural processes on steambanks and shorelines.

11. Placement of Dredged Materials on Beaches. Section 145, WRDA 1976 (Public Law 94-587) as amended by **Section 933** of WRDA 1986 and **Section 217** of WRDA 99, placement of beach quality sand from new construction or O&M dredging on beaches at state request.

12. Beneficial Uses of Dredged Material, Section 204 of the WRDA of 1992, as amended, authorizes the protection, restoration and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for new project construction or maintenance.

13. Aquatic Ecosystem Restoration, Section 206, WRDA 1996 authorizes the restoration and protection of aquatic ecosystem structure and function. No linkage to an existing Corps project is required. Cap of $5,000,000 in Federal funds per project.

(Continued)

14. Project Modifications for Improvement of Environment, Section 1135, WRDA 1986, as amended, authorizes review of completed water resources projects to determine the need for modifying the structures or operations to improve the quality of the environment. Review to determine if the operation of projects has contributed to the degradation of the quality of the environment is also authorized. Recommended structural and operational changes must be consistent with the authorized project purposes. Cap of $5,000,000 in Federal funds per project.

15. Selection of Dredged Material Disposal Methods, Section 207, WRDA 1996. Selection of a disposal method that is not the least-cost option is allowed if the incremental costs are reasonable in relation to the environmental benefits, including the benefits to the aquatic environment from creation of wetlands and control of shoreline erosion.

Table 3. Civil Works Policies that Support RSM

1. Civil Works Watershed Perspective. Policy Guidance Letter (PGL) 61 - *Application of a Watershed Perspective to Corps of Engineers Civil Works Programs and Activities,* establishes and describes policy regarding a watershed perspective to guide water resources development, protection, and management within the Civil Works program. Examination of water resources needs and opportunities in regional contexts along with integrative, regional or watershed approaches to in carrying out Civil Works projects and programs is emphasized. The system approach advocated is equally applicable to coastal regions as it is to interior watersheds, and the connecting system components. (See http://www.usace.army.mil/inet/functions/cw/cecwp/branches/guidance_dev/pgls/pglindex.htm).

2. Section 202, Watershed Assessments, WRDA 2000, Implementation Guidance – Products from watershed assessments can be plans or management documents that identify actions to be taken by partners and stakeholders to meet the objectives of the plan, not just projects recommended for Corps implementation. (See http://www.usace.army.mil/inet/functions/cw/cecwp/branches/mp_and_dev/Wrda00/wrda00202.PDF).

3. Consideration of the Broader Landscape Implications of Navigation Improvements. Planning guidance includes the requirements of Section 5 of the River & Harbor Act of 1935 that each investigation on navigation improvements potentially affecting adjacent shoreline will include analysis of the probable effects on shoreline configurations. A distance of not less than ten miles on either side of the improvement should be analyzed. (ER 1105-2-100, para E-14(h)).

4. Section 107 (River and Harbor Act of 1962) Planning Guidance – Proposed implementation measures shall be coordinated with other non-Federal shore protection projects in the same geographic region; to the extent practicable, Section 111 projects and shore protection projects pursued under other authorities in the same region, shall be combined into a comprehensive regional product (ER 1105-2-100, pg F-15).

5. Civil Works Planning Guidance Acknowledges the Need for S*ystems Analysis* in Shoreline Studies. A systems analysis is included among the principles in guidance for evaluation of benefits from hurricane and storm damage reduction projects. Appendix E of ER 1105-2-100, Paragraph E-24 (f) includes requirements for a systems analysis approach, which includes: physical processes, coastal alterations, shoreline change forecasts, and economic benefits and costs.

6. Beneficial Use of Dredged Material. Corps planning guidance (ER 1105-2-100) encourages districts to consider opportunities for aquatic ecosystem restoration when examining dredged material disposal. Consideration of opportunities to beneficially use dredged material can foster multi-objective analysis in dredged material management, and potentially achieve greater benefits than consideration of maintenance dredging objectives alone. Beneficial use is a business practice within O&M and authorized in a programmatic authority (Section 204). EM 1110-2-5026 provides guidance for planning, designing, developing, and managing dredged material for beneficial uses, incorporating ecological concepts and engineering designs with biological, economical, and social feasibility.

7. PGL 56, Section 207 WRDA 1996, Selection of Dredged Material Disposal Methods. Dredged material from construction, operation or maintenance of authorized projects can be used to create wetlands or protect environmental resources from erosion. Studies for new navigation projects or modifications to existing navigation projects shall examine the feasibility of using dredged material for ecosystem restoration. If feasible, this beneficial use would be authorized as part of the project. For maintenance dredging, Section 207 could be used if the environmentally beneficial disposal method has large incremental costs, which preclude the use of Section 204 (i.e. Federal cost >$5 million). The increment of costs to achieve environmental benefits are shared on a 75% Federal and 25% non-Federal basis. (See: http://www.usace.army.mil/inet/functions/cw/cecwp/branches/mp_and_dev/Wrda00/wrda00202.PDF).

Other Programs and Activities that can support RSM.

A number of activities and programs involve the implementation and management of Corps projects and studies in the coastal regions. Some of these encourage systems approaches and thus can support and be integral to RSM. These include:

- Dredged material management planning
- Beneficial use of dredged material
- Periodic nourishment
- Sec 516 sediment management strategies
- Potential linkages with the Regulatory Program, the Natural Resources Management Program, and Major Rehabilitation, and
- The regional sediment management demonstration program (which is discussed in the next section of this report).

1. Dredged Material Management Planning. Dredged material management planning is intended to help ensure that maintenance dredging activities are performed in an environmentally acceptable manner, use sound engineering techniques, are cost effective, and that sufficient confined disposal facilities are available for a time into the future (e.g. 20 years[6]). These plans address dredging needs, disposal capabilities, capacities of disposal areas, environmental compliance requirements, potential for beneficial usage of dredged material and indicators of continued economic justification.

Corps policy per 33 CFR Part 337.9 directs that, "*District engineers should identify and develop dredged material disposal management strategies that satisfy the long-term (greater than 10 years) needs for Corps projects. Full consideration should be given to all practicable alternatives including upland, open water, beach nourishment, within-banks disposal, ocean disposal, etc*."

[6] See ER 1105-2-100, pg 3-4.

Dredged Material Management Plans (DMMPs) are to be prepared for all Federal navigation projects, or groups of inter-related harbor projects, or systems of inland waterway projects (or segments)[7]. The DMMPs are to be updated periodically to identify any potentially changed conditions. DMMP may address multiple projects, and the development of these plans in the context of RSM may contribute to increased efficiencies and reduced O&M costs, and a broader array of benefits. The extent to which these plans have been implemented is not known, and it is suspected that only a few DMMPs have been developed as regional plans, which accommodate multiple projects and suites of opportunities. See discussion under policy issues.

Dredged Material Management Policy.

- Sound management of dredged material is a priority mission of the Corps.
- The Corps is committed to conducting dredging and managing dredged material in an environmentally sound manner.
- The interests of economic development and environmental sustainability will best be served when dredged material placement proceeds according to a management plan. Therefore each existing and proposed navigation project will have a dredged material management plan that ensures warranted and environmentally acceptable maintenance of the project.
- Beneficial uses of dredged material are powerful tools for harmonizing environmental values and navigation purposes.

Corps policy is that all dredged material management studies include an assessment of potential beneficial uses for environmental purposes including fish and wildlife habitat creation, ecosystem restoration and enhancement and/or hurricane and storm damage reduction. Districts and MSCs will make every effort to ensure that sponsors and other interests understand the valuable contributions that beneficial uses can make to management plans and will maximize use of regional forums to share experiences of opportunities for beneficial uses. [ER 1105-2-100, App. E]

Examples of regional dredged material management planning:

- **Intracoastal Waterway in Florida** – A long-range dredged material management program was initiated to address navigation channel maintenance for the 404 mile long intracoastal waterway in Florida. The plan was developed on a county-by county basis, defining short- and long-term needs, taking into account historical dredging and sediment information, and other engineering, environmental, operational and socioeconomic considerations. A technical advisory committee and a citizen's advisory committee provided input to and review of the plan as it progressed. The plan includes a number of centralized upland sites, each with designated active management procedures and techniques to facilitate material reuse to achieve long-term operational and environmental benefits, and address regulatory requirements. Beach placement is also an integral part of the management plan, particularly in those reaches adjacent to tidal inlets where shoals are comprised of beach-quality sands. Upland staging areas supplement the beach placement sites, allowing scheduling adjustments to be made to meet environmental or other

[7] **33 CFR Part 337.9** ... directs that, "District engineers should identify and develop dredged material disposal management strategies that satisfy the long-term (greater than 10 years) needs for Corps projects."

requirements. When fully implemented, the plan will include 54 upland containment facilities and up to eight beach placement sites. Implementation of the plan costs $120M ($60M acquisition costs and $60M construction costs.) The plan provides a common ground for environmental protection and navigation maintenance, and opportunities for a range of beneficial use of the material.

Once dredged material management needs have been addressed, resources can be directed to the control of sediment in-flow into the waterways. The plan include a general identification of the source of the sediments entering into the waterway channel, and this sediment in-flow is being addressed by the state and other government agencies through cooperative projects involving inlet management, stormwater control and shoreline stabilization. If successful, sediment in-flow reductions will save local and federal maintenance dredging funds, increase the length of time to fill the upland sites to capacity, reduce the impact of suspended sediments on the environment of Florida's waterways and increase retention of these sediment in our beach and upland systems.

- **San Francisco Bay LTMS** - A long-term dredged material management strategy (LTMS) was developed for the San Francisco Bay area where an average of 6 million cubic yards of sediments need to be dredged annually. The goals of the plan are to: maintain navigation channels in an economically and environmentally sound manner, eliminate unnecessary dredging, maximize the use of the material as a beneficial resource, and to establish a cooperative permitting framework. The plan development was a partnership effort among federal and state agencies, and navigation, fishing and environmental interests and organizations, and the public. Development of the plan included examination of different combinations of disposal sites within the estuary, offshore sites in the ocean, upland sites, and wetland disposal or reuse sites. The selected plan includes low disposal volumes at in-bay sites, medium disposal volumes in the ocean sites, and medium volumes of upland/wetland reuse placement. Implementation of the management plan includes a transition to ramp-down in-bay disposal as upland beneficial reuse sites are made available. Development of the plan was specifically authorized as a line item in the O&M budget. Major Corps dredging projects in the Bay contribute fees to support the monitoring of key sites.

2. Beneficial Use of Dredged Material. Corps guidance (ER 1105-2-100, pg E-20) encourages districts to consider options that provide opportunities for aquatic ecosystem restoration when determining an acceptable method of disposal of dredged material. Feasibility studies for new navigation projects or modifications to existing navigation projects examine the feasibility of using dredged material for ecosystem restoration purposes and, if feasible, such environmentally beneficial uses would be specifically authorized as part of the project. Where environmentally beneficial use of dredged material is the least cost, environmentally acceptable method of disposal, it is cost shared as a navigation cost. Section 204 of the WRDA of 1992, as amended, provides programmatic authority for selection of a disposal method for authorized projects, that provides aquatic restoration or environmental

shoreline erosion benefits when that is not the least costly method of disposal[8], with the incremental added cost shared with a non-Federal sponsor[9].

3. Periodic Nourishment. Public Law 84-826 provides that Federal participation in periodic beach nourishment may be appropriate when it comprises a more suitable and economical remedial measure for shore protection than retaining structures such as groins. Projects with structures included to maintain a shore alignment, but not to materially prevent littoral drift (which may nourish down drift beaches), such as low-profile groins and offshore breakwaters, are eligible for periodic nourishment. (ER 1105-2-100, pg E-140, para g).

4. Section 516 of WRDA 1996. Section 516 of WRDA 96 is titled Sediment Management, and authorizes the Secretary to enter into cooperative agreements with non-Federal interests with respect to navigation projects, or other appropriate non-Federal entities, for the development of long-term management strategies for controlling sediments at such projects. The strategies developed under this authority are to include:

- Assessments of sediment rates and composition, sediment reduction options, dredging practices, long-term management of any dredged material disposal facilities, remediation of such facilities, and alternative disposal and reuse options;
- A timetable for implementation of the strategy; and,
- Incorporation of relevant ongoing planning efforts, including remedial action planning, dredged material management planning, harbor and waterfront development planning, and watershed management planning.

No specific implementation authority was issued for this provision. However, it was used to some extent as the basis to fund the RSM demonstration program discussed in the next section. The authority could potentially be used for study funding, perhaps for coastal and inland watershed studies where there are sediment interests and concerns. No specific cost sharing was specified in this authority, funding for these studies could be sought at either a full Federal cost or as a cost-shared effort. The authority could potentially be used for Corps participation in the California Sediment Management Working Group.

5. Regulatory. The potential role of the Regulatory program in watershed planning is noticeably increasing as wetland management evolves within the contexts of ecosystem management and watershed planning. These broader scale approaches can facilitate addressing resource management goals through a combination of regulatory and conservation or stewardship activities. This evolution is acknowledged in one of the Interagency Ecosystem Management Task Force case studies:

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[8] Section 204 of WRDA 92 authorizes the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands in connection with dredging for construction, operation, or maintenance of authorized Federal navigation projects. Non-Federal cost sharing is 25%.

[9] See Section E-14 and Appendix F of ER 1165-2-100 for additional information regarding beneficial use of dredged material.

> "*The Corps and EPA have used their 404 authority to develop watershed-based programs that facilitate the ecosystem approach". ...* [The Section 404 program] *can complement ecosystem management because it involves analysis of potentially far reaching impacts of discrete activities, and provides opportunities for relevant resource agencies and other stakeholders to become involved* (IEMTF, 1996, Vol 3, South Florida case study).

The use of programmatic general permits can contribute to the ecosystem approach and regional objectives by protecting protect aquatic ecosystems, supporting comprehensive watershed management plans, and reducing duplication between Federal and non-Federal regulatory programs. General permits can be issued if they conform to these comprehensive plans and the authorized activities result in minimal individual and cumulative adverse effects on the aquatic environment.

In response to criticism that the practice of issuing individual permits, and a strict adherence to the Section 404(b)(1) sequencing process, is inefficient and ineffective with respect to both regional development and environmental interests, the Regulatory program has been working to incorporate more comprehensive, integrated wetlands regulation. The case-by-case, site specific decisions of the past often had limited ability to address issues such as cumulative effects, and other ecosystem-level impacts. This integrated approach includes the use of several tools, including: a) general permitting - nationwide permits, regional permits, and programmatic permits (33 CFR parts 320-331); b) special area management plans (SAMPs); c) advanced identification of wetlands (ADID); d) wetland mitigation banking; and e) in lieu fee mitigation programs.

SAMPs are planning tools utilized by local governments under the Coastal Zone Management Act for the purposes of facilitating both protection of wetlands and other natural resources, as well as economic growth in coastal regions. The Corps participates in the development of SAMPs with the intent of producing general permits that can accommodate regional watershed planning objectives and needs, including the balancing of ecological and development objectives.

The Corps participation in the development of regional wetland management plans, including Special Area Management Plans (SAMPs), and other initiatives that provide a broader perspective on wetland resources can play a role in RSM. Regulatory decisions that take into account landscape considerations, and are made in a watershed context, can support the ecosystem approach and RSM.

6. Natural Resource Management. The Corps manages over 12 million acres of land and water associated with 463 Civil Works projects as part of recreation and natural resource management within the Operations and Maintenance program. Natural resources management is accomplished through the use of one or more of the following management concepts: stewardship, mitigation, or enhancement (ER 1130-2-540, *Environmental Stewardship Operations and Maintenance Policies*). The resources targeted under this program include both natural (fish and wildlife, forests, wetlands, grasslands, soil, air, and water) and cultural (cultural resources, historic properties, and archeological) resources. The

trend in natural resources management is away from a "dominant-use philosophy", where management activities tended to maximize that resource to the exclusion of others. Contemporary program objectives are to manage natural resources on Corps administered land and water in accordance with ecosystem management principles, which emphasize integration rather than via the traditional compartmentalized approach. The program strives to integrate the management of natural and cultural resources with other authorized project activities in a "multiple use concept," that takes into account a more complete system.

Corps Natural Resource Management (NRM) policy encourages the use of ecosystem management principles in the management and conservation of the natural resources under Corps stewardship. The policy guidance for program implementation specifies and encourages working with other Federal resource agencies in developing specific natural resource management goals for all project lands, and coordinating management measures. The mission statement incorporates consideration of public recreation opportunities, and preservation of opportunities for future generations. Master Plans and Operational Management Plans are to be developed for each project, describing the authorized activities, resources within project boundaries, specific management objectives, and implementation plans for natural resource areas and recreation areas (ER 1130-2-540, and ER 1130-2-550, Chapter 3). General Plans for Fish and Wildlife Management are prepared pursuant to the Fish and Wildlife Coordination Act, to address fish and wildlife conservation and management for lands and waters administered by other agencies, or for lands acquired specifically for mitigation. Because of the breadth of their involvement in a region, natural resource managers may be able to significantly contribute to regional sediment management planning.

Corps guidance discusses cooperating with other natural resource agencies to work toward both National and regional natural resource management objectives. There are also numerous opportunities to work with local lake associations and state departments of natural resources to address local and regional ecosystem management objectives. The integration of other land management activities under the general natural resources management program helps ensure a more system oriented approach to environmental stewardship - holistic perspectives and integrated approaches are among the tenets of ecosystem management. Among these other programs are: (1) resource disposal and removal (forest products, agricultural crops and activities, minerals, sand, gravel, and embedded stone), (2) pollution abatement, (3) out granting of lands, and (4) pest control programs. To achieve a truly "total system" approach in the management of Civil Works natural resources, recreation objectives and resource management objectives will need to be considered together. Some districts have area project managers assigned to oversee natural resources management programs across

Potential RSM demonstration including natural resources management. The Northwestern Division is considering an RSM demonstration effort in the Columbia River basin that would address riparian habitat restoration in a way that links shorline erosion management, utilizes dredged material as an alternative source of material from that which is currently hauled in from a declining borrow area. In addition to ecological objectives, the effort would also include protection of cultural resources identified as significant by tribal stakeholders. The demonstration would pursue development of natural resources management Operations Plans in coordination with a regional DMMP.

several projects. This arrangement is can facilitate integration of these programs and their objectives across projects in a basin.

Natural Resource Management Mission Statement Excerpts (Source: ER 1130-2-540)

"*The Army Corps of Engineers is the steward of the lands and waters at Corps* [operated and maintained] *projects. Its Natural Resources Management Mission is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations.*"

"... The Corps manages for long-term public access to and use of the natural resources in cooperation with other Federal, State, and local agencies as well as the private sector."

"The Corps integrates the management of diverse natural resources components ... with the provision of public recreation opportunities. The Corps conserves natural resources and provides public recreation opportunities that contribute to the quality of American life."

7. Major Rehabilitation. Major rehabilitation can be conducted to either improve reliability or efficiency, or both. There may be occasions when operational and structural modifications required for improving reliability or efficiency may also address regional sediment management opportunities. An examination of opportunities to accomplish environmental objectives within current policies and authorities would help foster implementation of the ecosystem approach. This could be done while acknowledging constraints imposed by authorized project purposes, budget and schedules.

The RSM Demonstration Program

The Corps initiated an RSM Demonstration program to examine, apply and evaluate RSM opportunities, practices and benefits. The program focuses on managing sediment as a regional resource and integrating the collection of Corps and other programs and activities related to sediment in a region. While the concept applies to sediment processes and management within entire watersheds, the initial efforts of the demonstration program have focused on coastal sediment management. This is largely because of the evolution of the concept of RSM that was discussed in the brief history earlier in this report.

Goals of demonstration program include:

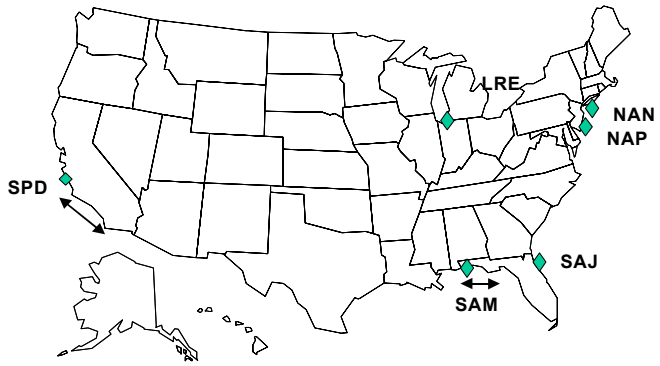
- Improve sediment management - especially keeping sand in the littoral system
- Demonstrate innovative approaches, technical advancements and tools for RSM
- Engage the various mission areas within the Corps
- Develop partnerships for more effective program integration and performance
- Achieve benefits
- Identify and overcome institutional and programmatic obstacles that prohibit or impede RSM approaches.

In early discussion of potential demonstration efforts, opportunities for the following were discussed as key to application of the RSM concept:

- Fostering "system" thinking and approaches by:
- Considering natural sediment pathways and geological controls (like hydrology in river streams)
- Recognizing interrelationships of Corps' and others' activities in the coastal region
- Regionally identifying priorities and building upon existing opportunities.
- Improving performance
- Minimize material re-handling (reduces costs)
- Better solutions with greater accommodation of economical development and environmental goals

The RSM demonstration program began in FY 2000, with Mobile District's Northeast Gulf of Mexico project, spanning an area that includes parts of the Florida and Alabama coasts to Mississippi. In FY2001, five additional demonstration initiatives were added to the demonstration program. As part of these efforts, sediment management problems are being defined, and alternative management approaches for

Regional Sediment Management Demonstration Sites



addressing the problems are being identified and examined.

Potential Products from the Demonstration Efforts Include:

1. Regional sediment budgets for the regions or relevant subregions.
2. Inventories of sediment resources located in the region.
3. Technical advisory committees to promote and facilitate regional sediment management.
4. Inlet sediment management plans.
5. Regional water circulation models.
6. Revised dredge material management plans for Federal navigation projects.
7. Coordinated RSM plans addressing Corps projects and studies and state strategic beach management and other plans, reflecting findings of the demonstration efforts.
8. Web pages documenting RSM efforts and sharing information with partners.
9. Discussion of actual and potential benefits from RSM.
10. Discussion of institutional impediments to implementing RSM.
11. Discussion of innovations potentially applicable outside of the demonstration efforts.

Summaries of the demonstration efforts are provided in the following section, and a discussion of the preliminary benefits anticipated from applying the RSM approach in the demonstration efforts follows. A website for the demonstration program has been incorporated into the broader RSM website at: http://chl.wes.army.mil/research/sedimentation/RSM/index.html . A number of the demonstration districts also have websites for their RSM specific efforts.

RSM Demonstration Efforts

This section provides summaries and highlights of the six RSM demonstration initiatives. Several of the initiatives were underway prior to funding of the national demonstration effort and are thus further along than those initiated with FY 2001 demonstration funding. These efforts, along with other relevant projects and programs within the districts are being linked to the demonstration program efforts, thus leveraging resources and providing synergy in application of the RSM concept. Information is provided regarding the potential benefits anticipated from the demonstration efforts based on information provided by the districts.

Mobile District

The Mobile District's demonstration project covers 375 miles of shoreline along the northeast Gulf of Mexico, extending from the St. Mark's River, FL, in the east through the Pearl River, MS, in the west. Included in this area are three deep draft projects, two shallow draft projects, one Federal shore protection project, and several state nourishment projects, plus a mix of Federal land ownership (e.g. National Park Service and the U.S. Air Force). Box 1 presents the goals and objectives laid out by the district for their RSM demonstration efforts.

The demonstration was initiated in 1999[10], and initial efforts included a series of facilitated workshops with other agencies and stakeholders. A technical working group (TWG) of interested agencies and local academia was formed to define the problems and opportunities and steer the demonstration effort[11]. The TWG operates without a formal partnering agreement, meeting twice a year to review program status and activities, and to recommend future actions. The TWG identified projects opportunities for management modifications to help produce results quickly.

Goal: to change the paradigm of project specific management to a regional approach in which the Corps cooperates with other levels of government, stops managing solely by project, and manages sand as a resource. Objectives of this demonstration effort include:

- Implement RSM practices
- Improve economic performance by linking projects
- Develop new engineering techniques to optimize/conserve sediment
- Identify bureaucratic obstacles to RSM
- Manage in concert with the environment

RSM efforts are expected to improve coastal resource management by maximizing the return of sand to the littoral system, reducing adverse environmental impacts, and increasing economic benefits.

Box 1. Northeast Gulf of Mexico RSM Demonstration Goals and Objectives.

Six initiatives were selected based on an analysis and prioritization of a wide range of sediment-related needs and opportunities in the region:

- Perdido Pass – down drift bypassing
- Mobile Pass (Sand Island) – beneficial use
- GIWW at Pensacola Harbor (Ft. McRee) – Sec 204 at Perdido Key
- East Pass (Norriego Point) – down drift bypassing
- St. Andrews Inlet/Panama City Harbor (Gator Lake) – link with Sec 1135
- Beneficial use of river sand - Black Warrior-Tom Bigbee; Apalachicola River

The experience gained from these initiatives will be extended to other projects and region sub-areas.

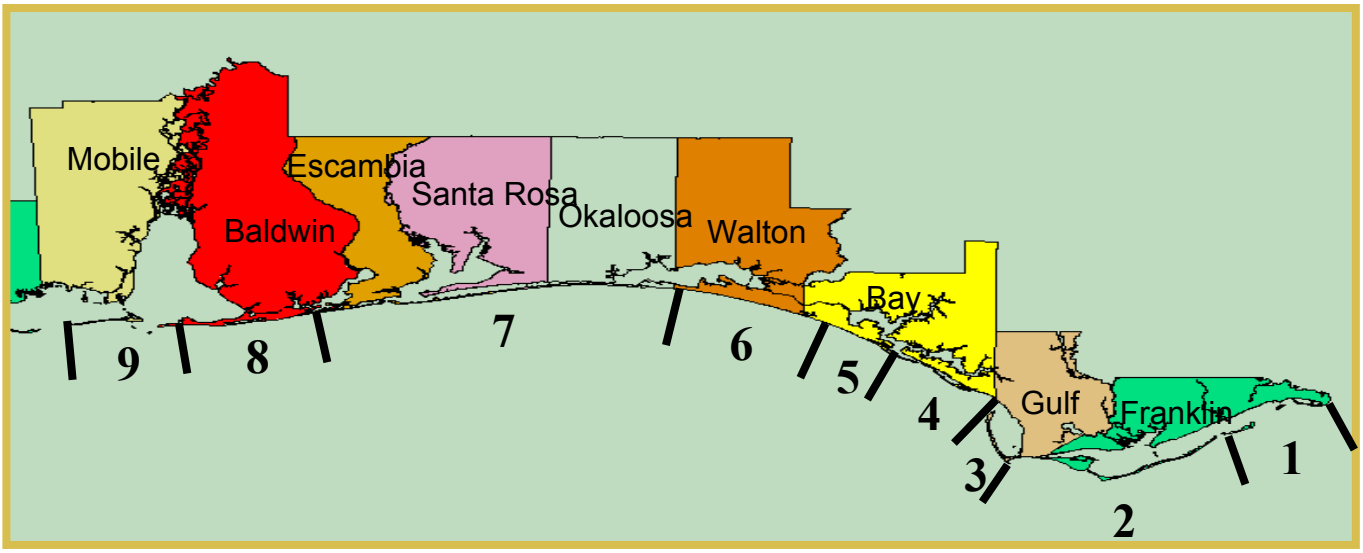
As a result of information from the TWG recommendations and the engineering studies, the district is changing operation and maintenance practices at three sites:

- New dredged material disposal sites at Perdido and East Pass Inlets, will minimize rehandling of material. A new contract will modify placement of maintenance material dredged from Perdido Pass navigation channel to a location that will improve return of sand down drift.
- The certification of new beach disposal site at East Pass is underway.
- The third initiative involves linking a disposal sites for dredged sediment along the Apalachicola River, with beach nourishment needs on the coast. Disposal sites along the river are full, and the demonstration initiative will examine the costs and benefits of

[10] Mobile District's RSM demo efforts were initiated with $200,000 of the District's O&M funds.
[11] Participants include the coastal, estuarine, environmental, and geological agencies from three states, their county offices, and other Federal agencies.

bringing this sediment to the coast for beach nourishment and/or environmental enhancement.

- The some sponsors found to help pay additional costs where recommended disposal costs more than at traditionally used sites.



Workshops conducted at sub-regional levels were held to introduce the RSM concept to local interests, present ongoing and planned activities, solicit local involvement at the county and city levels, identify local projects within each sub-region, and identify sources of information pertaining to each sub-region. Public meetings are also planned to inform the public about the RSM concept and the benefits of regionalized shoreline management.

The RSM initiative is contributing to the development of shoreline management plans for Alabama and Mississippi. Technical exchange meetings are held annually with the State of Alabama (Coastal Erosion Task Force), to share information and technical results of studies or analysis of shoreline processes. A Mississippi/Alabama Information Exchange meeting is held annually to address shared coastal interests and concerns. The meetings serve to foster cooperation and information sharing among federal, state and local government programs, and better understanding of resource management responsibilities.

One of the key needs and products of the demonstration has been the development of a regional GIS. At the start of the demonstration in October 1999, there was no baseline data for large portions of the region and historical data sets for the region were vastly different. These gaps and inconsistencies hindered the examination and selection of sand management decisions, particularly in a regional context. Partnerships established with Federal, state and local GIS programs have improved the compatibility and sharing of information (e.g. bathymetry, shoreline position, profiles, meta data), which is useful to the demonstration efforts and will be useful in future studies and project maintenance activities.

Other work being done by the district is benefiting from and contributing to the GIS and other RSM initiatives. A GIS technical working group was formed and workshops held to share the technology with other interested districts and stakeholders (see http://gis.sam.usace.army.mil/Projects/RSM_Workshop/index.htm). For example, two

environmental projects have been initiated, an 1135 at St. Andrews Inlet (Gator Lake), and a 204 at Pensacola Pass, and studies were initiated at St. Andrew's Inlet and Ft. McRee. Each will be linked to new sediment management plans. The availability of data and other information in the GIS, as well as the network of partnerships established as part of the TWG are also expected to benefit new specifically authorized studies (GI), reducing data collection and analysis needs, advancing the baseline for problem analysis and solution development.

For more detail about the Mobile District's RSM demonstration project see: http://gis.sam.usace.army.mil/Projects/RSM/index.htm .

Potential Benefits:

- Perdido Pass - Reduced rehandling, improve channel efficiency, hurricane damage mitigation, and improved safety. Increased sea turtle nesting habitat. Potential reduction in dredging costs (3 to 4%), value of sand $800K per year.
- GIWW at Pensacola Harbor (Fort McRee) - Increased disposal site capacity, reduced rehandling (dredging savings), improve channel reliability, stabilized beach mice/sea turtle habitat. Increased tourism. Stockpiling of 400,000 cy of sand stockpiled and sand on beach (est. value $920K).
- East Pass (Noriego Point) - - Protection of USAF facility, possible reduction in material rehandling. Stabilized sea turtle habitat; reduce O&M dredging costs. Value of reduced damage repair costs to USAF, $369 K per year,
- Panama City Harbor, St. Andrews Bay (Gator Lake) - Stabilize State Park shoreline, protect sensitive freshwater habitat, reduce dredged material rehandling. Anticipated reduction in O&M costs (Sec 111) of $100k per year; value of sand $507K .
- River Sand - Restore existing disposal area capacity and reduce need to acquire new lands. Provide potential suitable source of material for coastal system; continue to provide channel reliability. A new disposal site is estimated to cost $3M to acquire land and build dikes; the value of sand on beach and for coastal system is estimated to be $4.6M.

Jacksonville District

Prior to the demonstration program, the Jacksonville District and the Florida DEP's Office of Beaches and Coastal Systems had executed a Section 22[12] Memorandum of Agreement (MOA) for coordination of dredging activities in the coastal zone on a regional, rather than project scale. The MOA encompasses all phases of shore protection, navigation and beneficial use projects in northeast Florida (Nassau, Duval and St. Johns Counties). This agreement and associated investigations were conducted in the spirit of the CERB's charge to develop

[12] Section 22 of WRDA (Public Law 93-251), as amended, authorizes the Secretary of the Army, acting through the Chief of Engineers, to assist the states in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.

regional and systems approaches to sediment management. These efforts are being examined and supported by the RSM demonstration program.

As part of the work under the Section 22 agreement, the District provided technical assistance to the state in coordinating RSM activities in several subregions. An RSM Web site *(http://rsm.saj.usace.army.mil)* was developed as part of the agreement to facilitate coordination with other Federal and non-Federal agencies as well as the public.

Jacksonville District Demo Goals and Objectives discussed at Workshops:.
To apply the concept of RSM, which includes but is not limited to, coordination of dredging activities in the coastal zone for the purposes of enhancing regional sediment budgets, reducing project costs and restoring essential environmental habitats.

- Manage sediment on a regional scale
- Increase bypassing of beach quality sand at inlets
- Create and restore quality environmental habitat
- Reduce project costs
- Consider the impacts of flood control projects on the littoral system.

The Corps and state held 4 workshops to identify RSM needs and best RSM practices for the northeast region of Florida. Other Federal, state and local stakeholders were involved throughout the entire one-year process of identifying potential demonstration projects (PDPs). Northeast Florida was chosen as the start-up region based on the number of navigation projects, shore protection projects, U.S. Navy bases, and public parks located in the regional. The region also includes much of the St. Johns River, which has been designated as a National Heritage River. Workshop discussions revealed that a number of the PDPs were currently being addressed by the Corps and the state.

A number of PDPs were identified during the northeast Florida workshops held in 2000, including:

- Stabilizing the south end of Amelia Island using sand from the IWW,
- Bypassing sand at St. Mary's entrance intercepted north of the jetty at Cumberland Island and placement of dredged material on a shore protection project,
- Backpassing at Ft. George and bypassing sand at St. Johns River entrance from north of the jetty to the Doval County shore protection project,
- Bypassing sand at St. Augustine Inlet, linking navigation and shore protection efforts,
- Offloading beach quality material onto shoreline areas[13], and
- Demonstrating innovative technologies to maximize placement of beach quality material in the littoral zone.

These PDPs were examined at the fourth workshop in the context of Corps missions and the state's Strategic Beach Management Plan. Over 70 representatives from local and state

[13] The "offloading disposal areas" involves placing beach quality sand from upland disposal areas onto the beach. As part of maintenance operations for the Intracoastal Waterway, dredged material is routinely placed into designated upland disposal areas. Much of the material is either originally beach quality or is rendered so during the sorting process of the dredging operation. Once a large enough volume of suitable material is placed in a disposal area, it becomes economically feasible to offload it onto an adjacent beach to restore capacity in the existing disposal area in lieu of establishing another site.

government agencies, as well as consulting firms attended the workshop. Recommendations generated for each PDP addressed engineering, economic, environmental and policy issues, along with economic and environmental benefits.

The priority PDPs were identified as "stabilize south end of Amelia Island" and "backpass and bypass sand at Ft. George and St. Johns River Entrances."

- South Amelia Island - The state plan identified the need for renourishment because of critical erosion along the ocean shoreline of South Amelia Island. The plan also recommends a feasibility study of shore protection structures. The influences of the 1994 beachfill borrow pit on wave refraction and action of the existing groins on transport processes will be evaluated. Short-term efforts to implement this demonstration have recently been completed through a multi-agency (USACE, FDEP, Florida Inland Navigation District, South Amelia Island Shoreline Stabilization Association and others) cooperative RSM initiative. This effort resulted in the placement of approximately 330,000 cu yd of beach quality material from O&M dredging of the Atlantic Intracoastal Waterway, and construction of geotextile shoreline stabilization tubes. Ultimately, the goal of the PDP is to establish long-term solutions to the erosion problems on the south part of the island.

- Ft. George and St. Johns River entrances – This effort involves backpassing beach quality material onto Little Talbot Island and bypassing material across the entrance to the Duval County beaches. The demonstration will strive to identify the optimum location for placement of the bypass material. The state Strategic Beach Management Plan has identified a 10-mile segment of critical erosion, calls for continued beach nourishment in Duval County, and further study of the St. Johns River entrance. Several sources for beach renourishment material are being examined, including an upland site, the Jacksonville Harbor deepening project, the extensive ebb shoal system, a flood shoal, and the shoal that forms just south of the north jetty at the southern tip of Wards Bank. The demonstration effort will also examine backpassing of sand to persistent erosion areas located on the south end of Little Talbot Island, and restoring flows in Timucuan National Park[14]. Shoreline recession threatens state park facilities on Little Talbot Island. Several potential borrow sites for the St. Johns River bypass operations will be examined for the potential to serve as backpassing sources for the southern tip of Little Talbot Island. Funds provided by the Corps National RSM program along with matching State funds will be used to investigate various alternatives for implementing these efforts.

Potential Benefits:

- Jax Harbor Nav project - Deposition basin to reduce channel shoaling and nourish the Duval County Shore protection project. Based on most recent effort, could have saved $7M; future efforts (6-8 year period) with more material, lower cost differential, similar savings potential.

- South Amelia Island - Dredging efficiencies from "piggyback" of mob/de-mob; environmental

[14] The National Park Service is a major participant and proponent of this effort due to circulation and other water quality concerns in the area.

benefits from protecting freshwater lake in state park. (Beach placement from maintenance of AIWW; 250,000 cy Federally funded O&M and 80,000 cy state funded).

- Linking the St. Johns County shore protection project and dredging of the ebb shoal and navigation channel at St. Augustine Inlet will provide 3.6 MCY sand along the south beaches of Anastasia Island and St. Augustine and save over $1M in mobilization costs.

- Backpassing would alleviate both interference with the planned Jacksonville Harbor deepening and removing sand from a Coastal Barrier Resources Act (CBRA) parcel. It would also provide sand for eroding beaches of Little Talbot Island as well as slow the migration of Ft. George inlet. Cost savings across multiple projects could result.
  - Economic benefits include reduction in future renourishment and O&M costs, enhanced recreational usage, and increased protection for upland development.

- Environmental benefits of these PDPs include maintenance of nesting habitats for turtles and shore birds, reestablishment and stabilization of dune systems, increased viability of local species (e.g., beach mouse populations) and overall improvement to public lands.

Other Related Efforts in CESAJ - RSM and St. Johns County Shore Protection Project Regional sediment management practices are being implemented during initial construction of the St. Johns County shore protection project. The dredge to be mobilized for the shore protection project will also be utilized to provide advance maintenance of the navigation channel. This linking of the navigation and shore protection authorities will increase volume of material placed and result in more efficient use of the dredge. Channel maintenance material will be placed north of the shore protection project limits; extension of the shore protection project design template north into Anastasia State Park will result in a project cost savings to the navigation project and additional sand on the beach.

– Rick McMillen, SAJ

The district and the state initiated a similar series of workshops for southwest Florida in June 2001, including six counties and a number of Federal, state and local agencies, interest groups and A-E firms. The suggestions for potential demonstration projects identified at these workshops are summarized below.

PDP's suggestions from the Southwest Florida Workshops in 2001.

- Creativity in contracting to maximize dredge plant mobilization (consider both Federal and non-Federal projects)
- Beneficial use of material for ecosystem restoration
- Separation of fine material from beach quality material
- Experimentation nearshore placement
- Regional inlet analysis
- Economic feasibility of purchasing a dredge for regional navigation and shore protection needs
- Regional sand compaction analysis
- Stakeholder discussions on allocation of sand resources
- Increasing beachfill retention time
- Staging and rehandling areas to sort material of different quality
- Development of consistent state and Federal authorities
- Outreach program for improving public perception of beach restoration and informing them about RSM.

Philadelphia District

The Philadelphia RSM demonstration extends approximately 130 miles from Sandy Hook in the north (located in the New York District), to Cape May (mouth of the Delaware Bay) in the south. The demonstration effort is being linked with an authorized beach erosion control project. The state and several municipalities are partners in the effort. A suite of wave, current, and sediment transport models will be applied to the region to characterize the longshore and cross-shore transport rates, as well as the regional sediment budget. The RSM demonstration involves moving sand from an accreting beach northeast (updrift) of Cape May Inlet to the eroding southwest (downdrift) side of the inlet. Accretion along the updrift beach is believed to be caused primarily by the jetties at Cape May Inlet (constructed in 1911). Among the problems associated with this accretion are: storm water outfalls that do not drain because of beach accretion, and excessive beach widths that make recreational beach user access to the water problematic. Sand for nourishment of the downdrift shoreline has been obtained from an offshore borrow site, but that site has an insufficient reserve of material for future nourishment needs (approximately 200,116.4 cu yd). Through application of the numerical models, and possibly a pilot implementation study, two means of moving the sand will be examined: a continuous mechanical bypass system and trucking material as required.

Potential Benefits:

- Bypassing may reduce/eliminate need for beach nourishment
- Reduce/eliminate need for dredging
- Cost savings: $220k annually for 50 year period; 12 cycles of nourishment eliminated over 50 years.
- Reduced nourishment costs for Cape May City
- Better use of sand resources including extending life of borrow site and multiple uses of sand already littoral system
- Reduce clogging of outfalls and associated ponding and safety issues
- Development of inter-community and inter-agency working groups for sediment management issues and development of sediment management plans
- Provide sample procedures for other communities regarding equipment needs and methods of purchase
- Provide framework for inter-community loan of sediment moving equipment.

New York District

There are two initiatives within New York District's demonstration initiative: backpassing of sand at Jones Inlet, NY, and creation of an artificial overwash fan using dredged material proposed for Seabright, NJ.

The need to maintain longshore transport of material was recognized before the RSM demonstration program, and the need to provide material for storm damage protection projects, created a need for regional studies. The navigation inlets, shoreline protection projects and ecosystem concerns are recognized as interconnected. Other agencies are

concerned about regional impacts as well. The EPA and FWS have asked the district to examine the cumulative impacts of the beachfill placement and dredging activities, and raised concerns about endangered species and the obstruction of overwash fan development. The district is trying to connect the project areas into a regional system using the coastal process tools available.

The first initiative will explore the benefits of removing an attach shoal obstructing the shoreline down drift (west) of Jones Inlet, located on Long Island. This attachment zone formed as the ebb tidal shoal reached a size sufficient to bypass sediment to the adjacent beach. It is hypothesized that the attachment zone is now acting as a barrier to eastward-directed sand transport. Directly to the east of the attachment zone, and west of the inlet, the beach is severely eroded. The demonstration project will place sand scraped from the attachment zone into the severely eroded beach. In addition to providing an immediate source of sand for this area, it is believed that removing the attachment zone will allow east-moving sand to nourish the severely eroding region, at least until the ebb tidal shoal re-establishes the bypassing bridge. This demonstration project has the potential for national applicability, because many inlets in the United States share the same downdrift signature of Jones Inlet.

The second demonstration, creation of an overwash fan, attempts to restore this type of habitat on these populated barrier islands. On an undeveloped barrier island, storms with elevated wave and water levels will overwash the island and move sand into the bay. This material forms an "overwash fan," and provides habitat for specific endangered species. The residences and other infrastructure of these developed barrier islands prohibit this process from occurring on a regular basis. The success of an artificial overwash fan will be evaluated as an alternative for dredged material disposal, and, if successful, guidance for construction will be developed.

Potential Benefits:

- Improved shorebird habitat, and design and performance information regarding the effectiveness of using dredged material to mimic overwash sediment dynamics for improving this habitat (piping plover, least turn, others); examination of whether disposal costs can be reduced with this approach.
- Sea Bright - small-scale backpassing to reduce beach nourishment frequency – estimated to eliminate 1 $20-30M cycle over 50 years.

Detroit District

The Detroit District demonstration effort demonstration will examine the feasibility, criteria for, and benefits of implementing sand by-pass at New Buffalo Harbor, one of six Federally managed harbors along the southeast shoreline of Lake Michigan. Combinations of Federal, private, and natural processes influence the sediment regime in the region which experiences shoreline erosion and lakebed down-cutting. Beach quality sediment available to nourish eroding beaches is scarce, and the glacial till bluffs can erode rapidly when unprotected by a

sandy beach and nearshore profile. This erosion damages and threatens private and public property and infrastructure.

Problems at New Buffalo Harbor include both shoaling in the harbor and depleted sand supply to the down-drift reach. Currently there are no large-scale by-pass projects on the Great Lakes. The demonstration effort will examine placement location, rates and timing, along with other requirements and effects relevant to recommending continued and expended use of the by-pass system.

The Detroit District also striving to develop a nearshore dredged material placement policy, and a database to help improve future dredged material management, along with study and management activities. The district has drafted a " Nearshore Dredged Material Placement Policy for Operation and Maintenance of Federal Harbors". The policy is intended to:

- Help develop best sediment management practices based on sound engineering and environmental requirements to maximize related near shore benefits; improve coordination among offices within the district and with state agencies;
- Help insure better accessibility and use of information about sediment related needs identified in past studies;
- Prevent placement of sediment in areas where there is a potential for adverse effects upon adjacent shorelines and discourage placement of material where no value to the shoreline is obtained.

Multiple functions within the district are involved in the development of this policy, including the H&H Office, the Operations and Technical Branch, Planning, Programs and Project Management Division, along with area offices. In addition to establishing the policy the document lays out procedures for coordinating harbor dredging with locations that need material both internally among functional areas within the Corps and with state and local agencies. Noted in the policy is the use of information from Section 111 Detailed Project Reports, like littoral transport direction and rates, in conjunction with environmental and other information to help define potential dredged material placement sites.

Section 111: authorizes the Corps to investigate, study and construct projects for the prevention or mitigation of shore damages attributable to Federal navigation works.

Potential benefits anticipated it this demonstration effort include reduced channel/harbor maintenance costs, improved regional sediment supplies, improved cross-function coordination within the district regarding sediment needs and opportunities, and the availability of data, demonstration of a “good faith effort” on the part of the government to foster equilibrium in the system, and reduced conflicts in future studies and projects. The state DEQ has recommended this government lead in fostering more natural or balanced sediment regimes, which is important in defending the proposed policies regarding *erosion mitigation for private structures*, being coordinated through the Corps Regulatory Program. Currently, much of the regional public perception is that the government is not doing its part to mitigate erosion, and the public has been opposed to the draft policy. The district is also exploring the concept of a *sand bank* where proponents of new private shore protection projects would have the option to pay into a trust fund dedicated to financing larger scale beach nourishment projects. The sand bank would

compliment the erosion mitigation policy in which individual sand placements would be required to mitigate for coastal structures that prevent sand from entering the littoral system.

Potential Benefits:

- Reduced unit costs of harbor dredging could be realized if more material removed from the up-drift side; this in turn would reduce the dredging schedule from once every year to, approximately every three years. The cost reduction would come from spreading the costs for the large scale dredging out over three years. Plus as you mention trucking could be eliminated or at least reduced saving money.
- Reducing or eliminating the trucking of material could result in cost savings; trucking material versus placing accreted material in littoral zone - costs nearly equal but more sand moved could be moved with the bypass - almost twice as much ($4.8M)
- Harbor dredging costs reduced ($330k)
- Down drift erosion reduced by half (land, roads) (est. value $1.3M)

South Pacific Division, State of California

The South Pacific Division demonstration effort integrates a range of programs and activities proposed or ongoing within the Corps, state agencies, and by other stakeholders. It also includes efforts that target different scales of issues and activities. Corps participation includes both the Division and Los Angeles District, and may eventually expand to other districts.

Demonstration goals:

- Develop and implement, in conjunction with state and local partners, an RSM plan as part of the California Coastal Sediment Management Master Plan.
- Improve regional coastal program performance through a comprehensive statewide approach to solving complex sediment problems of shorelines, coastal wetlands and coastal watersheds.
- Devine and quantify the regional statewide sediment budget.
- Develop a centralized GIS database for stakeholder use.

- Historically, dominant transport of sediments has been from the rivers and streams to the coast. Damming of rivers has decreased the supply of sand by more than 50%, resulting in substantial erosion of coastal beaches.

- Sea cliff erosion also contributes to the natural sediment supply for California beaches. Armoring structures (e.g. riprap, sea walls) build to protect property and infrastructure cut off the natural supply of sand from the cliffs.

In FY 2000, the South Pacific Division entered into partnerships with the state, counties, and various interest groups with a goal of developing a statewide coastal sediment management plan. A Coastal Sediment Management Workgroup was established to facilitate watershed

management through federal, state and local cooperative efforts. (See: http://www.spd.usace.army.mil/csmwonline/ .) The workgroup's coastal sediment management goals are to:

- Coordinate activities with local, state, and Federal stakeholders and programs;
- Better coordinate activities with other related ongoing planning efforts;
- Identify collaborative approaches to projects; and
- Increase the awareness of state and Federal policies, programs and activities among local and regional governments.

Efforts are underway to develop a plan that will identify, evaluate and prioritize sediment management approaches in a framework that addresses natural and human influences on sediment resources, transport and deposition. These efforts are extending the regional studies conducted in Southern California, which began in the 1980's.

Funds from the RSM Demonstration Program are being linked and leveraged with a variety of other Corps and state initiatives. Among these efforts are finalizing the Coastal Sediment Master Plan, exploring the feasibility of moving material trapped behind dams on rivers feeding the coast to the coastline, and initiating a study on optimizing use of harbor dredged material for beach nourishment. Future efforts may also include development of a conceptual plan for capturing and reusing coastal sediments that are usually lost down submarine canyons.

- Two ongoing ecosystem restoration studies include dams identified as obstructing fish passage and natural sediment flows – Rindge Dam and Matillija Dam. Both were built for agricultural water supply in the 1940's, and heavy silt loads in the impounded streams has resulted in considerable deposition behind the dams. Ongoing studies will examine the potential for sediment behind the dams to be used to nourish the beaches on the coast.

- Several options have been discussed: remove the dams and allow riverine transport processes to move the material to the coast; excavate and truck the material to the coast; pump the material via pipline. The RSM demonstration is evaluating the costs, benefits, and time required for each of these options.

- Ownership of the material deposited behind the dams has long been a topic of discussion and debate in California. Reservoirs on many rivers in the region have reached sediment capacity, and some have degraded to such an extend that infrastructure must be repaired, replaced or removed.

Potential benefits:

- Data and information to support future analysis of system (upstream to coast) sediment issues, including development of viable alternatives and estimated costs (e.g. improved predictions of effects of wave climate, safer designs, reduction in over design due to data uncertainty, easily accessible and understandable data for stakeholder interests such as ocean water quality, habitat restoration, recreation).
- Technology potentially useful to other states.
- Riverine restoration, elimination of dam safety hazard, and potential sediment from behind the dams to nourish beaches on the coast.
- Partnerships with state and other agencies that will be valuable beyond the demonstration program.

Northwest Division – Columbia River (FY 2003 Start)

Two districts within the Northwestern Division (Portland District and Seattle District) are examining several proposed RSM demonstration initiatives in the Columbia River Basin.

- An Upstream Riparian Habitat Restoration initiative which would link shoreline erosion management and dredging – utilizing the dredged material as an alternative source of material from that which is currently hauled a distance from a declining borrow area. The protection of cultural resources is one of the objectives and benefits, in addition to habitat restoration. The effort would also include development of Natural Resources Management Operations Plans and linkage with a regional DMMP.

- The Mouth of the Columbia River (MCR) – The sediment at the MCR affects the entire Columbia River Littoral Cell, from Tillamook Head, OR, to Point Grenville, WA. A long-term strategy is needed for managing dredged material from the MCR. The State of Washington has initiated discussions on RSM for the MCR. The demonstration objective would be to implement a proactive, consensus based decision-making process for managing dredged material in the MCR to sustain an ecologically and economically healthy coastline in Washington and Oregon. Sediment sources, dynamics, transport, littoral zone characterization, the feasibility of nourishing the nearshore/foreshore, and environmental effects of placing material in the littoral zone may be examined through leveraged efforts among ongoing projects and studies, and the RSM demonstration program, and the RSM research program.

RSM Challenges Identified in the Demonstration Efforts

A number of "challenges" or constraints to implementing regional sediment management have been identified in the demonstration efforts thus far. They are listed below, more detailed discussion of some of the issues is provided in a later section: Implementation Challenges, Questions and Ideas.

Fiscal:

- Project specific funding limits regional approaches.
- Lack of dedicated funding for long-term involvement in regional initiatives.
- Funding cycles of various partners often do not coincide.
- Uncertainty of funds subject to annual appropriations and potential reprogramming away from projects agreed to in regional plans.

Institutional (often called "bureaucratic" in the demonstrations):

- Lack regulatory flexibility inhibits regional approach.
- Short-term permitting limits are not conducive to regionalized approaches.
- The project business focus tends to impede linking of projects.
- Interpretation of Federal "least cost disposal policy" considers only project costs and can result in loss of sand to the littoral system, and missed opportunities.

- Need evaluation framework useful in capturing broader suite of benefits; many benefits difficult to assess; projects benefits to physical system then assess traditional and other benefits; Reconciling short term costs for longer term benefits.
- Working with multiple states – fiscal, administrative, technological challenges.
- Public access requirements – opposed by private landowners, required for Corps involvement.
- Addressing public perception and expectations.
- Flexibility in real estate and contracting mechanisms.

Physical:

- Sediment characteristics prohibit beach placement of some dredged material.
- Locations of some disposal sites removes sand from the littoral system.
- Incompatibility of various types of projects.
- Size of projects, construction time and environmental windows may discourage regionalized integration.

Technical:

- Need improvement in modeling and assessment tools for evaluating problems and solutions across a range of spatial and temporal scales.
- Survey methods and techniques.
- Innovation in engineered solutions to address regional scale problems.
- Data collection, data gaps, inconsistent data.
- Design guidance relevant to regions.

RSM Benefits Identified in the Demonstration Efforts

Benefits from implementing the RSM concept can potentially be realized in terms of cost savings (both near-term and long-range), other efficiencies (such as achieving greater outputs for the same costs), as well as in important intangible and spill over benefits. The RSM Demonstration Program is being accomplished through leveraging of the demonstration funds with R&D and district project and study funds. These efforts have resulted in partnerships between the Corps, state, local, and other Federal offices, some of which are cost-sharing projects identified as part of RSM demonstration work. Key outputs from the Corps and state efforts within the demonstrations are expected to be improved methods for managing sediments within our nation's waterways, advances in conceptual analysis and numerical models, improved field measurement techniques, and implementation of GIS frameworks to support regional studies. Potential benefits from RSM include:

- Benefits from implementing the RSM include:
  - cost savings (both near-term and long-range)
  - other efficiencies (such as achieving greater outputs for the same costs),
  - important intangible and spill over benefits that may be institutional, programmatic or technical.
- Key outputs from the demo efforts are expected to be:
  - improved methods for managing sediments waterways and regions
  - advances in conceptual analysis and numerical models
  - improved field measurement techniques
  - GIS frameworks to support regional studies

Institutional

- Stronger partnerships - Partnerships among coastal and watershed stakeholders leading to improved business processes, data sharing, greater cooperation and collaboration among parties.
- Better information – Improved understanding of sediment movement in a region and the interrelationships of projects and management actions contributes to improved knowledge about problems, causes and solutions. This in turn contributes to development of more effective and efficient management approaches.
- Identification of institutional obstacles so they can be addressed. – Some issues may be addressable through clarification of policy, or revisions to business practices. Some issues may need to be addressed through multi-agency or other partnership efforts.

Programmatic

A) Process efficiencies

- Potential reductions in rehandling of material, improved channel efficiency and associated cost savings - over the longer term.
- Increased disposal site capacity and reduced need to acquire new sites.
- Improved efficiency and effectiveness through linked projects - Synergy derived from coordination of intra- and inter-agency projects and programs. Optimizing mobilization of dredging equipment.

B) Environmental

- Stabilized habitat for listed species (e.g. beach mice, sea turtles)
  Sediment as a resource
- Potential new sources of desirable sediment.

Technical

- New engineering techniques to optimize and conserve sediment - Bypassing of beach quality sand at inlets and implementing regional rather than project scale approaches.
- Foundations for future studies and projects in region – The improved process models, data and information management tools will benefit both current and future studies and projects.

Some benefits accrue to future projects. For example, the improved knowledge base on sediment processes in a region, or regional process models may be useful in future studies or management decisions, as could the partnerships established through a demonstration effort. This knowledge base and interagency relationships could result in a reduce requirement for data collection for future studies, or streamlined review or consultation processes in future projects. Additional benefit analysis will be included in future years of the RSM demonstration program. An evaluation framework is needed to facilitate development of recommendations based on experiences in the demonstrations.

Considerations from which benefits may be realized from RSM Demonstration Projects. Future examination of benefits from the RSM demonstrations may find it useful to examine the following categories of potential processes, effects and objectives:

Physical processes - Accretion/erosion management. Both accretion and erosion can be problems or opportunities - too much sand can clog channels, storm water outflow systems, etc.; erosion may threaten property, sensitive ecological resources, or infrastructure. Erosion may also provide a source of sediment valued in a system.	**Dredging efficiencies for existing coastal projects.** Efficiencies may result from scheduling maintenance for adjacent projects to achieve economies of scale such as shared contracts and reduced mob-/de-mobilization costs. Improved understanding of sediment flows can help to avoid rehandling. Use of refined technologies, such as pinpoint dredging systems may also result in cost savings and other efficiencies.
Environmental or ecosystem restoration. Sediment management may help protect or restore significant ecological resources. Measures under consideration include: reinforcing natural berms that protect freshwater lakes or wetlands from saltwater intrusion, placing sediment behind an island to mimic historic natural overwash and sediment dynamics (early successional habitat for colonial and nesting shorebirds), return of material to the littoral system where it ultimately can help stabilize beach habitat.	**Sediment as a valued resource (or expensive liability, depending on circumstances)** Dredged material may be put to beneficial uses rather than dumped or placed in disposal areas. This results in positive benefits where the material is wisely used, and may be less expensive than finding needed material elsewhere. Savings may also result from extending disposal area life, especially important as existing areas reach capacity. Stockpiling sand for emergency recovery from major storms may reduce recovery costs and improve emergency readiness and response. Sediments trapped behind dams may starve beaches of material that is expensive to replace, and accumulation reduces both the volume and effectiveness of the reservoirs original purposes.

Improved Processes and Partnership Benefits. The approaches taken to implement RSM involve substantial participation across agencies and levels of government. Participants in the Mobile District RSM Demonstration Project identified a number of important intangible benefits of working with partners and stakeholders that will ultimately lead to wiser sand and coastal management, potentially streamline processes and more effective solutions. Table 4 summarizes these benefits.

Table 4. Intangible Benefits from Mobile RSM Demonstration

Improved sand management	Wider beaches, more protection, less maintenance Keep sand in the littoral zone Keeping sand in the system as a beneficial use of dredged material
Aligned actions across agencies	Identifying programs that are working at cross-purposes (eg, trucking sand away from an area that needs sand) Opportunities to align programs at the Federal, State, and local levels
Improved understanding of physical processes	Sediment budget will identify areas of erosion/accretion to assist in modifying sediment management practices Better models and understanding of the physical system will lead to better decisions
Business process efficiency	Baseline data to make future feasibility studies faster and cheaper Building a common database for all agencies to use Solving datum problems, which are currently costly to fix, but more costly to ignore if errors lead to bad or inefficient decisions
Stakeholder collaboration	Improved communication between Federal, State, and local governments RSM is a catalyst for realizing the importance of managing the coastal resources Understanding where the various states are in terms of coastal management and policies
Preparedness	Identifying future problem areas, and acting now (expected concentrations in population growth, related development, recreational use) Identification of where data collection is needed

Source: ERDC/CHL CHETN-XIV-1 (Rosati, et al, 2001a)

Innovations. Although the demonstration efforts are still, for the most part, in early stages, several innovations and suggestions have already been identified which could foster increased application of the RSM concept:

- SAJ - use of Section 22 in working with the state to identify and prioritize RSM ideas and initiatives
- LRE - Nearshore Dredged Material Placement Policy for Operation and Maintenance of Federal Harbors and a database to support implementation of this policy; shore protection mitigation bank/trust fund
- Establishment of "staging areas" for managing sediment associated with multiple projects can achieve overall cost saving
- Suggestion to promote RSM concept through the Regional Management Centers.

Potential New Economic Framework.

RSM encourages weighing potential management options in a systems context and along with consideration of a broader range of benefits. The use of the "least cost" as primary criteria in navigation project planning is symptomatic of treating each site independently rather than in a system, and the primacy of this criteria emphasizes short term cost savings over potentially longer term cost savings or liabilities. This approach misses opportunities to manage sand resources more wisely.

Emphasis on this least cost criteria can result in actions that remove sediment from the littoral system through upland, isolated or offshore placement. It is typically applied to project sites, examined in isolation, rather than as part of an integrated watershed system. Offsite and unintended effects may not be recognized or rigorously considered, particularly if projects management plans are decades old.

Under a new framework, the economic effects of evaluating alternative sediment management activities could be considered using two categories*: cost savings and best management of resources* (per Carlson in Rosati et al, 2001a). Cost saving is most easily defined as achieving the same results or benefits from a project through more efficient methods. These savings may be realized by identifying production efficiencies such as combining dredging projects, or minimizing rehandling which may occur in adjacent dredging and beach nourishment projects. Better management of sediment resources may be achieved by considering a broader scope of beneficial effects of alternative approaches to project O&M, recognizing the value of sediment as a resource. For example, while keeping sediment in the system may be slightly more expensive than disposing material offshore, but it may reduce costs at an eroding beach (by reducing the frequency or magnitude of periodic nourishments), thereby realizing overall net benefits by not requiring an erosion control or beach-fill project. Another possibility is that dredged material can be put to a beneficial use, rather than be placed in a disposal area that may have declining storage capacity.

This new evaluation framework could help ultimately reduce the O&M backlog by more effectively applying O&M dollars and potentially leveraging funding across accounts to serve the nation. However, the actual adaptability of the Corps's administrative and programmatic process to accommodate this new framework has yet to be demonstrated. Regional, watershed, or comprehensive studies may provide some of the best opportunities to explore the potential application of this framework. Funding for over three dozen watershed or comprehensive studies was authorized in FY 2002. An examination of these efforts may help identify good candidates for examining the possibilities, merits, detractions and issues associated with applying this innovative programmatic evaluation framework. Such efforts could also include examination of potential cost sharing arrangements, identifying beneficiaries of new sediment management measures where there may be added costs. Future efforts within the demonstration efforts should document innovations or impediments to this new framework. Also see discussion in the next section of a proposed pilot initiative to explore innovative linkages among GI, CG and O&M funding in a region.

Implementation Challenges, Questions, and Ideas

While the system approaches embodied in the RSM may be readily embraced in concept, implementation challenges have surfaced with regard to policies, fiscal realities, decision frameworks and other issues. The CERB's RSM objectives included capitalizing on potential economic benefits, identifying and eliminating bureaucratic obstacles, and improving relationships with partners. An identification of policy issues and other impediments to implementing the RSM concept is included among the objectives of the RSM demonstration program. A number of a number of issues have surfaced during the early stages of the demonstration efforts that may effect the implementation of RSM as a standard business practice. Some are issues or questions that may potentially be resolved with additional examination. Others are "challenges" rather than true "obstacles", and have the potential to be addressed through innovation in program management and collaborative processes which, if over come as part of the RSM demonstrations, may help a variety of Civil Works programs and activities. The issues and questions are discussed below, with each being followed by a preliminary response. A list of the issues and questions discussed in this section is provided below.

1. Reconciling Working within the Federal Standard
2. Justifying added costs of disposal to restore wetlands or protect beach habitat.
3. Dredged Material Management Plans and RSM
4. Working with Multiple Cost-Share Sponsors
5. Accepting Voluntary Monetary Contributions to Accomplish RSM Activities.
6. Project Specific Funding
7. Evaluating Benefits Across Categories of Funding Accounts.
8. Other Stakeholder Issues
9. Section 933 Application
10. Administrative Procedure Information Sharing
11. RSM Interface with Individual Feasibility Studies
12. National Dredging Team
13. Sediment Budget Development.
14. Dredge Equipment Availability Limitations.

1. Reconciling Working within the Federal Standard

Among the fundamental issues in adopting the RSM philosophy and implementing RSM is the interpretation of the "base plan" for project dredging. The criteria for determining the base plan seems to vary among districts, if not individuals. Some districts identify the "least cost" criteria as the basis for the "Federal Standard" or "base plan", noting that actions taken under this interpretation can result in loss of sand to the littoral system.

RESPONSE: The concept of the "base plan" or "federal standard"[15] is intended to guide and promote cost efficiency in dredged material management. However, interpretation of what appropriately constitutes a base plan seems to be an obstacle to RSM in some districts. Part of the problem may be that the "base plan" for dredged material disposal is often miss-titled the *least cost plan*. Corps guidance states that the base plan is the *least costly alternative that is consistent with sound engineering practice and meets environmental requirements*. However, it seems that the *least cost* factor is thought, by some in the field, to have primacy over the other two, even if it prevents us from "doing the right thing". The keen competition for O&M funds is a significant reality, however, these constraints should not result in the agency avoiding pursuit of wise management decisions.

It may be helpful to elaborate on current policy with new language that conveys the following:

> The "base plan" allows for increments of cost over the least cost alternative to be included in the O&M costs of the base plan if one of the following is the case:
>
> a. The added cost is used to keep littoral sand in the system when it is recognized that removal of the material from the system has or will have adverse effects on the shore or coastal system. Such actions could include placement of material in feeder berms or other manners such that the currents will distribute sand in the system naturally, as opposed to placement of sand on the beach with contouring etc., as would be done for beach nourishment. The objective is keeping material available to the littoral system.
>
> b. The alternative disposal method will result in future cost savings. For example, using an alternative disposal site or method that would prevent material from re-entering the channel may cost more but it may extend the dredging cycle thus reducing the cost over the longer term. [Conceivably, cost savings could also result in other areas of the CW program - e.g. stockpiling sand for use later in a pending shore protection project may involve some additional O&M costs but result in savings as part of CG].
>
> Any added costs to use the material beneficially for ecosystem restoration should be cost shared per Section 204 (25% non-Federal), and added costs to place material on a beach will be cost shared per Section 145 (as amended by Section 933, etc.)

Additionally, the base plan concept has been applied on a project-specific basis, rather than on a regional basis which could allow consideration of cost efficiency across projects (e.g. at least "project pairs"), and beneficial uses. The potential to examine these considerations exists through dredged material management planning.

Section 207, WRDA 1996, Selection of Dredged Material Disposal Methods, modifies Section 204 WRDA 1992 to allow selection of a disposal method that is not the least-cost

[15] The term "Federal Standard" comes from the Corps Operation and Maintenance regulations of 26 April 1988 -33 CFR 209, 335, 336, 337, and 338.

option if the incremental costs are reasonable in relation to the environmental benefits, including the benefits to the aquatic environment from creation of wetlands and control of shoreline erosion. Cost sharing is specified (75% Federal, 25% non-Federal). See PGL 56 at: http://www.usace.army.mil/inet/functions/cw/cecwp/branches/guidance_dev/pgls/pdf/pgl56.pdf .

2. Costs of Disposal for Ecosystem Restoration or Protection

A question was raised regarding why dollar values couldn't be assigned to wetlands created using dredged material, where the benefits would be equal to the costs, as doing this would provide benefit values that could be used to help justify the additional increments of disposal costs for wetland creation.

RESPONSE: Environmental measures are justified, with consideration given to both non-monetary and monetary benefits and costs. Corps policy supports activities that produce positive environmental outputs, but does not require that these outputs be expressed in terms of dollars. Instead, justification is to be provided through cost effectiveness and incremental cost analysis, and a subjective determination that the non-monetary benefits out weigh the monetary costs. Consideration is given to the significance of the environmental resources and outputs regarding these resources, along with information regarding acceptability, completeness, effectiveness, and efficiency of the action, as well as discussion of relevant risk and uncertainty considerations (see ER 1105-2-100, Appendix E).

For a project where dredged material is being used to restore a wetland and costs are greater than the disposal costs in the base plan, these "separable" costs can be subtracted from the total project costs for the navigation project economic cost justification, and they would be used in the cost effectiveness and incremental analysis for justification of the environmental benefits.

3. Dredged Material Management Plans and RSM

Several questions were raised regarding how dredged material management plans (DMMPs) relate to RSM.

RESPONSE: In concept, DMMPs are a key element in RSM and can provide the regional planning perspective that links dredging projects in a region with one another, and with beneficial use opportunities. DMMPs typically consider the "readiness" issues of assuring that disposal sites and capacities are available to accommodate navigation channel maintenance needs. However, DMMPs can also identify and examine opportunities to achieve savings through coordinating projects and economies of scale, opportunities for beneficial use, and other opportunities to contribute to coastal watershed goals in a region that are related to sediment management (see earlier discussion under Sediment as A Resource). While DMMPs are to be developed for all projects, they can also be developed for multiple projects within a region. They can consider and explore RSM goals, opportunities and

priorities in a region, including those identified in watershed studies or other comprehensive studies.

> *Dredged material management planning for all Federal harbor projects is conducted by the Corps to ensure that maintenance dredging activities are performed in an environmentally acceptable manner, use sound engineering techniques, are economically warranted, and that sufficient confined disposal facilities are available for at least the next 20 years. These plans address dredging needs, disposal capabilities, capacities of disposal areas, environmental compliance requirements, potential for beneficial usage of dredged material and indicators of continued economic justification. The Dredged Material Management Plans shall be updated periodically to identify any potentially changed conditions. [ER 1105-2-100[16]]*

The opportunities for cost savings and achieving other benefits in connection with dredging and dredged material management requires application of "life cycle analysis" concepts. The DMMP's appear to be an appropriate vehicle for conducting "life cycle analysis" for dredged material management, and in doing this analysis helping to identify potential efficiencies and other benefits that could be gained buy an integrated regional approach to project management. It seems, however, that the development of DMMP's and their "perceived value" is uneven across districts. Some think they are not necessary or cannot be done if the current disposal site has 20 years of life left; others appear to not have implemented them or not place much value in the information they provide. The competition for O&M funding may, in many cases, result in DMMPs "falling below the line" in terms of budgetary priority.

The extent to which DMMPs have been implemented is not known. Some districts meet at least annually with resource agencies and other interested parties to discuss the potential availability and use of material expected to become available in the near term. However, budgetary constraints and competing O&M priorities are likely to have resulted in minimal development of DMMPs. Those that have been developed are likely to have focused primarily on future disposal capacity needs for a given project, rather than include sediment-related needs and opportunities. Similarly, those developed over a decade ago are likely to be missing opportunities to address contemporary system needs and opportunities. It is suspected that few have addressed these needs and opportunities at a regional scale. See Florida Itracoastal Waterway and San Fancisco Bay examples in earlier discussion.

Some districts participating in the RSM demonstration indicated that if information demonstrates an opportunity to explore and implement "smarter material management" (e.g. save on costs, reduce undesirable impacts), a new or updated DMMP could be developed -- based on the policy that they shall be updated periodically to identify any potentially changed conditions. Others did not think it would be possible to revisit DMMPs in the near term.

<u>Potential to develop a regional DMMPs in the context of RSM.</u> Efforts are underway to develop a 20-year disposal plan for the Chesapeake Bay – this effort may provide the potential to develop a regional DMMP that takes into account the variety of sediment management actions and needs in the region. A Dredged Material Placement Options

[16] PGL 49 on environmental dredging refers to EC 1165-2-200, Implementation of Guidance on Dredged Material Management Plans – evidently this EC was incorporated into ER 1105-2-100.

Program meeting held in the summer of 2001 in Baltimore included participation from CENAP and CENAB commanders and chiefs of Operations Division, the Maryland Secretary of Transportation, MDOT, the Maryland Port Administration, and other State agencies. Twenty-four possible options were discussed. It would seem that this effort, and others like it, might provide an opportunity to explore RSM goals and opportunities and help operationalize them within regional DMMP development.

4. Working with Multiple Cost-Share Sponsors

Over the course of discussion, several districts noted that some non-federal cost-sharing sponsors only have a limited interest in participating in certain activities and projects that may be identified in a region.

RESPONSE: Working with multiple cost-sharing sponsors may be integral to the regional problem solving approaches fostered by RSM. The Corps can help identify and engage the multiple stakeholders that may be necessary to accomplish RSM in a particular region (e.g. navigation, environmental and storm damage reduction interests). While working with multiple sponsors can create legal and coordination challenges, policy does not preclude multiple sponsors. As an alternative, some sponsors have agreed to participate through a primary sponsor, where the primary sponsor signs documents with the Corps and the other sponsors contribute through the primary sponsor. There may be inconsistent understanding or interpretation of this among the MSC's, as some districts thought it was possible to seek multiple signatures on cost sharing agreements but others did not. It may be helpful to identify examples where studies and projects have had multiple sponsors and make this information available through the RSM website or some other website (e.g. an HQ policy website).

5. Accepting Voluntary Monetary Contributions to Accomplish RSM Activities

Several questions were raised regarding the mechanisms available to accept voluntary funding contributions - one example involved accepting funds from a state to supplement ongoing or planned sediment and related data collection.

RESPONSE: In some instances, a CRDA - R&D arrangement may work - where funds are sent through CERDC-CHL to do the work in conjunction with an activity related to R&D. In some instances, an MOU with the state may provide an appropriate and sufficient vehicle, e.g. Gilgo Beach. Additionally, there are two authorities that allow the acceptance of funds from entities other than cost-sharing sponsors.

- *Section 203 of WRDA 1992* authorizes the acceptance of contributions of cash, funds, materials and services from persons, including governmental entities, but excluding the project sponsor, in support of environmental protection and restoration projects. In all cases the agreements must be developed in full compliance with all appropriate regulations.

- The "Challenge Partnerships Program" authorized by *Sec 225 of WRDA 1992* allows non-fed public and private groups or individuals to contribute to and participate in the operation and/or mgt of recreation and natural resources efforts at Corp projects. The proposed work needs to be in the annual or 5-year operations mgt plan. Guidance on this program is published in ER 1130-2-500.

6. Project Specific Funding

Project specific funding was identified as an impediment to applying the concept of regional sediment management, where as "regional funding" would provide greater opportunity to apply the suite of Civil Works authorities, projects and activities to problem solving that requires a regional perspective. Greater benefits may be achieved by leveraging funding across GI, CG and O&M accounts.

RESPONSE: While they may not provide regional implementation funding, regional comprehensive studies may provide good opportunities to explore the potential needs and opportunities to accomplish RSM through linking Corps projects and activities in a region. Potential products from these studies could include recommended operational changes, DMMP's, and "bundles" of projects that are linked to each other in implementing the plan. Requests for subsequent authorizations would specify the interrelationships among these various Corps activities. Planning assistance provided under Section 22 can identify and prioritize sediment management needs and the potential to link projects. (Working within exiting authorities, the Jacksonville District is working with the State of Florida to address sediment management needs in the different sub-regions of the state. See previous discussion under RSM Demonstration Program. Also, see DMMP discussion above in this section regarding planning that can assist in linking projects.

7. Evaluating Benefits Across Categories of Funding Accounts

Included in the concept of RSM is the consideration of potential benefits from linking projects and allowing moderate increases in expenditures in one category to produce benefits in another category (e.g. increase in O&M maintenance dredging costs by altered disposal practices to realize savings in beach nourishment or emergency management costs). How is this done?

RESPONSE: The application of this proposed new evaluation approach, and the adaptability of the Corps' administrative and programmatic process to accommodate this approach has yet to be demonstrated. Future efforts within the demonstration efforts should examine and evaluate innovations or impediments to this approach to investment decision making.

Regional comprehensive studies may provide some of the best opportunities to explore the potential application of this framework. Funding for numerous watershed or comprehensive studies was authorized in FY 2001 and 2002 (see Table 5 in next section). An examination of these efforts may help identify good candidates for exploring the possibilities, merits,

detractions and issues associated with applying this innovative programmatic evaluation framework. Such efforts could also include examination of potential cost sharing arrangements, identifying beneficiaries of new sediment management measures where there may be added costs to achieve the benefits. Also see discussion of proposed pilot initiative in then next section.

8. Other Stakeholder Issues

Once the technological matters have been sufficiently examined and the monetary issues have been addressed, the road to implementing an RSM measure may still not be clear if there is stakeholder apprehension and lack of support for RSM on the part of the affected public and other stakeholders. For example, in one case study, local landowners are objecting to the placement of sand or disposal pipes on their property for the purposes of getting sand into the system down drift.

RESPONSE: Institutional innovations, stakeholder involvement and overcoming procedural impediments are integral to RSM and emphasized as important components of the RSM demonstration program. The example above may point to the need for public education to be part of emerging RSM efforts, and additional consideration should be given to relating experiences and recommendations. Alternative outreach programs for informing the public about RSM may be helpful.

9. Section 933 Application

Several districts indicated that it would be useful to identify where Section 933 (beach quality sand on adjacent beaches) has been used. They indicated that it would be helpful to share information regarding benefits analysis and other guidance, agreement documentation, and other experiences in working through this authority.

RESPONSE: Only about a dozen Section 933 projects have been implemented. These projects will be identified and information made available to the districts. A potential avenue may be posting of the listing and associate information on the RSM demonstration Program website.

10. Administrative Procedure Information Sharing

Several districts indicated that it may be helpful to share cost sharing agreements relevant to RSM efforts, particularly those pertaining to voluntary contributions, special O&M requirements, etc.

RESPONSE: Noted. Avenues for doing this could be explored in the coming years of the RSM demonstration program.

11. RSM Interface with Individual Feasibility Studies

Early in the demonstration program, districts asked how RSM will/should RSM interface with individual feasibility studies.

RESPONSE: To the extent possible, RSM should include all Civil Works studies and projects in a region. Individual project feasibility studies may be able to identify and incorporate RSM objectives. Additionally, depending upon the circumstances, they may provide the appropriate forum for initiating discussion of RSM and exploring the integration of Corps projects into multi-agency or governmental plans. It would seem that broader HQUSACE affirmation of support for this concept is needed as some of the districts view RSM as an activity separate from other Civil Works studies and projects.

12. National Dredging Team

There is some confusion in some of the districts regarding the relationship of RSM to the National Dredging Team (NDT) and Regional Dredging Teams (RDT) efforts, particularly regarding RSM demonstration efforts and RDT efforts.

RESPONSE: An Interagency Working Group on the Dredging Process (1994) published an action plan for improving the dredging process which included recommendations for creating or augmenting regional dredged material management plans, and other recommendations for strengthening planning mechanisms for dredging and dredged material management (See Appendix A).

In response to the recommendations for enhancing coordination and communication in the dredging project approval process, the USACE established a multi-agency National Dredging Team (NDT) (http://www.epa.gov/owow/oceans/ndt/) to address dredging issues and promote regionalization of dredged material management. The NDT sets priorities for Dredged Material Management Plans (DMMP) and coordinates the plans on a national level. Regional Dredging Teams (RDT) are co-chaired by the Environmental Protection Agency and the USACE and provide a forum for conflict resolution. Dialog and coordination with the NDT, RDTs, and the RSM demonstration program could provide synergy among the various initiatives which seem to have common objectives and players. It could also facilitate identification of innovations and impediments to making RSM a standard business approach.

13. Sediment Budget Development

Sediment budgets are key to accomplishing RSM as they provide information about sediment sources and sinks, patterns of movement, etc. However, operable sediment budgets do not exist for all areas.

RESPONSE: Not all regions have the same needs for data and models, as they vary in system characteristics and conditions, as well and management needs and opportunities. In some instances, partial information may be available from individual studies and projects done in an area, but no regional connections and knowledge has been made. In some regions the state or another Federal agency may have developed the most extensive information or analytical tools. Authorized watershed or comprehensive studies may provide appropriate avenues for assembling or obtaining more comprehensive sediment data, along with models useful for conducting analysis to be able to adequately describe the system, predict the outcomes of alternatives under consideration, and inform the investment and management decisions in a particular region.

14. Dredge Equipment Availability Limitations

In some instances, limitations in dredge plant capabilities may impede implementation of alternative material disposal and placement recommended as part of RSM planning. For example, the desired new disposal alternatives may require placement in a nearshore or on shore area that is not accessible by the typical equipment used in a particular region, and alternative contractor equipment with the needed capabilities may not currently be readily available to the area.

RESPONSE: This may be strategic issue that could be discussed by the NDT and RDTs, within the O&M community, and forums where dredging industry representatives can participate in strategic discussions regarding how the Crops plans to conduct business in the future through the RSM concept.

Future Initiatives and Considerations

RSM Demonstration Program

The RSM demonstration efforts are scheduled to continue for 3 additional years (through FY05), assuming funding is made available. During this time, districts will identify additional opportunities for improving sediment management, applying technological and process innovations, and realizing benefits. Future demonstration efforts will extend the RSM concept inland to include sediment management needs and opportunities in riverine systems, or within systems involving river and coastal processes and activities.

Application of RSM in a longer time frame will also be explored. Discussion was initiated with Mobile district regarding a potential target region in which to examine development of a longer-range RSM vision for the year 2020 in collaboration with stakeholders. Additional work on evaluating the benefits of applying the RSM concept will be done across the demonstration efforts. The demonstration efforts will continue to help to shape and deploy the new RSM research program.

The demonstration efforts will continue to help identify impediments to implementing the concept of RSM, and develop recommendations for HQUSACE on facilitating the approach, removing impediments and promoting successful innovations. Demonstration program results and information will be helpful to other districts and stakeholders in understanding the benefits of applying RSM, and the science and technology available to assist them. Efforts are underway to explore broader application of the RSM concept, without waiting for completion of the demonstration program (per instruction by the CERB sub-committee over seeing RSM).

RSM "Primer"

The discussions in the previous section address a number of issues identified in the early stages of the demonstration efforts. Preliminary responses were developed in the course of examining these issues. A broader dissemination of these responses would be useful to numerous district and division staff that are just beginning to think about and embark on RSM-related efforts. An "RSM primer" was identified something that would be useful to explain RSM and answer some of the questions raised about the concept and it's implementation. Development of this document is underway by IWR-PA and ERDC-CHL. This report and Tech Notes from the RSM demonstration program will provide foundation material for the primer. Additional guidelines, along with other documents and tools useful in the broader implementation of RSM are underway through the RSM R&D program.

Examine Regional and Watershed Studies for Potential RSM Application

Funding for dozens of watershed or comprehensive studies was authorized in FY 2002. Table 5 summarizes the number of these studies based on appropriations and category classes use in the Programs Management Division budget summary spreadsheets. [* Note however that because ecosystem restoration and watershed studies have combined category classes (cat class), these numbers can be misleading as to the number of studies which are actually watershed level multi-objective studies, versus those that are single purpose studies at a watershed or otherwise comprehensive level. Similarly, comprehensive studies may have any of a number of single purposes, or be multipurpose]. An examination of an appropriate subset of these studies can help identify good candidates (and missed opportunities) for examining the merits, detractions, and issues associated with applying RSM.

Table 5. FY 2002 Appropriations[17]

Cat class	Type	Number*	$ Total
General Investigations			
143	Watershed/Ecosystem Restoration (Recon)	87	24,604
144	Watershed/Ecosystem Restoration (Feas)	49	15,323
150-152	Comprehensive Studies (Recon & Feas)	10	2,891
PED			
410	Watershed/ Eco Rest. (Not yet authorized for Construction)	16	5,101
610	Watershed/ Eco Rest. (Authorized for Construction)	6	1,913

Extending the RSM concept beyond the coastal regions, up into associated riverine systems will aide in more completely incorporating source material and sediment processes, and knowledge about them, with investment decisions and management responsibilities affected by these processes (See Box). This broader "watershed" focus should result in more effective and innovative approaches to sediment-related project development and management than the site-specific project approach.

Chesapeake Bay Study on Bank Erosion and Sediment Behind Dams on Lower Susquehanna River. The Chesapeake Bay Shoreline Erosion study (Baltimore District) is one example of an opportunity to extend RSM concepts into river systems. The District, in coordination with a number of state and Federal partners, is examining a comprehensive approach to erosion and sediment management in Bay watershed, including management of the sediment accumulating behind four dams.

It may also be useful to examine the use of the Planning Assistance to States authority provided by Section 22 (WRDA 1974, as amended), as another avenue through which to pursue regional examination of sediment management needs and opportunities collaboratively with states and other interested parties. (See previous discussion of Section 22 application in the Jacksonville District demonstration efforts).

[17] Source: CWB Spreadsheets

Pilot Initiative on Innovative Regional Execution of GI, CG and O&M

A pilot initiative allowing the regional combination of GI, CG and O&M funds may be useful in advancing the implementation of RSM. The project specific nature of funding has been identified as one of the impediments to implementing the RSM concept. A pilot effort has been suggested as a means to more specifically examine how the Corps can implement study, project and program activities in an integrated, regional context. Such an effort would emphasize efficiency and improved effectiveness in carrying out civil works programs and activities in a region, while addressing the full suite of identified needs and opportunities, and including both economic and environmental objectives. It would integrate consideration of responsibilities for operating existing projects, with new studies and projects, along with other agency activities. The concept for the pilot includes a "vertical team" representing policy, programs management, planning, engineering, operations, real estate and counsel to examine and advise on issues that surface during the course of the pilot initiative. Further development of this pilot concept is underway as part of the discussions with the CERB.

WRDA 2002 RSM Legislative Proposal

WRDA 2002 Legislative Proposal - Regional sediment management is a strategic objective of the Corps navigation mission and was identified among the water resources needs in the listening sessions. Acknowledging the difficulty of managing sediment as a system resource under the constraint of individual project funding, language for an RSM provision was drafted by the Corps for WRDA 2002[18]. The purpose of the legislation is to provide the authority for the Corps to study and implement RSM measures in conjunction with the operation and maintenance of Federal navigation projects for harbors or inland harbors. Several existing programmatic authorities are useful in meeting certain sediment management objectives particularly, where the benefits and beneficiaries are clearly definable in the short term and there are non-Federal cost sharing partners. These authorities are more difficult to apply to sediment management measures with delayed or cumulative benefits, and measures with widespread beneficiaries across multiple local or and state government jurisdictions. This authority is not intended to replace the cost shared authorities but focus on the "gray zone" between navigation channel dredging and dredged material disposal, and broader management actions that could enhance and improve channel reliability and respond to RSM objectives.

[18] The WRDA 2002 proposal is a Corps proposal, and at this time it is uncertain as to whether or not the proposal will be supported by the Administration. Another recent proposal, H.R. 5137 would allow other than a least-cost disposal if the additional cost is determined to be justified by the benefits, including storm damage reduction, environmental, and recreation. Non-Federal interests would be required to provide 35% of the costs.

Language authorizing RSM expenditures was drafted for WRDA 2002, to provide authority for the Corps to study and implement RSM measures in conjunction with the operation and maintenance of Federal navigation projects for harbors or inland harbors. Some of the background on the proposed authority is provided below:

- Section 204 (WRDA 92) and Section 145 (WRDA 76) are useful in meeting certain sediment management objectives particularly, where the benefits and beneficiaries are clearly definable in the short term and there are non-Federal cost sharing partners. The authorities are more difficult to apply to sediment management measures with delayed or cumulative benefits and measures with widespread beneficiaries across multiple local or and state government jurisdictions. This authority is not intended to replace the cost shared beneficial use authorities but focus on the gray zone between navigation channel dredging and dredged material disposal and broader management actions that could be taken to enhance and improve channel reliability and respond to RSM needs, impacts and environmental requirements.

- Regional sediment management is a strategic objective of the Corps navigation mission and was identified as a need in the listening sessions, however it is difficult to manage sediment as a system under the constraint of individual project funding. Also, the demand for hopper dredges and large pipeline dredges are variable and uncertain, depending on shoaling rates that are weather and storm dependent. The ability to accomplish regional sediment management activities during low dredging periods would be useful in private dredging asset management by helping to stabilize workloads.

- State coastal zone management agencies and local governments often believe that beneficial use of dredged material should be a 100 percent Federal responsibility funded by the Federal navigation maintenance program and reimbursed from the Harbor Maintenance Trust Fund. This argument also often involves concerns about the unmitigated down-drift impacts of Federal inlets and jetties. The Corps policy position has been that the Federal navigation operation and maintenance responsibility only extends to the most cost effective disposal alternative that is in compliance with Federal environmental laws and policies. Expenditures beyond this "Federal Standard" or base plan must be implemented under other authorities and cost shared programs. Federal funding of regional sediment management measures has the potential to undermine this policy position. This is addressed in this proposal by placing appropriation limits and project limits on 100 percent Federal regional sediment management expenditures.

- An authority for a $35 million appropriation is proposed. This would be a programmatic appropriation and a "remaining item" in either the Operation and Maintenance General, or Construction, General accounts. Some of these expenditures could be offset by navigation operation and maintenance dredging savings that would result from the regional sediment management measure. The proposed draft language is provided in Appendix C.

RSM and the National Shoreline Management Study

The RSM demonstration efforts and other RSM efforts will provide essential input to the National Shoreline Study (NSS) authorized by Section 215(c) of WRDA 1999.
The NSS legislation authorizes preparation of a report to Congress on the state of the shores of the United States and presents the opportunity to comprehensively examine the status of the Nation's shoreline for the first time in 30 years. The NSS is intended to update and develop information needed for current and future policies, decisions and programs related to shore protection and coastal management[19]. The NSS authority specifies a description of the systematic movement of sand along shores of the U.S. and development of recommendations regarding use of a systems approach to sand management.

> In 1971, the Corps published the National Shoreline Study. This was the first attempt by the Federal government to compile an analysis of the Nation's shorelines and to develop shore protection management guidelines. The study reported approximately 20,500 miles of ocean, estuarine and Great Lakes shorelines as experiencing significant degrees of erosion, with 2,700 of these miles identified as having critical erosion problems.

Per the authorization, the study will:

- describe the extent and causes of shoreline erosion and accretion,
- discuss the economic and environmental affects of these processes.
- describe the current Federal, state and local programs related to shore restoration and renourishment, which have evolved in recent decades.

The study will provide a technical basis and analytical information useful in developing recommendations on: 1) levels of Federal and non-Federal participation in shore protection; and, 2) use of a systems approach to sand management.

Some preliminary discussions of approaches to the study and initial discussion with potential participants and stakeholders began in 2000, however appropriations authority was not received for the study until FY 2002 ($300,000) and a more definitive implementation approach is being developed.

The RSM demonstration program will provide input to the National Shoreline Study useful in developing the recommendation regarding use of a systems approach to sand management. While this interface has yet to be discussed, it is likely to include discussion of systems approaches to sediment management as a means of increasing project effectiveness and reducing costs. The linkages of navigation and shore protection activities and relevance of regional planning and studies are also likely to be included.

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[19] Growth and development along the Nation's coastal areas has increased extensively over recent decades and is expected to continue. Federal, state and local policies and programs affecting shoreline management have evolved independently and there growing confusion as to how the different programs and responsibilities interrelate. The public has expressed a demand for both infrastructure and services to support economic growth, and a demand to protect the environment and to restore natural resource systems. Products from the NSS will provide information useful for policy analysis, coastal shore protection and land-use planning, along with coastal resources management.

Potential Application of RSM to Broader Coastal Management

Experiences with RSM also have the potential to position the Corps to be a stronger player in implementing, and perhaps redefining National Federal coastal policy, along with fostering more diverse Federal-State policy and program partnerships. The Corps navigation, storm damage reduction and ecosystem restoration missions are integrally linked when viewed with a regional perspective. They are also integrally tied to other Federal and state programs and these ties become most obvious when viewed regionally (e.g. linkages with refuge and park management, flood insurance, research, navigation safety, and especially coastal zone planning, and potentially the Unified Federal Watershed Policy efforts.). Doing so should provide an opportunity to examine program synergies and efforts that cross-purposes. See the following discussion of RSM and the Coastal Zone Management Act.

RSM and the Coastal Zone Management Act (CZMA)

RSM promotes the ideas and follows the principles of the CZMA. Most of the Nation's attention to CZMA has focused on its procedural and compliance requirements [20], however, the Act establishes a more general policy to encourage and assist states in their responsibilities in the coastal zone through *development and implementation management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values, as well as the needs for compatible economic development* (16 U.S.C. 1452).

The CZMA provides guidelines to develop a program for the management, beneficial use, protection and development of the land and water resources in coastal zones, through protection of natural resources, management of development, providing public access, and establishment of pollution control. It delegates responsibility to states to exercise their responsibilities as owners of coastal zone areas to develop and implement management programs to achieve wise use of the land and water resources. Participation and cooperation is encouraged among state and local governments, interstate regional agencies and Federal agencies to help states manage competing demands in coastal areas. The Secretary of Commerce is authorized to award Federal grants to assist the states in developing and administering management programs on land and water use for the coastal zone giving full consideration to ecological, cultural, historic and esthetic values as well as to the need for economic development. The box below summarizes the intended scope of state management programs under the CZMA. Among these responsibilities is the coordination and simplification of procedures to expedite government decision-making. The multi-agency collaboration integral to RSM can help foster this coordination and process improvement.

[20] Section 307 (16 U.S.C. 1456(c)(1)(A)) directs Federal agencies proposing activities or development projects including Civil Works activities, whether within or outside of the coastal zone, that are reasonably likely to affect any land or water use or natural resource of the coastal zone, to assure that those activities or projects are consistent, to the maximum extent practicable, with the approved state programs. Non-Federal projects requiring a Federal permit for an activity in or outside of the coastal zone, affecting any land or water use or natural resource of the coastal zone of the state, must provide certification to the permitting agency that the proposed activities complies with the enforceable policies of the states approved program.

The information made available through RSM should be useful in multi-objective coastal zone management as advocated in the CZMA.

State management programs, conducted in partnership with Federal agencies, are to provide for:

- Protection of natural resources, including wetlands, flood plains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife and their habitat, within the coastal zone;
- Management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to sea level rise, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands;
- Management of coastal development to improve, safeguard, and restore the quality of coastal waters, and to protect natural resources and existing uses of those waters;
- Priority consideration to coastal-dependent uses and orderly processes for siting major facilities related to national defense, energy, fisheries development, recreation, ports and transportation, and the location, to the maximum extent practicable, of new commercial and industrial developments in or adjacent to areas where such development already exists;
- Public access to the coasts for recreation purposes;
- Assistance in the redevelopment of deteriorating urban waterfronts and ports, and sensitive preservation and restoration of historic, cultural, and esthetic coastal features;
- Coordination and simplification of procedures in order to ensure expedited governmental decision making for the management of coastal resources; continued consultation and coordination with, and the giving of adequate consideration to the views of affected Federal agencies;
- Timely and effective notification of, and opportunities for public and local government participation in, coastal management decision making;
- Assistance to support comprehensive planning, conservation, and management for living marine resources, including planning for the siting of pollution control and aqua-culture facilities within the coastal zone, and improved coordination between State and Federal coastal zone management agencies and State and wildlife agencies; and,
- Study and development, where appropriate, of plans for addressing the adverse effects upon the coastal zone of land subsidence and of sea level rise. (16 USC 1452 (2)).

As highlighted above, state CZM programs are intended to provide for coordination and simplification of procedures in order to ensure expedited governmental decision making for the management of coastal resources. RSM can complement and help support this coordination and procedure improvement. RSM brings to the table a unique focus on sand and sediment management that most other programs do not have. Partnering with the multiple agencies to better integrate programs and policies that have the potential to affect sand and sediment management in the course of their missions can be a valuable asset to coastal zone management. Table 6 identifies categories of potentially relevant agency roles at the Federal level. At any one time, the range of Civil Works studies, projects and activities within a coastal region involve a broad cross section of coastal resources development, management and protection activities and requirements. RSM efforts may help in integrating these needs and identifying potential opportunities for intra- and inter-agency program synergies. Not only must the Corps address coastal zone consistency in its projects, there

may be opportunities for the Corps to partner with State Coastal Zone Management Offices in providing technical, design, and construction assistance with projects identified as state priorities relative to national coastal zone policies. Corps participation in the development of Special Area Management Plans (SAMPs), ecosystem restoration projects, watershed and other comprehensive studies may contribute to state coastal zone management plan objectives, and the broader goals of the CZMA.

RSM Research Program

Deficiencies in the scientific understanding of processes at regional scales, along with a lack of tools for data management and analysis create challenges, if not impediments to fair and open multi-objective analysis. Models based on weak databases with incomplete or inconsistent information can reduce the credibility of proposed management measures, limit the ability to consider tradeoffs, and make it difficult to establish shared vision of the future among agencies and stakeholders.

Objective science will improve current management decisions or preferences which may be based on based on anecdotal information or speculation. However limited resources make targeting scientific and engineering investigations in support of planning and management questions essential, along with leveraging of talents and resources among agencies to fill the knowledge gaps and build confidence and trust.

A Regional Sediment Management Research Program (RSMRP) was initiated in FY 02 to provide the knowledge and tools necessary to successfully manage sediment on a regional scale. (See http://hlnet.wes.army.mil/research/sedimentation/RSM/ProgDescriptionRSMP.pdf). The program will integrate the national demonstration projects and extend the regional management concept upstream. The overall goals of the RSMRP are to:

- Provide knowledge and tools needed for holistic regional sediment management in Civil Works water resource projects to support economic and environmental sustainability while providing justified high performance levels of service.

- Enable project planning, design, construction, operation, and maintenance that will minimize disruption of natural sediment pathways, or mediate natural processes that have adverse environmental or economic impacts.

Capabilities for managing sediment regionally have been identified through several business area workshops, program reviews, meeting with Demonstration Project personnel and virtual workshop forums. The field-identified needs are categorized in five areas:

1. Knowledge of sediment transport and related processes that are needed to better assess challenges and solutions.

2. Modeling and Assessment Tools - Means of evaluating problems and alternative solutions across a spectrum of temporal and spatial scales.

Table 6. Potential Federal Agency Partners and Stakeholders in RSM

This table provides a preliminary list of Federal agencies whose missions and programs may be relevant to RSM

Agency	Planning		Regulatory	Resource Stewardship		Shore Protection	Nav & Boat Safety	Data Collection & Mgmt	R&D	Technical Support Services	Emergency Response
	Landuse	Economic Development		Aquatic	Coastal						
FEMA			**X**			**X**				**X**	**X**
MMS			**X?**	**X**	**X**						
NPS					**X**						
NOAA - NMFS			**X**	**X**							
NOAA - OCRM	**X**	**X**				**X?**					**X**
NOAA - Sea Grant									**X**	**X**	
NOAA - CSC								**X**	**X**	**X**	
NRCS			**X?**								
USACE		**X**	**X**			**X**	**X**	**X**	**X**	**X**	**X**
USGS								**X**	**X**		
Coast Guard							**X**				**X**
EPA			**X**					**X?**	**X?**	**X?**	

3. Engineered Solutions - Designs and methods that provide best management practices for sediment challenges at the local and regional scale.

4. Informatics and Decision Support - Databases, graphical environments, software and procedures that accommodate Corps business practices and facilitate decision-making.

5. Technology Transfer and Insertion - External workshops, seminars, and one-on-one interactions to bring the best outside knowledge and tools into Corps practice, and internal workshops, training materials, and web-enabled tools to ensure rapid dissemination and use of the best technologies by the Corps.

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Appendix A – Recommendations from Report: *The Dredging Process in the United States: An Action Plan for Improvement*

The Interagency Working Group on the Dredging Process (Group) was convened by the Secretary of Transportation, in October 1993 to investigate and recommend methods to improve the dredging project review process. The Group had two major objectives:

- Promote greater certainty and predictability in the dredging project review process and dredged material management, and
- Facilitate effective long-term management strategies for addressing dredging and disposal needs at both the National and local levels.

The Group reviewed the current processes for authorizing Federal and non-Federal dredging projects; for identifying, planning for, and selecting dredged material disposal alternatives; and for funding Federal-dredging projects. The review included analyzing these processes and identifying ways to improve them, including coordination, information gathering, environmental compliance, overall sequencing of approvals, and use of long-term dredged material management planning.

In 1994, the Group published an action plan for improving the dredging process, which included recommendations to improve the regulations and planning procedures that govern dredging and dredged material disposal projects. Among these were recommendations for creating or augmenting regional dredged material management plans, and other recommendations for strengthening planning mechanisms for dredging and dredged material management. Regulatory, procedural, and philosophical obstructions were discussed and the recommendations were intended improve agency communication, gains in scientific research, equitable project funding, and new outreach activities for non-agency groups and individuals. These recommendations are summarized in the table below.

The RSM approach is consistent with this action plan and supports a number of the recommendations. RSM supports five of the recommendations directly (1, 2, 4, 6,16), and has the potential to support three others (3, 11, 12). RSM goals could be enhanced through implementation of Recommendations 13 and 17.

Summary List of Recommendations[21]

Rec. No.	Recommendation	Lead Agency	Time Frame	Page No.
Strengthening Planning Mechanisms for Dredging and Dredged Material Management				
1	Create and/or augment regional/local dredged material planning groups to aid in the development of regional dredged material management plans.	Corps	Short Term	8

[21] Source - Report of the Interagency Working Group on the Dredging Process (1994), at: http://www.epa.gov/owow/oceans/ndt/s6.html .

2	Identify the characteristics of successful Federal/state/local partnerships for use in developing dredged material management planning efforts.	Corps, EPA, NOAA MARAD	Short Term	9
3	Develop public outreach and education programs to facilitate stakeholder involvement.	All Agencies	Short Term	9
4	Provide guidance to relevant Agency field offices, state and local agencies, and the general public on opportunities for beneficial use of dredged material.	Corps, EPA	Short Term	10
5	Update guidance on disposal site monitoring requirements and procedures.	EPA, Corps	Short Term	10
6	Ensure that dredged material management planners work with pollution control agencies to identify point and nonpoint sources of sediment and sediment pollution and to implement watershed planning.	EPA, Corps	Sh ort Term	10
7	Review the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies (P&G) to determine whether changes are needed to better integrate the economic and environmental objectives of National Economic Development (NED) and Environmental Quality (EQ)	Corps	Long Term	11
8	Revise the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) to ensure that the planning process outlined in the legislation provides for linkages with plans which address dredging issues.	MARAD	Long Term	11
Enhancing Coordination and Communication in the Dredging Project Approval Process				
9	Establish a National Dredging Issues Team and Regional Dredging Issues Teams.	Corps, EPA	Short Term	12
10	Schedule pre-application meetings among the Corps, the applicant, the EPA, other interested Federal agencies and relevant state agencies for dredging projects that are potentially controversial or that may involve significant environmental issues.	Corps	Short Term	13
11	Develop and distribute a permit application checklist which identifies the information required from the applicant.	Corps	Short Term	13
12	Develop or revise the procedures for coordinating interagency review at the regional level to define the process by which various Federal parties coordinate on dredging projects.	Corps, EPA, FWS NOAA	Short Term	14
13	Establish a national MOA to clarify roles and coordination mechanisms between the EPA and the Corps.	EPA, Corps	Short Term	14
Addressing Scientific Uncertainties About Dredged Material				
14	Clarify and improve the guidance used to evaluate bioaccumulation of contaminants from dredged materials.	EPA, Corps	Short Term	15
15	Identify the practical barriers to managing contaminated sediments and ways to overcome the barriers.	Corps, EPA	Short Term	16
16	Identify means to reduce the volume of material which must be dredged.	Corps, EPA	Short Term	16
Funding Dredging Projects Consistently and Efficiently				
17	Revise WRDA to establish consistent Federal-local sponsor cost sharing, across all dredged material disposal methods.	Corps	Long Term	17
18	Study the feasibility of a fee for open-water disposal for non-Federal dredging projects.	EPA	Long Term	17

Short Term: Immediately implementable under existing regulations. Long Term: Requires regulatory or legislative change.

Appendix B - Civil Works Authorities, Policies and Programs that Facilitate Corps Participation in Regional Sediment Management

A number of USACE authorities and policies support the implementation of Regional Sediment Management (RSM). These include:

- General and specific authorities which provide opportunities and responsibilities for Corps activities in coastal areas;
- Policies which advocate regional or system approaches to water resources management and problem solving.

Below is a preliminary summary of authorities, policies, and programs that support and serve as "facilitators" for RSM.

Authorities

A number of authorities emphasize and support comprehensive, watershed or river basin studies, and the examination of water resources needs and opportunities in a regional context. Additional authorities authorize Corps studies, projects and work in coastal areas or specific authorities regarding sand or sediment management or the management of dredged material. These authorities provide advocacy, support and opportunities for RSM.

1. Section 202, WRDA 2000, Watershed and River Basin Assessments. Amends Section 729, WRDA 1986, providing authority to assess the water resources needs of river basins and watersheds, including ecosystem protection and restoration, flood damage reduction, navigation and ports, watershed protection, water supply, and drought preparedness. The originally the authorities specified specific studies however the current authority is considered as a broad authority for watershed and river basin assessments.

2. Basin and Specific Study Authorities. A number of study resolutions and specific studies allow, if not emphasize, comprehensive examinations of water resources needs and opportunities. Some of these studies pursue a single purpose in a comprehensive context, while others pursue a broader range of needs and purposes at the regional level. These study areas often include coastal areas or resources integrally connected to the coastal regions that may influence or be influenced by coastal resource development and management.

3. Planning Assistance to States (Section 22). Section 22 of the Water Resources Development Act (WRDA) of 1974, as amended, authorizes the Chief of Engineers to cooperate with states and Indian tribes in preparing plans for the development, utilization, and conservation of water and related land resources of drainage basins located within the boundaries of the state or Indian country. Section 221 of WRDA 1996 added "watersheds, and ecosystems" providing the opportunity for this authority to be used for watershed studies and ecosystem studies. Corps guidance encourages districts to continue to look for opportunities to assist in these types of studies where appropriate and when identified as a state or tribal priority. The non-Federal cost sharing is 50 percent. Fiscal year appropriations for the

program are limited to no more than $10 million, and expenditures are limited to $500,000 per year, per state or Indian tribe. *This authority has been used by CECW-SAJ to initiate RSM planning and coordination.*

4. Section 227(d) of WRDA 1996, State and Regional Plans, amends the 1946 Shore Protection Act by adding "Section 4, State and Regional Plans", authorizing the Secretary to cooperate with states in preparation of comprehensive state or regional plans for the conservation of coastal resources.

5. Section 516 of WRDA 96, Sediment Management, authorizes the Secretary to enter into cooperative agreements with non-Federal interests with respect to navigation projects, or other appropriate non-Federal entities, for the development of long-term management strategies for controlling sediments at such projects. The strategies developed under this authority are to include:

(1) Assessments of sediment rates and composition, sediment reduction options, dredging practices, long-term management of any dredged material disposal facilities, remediation of such facilities, and alternative disposal and reuse options; (2) a timetable for implementation of the strategy; and (3) incorporation of relevant ongoing planning efforts, including remedial action planning, dredged material management planning, harbor and waterfront development planning, and watershed management planning. In developing these strategies, consultation with interested Federal agencies, States, and Indian tribes and opportunity for public comment are required.

6. Consideration of Broader Landscape in Navigation Improvements. Pursuant to **Section 5 of the River & Harbor Act of 1935** each investigation on navigation improvements potentially affecting adjacent shoreline will include analysis of the probable effects on shoreline configurations. A distance of not less than ten miles on either side of the improvement should be analyzed. (ER 1105-2-100, para E-14(h)).

7. Changes to Completed Projects to Improve the Environment or Examine Changed Economic Conditions (Section 216). Section 216, Review of Completed Projects (River and Harbor and Flood Control Act of 1970) authorizes investigations for modification of completed projects or their operation when found advisable due to significantly changed physical or economic conditions and for improving the quality of the environment in the overall public interest. Under Section 216, initial appraisal reports are prepared using operations and maintenance (O&M) funds. The cost of preparing the initial appraisal report is limited to $20,000[22]. Results from these reports can be used to support initiation of reconnaissance studies through normal budgetary process. After completion of the initial appraisal, the 216 study process is that of a normal General Investigations study. A feasibility study under Section 216 authority would be appropriate for large scale ecosystem restoration projects linked to existing Civil Works projects, but whose costs would be too large for Section 1135, Section 206, or Section 204 authorities. Additional guidance can be found in ER 1165-2-119, Modifications to Completed Projects, at http://www.usace.army.mil/inet/usace-docs/eng-regs/er1165-2-119/entire.pdf .

8. Mitigation of Shore Damage Due to Federal Navigation Projects (Section 111). Section 111 of the River and Harbor and Flood Control Act of 1968 (PL 90-483), as amended by **Section 940** of WRDA 1986 (Public Law 99-662).). The Corps can recommend measures for the prevention or mitigation of erosion or shoaling damages attributable to Federal navigation works. Section 111 authorizes the investigation, recommendation, and implementation of structural and nonstructural

[22] If more than $20,000 is required, approval may be requested from HQUSACE, attention CECW-BC, including sufficient information to justify the additional expenditure.

measures to prevent or mitigate shore damages to both non-Federal public and privately owned shores, resulting from Federal navigation works.

This authority is applicable to the extent that such damages can be directly identified and attributed to Federal navigation works located along the coastal and Great Lakes shorelines of the United States. This includes shore damage attributable to the Atlantic Intracoastal Waterway and the Gulf Intracoastal Waterway. Under this authority, Federal funds may only be used to address the shore damages caused by the Federal navigation works. If there are multiple causes for the damages, Federal participation in a Section 111 solution may continue if the non-Federal sponsor agrees to bear all costs associated with correcting the shore damage not attributed to the Federal navigation works. However, when there is a larger shore damage problem caused by more than just the Federal navigation works, a complete solution should be formulated under either an authorized hurricane and storm damage study and project, or under Section 103 of the Rivers and Harbors and Flood Control Act of 1968 (PL 90-483) (see below).

The target degree of mitigation is the reduction of shore damage to the level which would have existed without the influence of navigation works at the time the navigation works were accepted as a Federal responsibility. This authority is not to be used to restore shorelines to historic dimensions[23]. Solutions should reduce the existing shore damage or prevent subsequent damages by action based on sound engineering and economic principles when equitable and in the public interest. Section 111 should not be used to construct or modify authorized shore protection projects or authorized shore damage mitigation elements of navigation projects, or for river bank erosion or vessel-generated wave wash damage (per EP 1165-2-1). The costs sharing in the same proportion as that used for the project causing the shore damage.

9. Storm Damage Reduction, Section 103. Section 103, River and Harbor Act of 1962 (PL 87-874), as amended, authorizes a program for Federal participation in the cost of protecting the shores of publicly owned property and private property where public benefits result. The Federal funding limit per project is currently $2,000,000 with a program limit of $30,000,000 per year. Section 103 is considered one of the authorities in the Continuing Authorities Program[24]. As of 1996, the Corps had constructed 14 projects that relate to shore protection and beach erosion control under this authority.(Hillyer (1996) - information on projects for the Section 103 program dates back to 1987).

10. Emergency Streambank and Shoreline Erosion Protection for Public Facilities and Services (Section 14). Section 14, Flood Control Act of 1946 (PL 79-526), as amended applies only partly to the shore protection and beach erosion control projects. The Federal funding limit per project is currently $500,000 with a program limit of $12,500,000 per year.

11. Placement of Dredged Materials on Beaches. Section 145 of WRDA 1976 (Public Law 94-587) as amended by **Section 933** of WRDA 1986 (Public Law 99-662), and **Section 217** of WRDA 99, authorizes the Secretary of the Army, if requested by a state, to "place on the beaches of such state beach-quality sand which has been dredged in constructing or maintaining navigation inlets and

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[23] From ER 1165-2-100, Pg E- 20.

[24] There are six legislative authorities under which the Secretary of the Army, acting through the Chief of Engineers, is authorized to plan, design, and construct certain types of water resources improvements without specific Congressional authorization. These authorities are called the "Continuing Authorities Program" or CAP when referred to as a group. Only three of these authorities pertain partly or entirely to hurricane and storm damage reduction, Sections 103, 111, and 14.

channels adjacent to such beaches, if the Secretary deems such action to be in the public interest…" . When placement of dredged material (beach quality sand) on a beach is the least costly acceptable means for disposal, then such placement is considered integral to the project and cost shared accordingly. In cases were placement of dredged material on a beach is more costly than the least cost alternative, the Corps may participate in the additional placement costs when: (1) requested by the state; (2) the Secretary of the Army considers it in the public interest (satisfactorily meet economic justification and other priority criteria generally applicable to all proposed Civil Works "new work" outlays); (3) the added cost of disposal is justified by hurricane and storm damage benefits (see paragraph 12-21, and Section IV of Appendix E, ER 1165-1-100), and (4) the shoreline on which the material is placed is open to public use. When all local cooperation requirements are met the Corps may cost share the additional costs -65% (Section 933, WRDA 1986, as amended by Section 217, WRDA1999). In cases where the additional costs for placement of the dredged material is not justified, the Corps may still perform the work if the State requests it, and the state or other sponsor contributes 100 percent of the added cost. If the State requests, the Corps may enter into an agreement with a political subdivision of the State to place the sand on its beaches, with the subdivision responsible for the additional costs. The Corps should consider and accommodate to the degree reasonable and practicable a state's or subdivision's schedule for providing its cost share. Each placement event should be supported by a separate decision document. Subsequent decision reports may be supplements to the original Section 933 decision document. (See ER 1165-2-130, at http://www.usace.army.mil/inet/usace-docs/eng-regs/er1165-2-130/entire.pdf).

12. Beneficial Uses of Dredged Material, Section 204 of the WRDA of 1992, as amended, provides programmatic authority for the protection, restoration and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for new project construction or maintenance.

13. Aquatic Ecosystem Restoration, Section 206, WRDA 1996, authorizes the restoration and protection of aquatic ecosystem structure and function. No linkages to an existing Corps project is required. A cap of $5,000,000 in Federal funds per project is specified.

14. Project Modifications for Improvement of Environment, Section 1135, WRDA 1986, as amended, authorizes review of completed water resources projects to determine the need for modifying the structures or operations to improve the quality of the environment. Review to determine if the operation of projects has contributed to the degradation of the quality of the environment is also authorized. Recommended structural and operational changes must be consistent with the authorized project purposes. Cap of $5,000,000 in Federal funds per project.

15. Selection of Dredged Material Disposal Methods, Section 207, WRDA 1996. Modifies Section 204 of WRDA 1992 to allow that a disposal method that is not the least-cost option may be selected if the incremental costs are reasonable in relation to the environmental benefits, including the benefits to the aquatic environment from creation of wetlands and control of shoreline erosion. Cost sharing is specified (75% Federal, 25% non-Federal).

Policies

A number of Civil Works policies advocate an integrative, regional or watershed perspective in carrying out Civil Works projects and programs. These policies provide a foundation of support for the concept of RSM.

1. Civil Works Watershed Perspective. Policy Guidance Letter (PGL) 61, *Application of Watershed Perspective to Corps of Engineers Civil Works Programs and Activities,* establishes and describes policy regarding a watershed perspective. This perspective is intended to guide water resources development, protection, and management within the Civil Works program. It emphasizes an integrative, regional or watershed approach to in carrying out Civil Works projects and programs, including the examination of water resources needs and opportunities in regional contexts. The perspective accommodates the multiple objectives and purposes of interest to federal, state and local interests. It is intended to help improve performance, customer satisfaction, and overall program efficiency and effectiveness and to assure use of the water resources in a sustainable manner, taking into account environmental protection, economic development, and social well-being. The system approach advocated is equally applicable to coastal regions as it is to interior watersheds, and the connecting system components. This policy is intended to foster examination of how Civil Works programs, projects and activities can be integrated to promote greater effectiveness and to prevent their working at cross-purposes. It is also intended to foster a systems view of problems and opportunities, rather than isolated views of individual projects. (For more information, see http://www.usace.army.mil/inet/functions/cw/cecwa/branches/guidance/pgls/pdf/pgl61.pdf).

2. Section 202 Implementation Guidance (Watershed and River Basin Assessments) – Assessments are to involve considerable consultation and coordination with Federal, tribal, state, interstate and local governments. They should be multi-purpose and multi-objective in scope. The objectives and scope of the effort are to be agreed upon between the Corps and sponsor(s), and outlined in a negotiated document. Products from watershed assessments can be plans or management documents that identify actions to be taken by partners and stakeholders to meet the objectives of the plan, not just projects recommended for Corps implementation. http://www.usace.army.mil/inet/functions/cw/cecwp/branches/mp_and_dev/Wrda00/wrda00202.PDF .

3. Consideration of the Broader Landscape Implications of Navigation Improvements. Pursuant to Section 5 of the River & Harbor Act of 1935 each investigation on navigation improvements potentially affecting adjacent shoreline will include analysis of the probable effects on shoreline configurations. A distance of not less than ten miles on either side of the improvement should be analyzed. (ER 1105-2-100, para E-14(h)).

4. Civil Works Planning Guidance Acknowledges the Need for Systems Analysis in Shoreline Studies. In Appendix E of ER 1105-2-100, hurricane and storm damage reduction is discussed as a mission area. A systems analysis is included among the principles in guidance for evaluation of benefits from these projects. Paragraph E-24(f)[25] includes:

(*1) Systems Analysis. Because shoreline processes are dynamic, shore protection measures may generate both beneficial and adverse impacts beyond immediate project sites. Impacts elsewhere may occur as a consequence of the design and implementation of site specific hurricane and storm damage reduction projects, and navigation projects may impact or be impacted by such projects. These impacts must be evaluated, and this requires expansion of the study area to include reaches adjacent to the project site. Generally, the adjacent reaches are bounded by natural features that interrupt or substantially limit the natural littoral processes (e.g., bays, sounds, inlets, geomorphic features, etc.). For studies which may not require a full systems approach, the justification shall be documented in the feasibility report. A systems analysis approach will include the following components:*

[25] From ER 1105-2-100, E-24 (f), in: SECTION IV – Hurricane and Storm Damage Prevention.

(a) Physical Processes. Develop a sediment budget for the segment of coast under investigation based on modeling of sediment movements, empirical data, and estimates of gross and net shoreline change rates over the past fifty year period, as well as rates of change during the most recent decade… .

(b) Coastal Alterations. Identify man-made alterations to the shore (jetties, sand-bypassing and recycling, dredging, seawalls, groins, breakwaters, beach nourishment, etc.) and estimate their contribution to the balance of littoral processes and shoreline changes… .

(c) Forecast Shoreline Changes. Forecast shoreline changes (including changes in nourishment requirements, if appropriate) and navigation related dredging requirements for the economic life of the proposed measure…

(d) Economic Benefits and Costs. Inventory potential damage centers and locations of other project induced benefits or costs. … .

5. Beneficial Use of Dredged Material. Corps guidance, published in ER 1105-2-100, pg E-20, encourages districts to consider options that provide opportunities for aquatic ecosystem restoration when determining an acceptable method of disposal of dredged material. Consideration of opportunities to beneficially use dredged material can foster multi-objective analysis in dredged material management, and potentially achieve greater benefits than consideration of maintenance dredging objectives alone. In addition to being a good business practice, there are authorities that enable the Corps to seek and implement beneficial use opportunities. See item 2 under Program and Activities below. EM 1110-2-5026 provides guidance for planning, designing, developing, and managing dredged material for beneficial uses, incorporating ecological concepts and engineering designs with biological, economical, and social feasibility.

6. PGL 56, Section 207 WRDA 1996, Selection of Dredged Material Disposal Methods, Section 207. Dredged material from construction, operation or maintenance of authorized projects can be used to create wetlands or protect environmental resources from erosion. Studies for new navigation projects or modifications to existing navigation projects shall examine the feasibility of using dredged material for ecosystem restoration. If feasible, this beneficial use would be authorized as part of the project. For maintenance dredging, Section 207 could be used if the environmentally beneficial disposal method has large incremental costs which preclude the use of Section 204 (i.e. >$5 million). The increment of costs to achieve environmental benefits are shared on a 75% Federal and 25% non-Federal basis. (See: http://www.usace.army.mil/inet/functions/cw/cecwp/branches/mp_and_dev/Wrda00/wrda00202.PDF).

Programs and Activities

A number of project or program specific authorities allow the Corps to implement and manage projects in the coastal regions. Some of these encourage systems approaches and thus can support or be integral to RSM.

1. Dredged Material Management Planning. The Corps conducts dredged material management planning for all Federal harbor projects to ensure that maintenance dredging activities are performed in an environmentally acceptable manner, use sound engineering

techniques, are economically warranted, and that sufficient confined disposal facilities are available for at least the next 20 years (ER 1105-2-100, pg 3-4). These plans address dredging needs, disposal capabilities, capacities of disposal areas, environmental compliance requirements, potential for beneficial usage of dredged material and indicators of continued economic justification. Dredged Material Management Plans (DMMPs) are to be prepared for all Federal navigation projects, or groups of inter-related harbor projects, or systems of inland waterway projects (or segments). [**33 CFR Part 337.9** ... directs that, "District engineers should identify and develop dredged material disposal management strategies that satisfy the long-term (greater than 10 years) needs for Corps projects."] DMMP may address multiple projects. The DMMPs are to be updated periodically to identify any potentially changed conditions. The development of these plans in the context of regional sediment management may contribute to increased efficiencies and reduced O&M costs. Information from these plans may be useful in planning for ecosystem restoration and coastal storm damage reduction if coordinated among the planning, engineering and operations staff.

Dredged Material Management Policy.

- Sound management of dredged material is a priority mission of the Corps.
- The Corps is committed to conducting dredging and managing dredged material in an environmentally sound manner.
- The interests of economic development and environmental sustainability will best be served when dredged material placement proceeds according to a management plan. Therefore each existing and proposed navigation project will have a dredged material management plan that ensures warranted and environmentally acceptable maintenance of the project.
- Beneficial uses of dredged material are powerful tools for harmonizing environmental values and navigation purposes. **It is the policy of the Corps that all dredged material management studies include an assessment of potential beneficial uses for environmental purposes including fish and wildlife habitat creation, ecosystem restoration and enhancement and/or hurricane and storm damage reduction.** Districts and MSCs will make every effort to ensure that sponsors and other interests understand the valuable contributions that beneficial uses can make to management plans and will maximize use of regional forums to share experiences of opportunities for beneficial uses. [See ER 1105-2-100, Appendix E]

2. Beneficial Use of Dredged Material. Corps guidance (ER 1105-2-100, pg E-20] encourages districts to consider options that provide opportunities for aquatic ecosystem restoration when determining an acceptable method of disposal of dredged material. Feasibility studies for new navigation projects or modifications to existing navigation projects are to include examination of the feasibility of using dredged material for ecosystem restoration purposes and, if feasible, such environmentally beneficial uses would be specifically authorized as part of the project. Where environmentally beneficial use of dredged material is the least cost, environmentally acceptable method of disposal, it is cost shared as a navigation cost. Section 204 of the WRDA of 1992, as amended, provides programmatic authority for selection of a disposal method for authorized projects, that provides aquatic restoration or environmental shoreline erosion benefits when that is not the

least costly method of disposal[26]. The incremental cost of the disposal for ecosystem restoration purposes over the least cost method of disposal is cost shared, with a non-Federal sponsor responsible for 25 percent of the costs. Smaller projects typically will be pursued within the programmatic limits of Section 204, as amended. Section 207 of the WRDA of 1996 amended this authority. Section 207 will primarily be used with new navigation projects or in conjunction with maintenance dredging when the incremental cost is large. Projects pursued under Section 207 authority are separately budgeted and will not count towards the Section 204 programmatic limit. (See Section E-14 and Appendix F of ER 1165-2-100 for additional information regarding beneficial use of dredged material, and Policy Guidance Letter No. 56 for guidance on implementing Section 207, WRDA 1996.).

3. Periodic Nourishment. Public Law 84-826 provides that Federal participation in periodic beach nourishment may be appropriate when it comprises a more suitable and economical remedial measure for shore protection than retaining structures such as groins. Under such conditions periodic nourishment can be considered "construction" for cost sharing purposes. Retaining structures may be recommended, but then any required periodic nourishment is not considered construction and is not cost shared by the Federal government. Projects with structures included to maintain a shore alignment, but not to materially prevent littoral drift (which may nourish downdrift beaches), such as low-profile groins and offshore breakwaters, are eligible for periodic nourishment (ER 1105-2-100, pg E-140, para g.).

Corps participation in periodic beach nourishment (sand replacement) is limited to the period specified in authorizing documents. Section 934 of WRDA 1986 allows extension of the authorized period to 50 years from the date of initiation of construction, if it is determined that, based on current evaluation guidelines and policies, the existing project is economically justified. Preauthorization reports will generally recommend Federal assistance in periodic nourishment for the economic life of the project. Nourishment costs will be shared in the same percentages as initial project installation costs were shared. (EP 1165-2-1, page 14-, para d). Section 934 authority is not used to extend the period of authorized periodic nourishment of projects that use sand bypassing plants (Hillyer, 1996).

[26] Section 204 of WRDA 92 authorizes the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands in connection with dredging for construction, operation, or maintenance of authorized Federal navigation projects.

Appendix C - Proposed Draft Legislative Language For WRDA 2002

SEC. XX REGIONAL SEDIMENT MANAGEMENT

(a) FINDINGS. The management of littoral, estuarine, and riverine sediments has the potential to produce cost savings in the operation and maintenance of Federal navigation projects and to restore natural sediment movements to the benefit of shorelines and coastal ecosystems.

(b) PLANNING. The Secretary is authorized to develop plans for regional sediment management in conjunction with dredging, dredged material disposal, beach nourishment and shoreline protection, environmental restoration and other activities associated with the implementation and operation and maintenance of Federal projects in the coastal zone. Sediment management plans will be coordinated with the Department of the Interior, Department of Commerce, Federal Emergency Management Agency, and state and local governments. Plans will be developed at 100 percent Federal cost.

(c) IMPLEMENTATION. The Secretary is authorized to carry out measures for regional sediment management identified in the plans developed under subsection (b) in conjunction with the operation and maintenance by the Secretary of an authorized harbor or inland harbor navigation project. Subject to subsection (d) and (e) of this section, measures for regional sediment management may be undertaken in any case where the Secretary finds that the environmental, economic, and social benefits of the project, both monetary and non-monetary, justify the cost thereof.

(d) COST LIMIT. In any fiscal year for any Federal navigation project the Secretary is authorized to expend up to an additional 25 percent over the average annual operation and maintenance costs in the interest of regional sediment management. These additional costs shall be 100 percent Federal.

(e) COST SHARING. Where the costs of a regional sediment management measure exceeds the Federal cost limits in subsection (d), the Secretary may undertake the measure, subject to the finding in subsection (c), if a non-Federal interest enters into a cooperative agreement to provide 35 percent of the cost of the measure that exceed the limits of subsection (d).

(f) PAYMENT FROM HARBOR MAINTENANCE TRUST FUND. The Federal cost of implementing this Section shall be paid from the Harbor Maintenance Trust Fund

(g) AUTHORIZATION OF APPROPRIATIONS. There is authorized to be appropriated not to exceed $35,000,000 annually to carry out this section of which $5,000,000 annually is authorized for development of plans under subsection (b). Such sums shall remain available until expended.

REPORT

This provision provides authority for the Secretary of the Army to plan and implement measures for regional sediment management in conjunction with operation and maintenance of Federal navigation harbor and inland harbor projects. The provision recognizes that the ability to manage littoral, estuarine, and riverine sediment has the potential to decrease Federal navigation project operation and maintenance costs in the long term and contribute to restoring shorelines and coastal ecosystems but that the costs of such management measures may exceed the most cost effective dredging and dredged material placement when only the limited objective of maintaining the individual navigation project is considered.