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IN THIS ISSUE

AIMS & SCOPE OF THE JOURNAL

The *Journal of Dredging* is published by the Western Dredging Association (WEDA) to provide dissemination of technical and project information on dredging engineering topics. The peer-reviewed papers in this practice-oriented journal will present engineering solutions to dredging and placement problems, which are not normally available from traditional journals. Topics of interest include, but are not limited to, dredging techniques, hydrographic surveys, dredge automation, dredge safety, instrumentation, design aspects of dredging projects, dredged material placement, environmental and beneficial uses, contaminated sediments, litigation, economic aspects and case studies.

BENEFICIAL USES OF DREDGED MATERIAL IN THE UPPER CHESAPEAKE BAY

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ABSTRACT

The use of dredged estuarine sediments has been widely advocated in Maryland as a natural resource for island restoration, marsh creation and enhancement, and shoreline stabilization, and as an economic resource for making marketable products, thereby providing a solution for dredged material management that would also help enhance the Chesapeake Bay ecosystem. About 3.5 million cubic yards of sediments are dredged each year from the approach channels in the Bay serving the Port of Baltimore and Chesapeake and Delaware Canal. Most of these sediments are suitable for beneficial use as either a natural or economic resource. The Maryland Port Administration, with technical assistance from the Maryland Environmental Service, has been working to establish beneficial use as a meaningful component of dredged material management for the Port of Baltimore. But, moving from concept to application has been impeded by various environmental, social and economic factors, to the extent that only one large-scale project has been implemented as part of Maryland's strategy for dredged material management. Linking the beneficial use concept to a specific geographic location has focused attention on tradeoffs that worked against acceptability of most projects in the upper Bay. Habitat conversion from one form to another, including restoration to a prior condition, has been a significant obstacle, especially with respect to fisheries habitat. Institutional and social factors have also affected the State's ability to advance beneficial use projects. This paper discusses the past and ongoing efforts to apply the beneficial use concept in the upper Chesapeake Bay. Beneficial aspects of the multi-objective Hart-Miller Island Dredged Material Containment Facility are discussed.

INTRODUCTION

Historically, the Chesapeake Bay has experienced a considerable reduction in the acreage of islands and marshes as the result of erosion and inundation from a relative rise in sea level. For example, Spry Island and Sharps Island disappeared and are now fishing reefs. Poplar Island has eroded from about 1,400 acres in the 1670s to under 5 acres today (Leatherman et al., 1995; MES, 1994a,b). Within the watershed, vast quantities of sediments are constantly eroded, transported and deposited in the upper Bay including the shipping channels. Every year, approximately 5 to 6 million cubic yards of sediments are dredged to maintain the Port of Baltimore's navigation infrastructure in Maryland, Delaware and Virginia. Each year, over 3.5 million cubic yards of sediments are dredged from the upper Bay approach channels to Baltimore Harbor and the

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Chesapeake and Delaware (C&D) Canal. Traditionally, these sediments were placed in open water areas near the channels that were dredged. Virtually all of this material is potentially suitable for use as a natural resource to achieve environmental benefits while at the same time providing for final deposition of the dredged sediments. On face value, beneficial use is an approach that is very alluring, providing an apparent opportunity for mutual cooperation among dredging and environmental interests. Over the past 20 years, concern about the Bay's environmental health helped stimulate opposition to the open-water placement of clean dredged material. Except for modest open-water placement near Pooles Island in the northern upper Bay, the Maryland Port Administration (MPA), as local sponsor, and the Philadelphia and Baltimore Districts of the U.S. Army Corps of Engineers (USACE) were not able to establish alternative open-water placement sites. As a result, at least 2 million cubic yards of clean dredged material were placed annually in the Hart-Miller Island Dredged Material Containment Facility (DMCF).

The possibility of using dredged material beneficially rather than disposing of it as a byproduct of dredging has gained broad-based conceptual support as an alternative to traditional open-water placement in the Chesapeake Bay. Using sediments as a resource is not new to the Bay. Practical application was introduced to the lower and middle Bay as early as the mid-1970s by the USACE through a few small-scale marsh restoration and oyster reef creation projects (Garbarino et al., 1994; NRC, 1994). Expanding from small-scale to large-scale application was proposed as a way to resolve the port's placement needs in a manner that would contribute to Bay restoration efforts and overcome longstanding controversy about dredged material management.

The MPA has sponsored intense planning since the early 1980s to resolve the port's placement needs, including consideration of beneficial use. This effort lead to the State's 1996 Strategic Plan for dredged material management, which includes the 1110-acre restoration of Poplar Island (MDOT, 1996, 1998). Yet, moving from concept to practical application has proven difficult despite the efforts of the MPA and the many federal, state and interest group participants in the MPA-sponsored Dredging Needs and Placement Options Program (DNPOP). Linking the beneficial use concept to specific sites focuses attention on site-specific environmental, social and economic tradeoffs that, in most cases, work individually or collectively against project acceptability. Conversion of habitat from one form to another, especially fisheries habitat, has been a major factor in determining whether or not the environmental value that would be gained would in turn justify modifications to existing site conditions.

THE STATE'S DREDGED MATERIAL PLANNING PROCESS

The MPA uses a 20-year, forward-looking planning window for managing dredged material. The port's dredging need over the next 20 years is about 110 million cubic yards, of which 80 million cubic yards is for maintenance; the remaining quantity is for new work to enhance safety and to maintain and improve port competitiveness. Planning data are continually updated to reflect changes in actual or projected dredging needs. The long-term planning approach allows for consideration of the magnitude of the dredging need; dredging needs beyond the 20-year window; time needed to advance placement projects from concept through implementation; prospective environmental conditions; changes in technology (for dredging, placement, ships, and intermodal transportation); and, associated implications to dredged material management, port infrastructure

requirements and port competitiveness. A longer planning horizon moves beyond what can be reasonably managed, except for implementation of options that begin within the 20-year window.

The State is implementing its strategic plan. The plan will provide over twenty years of placement capacity if all elements are successfully implemented at planned capacity, thereby providing a resource needed to maintain the port's navigation safety and competitive status. By taking a strong leadership, planning, design and coordination role at State expense, the State has been able to proceed with implementation in coordination with the U.S. Army Corps of Engineers but on a schedule that is independent of the early phases of the federal planning process for placement projects. This approach has overcome institutional factors that typically result in extended time periods of moving individual projects from concept to completion. Dike raising to extend the service life of the Hart-Miller Island DMCF has already been completed. The State role has expedited implementation of the Poplar Island restoration project, two open-water placement options, renovation and reactivation of a previously used containment facility, and initial investigation of a large-scale island containment in the upper Bay.

The Master Plan Initiative

Since the early 1980s, many traditional and non-traditional placement options were identified but few were supported. During the mid-1980's, 475 options were considered in the development of a draft Master Plan sponsored by the MPA (MPA, 1990). Extensive interorganizational and public involvement was purposefully included in the consensus-based planning process. The process incorporated lessons learned from the planning of the Hart-Miller Island DMCF and also included the introduction of additional alternatives, as required. It was thought that the Master Plan initiative would result in sufficient placement alternatives, thereby precluding the need for expansion of the Hart-Miller DMCF once filled to capacity in the early to mid-1990s, depending upon the ability to dewater and consolidated placed sediments. Upon closure, each cell is to be converted for recreational use and creation of wildlife habitat (Hamons, 1988).

Use of the deepest relic feature of the old bed of the Susquehanna River south of the Chesapeake Bay Bridge and north of Bloody Point on Kent Island, referred to as the "Deep Trough," emerged as a primary candidate for open-water placement. Preliminary analysis and field work determined that the area could potentially be used without causing significant environmental impacts (Versar, 1989, 1990). However, strong opposition arose from the public and environmental interest groups, and the Maryland General Assembly enacted a statute that prohibits the open-water disposal of dredged material in the legally defined Deep Trough.

The draft Master Plan was overtaken by events. A short summary report was published. A draft technical report was not published, but has been used as a resource for ongoing dredged material management planning (MPA, 1990). The lack of alternative placement sites compelled placement of large quantities of clean dredged material into the MPA's Hart-Miller Island DMCF, the State's only repository for contaminated dredged material. The facility's capacity was prematurely exhausted, necessitating raising of its dike system in 1988 (Hamons, 1988; NRC, 1994, 1997; Hamons et al., 1997).

The Governor's 1991 Task Force

With Hart-Miller Island nearly filled, Governor William Donald Schaefer appointed a task force to develop a consensus-based dredged material management plan for near-term and long-term solutions to the dredging and placement needs. The Governor's 1991 Task Force brought a panoply of state and federal agency representatives and environmental and public interest groups into a cooperative problem-solving effort in a manner similar to the Master Plan process. A consensus-based, multi-faceted approach covering a full range of placement categories was developed and recommended (MDOT, 1991). There seemed to be ample potential for beneficial use projects using dredged sediments, considering the loss of islands and marshes to physical forces at work in the Bay. The beneficial use of dredged material was recommended and emphasized as a principal element of both near- and long-term solutions. Subsequently, the planning focus was shifted to beneficial use in what can be characterized as a great and continuing experiment in shifting from a traditional to nontraditional paradigm for the management of dredged material. As discussed in later sections, the experiment has had a unique result: so far, the beneficial use concept has been capable of limited implementation on grand scale in the upper Chesapeake Bay.

Dredging Needs and Placement Options Program

The MPA and the Maryland Environmental Service (MES), an independent state environmental agency which operates the Hart-Miller Island DMCF for the MPA, collaborated in 1992 to develop the DNPOP program as the vehicle for implementing the Task Force recommendations. A multi-disciplinary, multi-organization approach with broad governmental, public and environmental interest group involvement was implemented. The MPA-sponsored program is facilitated at the technical level by MES. Executive, Management, and Citizen's Committees guide the planning process. The Executive and Management Committees are supported by information and analysis from working groups and advice from the Citizen's Committee. This approach provides for coordination at all levels of government and citizen interest.

The ongoing DNPOP program drew on the results of the earlier planning efforts as an information resource to aid the planning process. Participants initiated their planning activities by focusing on identifying and evaluating beneficial use opportunities. Over thirty-five beneficial use options have been considered since 1992 (Figure 1). The first phase of "Bay Enhancement" planning identified twenty near-term options for expedited investigation:

- restoration of Dobbins Island in the Magothy River;
- conversion of poor bay bottom at Sparrows Point to create marsh and upland habitat;
- conversion of shallow water bottom to create upland, intertidal marsh and freshwater habitat at Worton Point and prevent further erosion of a high bluff;
- restoration of Poplar Island at the mouth of Eastern Bay; and

- restoration of islands and creation and enhancement of marsh habitat at Aberdeen Proving Ground—sixteen options in the vicinity of Pooles Island and Gunpowder Neck.

Various area-specific and site-specific working groups were formed to provide technical support and advice. The Bay Enhancement Phase II Working Group was formed to develop mid-term and long-term placement options. This entire effort was characterized by extensive multi-disciplinary, multi-organization cooperative planning and assessment activities. An interdisciplinary, multi-party planning process with substantial opportunities for public participation has been a hallmark of the planning process for dredged material management for the Port of Baltimore beginning in the early 1980s.

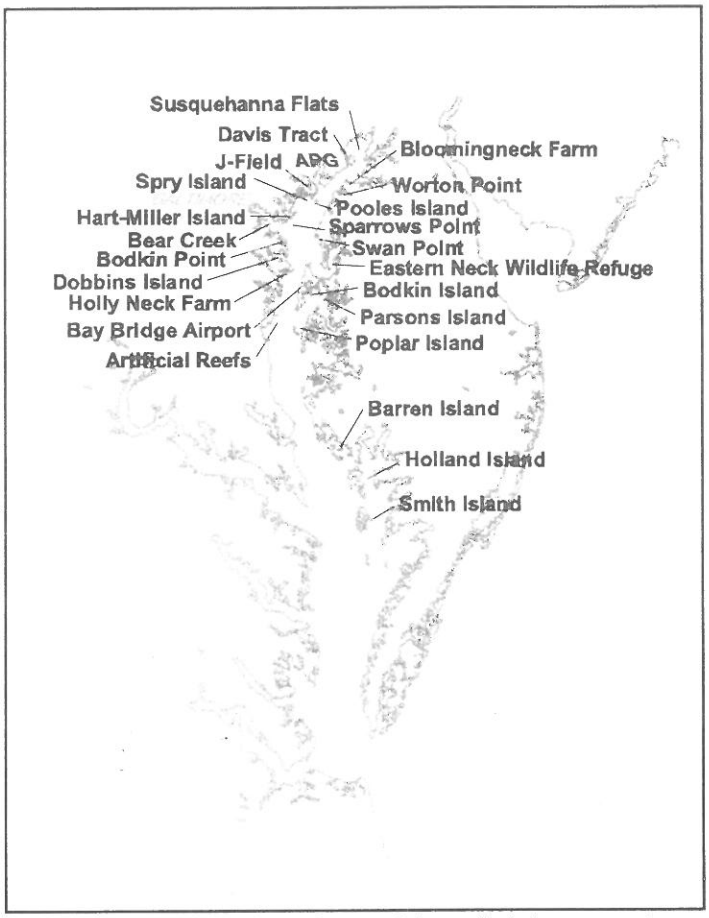

Figure 1. General locations of beneficial use projects that have been considered by the DNPOP program. Also shown is the location of Bodkin Island.

During the first half of 1995, all of the Bay Enhancement Phase I placement options, except the restoration of Poplar Island, had been determined to be either not feasible or incapable of implementation. Most of the Phase I options did not prove to be good candidates for implementation, potential environmental benefits not withstanding. In general, the linking of the beneficial use concept to a specific location resulted in identification of location-specific environmental tradeoffs. These tradeoffs usually involved the conversion of habitat from one form to another, typically at the expense of fisheries habitat.

Habitat conversion worked against project endorsement by state and federal resource agencies and other interested parties including watermen, environmental and community groups. Only the Poplar Island environmental restoration project received the institutional and popular support necessary to advance from prefeasibility studies to construction (which began in mid-1998). In this one case, the added environmental value was sufficient to balance the conversion of habitat from one form to another while the large scale of planned placements (38 million cubic yards) kept the unit cost per cubic-yard-placed within affordable limits.

Despite the dredging need and widespread interest in finding a solution to the placement problem, a broad-consensus on specific placement options was elusive. Lack of support for specific beneficial

use projects was associated with:

- adverse perceptions about dredging, dredged material and material placement;
- concerns and fears about the environmental quality of dredged sediments and their potential effects;
- environmental tradeoffs that are associated with virtually all placement options;
- social tradeoffs associated with some options;
- competing environmental missions and interests of the various interested parties; and
- the typically high cost of non-traditional placement options.

By mid-1995, with Poplar Island construction still several years in the future, urgent action to provide near-term placement capacity became imperative. The Hart-Miller Island DMCF was predicted to be filled in 1996 and the small-scale Pooles Island open-water sites had only an estimated two years of placement potential remaining.

STATE OF MARYLAND'S STRATEGY FOR DREDGED MATERIAL MANAGEMENT

The inability to broadly implement beneficial use options precipitated urgent planning by DNPOP participants in the first half of 1995 to avoid a dredging crisis that would have otherwise occurred during the winter of 1996-1997. A multi-faceted plan was developed which combined traditional, non-traditional and innovative management solutions into a balanced strategy for resolving near-term placement deficits while also providing long-term capacity. The State's strategy was formally announced by Maryland Governor Parris Glendening in September 1996. The objective is to provide 20-years or more of placement capacity for deep-draft channel dredging requirements in Maryland waters. The approach is reminiscent of the 1991 Task Force recommendations in that the State's plan called for a balanced program by type of placement, location and cost.

State Strategy for Dredged Material Management

The main features of the State's strategy included:

- raising the elevation of the north cell dike system at the Hart-Miller Island DMCF (along with accelerated development of the facility's south cell for recreational and wildlife uses);
- construction of the Poplar Island restoration project;
- renovation and reactivation of a previously used containment site in Baltimore Harbor;

- additional small-scale and large-scale open-water placement in conjunction with voluntary funding of the State's oyster recovery program by the MPA; and

- development of a large placement island in the upper Bay with a beneficial use component.

The cooperating State of Maryland Departments and Federal agencies prepared and signed a Statement of Cooperation to implement the strategy, subject to applicable rules, regulations and institutional regulatory responsibilities. Implementation of the full strategy is well underway.

The DNPOP program remains operative to assist in implementing the strategic plan and to find and screen supplemental placement options including beneficial use. The MPA also is sponsoring applied research into the potential for using suitable sediments in farming operations. The research is being managed by MES and performed by research facilities of the U.S. Department of Agriculture and the University of Maryland. The MPA has also acted on its announced interest in the use of dredged material as an economic resource. A preliminary review of available technologies and techniques was performed by MES for the MPA, and the MPA has initiated a procurement process for an innovative use system.

Implementation of the State's Strategy

The Hart-Miller Island DMCF north cell dike system was raised a second time in 1997 as the first component of the State's strategy. The objective was to provide additional capacity over the next 10-years (Hamons et al., 1997; NRC, 1997). Conceptual planning for the South Cell habitat development of Hart-Miller Island was performed by the Baltimore District for the Maryland Department of Natural Resources (MDNR) with support from the MPA and technical support by MES. The MPA sponsored the planting of vegetative test plots in the cell in order to generate field data to support the planting of vegetation upon cell development. Baltimore County sponsored construction of a beach stabilization and nourishment project at the MDNR State Park along the western side of the containment facility.

Two new, small-scale, open-water placement sites near Pooles Island were designated for use by the Philadelphia District. In February 1999, the Baltimore District released a draft Environmental Impact Statement for reactivation of a previously used open-water placement site for large-scale placement immediately north of the Chesapeake Bay Bridge. The MPA is currently completing a prefeasibility investigation for the upper Bay island placement site component of the State's plan. Each of these activities has been supported by interdisciplinary, multi-party technical working groups which have included participation by watermen, charter boat captains, and sports fishermen who participate on the DNPOP Citizen's Committee. Although all participants do not necessarily favor individual options, they nevertheless have worked cooperatively to achieve the best possible overall results.

BENEFICIAL USE CASE SUMMARIES

Over 35 beneficial use options have been screened for technical feasibility, environmental effects,

and prospective costs (Figure 1). Selected options are summarized in this section to highlight important considerations that have affected project planning and capability for implementation. Also reviewed are beneficial aspects of the Hart-Miller Island DMCF.

Island Restoration

Under the DNPOP program, restoration of island habitat became an early avenue for beneficial use planning because of the reduction and loss of island habitat at various locations in the northern half of the Chesapeake Bay estuary. It was thought that there would be broad-based support for such restorations, and that this would facilitate planning, design, funding and implementation. This planning assumption proved to be inaccurate for most proposed projects.

Dobbins Island, a small remnant island in the Magothy River north of Annapolis, was one of the first sites proposed for restoration. The island remnant consists of a narrow, high and eroding sediment bank with woody vegetation. Eroded sediments affect water quality in the general vicinity of the island. Placement of several hundred thousand cubic yards of clean dredged material inside of a dike system to expand the island's upland acreage, prevent further erosion, and create marsh habitat was suggested but was ultimately found to be impractical. Shallow water habitat surrounding the island remnant would be converted. Concern about the effect on wind patterns was raised by individuals who race sailboats in the lower Magothy River. It was also determined that the potential placement capacity was insufficient to make a meaningful contribution to the Port's dredging needs. Further, the shallow depths at the entrance to the river made barge access impractical. The distance from most dredging sites made hydraulic pipelines impractical. There was also lack of consensus regarding environmental effects. Although a small-scale beneficial use project at Dobbins Island might prove feasible, the site was found unsuitable for a port-related project.

Aberdeen Proving Ground (APG) has been frequently advocated by many individuals as an appropriate location for the placement of dredged material. On face value, APG would seem to be an appropriate location for multiple beneficial use projects. This U.S. Army post covers about 72,000 acres along the western shoreline in the northern upper Bay. The post's eastern boundary is near to and directly accessible from the western approach channels to the C&D Canal. About 40,000 acres of the post consist of open water. The remaining area consists of about 15,000 acres of wetlands and 17,000 acres of terrestrial habitat and developed areas. The post has over 55 major tenants and extensive military activities including research and development, many of which are classified.

Since its inception, the DNPOP program has focused considerable attention on the potential of APG. A multi-disciplinary working group was formed to help investigate possible beneficial use options at APG. A combination of sixteen sites and configurations was developed, a number of which involved island enhancements and restorations. None of the options have proven capable of implementation due to lack of consensus and environmental impacts resulting from a combination of resource conflicts, chemical contamination, presence of unexploded ordnance (UXO), conflict with military missions, and limited capacity. The difficulties associated with projects at APG are illustrated by several of the island restoration and enhancement placement options that have been

proposed.

One early proposal was restoration of Spry Island which had been lost to erosion. The site is now a shoal at the mouth of the Gunpowder River. Although inside of the APG boundary, the shoal is adjacent to the southern boundary and is outside of existing active military ranges at the Army post. Because the shoal has become fisheries habitat, its restoration to upland and marsh habitat was not supported by resource agencies with fisheries management responsibilities. The shoal is used for commercial fishing by Maryland watermen who also objected to conversion of the existing habitat for island restoration purposes (MES, 1994a). Restoration of Spry Island proved incapable of obtaining the broad-based support necessary for implementation.

Pooles Island was also proposed as a location for beneficial use projects (MES, 1994a). Initially, six options were proposed but were not capable of implementation because of environmental tradeoffs. Three containment island configurations in the Pooles Island area, including one that would connect to the island, are under consideration as candidates for the island containment component of the State's strategic plan. The containment island component includes incorporation of beneficial use to an extent yet to be determined.

Beneficial use projects in the vicinity of Pooles Island within the APG boundary have been opposed by APG because of: significant environmental value of the island and surrounding waters in their present state; active use of the island and vicinity for military missions; the presence of UXO; and, the fact that large portions of the post, including Pooles Island and all of the Edgewater Peninsula and Gunpowder Neck, are listed as Superfund sites under CERCLA.

Pooles Island is a relatively large island located in the middle of the northern upper Bay. The island is mostly wooded, but also has freshwater wetlands and ponds between its northern and southern sections. The ponds are used heavily by migratory waterfowl. The southern portion of the island is home for a large heron rookery that typically has about 1630 active nests each year. The island is also populated by deer and other wildlife. The Bay bottom immediately east and west of island contains a variety of physical conditions, some of which is considered important fisheries habitat by natural resource agencies and sport and charter boat fishing interests. There is an historic lighthouse on the northwest side and an underwater wreck west of the island. Because the background erosion rate is minimal with some accretion, the existing island habitat is not considered threatened.

The UXO issue is currently a showstopper for all potential beneficial use projects at the facility. The significance of this issue became apparent while DNPOP planners and resource agency participants were attempting to advance a small-scale shoreline protection and enhancement project at "J-Field" along the tip of Gunpowder Neck immediately west of Pooles Island. APG representatives estimate that between three and thirty million rounds of UXO are located throughout and immediately outside of the APG boundary. There is no national standard for the remediation of UXO. Therefore, the worst case situation would be removal and disposal at substantial cost. The technology for locating UXO at underwater locations is limited and removal is difficult and dangerous. With respect to beneficial use, the lack of a remediation standard means that if a marsh creation were undertaken to encapsulate an area, the marsh would have to be excavated to get to possible UXO should removal and disposal become the remediation standard.

Another complicating factor is that there is no definitive legal precedent regarding liability for UXO contaminated areas and remediation. Therefore, a representative of EPA Region 3 advised that one must assume the worst case situation with respect to liability, which is that any involvement whatsoever could lead to designation as a potential responsible party for any remediation that might subsequently be required. Thus, beneficial use within the entire APG controlled area is institutionally constrained indefinitely.

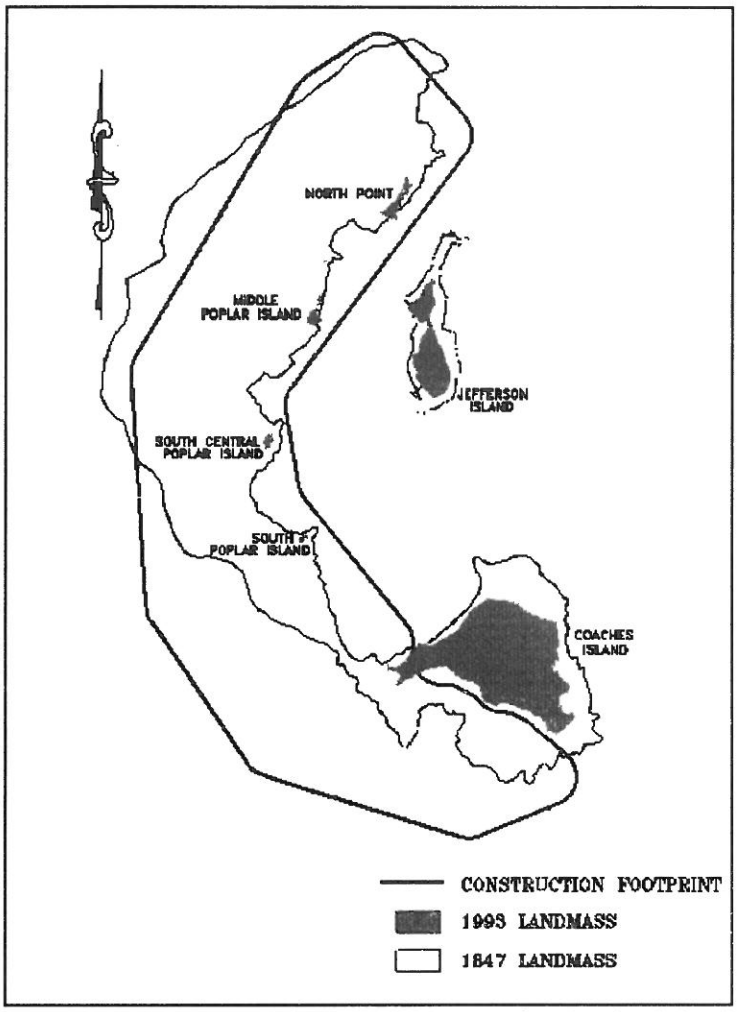

Figure 2. Plan view of general concept for Poplar Island restoration. The dike alignment was adjusted to a small extent from that shown to accommodate site-specific conditions.

Poplar Island in Talbot County at the mouth of Eastern Bay is the site of the only beneficial use option within the DNPOP program that has obtained the support needed to advance from concept to implementation. The island experienced rapid erosion over the past 50 years after suffering multiple breaches during a major episodic storm. Ownership of the remnants was obtained for the State through a real estate transaction. In 1993, MES obtained a grant from the Environmental Protection Agency (EPA) Chesapeake Bay Program and a matching cost share from the MPA to install obsolete barges as a temporary breakwater around Middle Poplar Island, preserving valuable nesting habitat until the remaining islets could be incorporated into the full-scale restoration project. The EPA Chesapeake Bay Program, through its Living Resources Subcommittee, provided several additional grants to assist with project planning and installation of rock reefs for fisheries habitat.

The first phase of the project consisting of 640 acres of uplands and wetlands is under construction by the Baltimore District, U.S. Army Corps of Engineers (USACE), as a beneficial use project under terms of Section 204 of the Water Resources Development Act of 1992. The MPA is the local sponsor. Construction of the first phase is nearing completion. Authorization and funding for the second phase have been obtained by the Baltimore District and the MPA. The contracting process for the second phase of the project was in progress during Spring 2000, with an award

expected in time to begin construction during the last half of the year. Each phase will hold approximately 19 million cubic yards of clean dredged sediments.

The planning and design for the Poplar Island restoration was accomplished in a total of 7 years, a significant reduction in the time frame for similar federal navigation-related projects (Fulford, 1994; MES, 1994b; Mohan and Urso, 1997). The accelerated schedule was made possible by:

- the prospect of imminent loss of valuable habitat which helped motivate consensus about the project;
- the local sponsor's assumption of reconnaissance, feasibility assessments, planning, engineering, design and environmental studies;
- integration of multi-organizational, interdisciplinary working group support into the planning and design activities as a component of the DNPOP program;
- the opening of new areas for commercial clamming by MDNR to offset a loss of clam beds within the prospective island restoration footprint;
- special Congressional funding authorization as a Section 204 project in excess of annual funding caps;
- concurrent performance of NEPA documentation by the Baltimore District; and
- expedited approval of final design by the Baltimore District once the restoration was authorized as a federal Section 204 project.

Of particular importance is the fact that although most of the island's historical footprint had been converted to shallow water habitat, this habitat had not yet achieved high environmental value for fisheries. The involvement of all interested parties in the process was also very important to consensus building and to achieving "ownership" of the solution by the panoply of participants. Overall, all parties concluded that restoration would achieve substantially greater environmental value for the Bay ecosystem than would be allowing complete loss of the islands to erosion. Impacts that would occur to a small, localized clam fishery were accommodated by MDNR through the opening of other areas for commercial clamming.

Another important factor is funding. There is limited federal funding for beneficial use projects, either under Section 204 or as the least cost placement option for channel dredging projects. Section 204 has an annual cap of $15 million in total for all projects. Further, Section 204 has typically not been funded to this level and the funds are competed for on a national basis. The first phase of the Poplar Island restoration, the northern half of the project, is estimated to cost about $46 million. It consists of 640 acres that will be configured into an upland cell on the west and two wetland cells on the east.

Section 204 funding is obviously not sufficient to enable large-scale beneficial use projects as a

practical component of dredged material management projects. Either special funding as a Section 204 project or specific authorization as a navigation project through a Water Resources Development Act would be needed. In the case of Poplar Island, the Maryland Congressional Delegation recognized the value of the restoration project and was able to coordinate a funding authorization in excess of the annual cap on Section 204 funding. Considering the costs of large-scale beneficial use projects and interest in them in other port regions, competition for federal funding is likely to remain high.

Island Protection and Enhancement

Small and modest-scale protection and enhancement projects have been proposed for some existing islands. For example, a non-port-related beneficial use project has been designed to expand habitat at Bodkin Island using dredged material from small federal navigation projects (Maynord, et al., 1991). However, small-scale island protection and enhancement projects such as those shown in Table 1 have not been practical for implementation to help resolve the port's dredged material placement needs. Reasons include one or a combination of the following factors: limited placement potential; environmental effects; cost of planning, design, environmental documentation, construction, and transportation; the level of effort and resources required to develop multiple placement options.

Table 1. Island Protection and Restoration Options

Location	Characterization	Evaluation
Eastern Neck Island National Wildlife Refuge	National Wildlife Refuge Prior small-scale beneficial use project using segmented breakwaters and sandy dredged material to protect eroding shoreline and create shallow water habitat.	Placement potential limited to about 50,000 cubic yards without significantly altering the character of existing habitat. Small placement potential relative to Port dredging need.
Parsons Island (privately owned) (Figure 3)	100-acre island in agricultural use. Eroding at a rate of about 2 acres per year. Eroded material believed to adversely impact nearby oyster beds. Owner interest in preserving habitat for migratory waterfowl.	Potential to double acreage to 200 yards. Submerged aquatic vegetation surrounding island would be impacted. Potential for between 1 to 3.5 million cubic yards of placement.
Barren Island	Prior modest-scale beneficial use projects to protect eroding shoreline. Site is up to 60 miles down bay from channels.	Placement potential for marsh creation is 500,000 cubic yards. High transportation costs and small placement potential relative to dredging need.
Holland Island (privately owned)	85-acre island used primarily for recreation. Size at time of early settlement was 260 acres. Site is up to 60-70 miles down bay from channels.	Potential for modest to large-scale beneficial use project. High transportation and construction costs.
Smith Island (state and private lands)	Historic fishing community. Significant losses of habitat due to erosion and relative sea-level rise. Site is 65-75 miles down bay from channels.	Potential for modest to large-scale beneficial use project. Fine grained sediments not well suited for raising island elevation, although suitable for marsh creation and enhancement. High transportation and construction costs.

When additional transportation and construction costs of perhaps as much as $10-25 dollars or more per cubic yard are compared to the large-scale dredging need, it becomes apparent that shifting to down-bay beneficial use projects could add tens to hundreds of millions of dollars in placement costs relative to upper Bay options. Considering how the Army Corps of Engineers calculates local cost share responsibilities and the technical feasibility of open-water placement sites relatively near the channels being dredged, the increased transportation costs may have to be borne by the State. Nevertheless, the options shown in Table 1 were considered and are still possible options for supplemental dredging needs, along with several other potential options that have been suggested.

Shoreline Stabilization and Enhancement

Small-scale through large-scale shoreline protection and enhancement projects have been proposed for various upper Bay locations (Figures 1 and 3). None have been practical and capable of implementation. Impediments to implementation have been related to limited placement potential; environmental effects; cost of design, environmental documentation, construction, and transportation; lack of consensus; institutional constraints; or a combination of these factors. The smaller projects typically were not suitable because of a combination of limited capacity and adverse environmental effects. Two large-scale projects were proposed but have not been capable of implementation.

Figure 3. Field evaluation of Parsons Island by MPA, MES and U.S. Fish and Wildlife Service team as a possible site for an island restoration project. *(W. Young, MES)*

Sparrows Point is located on the north side of Baltimore's Outer Harbor. The existing shoreline is upland composed of slag materials from operations by the Bethlehem Steel Corporation

(Figure 4). The bottom in the area is very soft and of marginal value for fisheries. A beneficial use project of about 300 acres with a placement potential of ten million cubic yards was proposed in 1992. The project was to consist of a breakwater to create productive wildlife habitat including aquatic and intertidal wetlands, high marsh, and upland nesting areas. The proposed project was also envisioned as providing aesthetic relief for the entrance to the harbor.

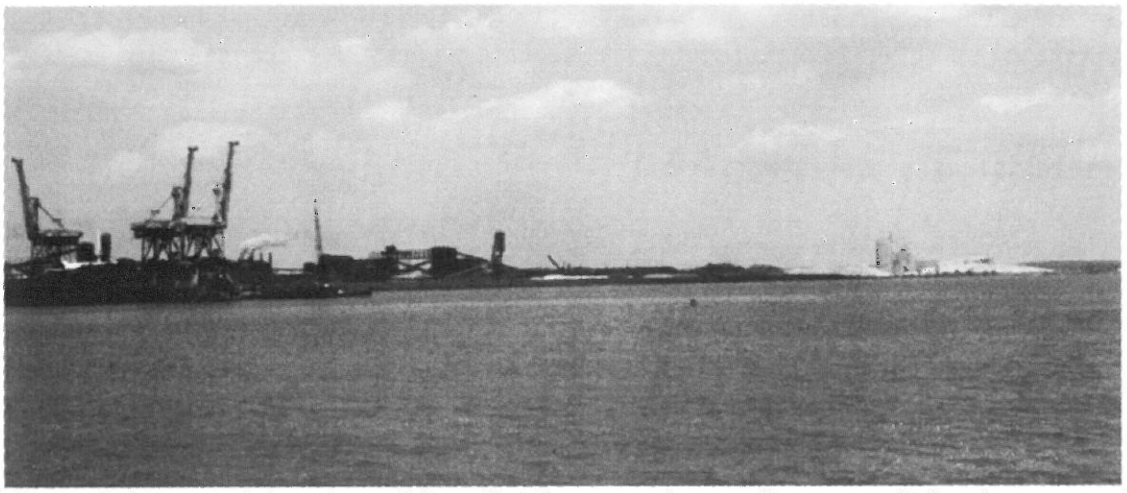

Figure 4. Proposed location of beneficial use project at Sparrows Point in center of picture. *(W. Young, MES)*

Preliminary engineering determined that a project was feasible, although bottom conditions might necessitate "floating" the dike on top of geotextile fabric. An assessment determined that the area's biological productivity is similar to that of other areas inside the harbor, but less productive than the Bay (MES, 1995b). However, inasmuch as a closed dike system was required, implementation was considered by some to be institutionally constrained by a State law that prohibited construction of a containment site within five miles of the Hart-Miller-Pleasure Island Chain. This law had been enacted in response to citizen opposition to construction of the Hart-Miller Island DMCF in Baltimore County and fears that an additional containment facility might be constructed in the county.

The Sparrows Point concept was presented to local citizens. Citizen support for the beneficial use project and for a revision to the law was not obtained. Local citizens expressed anger at the past filling of open-water areas by the steel mill and strongly objected to the conversion of any additional open-water areas, regardless of the potential environmental benefits.

Worton Point in Kent County was proposed in 1992 as the site for a 200-acre beneficial use project with a potential capacity of about eight million cubic yards for clean dredged sediments. The concept consisted of preventing erosion and creating important habitat through construction of an armored dike system, and filling to create fastland, tidal wetlands, upland and freshwater ponds. The point is wholly owned by one landowner. It is immediately south but outside of the northern portion of the upper Bay, which has been designated as a rockfish spawning area. The point consists of eroding cliffs that are adversely affecting water quality in the area (Figure 5).

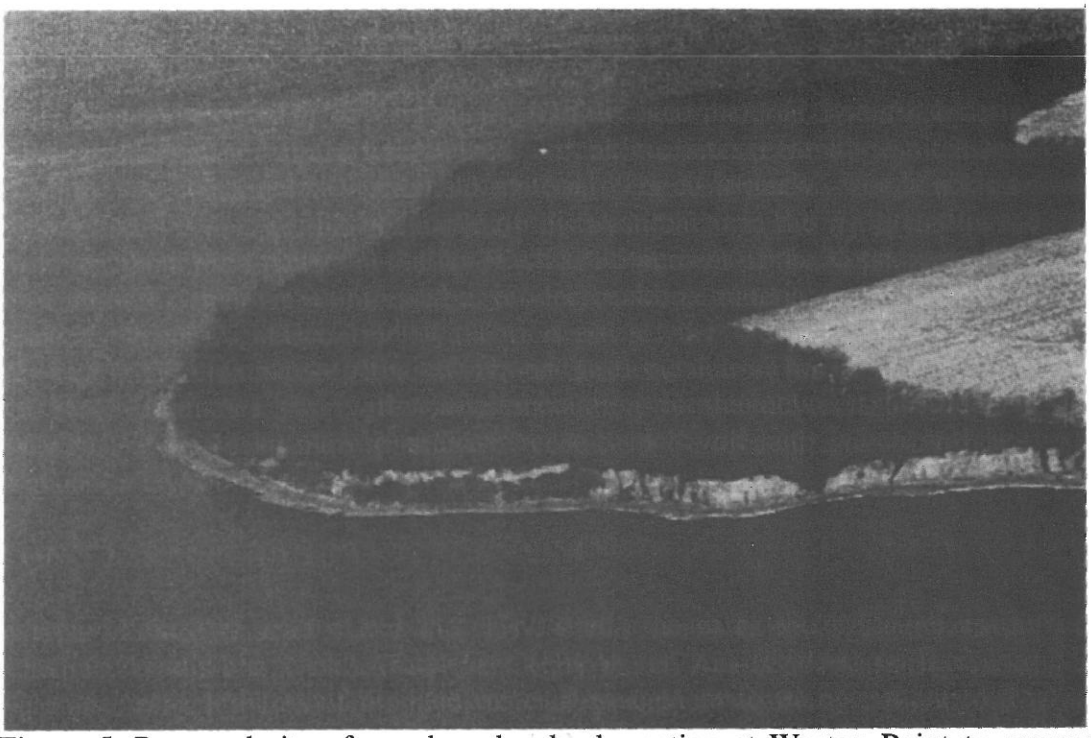

Figure 5. Proposed site of marsh and upland creation at Worton Point to prevent shore erosion. *(T. Banta, MES)*

Extensive multiparty, interdisciplinary working group planning and evaluation were performed including involvement by engineers contracted by the property owner. Issues included conversion of shallow water habitat, potential impacts to a small, seasonal recreational fishery, and potential effects on upwelling from a nearby deep hole considered beneficial to rockfish foraging. However, no fatal flaws were identified. Despite these environmental tradeoffs, the potential habitat benefits were considered sufficient to merit detailed investigation (MES, 1994a). The Philadelphia District, USACE, prepared a plan of action for a reconnaissance study. An assessment of finfish data was prepared (MES, 1996). In response to a request for a right of entry for the purpose of performing geotechnical and groundwater investigations, the landowner unexpectedly withdrew support in 1995, ostensibly over environmental concerns. Repeated efforts to obtain the landowner's cooperation have not been successful. Technical feasibility remains uncertain.

Hart-Miller Island Multiple-Use Project

The Hart-Miller Island DMCF is typically thought of only as a confined disposal facility. It is in fact a multiple-use project that already has provided substantial environmental and recreational benefits. As part of original agreements upon establishment of the complex, the State is committed to converting the containment cells for use by wildlife and for recreation once the cells are filled. As part of the official response to the dike raising in 1996, the Maryland General Assembly enacted a statute turning the State's commitment into binding requirements.

Environmental and Economic Contributions. The original dike system reunited and protected the remnants of Hart and Miller Islands. A recreational beach was constructed between the remnants and the western dike (Figure 6). The dike system has provided shelter for a constructed beach and helped preserve shallow water habitat surrounding the remnants and the island habitat that remained at the time of construction. It has also provided physical protection for the shorelands to the west from wind-generated waves and winter storms as well as protection from the movement of large ice floes during cold winters. In contrast to the incorrect characterization of the containment cells as wastelands by some individuals, the complex provides important habitat for shorebirds and migratory waterfowl. There is habitat suitable for seasonal and year-

Figure 6. West side of Hart-Miller Island during the summer boating season. Recreational beach protected by segmented breakwaters shown in center of picture. *(L. D. Heath, MES)*

round use by a variety of species. The remnant islands are used by small mammals and birds. Ospreys establish nests around the complex. Commercial crabbers fish the area on the east side of the facility. Commercial pound nets have been placed in the vicinity of Miller Island during the Fall.

Containment Cell as Interim Habitat. The containment facility's north cell (active) and south cell (filled) have, in effect, served as "interim" wildlife habitat even while in use for dredged material management. Human access to the cells is limited to dredged material management. Food sources have been replenished annually through the placement of dredged sediments. The sediments contain benthic organisms that attract large numbers of birds during fall through spring migrations. Since 1977, over 268 different species have been observed and documented in and around Hart-Miller Island by bird watchers from the Maryland Ornithological Society. Ducks use the cells as breeding and nursery habitat.

Recreation. The island remnants and beach have been a State Park since the creation of the facility in the mid-1980s. Since that time, the sheltered cove between the former island remnants, constructed sandy beach, vegetated low dunes, upland and wetland habitats, and upland recreational wooded areas have attracted thousands of boaters, recreational fishermen, crabbers, picnickers, sunbathers and bird watchers. Additional recreational facilities have added to the park's attraction as a boater destination and recreation site. Improvements include a comfort station with showers, an observation tower, a park office and multi-use building, a deck with picnic tables overlooking the woodlands and wetlands, a boardwalk to and from the beach, and primitive campsites. The comfort stations have incorporated self-composting toilets as an environmental attribute. The beach was recently stabilized, protected and nourished through the construction of segmented breakwaters, rip rap to protect portions of Miller Island, and nourishment using sand dredged from a nearby channel that was stored at the containment facility for this purpose (Figure 6). The beach improvements were sponsored by Baltimore County. MES provided on-site construction management support. Although the park attracts recreational users most of the year, the principal recreational use occurs from late Spring through early Fall. During peak weekend periods, up to 1,200 pleasure boats have been observed at the island. Up to 70,000 individuals and 3,100 overnight campers have visited the park annually during peak years.

USE OF DREDGED MATERIAL AS AN ECONOMIC RESOURCE

During the search for suitable placement options, there have been frequent inquires regarding the potential for the "recycling" of dredged material from the Bay to beneficial uses. The MPA has desired to include innovative uses in the DNPOP program since its initiation, with the objective of using dredged sediments as both a natural and economic resource. Initially, the MPA established a long-term goal to develop a capability to recycle up to 500,000 cubic yards of sediments annually. Subsequently, the MPA expressed interest in achieving a capability in ten years to recycle up to 2 million cubic yards of dredged material each year, insofar as practicable and cost competitive with other dredged material management options. Although a formidable goal, the current advancement in technologies for innovative management of the dredged material stream suggests that economic use of sediments on a large-scale may by achievable within the next decade.

Landfill Applications

In 1995, the MPA and MES conducted a field trial to assess the technical and economic feasibility of using selected dredged material in the construction of a landfill cell. Although most material received by the Hart-Miller Island DMCF consists of fine silts and clays, sandy material is occasionally received and stockpiled. About 14,500 cubic yards of clean sandy material was mechanically excavated from one of the stockpiles. The material was barged to Easton, Maryland. The material was offloaded and trucked to the Midshore Regional Solid Waste Facility owned and operated by MES for four counties. The material was placed on top of a geotextile liner during cell construction. The cost of excavation, multiple rehandling and transportation was about $14 per cubic yard, not including the initial cost of dredging, placement and stockpiling. The approach was not cost-competitive with other sources of suitable

construction materials on the Eastern Shore, although the field trial was technically successful (MES, 1995a).

Turning Mud into a Cash Crop

Clean dredged sediments have been placed on farmland in various locations around the country. After weathering of the sediments and sometimes the application of amendments such as lime, the lands have been returned to active agricultural use. In some cases, such as in New Jersey along the Delaware River near Camden, lowlands along the river have been filled and subsequently farmed. In one case, a farmer "hayed" phragmites and fed it to his cattle (Landin, 1997). Farm application of clean dredged material has occurred for many years in Maryland, albeit on a small scale, and is typically associated with maintenance and improvement of federal and county small boat channels and private marinas. Generally, several acres of land with riparian access are leased from a farmer. Compensation is typically per-cubic-yard placed plus preparation of the soils for crops. The topsoil is scraped off and formed into a berm to hold hydraulically placed clean sediments in thin lifts of 1 to 2 feet to enable natural dewatering. The topsoil in the berms is then bulldozed back over the acreage. Soil amendments such as lime are often added. The topsoil, soil amendments and sediments are mechanically tilled and blended, and the acreage is returned to active farming (Duff and Corletta, 1997).

Although the concept of farm application has been applied for many years, there is little documentation to guide future applications. However, the fact that there is considerable farmland reasonably accessible from the upper Chesapeake Bay, the concept of returning suitable sediments to farms could aid in the dredging of ship channels while helping offset the longstanding effects of soil erosion from upland locations. The MPA is sponsoring applied research into the farm application of clean sediments from approach channels in Maryland waters. The research includes identifying which soil amendments might be needed and crop suitability. This research is being managed by MES for the MPA. Field research is being performed by the University of Maryland, College of Agriculture, Wye Research and Education Center (Wye). Technical analysis is being performed by U.S. Department of Agriculture - Agricultural Research Service - Beltsville Agricultural Research Center (USDA). Bench scale testing is being performed at the Wye facility to collect and assess leachate and soil quality changes over time from both untreated and amended sediments. Germination and production of various crops are also being studied. The results of the bench testing will be used to assess geophysical conditions that would be suitable for farm application. The results will also be used in the planned planting, monitoring and analysis of field test plots at the Wye facility. USDA is also doing bench-scale testing focusing on industrial and agricultural residuals which could potentially be combined with dredged material to make a value-added agricultural product. Both research facilities are performing literature searches and reviews.

Although we believe that there is significant potential for farmland use of clean dredged sediments at suitable locations, obtaining public support for farm application will require considerable coordination and demonstration of suitability. For example, a private venture, Creative Environmental Solutions, attempted to acquire and use several Eastern Shore farms very near the Bay for the placement of clean dredged material. The concept was to adapt the small

acreage approach described in this section to a larger scale with multi-year placements along with aesthetic landscaping and annual planting of suitable crops that might provide interim habitat and help with dewatering. Stiff opposition was encountered from nearby residents and citizens who considered the approach a threat to their quality of life and property values. Dredged material was also inaccurately characterized as sewage sludge. The proposal was ultimately withdrawn.

Innovative Use of Clean and Contaminated Sediments

The MPA has for many years been interested in the potential beneficial use (sometimes referred to as "beneficial reuse") of clean and contaminated sediments for innovative commercial applications. The MPA issued a Request for Proposals (RFP) in December 1999 for establishment of an innovative use system at the Cox Creek containment facility, located in the harbor area, that is being renovated and reactivated. The MPA is hopeful that "perpetual" capacity might be achieved in the future by using the containment facility as a receiving site and the adjoining upland property as a processing site for the production of environmentally suitable marketable products and end uses from contaminated and clean dredged sediments. Products and end uses and any waste streams from the innovative use system would need to comply with applicable regulatory criteria. A phased approach from bench tests through full-scale production is included in the RFP. MES is providing planning and technical support to the MPA for this activity, drawing on certain experience from the agency's environmental services and waste management service area, including the processing and marketing of recyclable materials.

The innovative use of dredged material on a large scale may or may not prove to be a near-term solution. However, technological developments suggest that innovative uses have the potential to become practical and cost-competitive to some extent over the next decade. Issues for consideration include:

- availability and suitability of technology;
- processing requirements;
- capability to produce environmentally sound products and end uses;
- capability to minimize or avoid waste streams, and associated regulatory requirements;
- availability and capability for contracting proprietary or patented technology and processes;
- marketability of products including possible competition for existing markets and market creation;
- public and consumer acceptance of products and end uses, especially for products produced from contaminated sediments;

- innovative use potential relative to dredged material management need; and
- cost-effectiveness.

Ultimately, innovative use will only become successful if the products using dredged sediment can be cost-effectively marketed or otherwise used in an environmentally appropriate manner, regardless of how well the various technologies may perform.

LESSONS LEARNED

Much has been learned through the identification, screening and assessment of a full range of placement options, especially beneficial use opportunities. The lessons and insights gained serve as the context for determining the practicality, technical feasibility, cost-effectiveness, and environmental acceptability of beneficial use in the upper Bay insofar as habitat development, enhancement, and restoration are concerned. These lessons and insights may also be adaptable to beneficial use planning in other areas, depending upon local conditions.

Scale of Dredging Need is Fundamental to an Effective Strategy

Recognition of the scale of the dredging need is a key to effective strategic planning. A continuing large-scale dredging need necessitates a large-scale solution, a long-term planning horizon, and economies of scale. It has been our experience that if the problem-solving for the dredging need is viewed over the short rather than long term, then small-scale projects with limited capacity and typically high costs often appear to be more attractive than they are relative to actual placement needs. The considerable effort that is required to plan, design and permit small-scale beneficial use projects can approach the level of effort required for large-capacity projects without the corresponding economies of scale. This does not mean that small-scale projects do not have a role. Options with limited capacity can potentially help, for example, to satisfy increased placement needs in certain years. However, small-scale beneficial use projects have not been sufficient to resolve the overall placement needs either in terms of capacity or cost effectiveness.

Evaluation of Placement Options Needs to be Balanced with Available Resources

It is not practical nor are the resources available to conduct full-scale or even prefeasibility assessments for every possible option. Interdisciplinary screening criteria should be applied to assess each option's potential and to determine if there are any apparent showstoppers. Work can then be focused on the more promising options, conserving and optimizing available resources. However, sufficient information needs to be developed in order to support the consideration of alternatives required as part of the National Environmental Policy Act (NEPA) process for projects that would result in a major federal action.

Information Sharing is Essential to Planning and Implementation

Search and screening efforts need to be documented sufficiently to demonstrate the competence and thoroughness of the planning process. The results need to be disseminated to all interested

parties, the public and the news media to insure that accurate information is available. The sharing of information needs to begin early in the planning process and continue through implementation.

Information sharing does not necessarily mean a lack of controversy. For example, the DNPOP program has broad-based involvement with the panoply of interested parties. However, it has not been possible to achieve a consensus on all options. Public opposition to specific upper Bay placement options, including beneficial use, has often taken the form of challenges to the adequacy of the search for other alternatives. Yet, over 500 options have been considered since the mid-1980s. Nevertheless, an effective information-sharing program has been essential to maintaining cooperative working relationships despite differing perspectives.

Funding Insufficient to Rely Exclusively on Beneficial Use

Insufficient dedicated resources are available to enable exclusive reliance on beneficial use projects for a large-scale dredging need. These options are usually more expensive than traditional placement actions. Beneficial use option costs should include construction, habitat development and site maintenance costs in addition to transportation and environmental monitoring costs. In many cases, the locations with the best potential for a habitat restoration or enhancement project are far removed from the channels to be dredged. Incremental costs that exceed the federal cost share relative to the "base plan" for each project often become the responsibility of the local sponsor. With respect to the Port of Baltimore, incremental costs for distant sites are estimated to be on the order of hundreds of millions of dollars over the operational lifetime of such sites.

Section 204 federal funding for beneficial use projects is capped annually at $15 million per year. Except for special Congressional funding arrangements for Poplar Island, which has a projected construction cost of over $70 million, Section 204 has not been fully funded. Certain calculated risks were assumed by the State in undertaking the planning of the island restoration project. Although federal participation and the level funding was initially uncertain for Poplar Island, it was believed that some level of federal participation was inevitable because of the project's environmental benefits. During the planning process, State officials coordinated with the USACE and the State's Congressional Delegation to obtain federal sponsorship and full project funding. The overwhelming environmental benefits of restoring Poplar Island motivated broad institutional support. Without these benefits, obtaining exceptional federal funding support would have been most difficult. Even with the environmental benefits, the Maryland General Assembly raised concern about the prospective costs of the project.

Institutional Constraints can Preclude Beneficial Use

The planning and implementation of beneficial use projects can be complicated by institutional barriers or constraints. For example, construction of a dike to hold material in place for the marsh creation proposed for Sparrows Point appears to some to be prohibited by the State statute that precludes construction of a containment within five miles of the Hart-Miller-Pleasure Island Chain. Planning must consider the institutional situation and the potential for institutional factors

to delay or preclude certain otherwise feasible placement options. A candid assessment is needed to determine if there is reasonable expectation for relaxation, waivers, or removal of institutional constraints. If not, then options so constrained may be best eliminated from further consideration or put on hold until such time that institutional conditions favor revisiting the option. It may nevertheless be necessary for the USACE to consider such options in order to comply with NEPA.

Beneficial Use does not Guarantee Acceptability

The fact that a project proposes to use dredged sediments beneficially does not guarantee acceptability. Although the beneficial use concept has broad conceptual support, each proposal must be evaluated on its own merits. Some areas or regions may be better suited for beneficial use projects than others. Early consideration needs to focus on site-specific conditions or circumstances that could affect project acceptability. In this regard, a multi-party, interdisciplinary planning process with outreach to interested and affected parties is essential.

SUMMARY

Beneficial use opportunities are more limited than originally thought for the upper Chesapeake Bay. Both natural and economic resource applications are needed for beneficial use to make a meaningful contribution due to the scale of the dredging need. Shifting to beneficial use projects does not alleviate the issues, problems and concerns associated with finding suitable placement options. Strong conceptual support for beneficial use does not automatically extend to individual projects. Expanding the beneficial use concept from small-scale demonstrations to a principal role in solving dredged material placement needs has been impeded by various environmental, institutional, social and economic factors. Although many environmentally oriented projects have been proposed, only the planned large-scale restoration of Poplar Island has obtained sufficient institutional and public support and the State and Federal funding necessary to enable implementation. Limited Federal funds for beneficial use projects are competed for nationally. Beneficial use does not offer a comprehensive solution for the upper Bay in the foreseeable future. Economic use of dredged material has yet to be proven as a practical alternative on a meaningful scale for the Chesapeake Bay region, although efforts to do this are in progress.

This paper was revised from the original paper by Hamons and Young (1999). It contains updated information about several beneficial use options, minor editorial corrections for completeness, accuracy and clarity, and has been reformatted from the previously published version. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Maryland Port Administration or the Maryland Environmental Service.

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BENEFICIAL USE OF DREDGED MATERIAL IN THE ROCK ISLAND DISTRICT

Michael D. Cox[1]

ABSTRACT

The US Army Corps of Engineers is responsible for maintaining approximately 25,000 miles of navigation channel for the United States waterway transportation system. Channel maintenance is typically accomplished by dredging or by use of various methods to reduce dredging, such as flow regulating structures (commonly known as wing dams or closing structures along the Upper Mississippi River Navigation Project). Dredging involves removing material from a channel and transporting this dredged material via pipeline, barge or hopper dredge to a placement site. The development of dredged material placement sites is becoming increasingly difficult nationwide, due to numerous factors including the effects on aquatic habitat and floodplain, the availability of suitable placement sites near the vicinity of the dredging area, the potential for contaminated dredged material, and concerned or unwilling landowners. The Corps of Engineers strives to locate beneficial uses for dredged material when developing placement sites.

INTRODUCTION

The purpose of this paper is to describe the process that the Rock Island District (Rock Island) uses to develop dredged material placement sites, with regard to beneficial use within its portion of the Upper Mississippi River and Illinois Waterway Navigation Projects. Background information is given about the history of dredging and placement within Rock Island's waterways. The reader will learn how dredged material was placed historically and why many of the historic placement sites and methods are no longer usable. New placement sites are expensive, and additional funding is extremely limited. This paper illustrates how the Rock Island promotes beneficial use removal of dredged material from placement sites, and the challenges involved. Solutions to the funding and beneficial use challenges, such as the development of site specific long-term dredged material management plans, cost sharing and advertising are discussed.

BACKGROUND

Rock Island is responsible for maintaining the 9-foot navigation channel along more than 550 miles of river systems (see Figure 1). Rock Island's portion of the Upper Mississippi River (UMR) extends from Lock 10, in Guttenburg, Iowa, to Lock 22, below Hannibal, Missouri. On the Illinois Waterway (IWW) Rock Island's portion extends from T. J. O'Brien Lock, near Chicago, to La Grange Lock, about 80 miles from the mouth of the IWW. Steam powered navigation began on both rivers in the 1820's. The federal government began navigation improvements along both rivers in the 1830's (USACE, 1992a). This included blasting rock cuts at the Rock Island Rapids and other areas. By the 1870's, construction began on the 4 ½-foot

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deep channel on the UMR and the 7-foot deep channel along the IWW (only between the mouth of the IWW and near where Starved Rock Lock is located, at river mile 231). In 1907, Congress authorized improvements of the UMR to upgrade to a 6-foot deep channel and in the 1930's both rivers were improved to the current 9-foot navigation channel. The entire length of the IWW was then open to navigation. It replaced the Illinois and Michigan Canal, which was built in the 1840's for navigation between Chicago and the IWW below the Starved Rock area. The State of Illinois constructed portions of both the 7 and 9-foot navigation systems on the IWW.

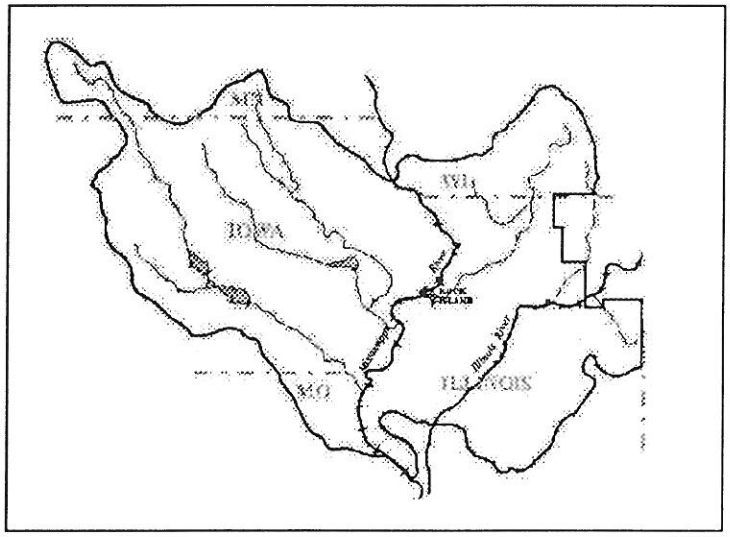

Figure 1.
Rock Island District Area

There are nearly 180 historic dredging areas within Rock Island, 15 to 20 of which are dredged each year. Dredging is accomplished by both hydraulic and mechanical means. Rock Island typically uses the government owned 20-inch cutterhead dredge *William A. Thompson* for maintenance along the UMR. Other dredges, up to 24-inch, have also been utilized. Smaller cutterhead dredges, usually 12-14-inch, are used along the IWW to better handle bankline placement of the finer sediments found there.

> Bankline placement is the use of dredged material along the shoreline of a river for beach nourishment or bankline stabilization. Most bankline placement sites in Rock Island are historic sites consisting of sand substrate, with finer sand on the IWW. Using larger sized dredges places a larger volume of water on the bankline. Rock Island has found that this results in increased turbidity (water quality) problems along the IWW by reducing the material settling efficiency, and also by increasing bankline erosion during placement operations.

Mechanical dredging with backhoes and cranes equipped with either clamshell or dragline buckets is also used for about 10-15 percent of the required maintenance dredging. Mechanical equipment is utilized for a variety of reasons. Some river sediment, especially along the upper

IWW, consists of large gravel, cobble and stone. Hydraulic cutterhead dredges are incapable of efficiently dredging large quantities of this type of rocky material; experience has shown reduced production rates and additional wear and tear on equipment. Another main reason for mechanical dredging involves the location of the placement site relative to the dredging area. Loading dredged material onto barges allows transportation of material greater distances than by using standard cutterhead equipment. Rock Island expects mechanical dredging to increase another 10 percent within the next 10 years because of placement site location; it is becoming increasingly difficult to locate suitable placement sites in close proximity to the dredge cuts.

Dredging volumes in Rock Island have reduced significantly since the post-construction period of the 9-foot channel (see Figure 2). During the 1940's the District averaged more 2.5 million cubic yards (cy) of dredging each year, or an average annual volume of about 1.8 million cy on the UMR and about 750,000 cy on the IWW. In the past 10 years the average annual volume for the UMR has been about 450,000 cy, and about 275,000 cy on the IWW. Some of this reduction is accounted for by Rock Island's decision in the mid 1970's to reduce the dredging depth of the dredge cuts on the UMR from 13 feet to 11 feet. This was done at the request of the US Fish and Wildlife Service (USFWS) as a means to reduce environmental impacts of dredged material placement. The USFWS felt that reducing the volume of material dredged had the potential to lessen the acreage of aquatic habitat converted to terrestrial land, and Rock Island agreed. While very infrequent instances have arisen that may have restricted navigation for short periods (e.g., unanticipated rapid shoaling increasing grounded tows and dredging requirements), this program has become very successful in reducing the disturbance to the river environment and the cost of maintaining the channel as well. This change reduced the volume of material dredged by nearly 50 percent. Prior to the 1970's, Rock Island routinely dredged 4 feet of overdepth as a means of advanced channel maintenance. Even if additional funding were available, this type of advanced maintenance dredging is no longer allowed without further written justification (USACE, 1996a). Depth and width reduction methods have been used along the IWW with similar success. However, dredging volumes along the IWW have risen nearly 20 percent in the 1990's when compared with dredging in the 1980's. This may be due in part to the increase in bankline placement, and subsequent increase in bankline erosion and migration of material (see "PROBLEMS WITH HISTORIC SITES", last paragraph). Dredging volumes along the UMR show a 14 percent decline during the same time period.

Dredged material within Rock Island is primarily beach type sand, classified as medium to fine sand. However, in certain areas the material to be dredged may consist of silt, heavy mussel shell, gravel, cobbles, small boulders, logs, stumps, roots, riprap, mud and clay. Any combination of these materials may be encountered in any percentage of the total material to be dredged. In some dredging areas there may be debris of all kinds and loose ledge rock. Dredge cuts containing large percentages of these types of material are few in number, but even cuts with smaller percentages are certainly a challenge not only to dredge, but also to place the material. Dredging production rates tend to be lower with such mixtures of material, when compared to more consistent sand gradations. In addition, experience in Rock Island has shown that such materials are less marketable for beneficial use.

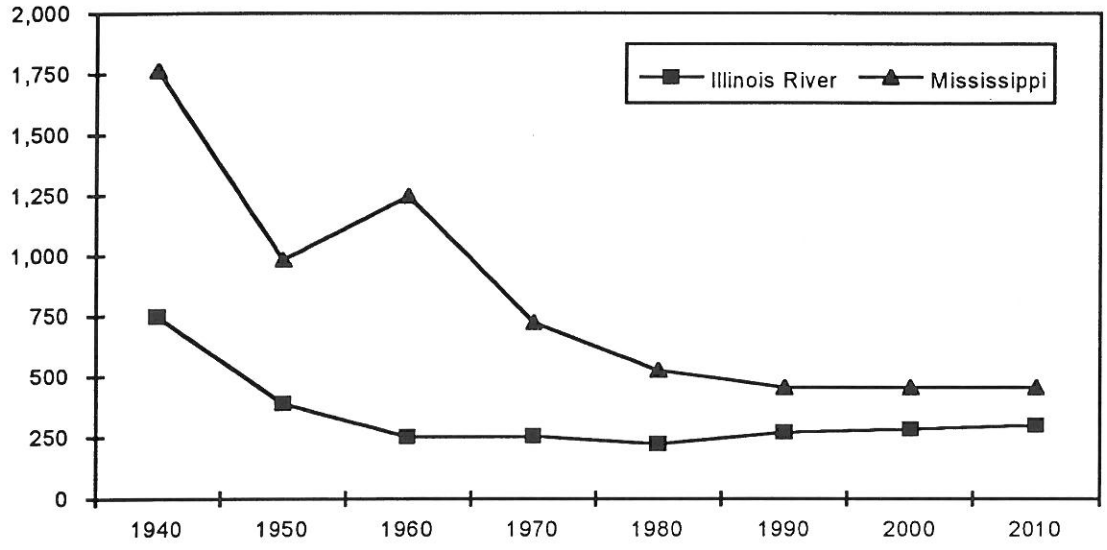

Figure 2.
Historic and Estimated Future Dredging in Rock Island District
Average Annual Volumes (x 1,000)

COORDINATION

Prior to dredging, much coordination is required for permit, regulatory and/or natural resource compliance. First we must justify the need for maintenance dredging. This is usually easily accomplished by regularly performing reconnaissance and condition surveys at known trouble areas. Secondly we meet with the On-Site Inspection Team (OSIT) for concurrence of the proposed historic placement. After OSIT concurrence, we need to ensure that we have all the required permits, check environmental assessment for any listed use restrictions, such as heron nesting or bat summer roosting seasons, Section 404(b)(1) evaluation as necessary, floodplain permits and/or Section 401 water quality certification as required by the appropriate State. Next is the scheduling of final dredging surveys and dredging equipment. Coordination with the Coast Guard (USCG) and the towing industry also helps in prioritizing dredging events. We must also ensure that adequate funding is available. This is sometimes the most difficult challenge. We also continually search for potential beneficial users who may have a use for material in this area at this particular time.

The OSIT was formed during the Great River Environmental Action Team (GREAT) studies, and consists of State and Federal natural resource and regulatory agency representatives, as well as the Corps. The GREAT was authorized by Congress in the Water Resources Development Act (WRDA) of 1976. The purpose of GREAT was to develop a total river resource management plan for the entire Upper Mississippi River system and, in particular, to resolve inter-agency disputes relative to the Corps channel maintenance activities.

HISTORIC PLACEMENT

In the past, historic dredging records indicate that Rock Island placed dredged material primarily in open water, along bankline sites, inland stockpiles sites, and within forested areas, all of which were close to the dredging areas, usually within one mile. Many open water areas included main channel borders, back channels behind islands, borrow pits formed from levee construction, and wing dam fields. The primary goal was to get the dredged material out of the navigation channel as quickly and effectively as possible. But it appears that the Corps did not arbitrarily place material just anywhere. Consideration was given to the potential for erodibility of the material (will the material move back into the navigation channel?). Historic pre-placement surveys show that dredged often material was placed in shallow sand flats and other areas that were aggrading naturally, rather than rapidly scouring areas. Maintenance of the channel has always included ways to reduce the volume of required dredging. Many wing dams and closing structures have been in place since the 1880's to reduce the need to dredge, and these measures continue today.

Since the early 1980's, placement of dredged material in the thalweg has been used successfully at 10 sites along the UMR. The thalweg is the line following the deepest part of the river. Dredged sand is introduced back into the river in deeper areas of the main channel (greater than 20 feet), leaving sensitive habitat regions (side channels, sloughs and shallow backwaters) undisturbed (Stang, 1985). Thalweg placement has been and continues to be attractive to Rock Island in some instances because, in addition to low costs and minimal operational problems, effects on habitat are small (Baker, et al., 1984). Even so, beneficial use is still pursued for dredge cuts in the vicinity of thalweg placement sites.

In addition to open water placement, various other placement sites had been utilized historically. These included placing sand on river islands, either at thin layers (less than 4 feet deep) to preserve the forest population, or at thicker layers to keep the footprint of disturbance smaller and to potentially reduce operational costs by lessening downtime during dredging operations. Other methods include island creation close to the dredge cut; construction fill for recreational parks and city riverfront areas; levee stabilization on the river side of levees; levee fortification on the land side of levees to widen and strengthen levees (but not to raise them); rebuilding levees that have overtopped or failed; and placing sand in upland locations out of the floodplain. Moreover, beneficial use stockpile sites, where dredged material is placed for later removal by other parties, have been used since the mid 1960's. But the existing beneficial use sites cannot accommodate the required dredging volumes in most areas.

PROBLEMS WITH HISTORIC SITES

While many parts of the river are deficient with respect to habitat diversity, and can be aided by dredged material placement (e.g., island and marsh creation), many historic placement areas have filled and are no longer usable. Rock Island has been running out of room for continued placement activities near many dredge cuts, requiring more material to be transported longer distances to new sites or other historic placement sites located further from the dredge cuts. Additionally, in 1979, as a result of a lawsuit between the Corps and the State of Illinois, the

Corps agreed to obtain floodplain permits from the State prior to placement of dredged or fill material within the floodplain of the rivers. This agreement resulted in the removal of many other historic and future sites from consideration for dredged material placement.

The floodplain agreements of 1979 led to an increase of bankline placement of dredged material. In some instances, no other practicable alternatives could be realized. Bankline sites near chronic large volume dredge cuts became overwhelmed with dredged material. The Mackinaw River dredge cut, along the IWW, is the best example of this phenomenon. It is estimated in the Mackinaw River Dredged Material Management Plan (DMMP) that as much as 35 percent of the total volume of any single dredging event in this area was comprised of eroded bankline material from previous dredging events (USACE, 1992b). This is one of the first areas where Rock Island started to develop long term plans to find placement sites outside of the floodplain. The Mackinaw River DMMP estimates that within ten years after implementation of the new placement sites, dredging in this area may be reduced more than 35 percent, which will help offset the initial acquisition and construction costs incurred.

LONG TERM PLANNING

With the advent of environmental laws of the late 1960's and the early 1970's, such as the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA), an increased environmental awareness, especially concerning impacts of dredged material placement to the river environment, has resulted in a closer look at our placement methods. Bankline placement, which had been considered an environmentally acceptable method of placement in most cases for single dredging events, cannot be considered acceptable for the long term; continued, long-term use of many bankline sites can physically overwhelm such sites, resulting in dredged material encroaching further into the aquatic habitat. Additionally, new regulations require the Corps to develop long-term alternatives for dredged material placement. Long-term is defined as a minimum of 20 years, with 40 years typically used for our long-term plans (USACE, 1997).

As a result, Rock Island has been working on Dredged Material Management Plans (DMMP) for the long-term placement of dredged material. The goals of the DMMP program are to assure that future dredged material placement activities will minimize or avoid adverse environmental impacts where possible, will be operationally efficient, and will use dredged material beneficially when possible (USACE, 1990). This program is intended to ensure that all practicable and reasonable alternatives for the placement of dredged material are fully considered on an equal basis, that is, giving full consideration to the views of the resource agencies when making this evaluation. The DMMP identifies the method of placement of dredged material in the least costly manner, at the most practicable location, consistent with engineering and environmental requirements. This type of placement is called the Federal Standard, or Base Plan (USACE, 1988). However, Section 207 of WRDA 96 allows more costly placement methods exceeding the Base Plan for certain beneficial uses of dredged material, if the increases in cost are reasonable. Plans are developed or are being developed for forty recurrent dredge cuts on the IWW and fifty recurrent dredge cuts on the UMR. These plans identify environmentally sound and operationally feasible dredged material placement sites.

Rock Island started working on DMMP in the early 1980's as a result of recommendations from the GREAT and direction from Corps headquarters (USACE, 1990). In addition to coordination previously mentioned, coordination for long term planning also includes discussion with and review by the River Resources Coordinating Team (RRCT), an inter-agency committee also formed during the GREAT studies. The DMMP process has been accelerated in recent years, with the start of a Process Action Team (PAT) for the DMMP, in 1996. The PAT, consisting of Corps and natural resource agency representatives, was formed to find ways to improve DMMP quality and streamline the development process. This PAT process, plus early coordination with the resource and regulatory agencies, and continued work with the Coast Guard and the towing industry, has been most successful.

FUNDING CHALLENGES

Long term planning and implementation of new placement sites involves additional coordination, time and expense. Potential new sites are usually located further from the dredge cut, either up or downstream, or further inland. Rock Island channel maintenance databases indicate that in recent years more dredged material has been placed upland or further up in the floodplain. Moreover, new sites typically include higher cost for real estate land acquisition than historic sites required. Willing landowners and beneficial users are continuously sought for each dredging project, but the expense is still much greater than just 10 years ago (see Figure 3). Rock Island spends $5 to 7 million per year for dredging activities, or nearly 10% of the annual Operations and Maintenance (O & M) budget. In addition, Rock Island dredges less than 1 million cy of material each year, while nationally more than 300 million cy are dredged annually. Sometimes it appears difficult to impress upon funding authorities the importance of the navigation channel maintenance along the UMR, because we work/dredge on a much smaller scale. Additional funding for O & M activities for the Corps is extremely limited. Other funding avenues and placement methods need to be identified. Alternative funding solutions are discussed later in this paper under, "OTHER FUNDING – CONTINUING AUTHORITIES." Potentials for reducing costs include development of beneficial uses, and cost sharing by local interests. It should be noted that the UMR navigation system does not have a local sponsor for the project; placement of dredged material in compliance with the Federal Standard is 100% federal responsibility.

BENEFICIAL USES

Dredged material is a manageable resource suitable for a wide variety of beneficial uses, including commercial, industrial, urban, recreational, natural resource and agricultural uses. Examples of these may be seen in many of the historic placement sites throughout Rock Island, including fill for parks and riverfront development, recreational beaches, natural resource habitat developments (e.g., moist soil unit and refuge levee repairs), island creation or elevation, and beneficial use removal sites. Early coordination in the long term planning process helps to inform potential users of such opportunities. Initial contact is accomplished by sending a coordination letter announcing the environmental assessment of new placement sites for each

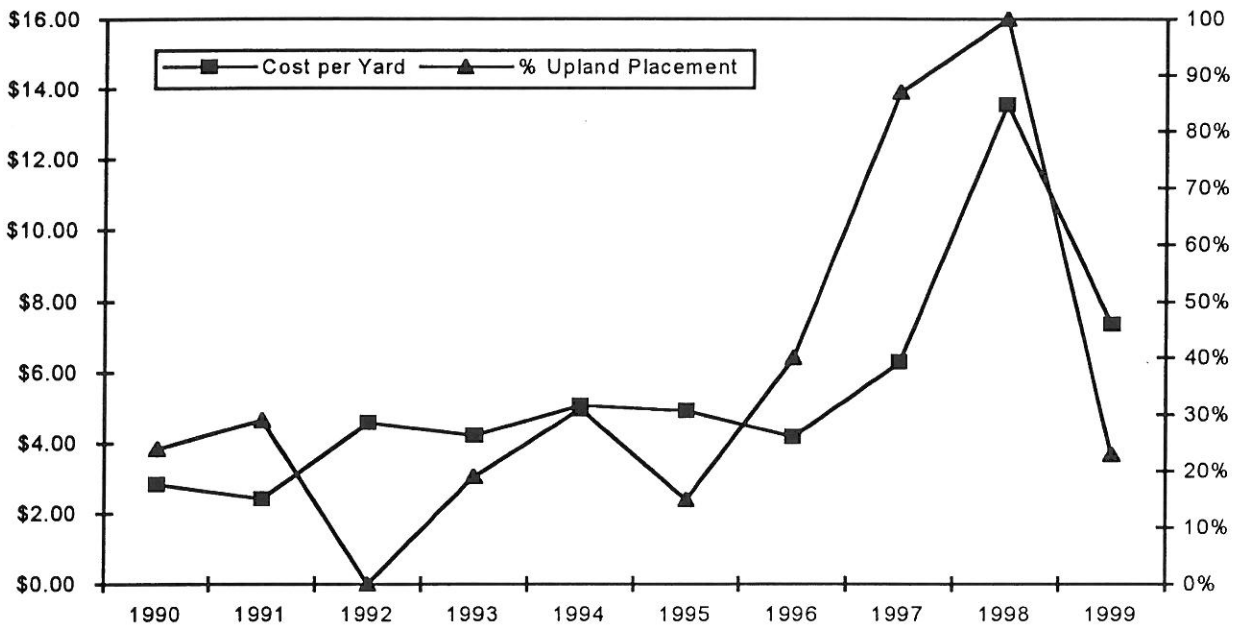

Figure 3
Mississippi River
Dredging Costs and Upland Placement

"Percentage of Upland Placement" refers to the amount of dredged material that is placed upland, rather than on historic floodplain sites. The cost per yard for 1997 is lower than the proportional trend because of an anomalous high-volume dredging event that year (150,000 cubic yards, more than triple the average volume per event). The reduction of cost and upland placement shown for 1999 resulted from increased use thalweg placement during that year.

DMMP. Once the environmental enhancement possibilities are evaluated, another option is to develop new beneficial use sites at locations best suited for material removal by local users. Beneficial use sites should be located as near the dredge cut as possible, and developed so that potential users will have ready access to the material; these factors should be evaluated during the DMMP site selection process.

It is vital to learn of potential users during the site selection process. If the material removal is expected for beneficial use, fewer acres need to be developed for the placement site. Reduced land acquisition can significantly reduce the cost of the dredging and placement operation. In the late 1980's Rock Island performed two beneficial use surveys, one for each river. Questionnaires were sent out to hundreds of potential users such as contractors, excavators, quarries, local governments, highway departments, and natural resource agencies. In addition, the State of Iowa completed a supplemental beneficial use survey in 1993 for Pool 11 on the UMR. These surveys gave an indication of who may show interest in the material, how much they may use and how

far they would be willing to travel for free material. The surveys stated that users would be responsible for excavation and transportation costs. The development of beneficial use removal sites has not been as successful as the surveys had indicated. Further coordination and advertising is required to update potential users of material availability.

Another means of coordinating the availability of dredged material is through news releases to the media, advertising sand free for the hauling. Rock Island regularly sends out district wide and site specific releases, advertising sand (and some silt) available at existing sites. These releases also ask for information concerning local use, stating that new sites will be developed at different locations, depending on potential use. The media, especially newspapers and radio, advertise the availability of sand. This type of advertising must continue and become an ongoing part of the channel maintenance program. To date, we have achieved limited success, but each year we find new users that previously had not known about the beneficial use opportunities.

The dredged material is always advertised as free for the hauling. Rock Island completed a marketability survey in 1998, showing that literally no one is willing to pay for the material, as sand is readily available from other sources. Most of the rivers in Rock Island fall within areas of glacial alluvial deposits. Sometimes sand deposits exceed depths of 200 feet. Contractors have shown that an efficient method of obtaining large volumes of sand is to dig a hole near a construction site and set up a classifier. Suitable material is made available at little cost. Our free dredged material is no longer considered free if one must transport it long distances.

There are numerous existing dredged material stockpile sites within Rock Island, many of which are filled to capacity. One such site has more than 750,000 cy of material stockpiled (Buzzard Island, Pool 20). This site originally had poor road access. In the mid 1980's, the Corps built a new road to the site, and the county upgraded their portion of the road to the State highway. This work was done in anticipation of beneficial use removal. Since then, less than 1,000 cy has been removed. However, responses to recent advertisements (fall, 1999) have indicated greater potential for future use; a local asphalt company is experimenting with the material.

To increase beneficial use removal, Rock Island initiated, in the fall of 1999, a "free loading" pilot program at one stockpile site along the IWW. The availability of free sand was advertised, as well as the offer to load sand for free at selected times. Small trucks (pick-ups) were discouraged from participating due to concerns about the potential for damage to smaller private vehicles and associated liability. This program had varying degrees of success, as less than 1,000 cy was removed from the site during this two-week period. However, many new users showed interest in the program, and participated in this pilot program by taking small amounts of material to experiment with usage. Rock Island expects greater potential for future removal due to increased advertising, and this program is expected to continue.

To follow up our most recent advertisements, Rock Island plans to contact potential beneficial users, including county and state highway departments and local communities along the river. These parties will be alerted to the advertisements and asked if they have uses for such material. Information will be given about the specific area of each party contacted (location of existing

sand, potential areas for new development of stockpile sites, the type of material to be dredged, grain size information, and the volume of material expected to be dredged in the future). Rock Island will further discuss any concerns each party has, and offer to meet with each party, individually or at public meetings.

Other beneficial use applications are being researched. Three power companies within Rock Island have accepted dredged material within flyash or bottomash storage areas, for such uses as final cover or rooting zone layers, or for elevating a new site to further separate bottomash from groundwater. State permitting agencies have approved power company plans to use dredged material for such improvements. One power company is also researching the feasibility of mixing dredged material with flyash and other materials to make a marketable manufactured soil. A creative private individual is investigating the feasibility to use dredged material to manufacture riprap. State DOT material gradation requirements indicate that dredged material is unsuitable for asphalt production for high quality roadwork. However, a local contractor is testing dredged material for use in lesser quality asphalt jobs that need not meet State requirements. If successful, the contractor has indicated that this may develop into a new market for Rock Island's dredged material. The Minnesota DOT has required use of another Corps District's dredged material for large road jobs. This material is primarily medium to fine sand, similar to Rock Island's. Although the dredged material was not suitable for the actual road construction, it was used successfully for adjacent berm work. Local State and County highway departments are being contacted in this regard.

BENEFICIAL USE CHALLENGES

Rock Island tries to involve local landowners and communities early in the placement site development process to address and satisfy any concerns up front. Corps representatives have attended numerous city and county board meetings and hope to continue this type of coordination. In our experience most of the public appreciates personal contact rather than a form letter, or even a phone call.

One of the first reactions the District often receives when starting the site selection process to develop new beneficial use sites is a firm "NIMBY", or "Not In My BackYard." After the initial shock of hearing the proposal for a new stockpile site nearby wears off, one of the first questions to Rock Island is, "Is the material contaminated?"; then, "When was the material tested?" To respond to these types of concerns, the St. Paul District Channel Maintenance Management Plan (USACE, 1996b) and Rock Island District's Water Quality and Sedimentation Section describes the testing process, as follows. A standard operating procedure for contaminant determination is needed to provide a consistent and expedient decision-making process, because of the number of dredge cuts within the Districts, and the short time between the determination of the need and the actual dredging. A three-tiered testing approach consistent with the Inland Testing Manual (EPA, 1998), with a decision-making process at the end of each tier, is recommended as the standard testing and evaluation protocol. Tier I is an initial evaluation which includes the following: particle size gradation, which can indicate a potential for contaminant levels; availability of sediment quality data in or around the project area; historical input information,

including type and proximity to point and non-point discharges, spills and other sources of pollution; sedimentation history to determine when and how the material to be dredged has accumulated; description of project area, including identification of sensitive areas; and project description, including quantities of dredged material and dredging and placement methods and sites being considered. Tier II comprises the standard bulk chemical analysis of sediments and/or an elutriate analysis. Tier III involves more sophisticated tests, including column settleability and biological response tests.

This District can usually satisfy contamination concerns for most dredge cuts, excluding the canals near Chicago, by performing a Tier I evaluation. Dredged material within the District is comprised primarily of medium to fine sand. Contaminants tend to be associated with fine sediments (e.g., silts and clays). When dredged material contains low percentages of silts and clays, there is usually no reason to believe contamination is present. A grain size analysis is performed on all samples of each dredge cut in Illinois. In the past, if a sample contained large percentages of fines (greater than 20 percent passage of material through a #230 sieve), a chemical analysis for various organic and inorganic contaminants was performed. However, since a 1994 rules change written by the Illinois Pollution Control Board, the chemical analysis requirement has been significantly reduced. The only chemical analysis required by the rules change is an elutriate test for ammonia when sediment samples contain greater than 20 percent fines. The results from this test are used in a computer model. The model must show that the mixing zone predicted to occur from the discharge of this type of dredged material along a bankline will not exceed maximum allowable dimensions. If the predicted mixing zone is within the allowable dimensions, the impacts from any increase in ammonia levels as a result of placement are expected to be minimal.

Contaminant concerns are usually addressed when the District advertises free sand. Showing merely that there is no reason to believe contamination is present does not satisfy many potential beneficial users, or local landowners who may consider accepting dredged material onto their property. Considering these concerns, and in view of previous data showing measurable levels of PCBs and heavy metals along parts of the IWW and the UMR, Rock Island considers it prudent to perform additional chemical analyses. Sometimes landowner concerns may be addressed and satisfied by showing prior analyses of dredged material from the particular dredge cut, or another dredging area nearby.

In 1999 both grain size and chemical analyses were performed at a small boat harbor in Pool 15 (see Table 1), and also in Peoria Lake on the IWW (see Table 2). Both sediments were primarily lean clays, and contain much higher percentages of fines than do typical navigation channel dredged material. Rock Island's Water Quality and Sedimentation Section personnel interpreted the test results and indicated that PCB and heavy metal concentrations were below the standards/criteria they were compared with (Bierl, 1999). Since most states, including Illinois, do not have sediment standards for dredged material, analyte concentrations were compared with State of Washington Sediment Quality Standards (SQS), U.S. Environmental Protection Agency (USEPA) ceiling concentrations for sludge application on land and/or the Lowest Apparent

Effects Threshold (LAET) concentrations found in Barrick et al., 1988. It was determined from these comparisons that there should be no adverse impacts to biological resources.

Table 1. Chemical Analysis Results from Marquis Boat Harbor, Pool 15 Dredged Material in mg/kg Dry Weight

ANALYTE	MBH-1	MBH-2	WASHINGTON SQS	USEPA	LAET
Arsenic	9.1	11.7	57	75	57
Chromium	11.4	15.6	260	-	260
Copper	40.8	24.3	390	4,300	390
Lead	21.4	37.1	450	840	450
Mercury	< 0.16	< 0.18	0.41	57	0.41
Zinc	71.4	114	410	7,500	410
PCBs	0.0800	0.0910	-	-	0.130

Table 2. Chemical Analysis Results from Peoria Boatyard Dredged Material in mg/kg Dry Weight

ANALYTE	PB-1	PB-2	WASHINGTON SQS	USEPA	LAET
Arsenic	11.4	10.6	57	75	57
Chromium	36.3	32.2	260	-	260
Copper	43.6	38.7	390	4,300	390
Lead	53.4	43.3	450	840	450
Mercury	0.18	0.33	0.41	57	0.41
Zinc	220	214	410	7,500	410
PCBs	0.0770	0.0620	-	-	0.130

Our navigation channel dredged material typically contains much lower percentages of fines than the material described above. Therefore, these types of analyses may sometimes be considered worst case scenarios. Thus far, very few samples of navigation channel dredged material have contained detectable levels of PCBs. Those samples that indicated detectable levels of PCBs usually consisted of higher percentages of fines.

Another typical question of local and interested parties is, "What will the placement site look like while you are placing material, and after you are done?" This is usually addressed at public meetings or local board meetings. Slide presentations are given to show what the operations of preparation and placement involve, and what the placement site will look like. More importantly, the presentation also shows what the sites will not look like. Positive input from meeting participants indicates that these presentations have proven very successful.

OTHER FUNDING - CONTINUING AUTHORITIES

One of the main obstacles to increased beneficial use of dredged material has been the lack of Federal authority within the Base Plan to participate in beneficial use projects, and the lack of Federal funding for such projects (Worthington, 1997). The Federal Standard, or Base Plan, described in Code of Federal Regulations set the policy, limiting Corps financial participation in placement of dredged material to the least costly alternative that is consistent with sound engineering practice and meeting compliance with all Federal environmental regulations (USACE, 1988). However, additional authorities in recent years have broadened the Corps' role in beneficial use programs. Section 1135 of Water Resources Development Act of 1986 (WRDA 86) authorized review of Corps projects to determine the need for modifications in the structures and operations of such projects for the purposes of improving environmental quality. WRDA 96 broadened this authority to include modifications to respond to environmental degradation caused or partially caused by the project. Modifications on project lands, or other locations affected by the project, are cost shared on a 75% Federal and 25% non-Federal basis. Funding for the 1135 program started in 1991 and has continued each year.

Section 204 of WRDA 92 authorizes beneficial use of dredged material for environmental protection, restoration and creation of aquatic and ecologically related habitats. Section 207 of WRDA 96 modified Section 204 by stating that, when maintaining navigation projects, a placement method other than the least costly alternative may be selected if the costs are reasonable relative to the environmental benefits. Projects are cost shared on a 75% Federal and 25% non-Federal basis.

Section 204 is the Corps' primary program for beneficial use of dredged material. However, since it was initially funded in 1994, this has remained a largely untapped resource. This program has been funded only at $2-3 million each year, far below the authority level of $15 million. The only State along the Mississippi River System to participate as a local sponsor for Section 204 so far is Louisiana, in programs to protect and create marsh and to protect and restore islands. Rock Island has identified numerous opportunities for Section 204 projects along the UMR including restoration of abandoned mines, island creation and protection of environmentally sensitive areas along each river. We are coordinating with Illinois Department of Natural Resources (DNR) for a Section 204 proposal to set back a flood control levee and construct a new levee using dredged material. This would return more than 300 acres of sloughs and bottomland hardwoods back in direct contact with the river system, and would improve floodplain management. We are also working with the Illinois DNR for abandoned strip mine reclamation. Abandoned mines are located adjacent to or near the IWW. Many of these have already been restored (mine tailings shaped, covered and revegetated), but many remain that still require attention to reduce the impacts associated with acidic mine tailings eroding into the river. Using Section 204 authority, dredged material can be used as fill and/or cover material for these restorations.

Section 206 of WRDA 96 authorizes aquatic ecosystem, wetland, and riparian floodplain habitat restoration. Non-Federal sponsors are required and may include taxing bodies or non-profit

organizations. Projects are cost shared on a 65% Federal and 35% non-Federal basis. Section 206 offers the opportunity to restore or improve aquatic and related environments with no tie to a previous Corps project. Sponsors may fulfill their obligations by work-in-kind. Lands owned or purchased by the sponsor for the project are also creditable. Rock Island has initiated more than a dozen projects under Section 206 authority, including aquatic restoration of tributary watersheds. Other potential restorations could include deepening side or backwater channels, fish passage, stream restoration, and pool and riffle construction. To date, no projects have utilized navigation channel dredged material.

Section 216 of the Rivers and Harbors Act of 1970 authorizes the review of completed projects and the potential modification of such projects using dredged material for environmental purposes. This program is applicable if physical, economic or environmental conditions of the project have changed. Rock Island currently has a number of feasibility studies ongoing under Section 216 authority.

The largest challenge when considering these continuing authorities programs for beneficial use projects is finding a local sponsor to share the costs. Even when an interested party is identified, they often cannot secure the funds for their portion of the project. Much of this obstacle is overcome with Section 204, 206 and 1135, as the local sponsor's responsibility for cost sharing of the project may be met by using land values. For example, under Section 204, the donation of land, or use of sponsor land for the project, may result in the local sponsor incurring no cash outlay if the value of the land meets or exceeds their 25% portion of the project. This idea is becoming attractive to many agency representatives. In addition, as citizens become more aware and actively interested in the protection and restoration of the river systems, more State funding is being made available for such projects. However, local environmental and economic development programs are initiated by different agencies and departments, and it is nearly impossible to keep informed and updated on all programs (e.g., Conservation Reserve Program and Conservation Reserve Enhancement Program). Although Rock Island continues to coordinate and participate in inter-agency planning, non-Federal leadership is essential to help orient all interested parties and stakeholders to beneficial use programs and make them aware of the potential funding opportunities available.

FURTHER COORDINATION

A National Dredging Team has been established by Corps headquarters to improve the dredging process and aid in the development of regional dredged material management plans (MarAd, 1994). Principle objectives are public participation and early planning as means to improve the dredging process. A number of coastal and Gulf Regional Dredging Teams (RDT), and the Great Lakes Team, have been developed. The Mississippi River Valley Division (MVD) had been tasked by headquarters to look at the feasibility of developing such a team for the Midwest waterways. The first Midwest RDT meeting was in December 1998. There were 57 representatives in attendance from 29 agencies, including 7 Corps Districts, the Corps' research laboratory at Waterways Experimental Station in Vicksburg, Mississippi (WES), MVD, 7 other Federal agencies, 2 Industry organizations and 11 State agencies from 6 States. There has been

one other Midwest RDT meeting, in 1999. These meetings have provided good opportunities for information exchange concerning different portions of the river system. The large attendance indicates that there is great interest in the development of a Regional Dredging Team for the Midwest, and meetings are scheduled in 2000. However, many representatives remain cautiously optimistic because of fears that this new Team will be nothing more than another bureaucracy to complicate matters and disorganize the good coordinating teams already in place.

A Beneficial Uses Group (BUG) is being considered in the Rock Island. This inter-agency group would work with the DMMP Team to help develop placement sites in an environmentally sound and economically acceptable manner, but especially, to the extent possible, to ensure incorporation of other public benefits and beneficial uses into the DMMP (Bufkins-Jones, 1997). Rock Island is developing a web page to compile and organize beneficial use information.

SUMMARY

Development of new placement sites is required for continued maintenance of the navigation project. Long term planning and coordination is essential for the success of the beneficial use program. Another key to beneficial use planning is flexibility; what works well at one site may not work at other sites. The Corps does a very good job of coordinating dredging activities with the resource agencies, local communities, the Coast Guard and the towing industry. This must continue, because we need to ensure we are in compliance with applicable regulations and we must address local concerns. We also need to keep track of the priorities of our customers.

Some believe a beneficial use program alone could fill a full time position and, if it were done correctly, I'd have to agree. Additional funding authorities, such as Section 204, need to be pursued, and local interests must be shown the opportunities available through partnership ventures. Other solutions discussed in this paper, such as advertising and the Beneficial Uses Group, should be an ongoing operation.

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NOTES FOR CONTRIBUTORS

GENERAL

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