

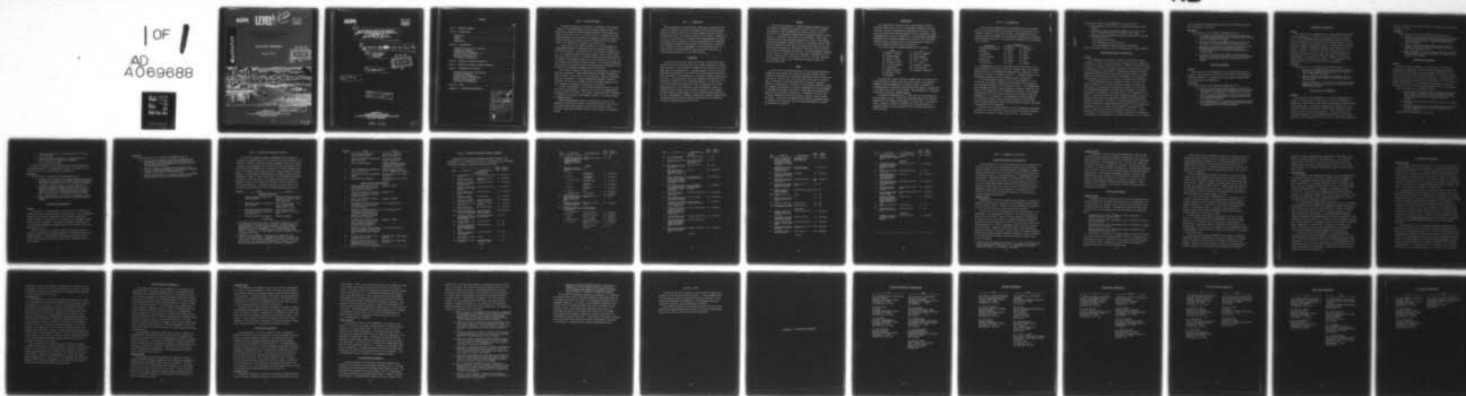
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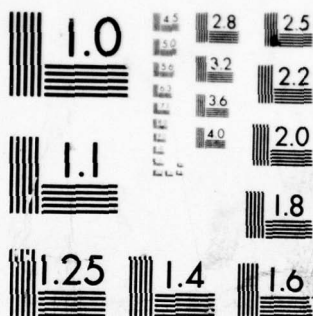
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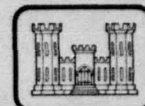


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ENVIRONMENTAL PROTECTION AGENCY/
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ON CRITERIA FOR
DREDGED AND FILL MATERIAL

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ACTIVITY REPORT

January 1979

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ENVIRONMENTAL PROTECTION AGENCY/
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ON CRITERIA FOR
DREDGED AND FILL MATERIAL

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ACTIVITY REPORT. Oct 76-Jan 79

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R. M. Engler, ~~CE~~
F. G. Wilkes, ~~EPA~~
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PART I: EXECUTIVE SUMMARY

A technical committee of scientists and engineers from research elements of the Environmental Protection Agency (EPA) and the U. S. Army Corps of Engineers (CE) Waterways Experiment Station (WES) was formed in late 1975 to act as a focal point for coordinating and disseminating agency research related to regulatory functions pursuant to Sections 404 and 103 of Public Laws (PL) 92-500 and 92-532, respectively. The committee is cochaired by the EPA and CE.

A major goal of the Technical Committee is the development of a comprehensive manual for implementation of all technical phases of PL 92-500 and 92-532. Other objectives of the Technical Committee are to: (a) recommend research priorities needed in order to fully implement Sections 404 and 103, (b) establish joint projects and priorities, (c) conduct joint program reviews, (d) avoid duplication of effort, and (e) exchange and disseminate research results. The Technical Committee also reviews and evaluates interim testing procedures promulgated by the CE and EPA for immediate implementation by field units.

The Technical Committee consists of six subcommittees cochaired by EPA and CE personnel: Bioassay/Bioevaluation, Wetlands, Contaminants, Physical Impacts, Mixing Zone, and Fill Material. These subcommittees guide the development of interim implementation manuals required by PL 92-500 and 92-532 and recommend research programs designed to generate information necessary for improving these manuals.

A major accomplishment of the Technical Committee during the past year was the publication of a manual to be used in the implementation of Section 103 of PL 92-532. This manual contains procedures applicable to evaluation of potential environmental impacts of the ocean disposal of dredged material.

Other accomplishments include the successful pursuit by both agencies of high-priority research identified during the first year of the committee and joint funding of certain high-priority items. A listing of these major research areas and their progress is presented herein.

Abstract
↓

PART II: INTRODUCTION

The Environmental Protection Agency (EPA)/Corps of Engineers (CE) Technical Committee on Criteria for Dredged and Fill Material presents herein its Activity Report for the period beginning October 1976 and ending January 1979. The primary activity of the Technical Committee is to act as a focal point for coordinating and disseminating the results from agency research related to criteria and guidelines for regulating the discharge of dredged and fill material as mandated by the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and for ocean disposal of dredged material under the Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532).

Background

Abstract
←

During the course of the legal and technical negotiations between the EPA and the CE on the Section 404 (PL 92-500) guidelines for evaluating the impact of the discharge of dredged and fill material into navigable waters and wetlands areas, it became apparent that the continued development and revision of the technical criteria and guidelines would best be ensured by the appointment of a technical committee charged with this task. It was appropriate that this committee be composed of representatives from both of the responsible agencies, the EPA and CE. It was further evident that there was a need to coordinate the research being conducted at EPA laboratories on the environmental impact of dredged material disposal with the research projects of the Dredged Material Research Program (DMRP) and other research being conducted at the WES. Accordingly, a committee consisting of research personnel from appropriate EPA Environmental Research Laboratories and from WES was officially formed during the fall of 1975.

Purpose

The specific purposes of the EPA/CE Technical Committee are to (a) develop an implementation manual for Section 404 of PL 92-500; (b) develop an interim implementation manual for Section 103 of PL 92-532; (c) coordinate dredged material ecological research activities (i.e., establish joint projects and priorities, conduct joint program reviews, avoid unplanned duplication of effort, and exchange and jointly disseminate research results); (d) mutually develop implementation manuals for both short- and long-term methods; and (e) provide technical guidance for subsequent revisions of Sections 103 and 404 criteria and guidelines as required. The interim manuals discussed in this report are those required for immediate implementation of the various technical parts of Sections 103 and 404. The term "implementation manual" refers to the comprehensive guidance manuals for Sections 103 and 404.

Scope

Section 404 of PL 92-500 specifies that any proposed discharge of dredged or fill material into waters of the United States must be evaluated through the use of guidelines developed by EPA in conjunction with the CE. Section 103 of PL 92-532 states that specific criteria must be followed in reviewing applications to dispose of dredged material in ocean waters. The scope of the Technical Committee includes the assembly and synthesis of technical information for the development of implementation manuals suitable for conducting the evaluations mandated by the legislation cited above. To accomplish this task, the Technical Committee utilizes all pertinent research - past, present, and future - conducted to determine the potential environmental impact of dredged and fill material and to develop methodologies to predict and determine such impacts.

Organization

The organizational approach used in establishing the EPA/CE Technical Committee was to form an interagency committee to review, interpret, and make recommendations regarding all activities. This group was termed the Technical Committee and was constituted to make recommendations to and be responsible to top-level agency management. Membership of the Technical Committee was limited to staff who have broad knowledge, responsibilities, and understanding of needs for research programs in dredge and fill activities.

The current Technical Committee members are as follows:

<u>EPA</u>	<u>CE</u>
Dr. Frank G. Wilkes*	Dr. Robert M. Engler*
Dr. William Brungs	Mr. James Brannon
Dr. Harold V. Kibby	Dr. Roger T. Saucier
Dr. Michael D. Mullin	Dr. C. J. Kirby
Mr. T. William Musser	Mr. Charles C. Calhoun
Dr. Jack Gentile	Mr. M. Burton Boyd
Dr. Spencer Peterson	Dr. Richard K. Peddicord
Mr. William S. Davis	
* Cochairmen	

To conduct the various technical programs under its purview and to accomplish goals of narrow scope and specific detail, the Technical Committee formed subcommittees to provide methods, procedures, or recommendations for modifying the guidelines and criteria, as applicable to its particular aspect of the problem. Each subcommittee is cochaired by EPA and CE Technical Committee members.

The Technical Committee meets at least twice a year with EPA and CE alternating as hosts. During this reporting period, the Technical Committee met in Vicksburg, Mississippi, 17-19 May 1977. A meeting in Duluth, Minnesota, planned for November 1977, was canceled due to inclement weather and was subsequently held in January 1978 in Gulf Breeze, Florida.

PART III: SUBCOMMITTEES

The concept of designating ad hoc subcommittees on an as-needed basis to aid in addressing priority problem areas was approved by the Technical Committee at its first meeting. The subcommittees are co-chaired by EPA and CE members of the Technical Committee and staffed by EPA/CE technical personnel. The designated subcommittees and cochairmen are as follows:

Subcommittee	Cochairmen	
	EPA	CE
Bioassay/Bioevaluation	Dr. Gentile	Dr. Peddicord
Wetlands	Dr. Kibby	Dr. Kirby
Contaminants	Dr. Mullin	Dr. Engler
Physical Impacts	Dr. Wilkes	Mr. Calhoun
Mixing Zone	Dr. Brungs	Mr. Boyd
Fill Material	Mr. Davis	Mr. Brannon

Subcommittees can call on other agencies and consultants or non-agency personnel to aid them in specific technical areas. The technical problem areas and the designated subcommittees and cochairmen are presented and discussed in subsequent sections. A complete listing of the subcommittee members and their addresses is given in Appendix A.

In the developmental stages of the Technical Committee, it was decided that the various subcommittees would guide the development of the Implementation Manuals for PL 92-500 and 92-532. The subcommittees would recommend research programs designed to generate information that would fill knowledge gaps in the Implementation Manuals. The Implementation Manuals would be revised or expanded as appropriate using this information as it is generated. The subcommittee research programs are, therefore, directed toward developing methods for determining specific needed information rather than generating information applicable to all dredge and fill operations.

During the first reporting period year the subcommittee established a priority for each identified task after which the Technical Committee integrated the tasks into a master priority list. The following

criteria were used by all subcommittees to set priorities:

- Bottom sediment impacts are more important than water column impacts.
- Influence of time is of prime importance (i.e., what is the nature, degree, and extent of the impact over time?).
- The user of this information will have to answer the following general questions:

Will there be an effect?

How significant will the effect be?

How can significant adverse impacts be minimized?

These criteria will remain in force for development of future programs.

Bioassay/Bioevaluation Subcommittee

Purpose

This subcommittee recommends, develops, and evaluates bioassay techniques to be used in the evaluation of applications for dredged and fill material disposal regulatory permits. Laboratory and field research is conducted to refine the bioassay techniques, relate them more closely to field conditions, and improve the interpretive guidance for making extrapolative predictions of field effects from the laboratory results. Methods for conducting field surveys for predisposal site evaluation and postdisposal monitoring are tailored to dredged and fill material.

The Bioassay/Bioevaluation Subcommittee relies on the Physical Impacts Subcommittee to outline information needed to determine the area likely to be impacted and the physical conditions of that impact. The Contaminants Subcommittee provides input on methods to determine the presence, concentration, and chemical nature of contaminants in the material. Using this information, the Bioassay Subcommittee provides a program outline to develop appropriately sensitive and implementable evaluative techniques. The results of these evaluations must be interpreted in light of the mixing and dilution guidance from the Mixing Zone Subcommittee in order to make useful estimates of potential field effects. Guidance is provided to regulatory personnel on: (a) the applicability of various bioassay techniques to particular situations, (b) strengths and limitations of the various techniques, and (c) factors

to be considered in interpreting the results and estimating the potential for effects in the field.

Objectives

The objectives of the Bioassay Subcommittee include:

- a. Providing District Engineers and Regional Administrators with bioassay methods and factors to consider when selecting them (for Implementation Manuals).
- b. Identifying research requirements and priorities for the the purpose of developing additional bioassay methods.
- c. Ensuring that bioassay testing procedures developed by the respective agencies meet the regulatory mandates of PL 92-500 and 92-532 while remaining implementable on a regional basis.
- d. Acting as a technical review panel for bioassessments developed by the respective agencies and making recommendations to the Technical Committee concerning such procedures.

Wetlands Subcommittee

Purpose

The purpose of this subcommittee is to consider definitions and aspects of jurisdiction for Section 404 of PL 92-500, with emphasis on wetlands boundaries. Coordination with other agencies doing similar work takes place where appropriate.

Objectives

The objectives of the Wetlands Subcommittee are to:

- a. Prepare a state-of-the-art description of wetland types with explanation of how District Engineers can relate this information to requirements of Section 404 of PL 92-500.
- b. Identify research requirements to develop needed information concerning wetlands and vegetative definitions for the Implementation Manuals.
- c. Make recommendations to the Technical Committee concerning the overall wetlands evaluation program and discuss inter-relationships with other Federal programs.

Contaminants Subcommittee

Purpose

The purpose of this subcommittee is to provide methods for characterizing contaminants in dredged and fill material used in bioassay tests. The Bioassay/Bioevaluation Subcommittee provides methods of using this information in conjunction with bioassay results to predict potentially harmful environmental impacts of dredged and fill material. Emphasis is placed on dredged/fill material after they have been deposited. Methods are provided for initial characterization of the materials, fractionation of the sample into different subsets, and determination of toxic metals, persistent organics, and petroleum hydrocarbons in the sample and its subsets. This subcommittee also provides chemical tests to the Fill Material Subcommittee.

Objectives

The objectives of the Contaminants Subcommittee are to:

- a. Provide the permitting authority with chemical methods to characterize contaminants in dredged and fill material (for the Implementation Manual).
- b. Identify research requirements and priorities for the purpose of developing additional contaminant characterization methods.
- c. Make recommendations to the Technical Committee concerning sampling and analytical procedures to be included in the Implementation Manual.

Physical Impacts Subcommittee

Purpose

The purpose of this subcommittee is to provide recommendations on methods for evaluating the direct physical impacts of disposing of dredged and fill material in open water (water column and bottom effects) or on upland areas. The impacts considered will include, but not be limited to, those on circulation, stratification, temperature distribution, light penetration, and smothering. The application of the procedures developed by this recommended research will provide information for use in conjunction with the results of bioassay/bioevaluation

tests to assess the total potential impact of dredged and fill material on aquatic systems.

Objectives

The objectives of the Physical Impacts Subcommittee are to:

- a. Provide the permitting authority with methods for assessing the direct physical impact of disposing dredged and fill material and the factors to consider when selecting a particular method.
- b. Identify research requirements and priorities for the purpose of improving and applying available methods for determining physical impacts.
- c. Make recommendations to the Technical Committee concerning physical impacts evaluation procedures to be used in the Implementation Manuals.

Mixing Zone Subcommittee

Purpose

The work of this subcommittee is divided into two categories: biological and engineering. Based on different disposal techniques, current EPA and CE programs will provide models and methods for determining (a) rates, (b) current and flow patterns, (c) surface and bottom area covered, and (d) water column characteristics. The engineering approach would provide the plume size, surface area, etc. The biological approach would develop a set of guidelines to determine how large an affected area can be without exceeding acceptable levels of degradation.

Important points to be considered include:

- a. As exposures in the mixing zone are intermittent and short-lived in nature, adjustments must be made when relating water quality criteria to the EPA Water Quality Criteria, as these values are based on continuous low-level exposures.
- b. Whether or not water quality criteria are met at the mixing zone edge.
- c. The bottom exposures may be more significant than those in the water column because of the short duration of the disposal operation.

The Mixing Zone Subcommittee will provide:

- a. Biological guidelines to determine how much of an area can be degraded.
- b. Engineering methods (models) to determine how much of that area would be committed for disposal.
- c. Site selection guidelines.

Using this information, the Bioassay/Bioevaluation Subcommittee will provide methods to determine what the impact of dredged and fill material will be if it falls within a specified area.

Objectives

The objectives of the Mixing Zone Subcommittee are to:

- a. Provide District Engineers and Regional Administrators with guidelines to determine the acceptable area of degradation and possible disposal area (for the Implementation Manual).
- b. Recommend a research program to develop improved techniques for estimating mixing zones resulting from the open-water disposal of dredged material, with particular emphasis given to the relationship between the mixing zone, the disposal site, and proposed bioassay methods.
- c. Make recommendations to the Technical Committee concerning mixing zone procedures to be used in the Implementation Manuals.

Fill Material Subcommittee

Purpose

Fill material, as distinguished in Section 404 of PL 92-500 from dredged material, is material used to raise elevation. This subcommittee focuses on the problem of leaching from fill material deposited in aquatic systems. Fill material types, release sites, and impact assessment tests are categorized. The research planned and coordinated by this subcommittee emphasizes adapting existing test methods rather than developing new tests.

Input obtained from the Physical Impacts Subcommittee provides methods for determining the physical impact of fill material as well as dredged material. The Contaminants Subcommittee supplies the Fill Material Subcommittee with tests for the chemical characterization of fill material.

Objectives

The objectives of the Fill Material Subcommittee are to:

- a. Provide District Engineers and Regional Administrators with methods of assessing impact of leaching from fill material and factors to consider when selecting them (for the Implementation Manual).
- b. Identify research requirements and priorities for the purpose of developing additional applications of available methods to fill material leaching problems.
- c. Make recommendations to the Technical Committee concerning procedures to be used in the Implementation Manuals.

PART IV: PROGRESS ON RESEARCH PRIORITIES

The research programs originally recommended by the Technical Committee for implementation of PL 92-500 and PL 92-532 are shown in the following tabulation. The items listed as immediate priorities include information and procedures that are needed to revise and upgrade the CE PL 92-500 Interim Guidance* and to develop the PL 92-500 Implementation Manual. The longer term research priorities include research programs needed for a more complete understanding of ecological perturbation and mitigation of impacts. The current status of each program is indicated. It should be noted that most of the programs initially considered of immediate priority by the Technical Committee have been completed or are nearing completion. Information from many of these projects has already been incorporated into the PL 92-532 Implementation Manual.**

Priority	Title	Status
<u>Immediate Priorities</u>		
1	Benthic Organism Bioassay and Bioaccumulation	Methods developed and incorporated in PL 92-532 Implementation Manual.
2	Sampling, Analytical and Interpretive Manual	Joint EPA/CE project. Project. Initiated 8/77. \$100K/yr for 2 years.
3	Wetlands Vegetation Identification Guide and Transition Zone Characterization	Joint EPA/CE projects. First guides to be issued 6/78.
4	Improved Mixing Zone Guidance	Under development.

(Continued)

* Environmental Effects Laboratory, "Ecological Evaluation of Proposed Discharge of Dredged or Fill Material. Interim Guidance for Implementation of Section 404(b)(1) of PL 92-500 (Federal Water Pollution Control Act Amendments of 1972)," Miscellaneous Paper D-76-17, June 1976, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

** EPA/CE Technical Committee on Criteria for Dredged and Fill Material into Ocean Waters. Implementation Manual for Section 103 of Public Law 92-532 (Marine Protection, Research, and Sanctuaries Act of 1972)," July 1977 (Second Printing April 1978), U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

<u>Priority</u>	<u>Title</u>	<u>Status</u>
5	Fill Material Assessment: Types and Quantities	CE project completed. Report issued 12/77.
6	Survey of Present Methodologies (Fill Material)	CE project completed. Report issued 12/77.
7	Water Column Bioassay	Methods developed and in- corporated into PL 92-532 Implementation Manual.
8	Ocean Disposal Site Designation (as per PL 92-532)	EPA/CE project initiated FY 78. \$9,000K for 3 years.
9	Ocean Disposal Site Designation Manual	EPA/CE project to be initia- ted 9/78.
10	Bioassay/Field Assessment	EPA/CE project to be initia- ted 6/78.

Longer Term Research Priorities

1	Benthic Organism Bioassay and Bioaccumulation Test Develop- ment (Chronic Effects)	Ongoing - EPA/CE.
2	Predictive Models for Determin- ing Short-Term Physical Fate of Disposed Materials	Ongoing - CE.
3	Short- and Long-Term Sediment/ Water Interactions	Ongoing - EPA/CE.
4	Procedures to Evaluate and Quan- tify Mobility of Contaminants from Fill Material	To be initiated FY 79.
5	Methods to Predict Material Dis- tribution from Wetlands Fill and Effects of Topography and Elevation Changes on Wetlands Drainage and Circulation	To be initiated FY 79.
6	Evaluation and Field Verifica- tion of State-of-the-Art Pre- dictive Models of Sediment Dispersion and Transport	Ongoing - CE/EPA.
7	Methods to Predict how Changing Bottom Topography and Depth from Fill Operations Alters Circula- tion	To be initiated FY 79.
8	A Final Decision Tree for the Implementation Manual	Ongoing - EPA. Final report due 6/78.
9	Metals Uptake by Plants from Dredged and Fill Material in Marsh and Terrestrial Discharge.	Ongoing - CE. Final report due FY 79.

PART V: CURRENT AND COMPLETED RESEARCH PROGRAMS

Ongoing EPA and CE research programs directly related to the development of the Implementation Manual are presented in the following tabulation according to subcommittee functional areas.

Agency	Project Title	Investigating Group	Total Funding \$K	Project Completion FY
<u>Bioassay/Bioevaluation</u>				
CE	Biological assessment of the elutriate test	Environmental Laboratory, WES	297	1976(complete)
CE	Availability of sediment-sorbed pesticides to benthos	LFE Environmental Analyses Laboratory	106	1976(complete)
CE	Development of time-dilution bioassay technique appropriate to dredged material	Stanford Research Institute	99	1977(complete)
CE	Development of bioassay methodologies using selected benthic organisms	Environmental Laboratory, WES	270	1977(complete)
CE	Vertical migration ability of benthos in dredged material deposits	University of Delaware	127	1977(complete)
CE	Availability of sediment-sorbed metals to benthos	Texas A&M University	101	1977(complete)
CE	Response of aquatic animals to suspended dredged material	University of California, Bodega Marine Laboratory	197	1977(complete)
CE	Uptake of oil and grease from dredged material	Naval Biomedical Research Laboratory	72	1977(complete)
CE	Benthic recolonization of dredged and disposal sites	San Jose State University	107	1977(complete)
EPA/CE	Release and bioavailability of pollutants from dredged spoils of discharge of coastal waters	Corvallis Environmental Research Laboratory University of Washington	40/200	1977(complete)
EPA	Development of multispecies benthic bioassay for toxicity of dredged material proposed for marine disposal	EPA in conjunction with the New England Aquarium	80	1978
EPA	Multispecies benthic bioassay for dredge spoils	Corvallis Laboratory	170	1978
EPA	Development of a bioassay procedure for estimating the impact of dredged material on estuarine and marine environments	Gulf Breeze Laboratory	150	1978
EPA	Development of bioassay procedures for pollution of harbor sediments	University of Wisconsin	198	1978
CE	Species selection for regulatory program	Contract	75	1979
CE/EPA	Multiple species bioassay for dredge spoils	Environmental Research Laboratory, Gulf Breeze	10	1979

(Continued)

Agency	Project Title	Investigating Group	Total Funding \$K	Project Completion FY
CE/EPA	Field assessment of bioassay	TenECO	25	1979
EPA	Development of ecosystem models of benthic environment for use in predicting the impact of dredged material disposal on estuarine and marine benthic communities	Virginia Institute of Marine Science	500	1981
<u>Wetlands</u>				
CE	Development of regional wetland vegetation identification guides	WES		
	A. Alaska	Dr. David Murray Fairbanks, AK	35	1977(complete)
	B. West Coast	Dr. Thomas Harvey Santa Clara, CA	30	1977(complete)
	C. Interior-Great Lakes	Mr. Gerould Wilhelm Lilse, IL	25	1977(complete)
	D. Florida	Dr. Howard Teas Miami, FL	36	1977(complete)
	E. Puerto Rico	Dr. Howard Teas Miami, FL	38	1977(complete)
	F. Gulf Coast	WES	30	1977(complete)
	G. Synthesis and Review	Dr. Richard Daley	86	1977(complete)
CE	Regional wetlands identification and delineation, and development of detection and monitoring procedures and systems	Several CE Districts and Laboratories	500	Variable
CE	Preparation of technical wetlands manual and methodology for wetlands evaluation	USAE Institute for Water Resources	100	1977(complete)
EPA	Development of vegetative criteria for wetland upper boundary determinations	Corvallis Environmental Research Laboratory		
	A. Pacific Northwest	Oregon State University	46	1977(complete)
	B. California	San Jose State University	52	1977(complete)
	C. Alaska	University of Alaska	80	1977(complete)
	D. Interior-Great Lakes	Winona State University	33	1977(complete)
	E. South Atlantic	Virginia Institute of Marine Science	36	1977(complete)
	F.	National Ocean Survey	85	1978

(Continued)

Agency	Project Title	Investigating Group	Total Funding \$K	Project Completion FY
<u>Contaminants</u>				
EPA	Future dredging quantities on the Great Lakes (Grant)	Eastern Michigan University	27	1975
CE	Development of dredged material disposal criteria	Texas A&M University (Sub-contract to University of Texas at Dallas)	133	1975
EPA	Water quality reports of sediment dredging in large lakes systems (Grant)	University of Michigan	236	1976
CE	Study of mobilization and immobilization of pesticide and PCB materials into water column during dredging and disposal	Envirex, Inc.	102	1976(complete)
CE	Direct and indirect effects of sediment organic fractions on the mobilization and immobilization of various contaminants during dredging and disposal of sediments	Cold Regions Research and Engineering Laboratory	126	1976(complete)
CE	Effect of dispersion, settling, and resedimentation on migration of chemical constituents during open-water disposal of dredged material	Dept. of Environmental Engineering, University of Southern California, Los Angeles	97	1976(complete)
CE	Investigation of partitioning of various elements in dredged material	Environmental Laboratory, WES	312	1976(complete)
EPA	Rate of accumulation of potentially hazardous substance in recent sediments in Lake Huron	University of Michigan	110	1977(complete)
CE	Study of Eh, pH, and DO effects on chemical constituent migration during open-water disposal of dredged material	Agronomy Department Louisiana State University	91	1977(complete)
CE	Refinement of current disposal criteria, identification of subject areas for further development, and refinement of bioassay procedures for disposal criteria	University of Texas at Dallas	143	1977(complete)
CE	Long-term release of contaminants from dredged material	Environmental Laboratory, WES	100	1977(complete)
CE	Physical and chemical characterization of contaminated dredged material influents, effluents, and sediments in confined upland disposal areas	Environmental Laboratory, WES		
CE	Study of leachate from dredged material in upland disposal sites and/or in productive areas	SCS Engineers, Long Beach, CA	129	1977(complete)

(Continued)

Agency	Project Title	Investigating Group	Total Funding \$K	Project Completion FY
CE/EPA	Physical and chemical monitoring of river sediments and water and confined disposal area dredged material influents, effluents, and sediment during high-solids dredging of a PCB spill	Environmental Protection Agency, Region X, and Seattle District, CE	17/9	1977(complete)
CE	Characterization of confined disposal area influent and effluent particulate and petroleum fractions	University of Southern California, Los Angeles	30	1977(complete)
CE	Physical and chemical characterization of dredged sediments and leachates in confined land disposal areas	SCS Engineers	154	1977(complete)
CE	Dredged Material Research Program aquatic disposal field investigations	Contract and in-house WES	5000 6000	1977(complete)
EPA	Uptake and release of hazardous substances by suspended materials and sediments in lakes	University of North Carolina	197	1979
EPA	Survey of nutrients and hazardous substances in Saginaw Bay, Michigan	Cranbrook Institute of Science	409.9	1979
CE/EPA	Procedural guide for ocean surveys	Contract	75	1979
CE	Metals availability to marsh plants from dredged and fill material	WES	225	1979
EPA	Sediment-water exchange model	Manhattan College	300	1980
CE/EPA	Sampling and analytical manual for dredged and fill material	Great Lakes Laboratory	200	1980
<u>Physical Impacts</u>				
CE	Assessment of aesthetic and ecological significance of turbidity in various aquatic environments	Living Marine Resources, Inc.	46	1977(complete)
CE	Determination of the vertical migration ability of benthos in dredged material deposits	University of Delaware	127	1977(complete)
CE	Response of selected aquatic organisms to suspended dredged material	Bodega Bay Marine Institute	167	1977(complete)
CE	Dredged Material Research Program various habitat development studies	Various contractors and in-house WES	3000	1978(complete)
CE	Dredged Material Research Program field studies	Various contractors	6000	1978(complete)

(Continued)

Agency	Project Title	Investigating Group	Total Funding \$K	Project Completion FY
CE	Dredged Material Research Program Task 1B and 6C studies related to movements of dredged material	Various contractors and in-house WES	1000	1978(complete)
		<u>Mixing Zone</u>		
CE	Participation in field verification of Tetra Tech models for predicting short-term physical fate of dredged material	Hydraulics Laboratory, WES	60	1977(complete)
CE	Analysis of long-term sediment transport model	Hydraulics Laboratory, WES	40	ongoing
CE	Physical characteristics of dredged material and the effects of dispersion behavior during open-water disposal operations	Yale University	208	1977(complete)
CE	Nature, degree, and extent of turbidity generated by open-water pipeline disposal operations	State University of New York	193	1977(complete)
CE	Fluid mud dredged material: its physical nature and dispersion	Virginia Institute of Marine Science	146	1977(complete)
CE	Accoustical study of dredged material discharged in the coastal environment	Sea-Air Interaction Laboratory, NOAA	21.5	1977(complete)
CE	Refinement of current disposal criteria, identification of subject areas for further development, and refinement of bioassay procedures	University of Texas	144	1977(complete)
EPA	Simplification of Koh-Chang Model	JBF Scientific Corp.	46	1977
EPA	The dispersion and fate of hazardous materials in large lakes	Case Western University	350	1978
		<u>Fill Material</u>		
CE	Assessment of the types and quantities of fill material and the impacts of their disposal	University of Oklahoma	91	1977(complete)

PART VI: SUBCOMMITTEE ACTIVITIES

Bioassay/Bioevaluation Subcommittee

Since publication of the First Annual Report* this subcommittee has played a major role in the development and publication of an implementation manual for the criteria regulating ocean dumping of dredged material under Section 103 of PL 92-532. Since the first printing of "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters - Implementation Manual for Section 103 of Public Law 92-532 (Marine Protection, Research, and Sanctuaries Act of 1972)" in July 1977, approximately 8000 copies have been distributed in this country and some requests for copies have been received from abroad. A workshop on application of the techniques in the manual was held 19-20 October 1978 with approximately 50 EPA, CE, and bioassay contractor personnel participating.

Immediate needs

Workshops such as the one mentioned above appear to be useful for personnel conducting the required tests and administering the bioassay-based regulatory program. Therefore, similar workshops are planned on a two to three per year basis until the need has been met.

A major activity of this subcommittee will be participation in the development of an implementation manual for the final guidelines for Section 404 of PL 92-500. This will involve adaption of appropriate procedures from the ocean manual to freshwater-estuarine ecosystems. Relatively little new research is likely to be required for this, with existing expertise of various subcommittee members and their laboratories sufficing. Research currently underway at the Environmental Research Laboratory, Gulf Breeze, Florida, under joint agency funding on multispecies sediment bioassay technique development, should contribute to both the Section 404 manual and the anticipated revision of the Section 103 manual.

* EPA/CE Technical Committee on Criteria for Dredged and Fill Material, "First Annual Report," March 1977, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi.

Long-term needs

As experience with the Section 103 Implementation Manual becomes more widespread and sufficient feedback representing a high level of expertise develops, technical revision of the manual will be undertaken where appropriate. The subcommittee will be careful that changes are not made for the sake of change, but only when a need has been demonstrated and an improved alternative documented. The workshops mentioned earlier will be a first step in evaluating needs and assessing possible modifications. The multispecies sediment bioassay currently being developed under joint funding is also expected to be useful in this regard. Work within both agencies is underway to improve both the usability and technical refinement of existing procedures. These efforts will be primarily in the realm of benthic bioassays and bio-accumulation evaluation.

Wetlands Subcommittee

Immediate needs

The highest priority need within the scope of this subcommittee has been the preparation of guidance for CE Districts and Divisions to use in identifying, on a regional basis, the major plant associations and communities found in wetlands. Considerable progress was made during the past year; the following guides were published and distributed by WES:

Technical Report Y-78-2, "Preliminary Guide to Wetlands of Peninsula Florida," February 1978.

Technical Report Y-78-3, "Preliminary Guide to Wetlands of Puerto Rico," April 1978.

Technical Report Y-78-4, "Preliminary Guide to Wetlands of the West Coast States," April 1978.

Technical Report Y-78-5, "Preliminary Guide to Wetlands of the Gulf Coastal Plain," May 1978.

Publication of the guides for Alaska (Technical Report Y-78-9) and the South Atlantic States (Technical Report Y-78-7) is expected by the last quarter of FY 79. The guides for the Interior-Great Lakes region and the North Atlantic States are in final draft form and should be published by the end of the 1979 calendar year.

Final reports from all grantees conducting the Community Structure Studies have been received. The final report from the National Ocean Survey was expected by December 1978. Preliminary guidance for determining marsh boundaries will be available for West Coast areas by spring, 1979. In order to facilitate coordination with the CE on their effort, final reports will not be published until after their part of the study is completed.

Due to procurement difficulties, differences in contracting procedures, and other problems, the transition zone studies to be funded by the CE are considerably behind schedule and not in phase with those funded by EPA. However, progress is now being made and the lost time has not been completely without benefit. Through experience gained in the EPA-funded studies and a greater time for planning, the scopes of the presently planned CE studies have been improved and modified in a manner designed to yield more definitive results.

As of July 1978, contract negotiations were in progress for the studies in Peninsular Florida, the Altamaha River Basin (Georgia), Southern Louisiana, and the Missouri River Basin, and proposals were being evaluated for a contract for a study of the Connecticut River Basin. It was expected that all contracts would be awarded by September 1978, field studies accomplished during 1979, and final reports submitted in the spring of 1980.

Related studies under separate funding both by the CE and the EPA (e.g., a wetland study being accomplished by the CE's Vicksburg District) are contributing to the overall goal of development of a methodology for selecting limits of jurisdiction within wetland transition zones. The CE and EPA will continue to work cooperatively toward a final guidance document that will reflect the results of all research in this subject area.

Other activities of the subcommittee in the context of immediate needs have involved consideration of a need for a definition of "headwaters" as related to the jurisdictional limits of the Section 404 program. However, before that phase of the Section 404 program became effective and hence an actual field need developed, PL 92-500 was

amended by Congress, delegating the regulation of those phases of the program involving headwaters to individual states. It is possible, though, that a need will arise for an effort that would assist the agencies and/or the states in determining the location of the jurisdictional limits of the program under Federal control from that under State control.

Long-term needs

The subcommittee has commented previously (see First Annual Report) on the need for longer term research to address certain fundamental aspects of regulatory functions, especially related to wetlands. In part, these relate to jurisdictional aspects (e.g., the relative functional values of different wetland types), but they also include needs related to wetlands impacts, development, and mapping procedures. In all cases, there are specific definable needs not presently being pursued in a comprehensive manner by any agency under any program. They are also needs that would require considerable funding over a 5-year or longer period for meaningful results to accrue.

It is recognized that appreciable impetus will have to be generated in some manner and much planning and coordination accomplished before a major program can be authorized and implemented. However, during the past year, several steps were taken in a positive direction. One of these involved the establishment of an informal CE/EPA interagency committee designated the Wetlands Research Coordinating Committee. This committee will serve specifically to identify needs, coordinate ongoing and proposed research, and recommend research to fill agency information gaps. Membership of the committee, to include both technical and policy representation, has not been finalized nor has the method of liaison with the EPA/CE Technical Committee been established.

A second step was the establishment of a National Wetlands Technical Council consisting primarily of representatives of the academic community and including a number of nationally prominent wetland researchers. The objective of the council is to determine national research priorities for wetland studies and both the CE and EPA are pursuing coordination with the council to ensure that the needs of both agencies are known and understood.

Contaminants Subcommittee

Immediate needs

The highest priority need as presented in the First Annual Report of this subcommittee was the development of a Sampling, Analytical, and Interpretative Manual for the PL 92-500 dredged and fill material regulatory program. Through joint EPA/CE funding, the WES and the Grosse Ile laboratories provided a grant to Dr. Robert Sweeney of the Great Lakes Laboratory, State University of New York at Buffalo, to accomplish this task. The manual is to be completed in two volumes, one each year, over a 2-year period at an equally shared funding level of \$200K. Completion of the project is scheduled for August 1979.

A high priority need that has evolved since the last report has been the development of a "Procedural Guide for Designation and Assessment Surveys of Ocean Sites for Dredged Material Disposal." The formal designation of specific ocean disposal sites developed through a thorough physical, biological, and chemical assessment is a requirement of PL 92-532 and the International Ocean Dumping Convention and must be carried out in order to retain use of a specific ocean disposal site. A request for proposals has been advertised for this document, with a completion date of March 1979. This guide will be a field manual for the conduct of specific surveys required by the ocean disposal criteria (January 11, 1977, Federal Register) and will not duplicate the sampling and analytical manual being developed by WES and the Great Lakes Laboratory.

Future planning in this area should emphasize completion of the manuals within the projected time frame. Expanded regulatory requirements will be forthcoming by early FY 79 as the PL 92-500 Section 404(b) Dredged and Fill Material Guidelines are updated by EPA and CE and these changes will be immediately factored into research planning and coordination. The expected changes will include increased emphasis on toxic substances (Section 307(a) of PL 92-500) in dredged and fill material and development of a leaching test for fill material. The new guidelines will also place greater emphasis on fill operations in wetlands

and aquatic systems, with reference to chemical and biological effects. Consequently, the efforts of this subcommittee will include a thorough assessment of chemical/water interaction of fill material contaminated by Section 307(a) toxic substances.

Long-term needs

This research area places special emphasis on sediment-soil-fill/water interactions as they affect wetlands and aquatic systems impacted by dredged and fill activities. In order to fully understand these interactions, the mechanisms and kinetics governing the resultant effects need to be investigated. Studies were initiated during this reporting period to evaluate the magnitude of the uptake of toxic metals by plants grown on contaminated and noncontaminated material under wetland and terrestrial conditions to determine and develop predictive methods or models to apply to a wide range of fill/dredged material conditions. Chemical extraction techniques are also being evaluated as a predictive tool to project the uptake potential from dredged and fill material of metals. These investigations, being conducted at WES, are two thirds completed. Initial results indicate that certain chemical extractants can be used to predict biological availability of toxic metals in dredged and fill material with respect to marsh and terrestrial plant uptake.

Future research will consider the fate of persistent organics in dredged or fill material placed in aquatic, wetlands, or terrestrial systems. These studies will investigate the potential for chemical interactions and mobilization of Section 307(a) substances when toxic and/or highly contaminated dredged material is placed in an upland dike containment area. Future work will also emphasize the constraints imposed by the Solid Waste Management Act of 1976 that has pollution control in terrestrial systems as its primary goal.

Physical Impacts Subcommittee

The studies listed under this subcommittee in the tabulation of ongoing EPA and CE research programs in Part V were completed. The literature review conducted by the University of Wisconsin indicated that turbidity generated by dredging and disposal operations is generally more of an aesthetic than ecological problem. The study conducted by the Bodega Bay Marine Institute substantiated the conclusion drawn from the literature review. It was found that the tolerance level of a wide variety of organisms to direct effects of suspended solids exceeds conditions created in the water column by most dredging and disposal operations. The University of Delaware study showed that the vertical migration ability of benthos is maximized when dredged material placed in an area is similar to the existing material. The field studies, in general, verified the findings of the aforementioned literature review and laboratory studies. Habitat development studies indicated that under some conditions marshes will recover when covered with dredged material.

Data and models developed for DMRP Tasks 1B and 6C (Movements of Dredged Material and Turbidity Prediction and Control, respectively) can be used to predict the fate of dredged material disposed of through open-water disposal. Techniques are available to predict the general physical changes caused by open-water discharge of dredged material and perhaps some types of fill material. Chemical effects can also be predicted based on the composition of the sediment and interstitial water and literature test results.

Immediate needs

Existing data and models developed for the DMRP can be used to predict the general physical changes caused by open-water discharges of dredged material and perhaps some types of fill material. Chemical effects can also be predicted based on the composition of the sediment and interstitial water and elutriate test results. Since biological effects are not easily predicted, immediate research should focus primarily on the benthic community and its response to the physical impacts of disposal operations.

Long-term needs

The subcommittee recommends two areas that should be investigated. The first is to develop methods to predict the direct physical impact and secondary chemical and biological impacts associated with discharge of fill material. Prediction methods could permit the investigation of techniques for recognizing the physical impacts of fill operations and the definition of the nature and magnitude of fill operations to evaluate the related biological and chemical interactions.

The second area of needs involves development of methods to predict how changing bottom topography and depth from dredge or fill operations alters circulation patterns. Methods would be developed to predict the extent and depth of coverage resulting from open-water disposal of fill material. Also, methods of predicting changes and nature of surface sediment would be developed. Knowing the coverage and expected changes would allow prediction of the associated circulation patterns.

Mixing Zone Subcommittee

Since publication of the first committee report, subcommittee members have been involved in both short-term and long-range activities related to the development of guidance on the mixing zone concept. During this period, subcommittee members assisted with development of the section, "Estimation of Initial Mixing," of the Implementation Manual for Section 103 of PL 92-532, "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters," published jointly by the EPA and the CE in July 1977. Intermittent consultation has also been provided relative to the proposed revision of the criteria for Section 404 of PL 92-500. Only limited additional effort has been directed toward drafting of narrative guidance to assist in evaluation of the acceptability of the mixing zone associated with specific disposal operations, but it is anticipated that this material will be useful in developing the Implementation Manual for Section 404.

Immediate needs

Subcommittee members also have been conducting or managing studies that will provide information useful for future improvements to mixing

zone guidance. These efforts have been sponsored by the DMRP and relate to the longer term research priorities listed in the First Annual Report. One study involved an evaluation of predictive models developed earlier by Tetra Tech, Inc., for determining the short-term physical fate of disposed materials. After some corrections and improvements during this study, the models now provide useful qualitative information concerning open-water dredged material disposal operations. More extensive field information is needed to improve the knowledge of required coefficients before quantitative predictions can be obtained from the models. The DMRP-sponsored work has been completed and is reported in "Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data," Technical Report D-78-77, by B. H. Johnson and B. W. Holliday.

Long-term needs

A second study relates to the development of an improved capability for predicting the longer term distribution of dredged material deposited at a given disposal site. This work is directed toward evaluation and further development of the sediment transport models developed under DMRP sponsorship by Dr. Ray Krone and associates at the University of California, Davis. The models are being modified and improved to expand their capability and adapt them for use on project-related studies. No formal report is planned on the DMRP-funded work, which has been completed, since work is continuing on the models under project sponsorship. The improved models will be more formally documented when the current model generalization work is completed. Project applications also are scheduled in the immediate future.

Fill Material Subcommittee

A rigorous analysis of all pertinent literature related to the discharge of fill material falling under the jurisdiction of PL 92-500 was conducted by the University of Oklahoma under contract to WES. The information was published as Technical Report D-77-29, "An Assessment of Problems Associated with Evaluating the Physical, Chemical, and Biological Impacts of Discharging Fill Material," by L. W. Carter et al.,

December 1977. The literature analysis, personal and telephone interviews, case studies, and workshop discussion undertaken as part of the contract disclosed a great deal of information about fill material. According to this study, however, such information has been generated to satisfy isolated requirements concerning fill material and fails to lend itself to a comprehensive treatment of the fill discharge problem. A major contribution of this study is the delineation of technical information deficiencies. The ranking of the identified technical problems and needs by the contract specialist is presented as follows, in decreasing order of priority:

- a. There is a need for extensive studies related to prediction and assessment of the impacts of fill material discharge on the physical, chemical, and biological environments. Included herein are technical needs for impact identification, quantification, and predictive modeling.
- b. There is a need for research on various construction techniques which could be utilized to minimize the impact of fill material discharge. Included should be studies of the response of various materials once they are placed in a fill.
- c. Additional research is needed to identify control measures for minimizing impacts, as well as to develop monitoring methods for evaluating these control measures.
- d. There is a need for research to verify predicted impacts. This would include long-term monitoring of water quality in the vicinity of fill discharges, as well as possible adjustment of predictive methodologies.
- e. Since many of the impacts from fill material discharge are related to chemical interactions and effects, there is a need for basic research on many chemical processes which occur within the aquatic environment.
- f. Since additional impacts from fill material discharge are related to biological interactions and effects, there is a need for basic research on many biological processes which occur within the aquatic environment.
- g. Due to the extensive research program conducted for dredged material, there is a need for information on the applicability of these research findings to the general problem of prediction and assessment of the impacts from fill material discharge.
- h. There is a need for basic information and definition associated with wetlands, as well as characterization of numerous types of fill material.

- i. There is a need for a definitive study on the current magnitude of fill discharge operations, the uses of filled areas, and the types of fill materials involved. This information also needs to be projected into the future in order to ascertain the long-term concerns.

The technical complexities relating to discharge of fill material are further complicated by different legislative requirements that may be interpreted in ways that result in overlapping responsibilities of Government agencies. For instance, the discharge of municipal solid waste as fill in wetlands and tidal flats could conceivably be controlled, in part, by the Resources Conservation and Recovery Act PL 94-580, Section 402 of PL 92-500, and Section 404 of PL 92-500. Intra-agency and interagency examination of policy alternatives has been underway during the past year. The outcome of such policy deliberations will have a direct bearing on research requirements and support for discharge of contaminated fill material originating on land.

PART VII: GOALS

The EPA and the CE will continue to work together toward the development of revised Section 404 guidelines. It is recommended that the two agencies continue, through the Technical Committee, to work toward the development and promulgation of implementation manuals required by legislation and by subsequent guidelines.

The Technical Committee will continue to monitor the use of the EPA/CE Ocean Dumping Implementation Manual and, based on the problems which arise, plan to revise the manual as appropriate.

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Environmental Protection Agency/Corps of Engineers
Technical Committee on Criteria for Dredged and
Fill Material.
Activity report. 1979-

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Springfield, Va. : available from National Technical
Information Service, 1979-
nos. 27 cm.

1979- R. M. Engler, F. G. Wilkes, Cochairmen.

1. Dredged material. 2. Dredged material disposal. 3. Environ-
mental effects. 4. Fills. 5. Waste disposal sites. I. Engler,
Robert M. II. Wilkes, F. G. III. United States. Army. Corps
of Engineers. IV. United States. Waterways Experiment Station,
Vicksburg, Miss.
TC187 E6a 1979