
Name of Organization: ERDC Waterways Experiment Station

Type of Organization: Federally-funded R & D Center

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Project Title: Mobile Treatment Plant - Process Streams Management

Project Category: Contaminated Sediments

Rank by Organization (if applicable): 0

Total Funding Requested (\$): 123,322 **Project Duration:** 1.5 Years

Abstract:

The ERDC Waterways Experiment Station, in cooperation with the USACE District Detroit, is presently working to assemble a mobile separation plant that can be used throughout the Great Lakes area for recovery of dredged material from confined disposal facilities (CDFs). The first phase of this effort, acquisition and demonstration of a mobile hydrocyclone unit, is to be completed this year (GLNPO ID: GL98079). The hydrocyclone will constitute the core separation component of the treatment train. The two principal remaining components are the material preparation and the dewatering components. Material preparation encompasses excavation of material from the CDF, removal of oversize material, and slurring the material prior to introduction to the hydrocyclone. The dewatering component addresses management of the hydrocyclone overflow, a dilute slurry of predominantly fine materials. The large volume of this process stream presents a potential obstacle to full scale implementation of physical separation as a dredged material recovery strategy. The ERDC Waterways and Detroit District propose to evaluate management alternatives for this process stream, to provide the basis for equipment selection for the dewatering component of the treatment train, and to maximize volume recovery at CDFs for least cost.

Geographic Areas Affected by the Project

States:

<input type="checkbox"/> Illinois	<input type="checkbox"/>	New York
<input type="checkbox"/> Indiana	<input type="checkbox"/>	Pennsylvania
<input type="checkbox"/> Michigan	<input type="checkbox"/>	Wisconsin
<input type="checkbox"/> Minnesota	<input type="checkbox"/>	Ohio

Lakes:

<input type="checkbox"/> Superior	<input type="checkbox"/>	Erie
<input type="checkbox"/> Huron	<input type="checkbox"/>	Ontario
<input type="checkbox"/> Michigan	<input checked="" type="checkbox"/>	All Lakes

Geographic Initiatives:

<input type="checkbox"/> Greater Chicago	<input type="checkbox"/> NE Ohio	<input type="checkbox"/> NW Indiana	<input type="checkbox"/> SE Michigan	<input type="checkbox"/> Lake St. Clair
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Primary Affected Area of Concern: All AOCs

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area: Not Applicable

Other Affected Biodiversity Investment Areas:

Problem Statement:

Implementation of physical separation is prescribed chiefly by two limiting factors: 1) the presence of economic quantities of a separable dredged material fraction suitable for beneficial use or alternative disposal, and 2) sufficient area and storage capacity at the facility for equipment and material staging and management of process streams. That is, it must be logistically feasible to handle the process streams and sufficient capacity must be recovered to justify the expense of processing.

Substantial volumes of water must be introduced to the treatment train during the separation process. A 70 ton/hr plant will have a 1000-1200 GPM feed rate. Given the limited storage capacity and zero discharge requirements existing at some facilities, management of process water is critical to implementation of physical separation at full scale. The bulk of the process water will report to the hydrocyclone overflow which, as previously stated, consists of a dilute slurry of predominantly fine materials. The short term volume of these fine materials after gravity settling is expected to be greater than the corresponding volume prior to excavation. The gross capacity recovered by removing the coarse material will be reduced, at least in the near term, by this "bulking" effect on the fines. Additionally, the use of coagulants may be necessary to rapidly reduce the suspended solids and permit re-use of process water. The volume after settling of the flocculated fines is expected to be greater than that of the unflocculated fines. Equipment is available for more aggressive dewatering of the fines, and would substantially reduce the dewatered volume, but at an associated increase in cost.

The water management requirements may make or break a project both in terms of technical feasibility and economics. The principal questions are:

- If only gravity settling is used, will settling proceed rapidly enough to permit re-use of process water?
- What are the relative volumes occupied by unflocculated and flocculated sediments after the initial gravity settling period? (How much capacity is recovered that can be utilized in the near future, and how much of that is lost with the use of coagulants?)
- What are the relative consolidated volumes occupied by unflocculated and flocculated sediments? (What is the long term effect on volume recovery with coagulant use?)
- how much more storage capacity can be recovered with the addition of mechanical dewatering, and is the additional cost justified?

Settling of fine materials can be modeled, but the applicability to flocculated materials has not been demonstrated. Physical testing is needed to determine comparative fine residual volumes resulting from various dewatering alternatives.

The ERDC Waterways and Detroit District propose to evaluate the resulting sediment volume for four dewatering

approaches: gravity settling of the overflow, gravity settling with flocculation, flocculation with screen dewatering , and flocculation with screen dewatering followed by a belt filter press. Each additional process represents an increase in cost and complexity, but with the potential for increasing net volume recovery and/or facilitating process water re-use. Testing for this effort will be conducted at bench scale. Field scale implementation of the optimum alternative will follow at larger scale, pending future funding for equipment acquisition and operation.

Proposed Work Outcome:

Results of this effort will be used to identify the minimum necessary equipment for the dewatering component of the mobile treatment plant, project maximum expected capacity recovery for the different water management alternatives, and evaluate cost versus benefit as a function of dewatering alternative selected.

Project Milestones:	Dates:
Project Start	10/2000
QAPP	12/2000
Field Sampling	04/2001
Settling Test Results	07/2001
Consolidation Test Results	07/2001
Screening Test Results	07/2001
Data Analysis	08/2001
Final Report	09/2001

Project Addresses Environmental Justice

If So, Description of How:

Project Addresses Education/Outreach

If So, Description of How:

Project Budget:

	Federal Share Requested (\$)	Applicant's Share (\$)
Personnel:	23,670	2,630
Fringe:	0	0
Travel:	5,500	0
Equipment:	0	0
Supplies:	550	0
Contracts:	87,108	3,900
Construction:	0	0
Other:	0	0
Total Direct Costs:	116,828	6,530
Indirect Costs:	6,494	0
Total:	123,322	6,530
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

5% of the entire project costs will be supported by: in-kind contributions and support from Brown County and the USACE District Kewaunee area office, leveraging under the DOER research program for a portion of salary and laboratory support costs.

Description of Collaboration/Community Based Support:

Field support and coordination will be provided by Brown County Port Authority and efforts will be coordinated with Wisconsin DNR.