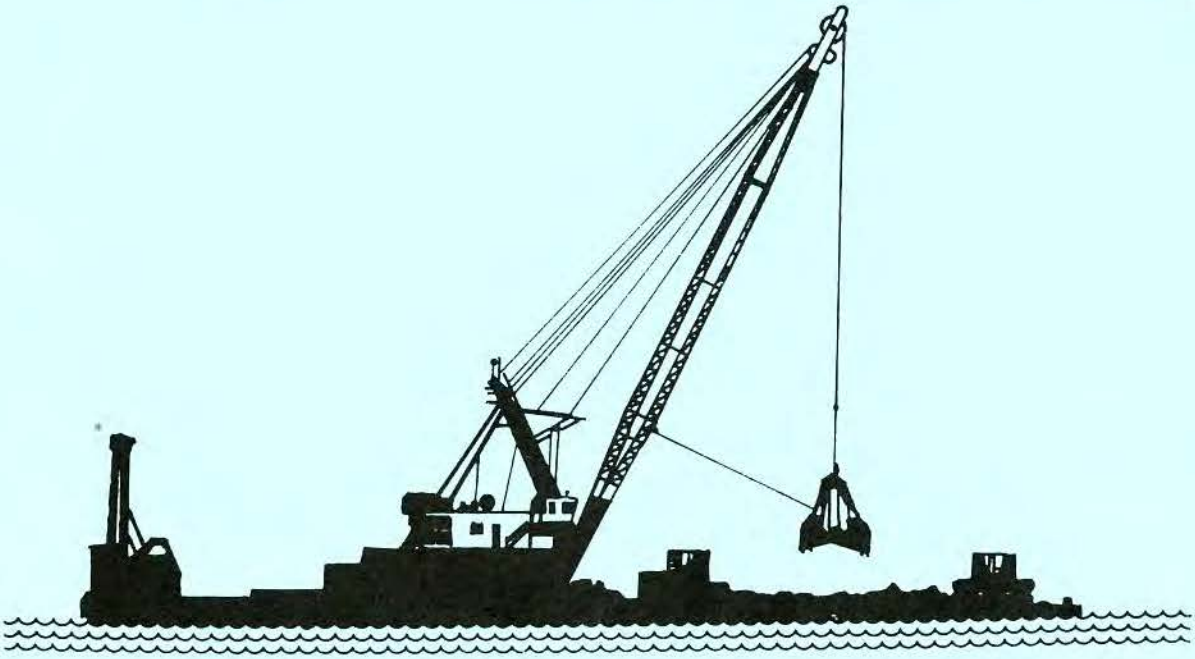
US Army Corps
of Engineers
Seattle District

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

DREDGED MATERIAL EVALUATION PROCEDURES AND DISPOSAL SITE MANAGEMENT MANUAL

Grays Harbor and Willapa Bay, Washington



June 1995

EPA
Region 10

WASHINGTON STATE DEPARTMENT OF
Natural Resources

DREDGED MATERIAL EVALUATION PROCEDURES AND DISPOSAL SITE MANAGEMENT MANUAL

Grays Harbor and Willapa Bay, Washington

U.S. Army Corps of Engineers, Seattle District
U.S. Environmental Protection Agency, Region 10
Washington Department of Natural Resources
Washington Department of Ecology

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DREDGED MATERIAL EVALUATION PROCEDURES
AND
DISPOSAL SITE MANAGEMENT MANUAL

Grays Harbor and Willapa Bay, Washington

The program established by this manual becomes effective upon signature by the four agency heads. Each agency will carry out its roles and responsibilities for program implementation under existing authorities. Programmatic changes will be made in conjunction with an annual review process, with all plan changes subject to the approval of the four agencies.

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EXECUTIVE SUMMARY

This manual addresses (1) the development of comprehensive evaluation procedures governing sampling, sediment testing, test interpretation (disposal guidelines) for determining the suitability of dredged material primarily for unconfined, open-water disposal and (2) the formulation of a dredged material disposal site management plan that will ensure adequate controls and public accountability for disposal of material at designated multiuser estuarine and ocean dredged material disposal sites at Grays Harbor and Willapa Bay, Washington. The manual has been developed pursuant to the Clean Water Act of 1977 (Public Law 92-500), as amended, and the Marine Protection, Research, and Sanctuaries Act of 1972 (Public Law 92-532), as amended.

The Grays Harbor and Willapa Bay Dredged Disposal Analysis Study has been a Federal-State cooperative effort between four principal agencies: U.S. Army Corps of Engineers, Seattle District (Corps); U.S. Environmental Protection Agency, Region 10 (EPA); Washington Department of Ecology (Ecology); and Washington Department of Natural Resources (DNR). A review and synthesis of studies conducted, information gathered and reviewed, and analyses performed during development of the evaluation procedures and the disposal site management plans is provided in this manual. The manual is comprised of four parts:

- Part I - Background and Program Development
- Part II - Evaluation Procedures
- Part III - Disposal Site Management
- Part IV - References

The goal of the study was to provide the basis for publicly acceptable guidelines governing environmentally safe unconfined, open-water disposal of dredged material at existing estuarine and ocean disposal sites, thereby improving consistency and predictability in dredged material management. The establishment of evaluation procedures is necessary to ensure continued operation and maintenance of both federal and non-federal navigation features at Grays Harbor and Willapa Bay, to minimize delays in scheduled maintenance dredging, and to reduce uncertainties in regulatory activities. The objectives of the program are as follows:

- To define consistent and objective evaluation procedures for the dredged material being considered for disposal at existing estuarine and ocean unconfined, open-water disposal sites.
- To document appropriate disposal site use management considerations, including environmental monitoring, that define a management strategy to ensure continued operation of the existing unconfined, open-water disposal sites.

- To ensure that evaluation procedures and disposal site use management plans are consistent with existing applicable Federal and State laws and regulations, including mechanisms for periodic review and updating of program elements.

Cost effective disposal of dredged material is essential to the economic interests of the Grays Harbor and Willapa Bay region. Periodic dredging, including maintenance dredging of the Federal navigation channels at Grays Harbor and Willapa Bay, is necessary to maintain navigability. For dredged material without significant levels of chemicals of concern, disposal at unconfined, open-water sites is generally the least costly alternative. As upland and nearshore areas are difficult to secure, use of unconfined, open-water disposal will continue. The dredged material evaluation procedures will be the basis for deciding what materials will continue to be acceptable for unconfined, open-water disposal at designated estuarine and ocean disposal sites.

Responsibilities of each of the regulatory agencies under Sections 401 and 404 of the Clean Water Act (CWA), and Sections 102 and 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA), will be fulfilled in accordance with each agency's authorities and policies. The Grays Harbor and Willapa Bay program will be cooperatively implemented through the regulatory process and will be applied by each regulatory agency consistent with applicable authorities and policies. The dredged material evaluation procedures and disposal site management plans provide the basis for an overall approach which can meet the case-by-case requirements of CWA Section 401 and Section 404 and MPRSA Section 102 and Section 103. Most elements of this program are common to these authorities.

Recurring program reviews of the evaluation procedures and disposal site management plans will be conducted by the Corps, EPA, Ecology, and DNR. Program reviews will be conducted in conjunction with the annual review of the Puget Sound Dredged Disposal Analysis (PSDDA) program, a similar program established for the Puget Sound, Washington, region.

DREDGED MATERIAL EVALUATION PROCEDURES AND DISPOSAL SITE MANAGEMENT MANUAL

Grays Harbor and Willapa Bay, Washington

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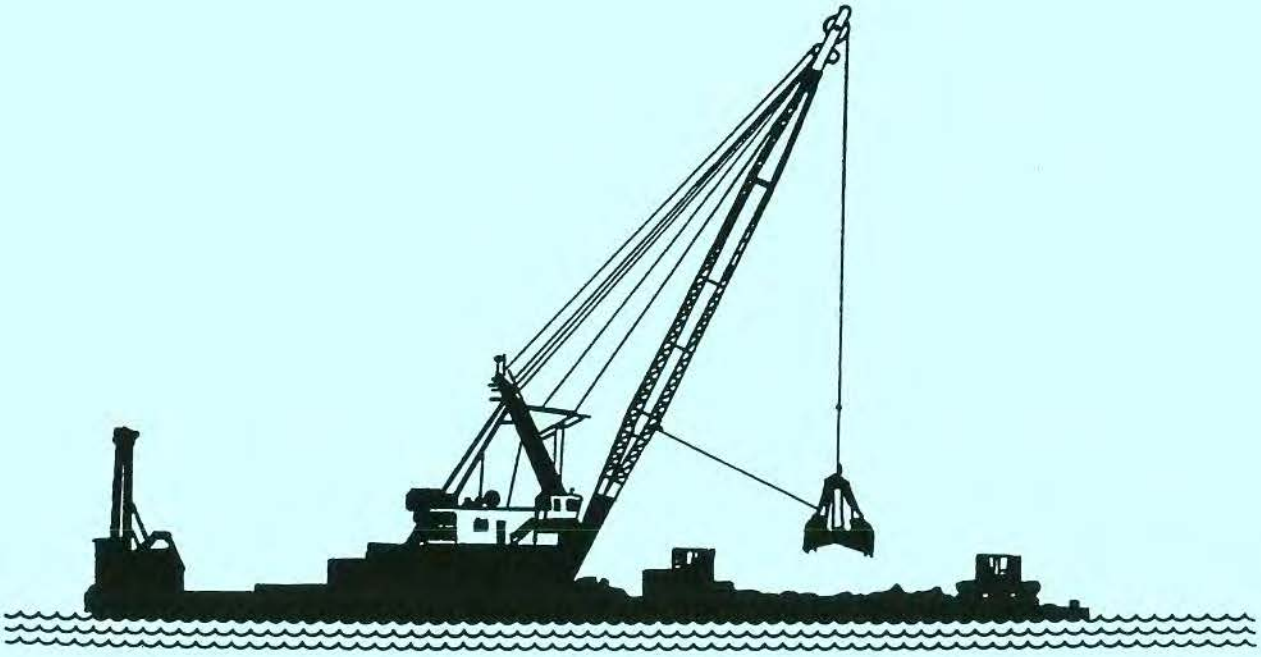
PART I

BACKGROUND AND PROGRAM DEVELOPMENT



CHAPTER 1
STUDY GOALS, DESCRIPTION, AND ORGANIZATION

1.1 INTRODUCTION.

This manual addresses (1) the development of comprehensive evaluation procedures governing sampling, sediment testing, test interpretation (disposal guidelines) for determining the suitability of dredged material primarily for unconfined, open-water disposal and (2) the formulation of a dredged material disposal site management plan that will ensure adequate controls and public accountability for disposal of material at designated public, multiuser estuarine and ocean dredged material disposal sites at Grays Harbor and Willapa Bay. This manual has been developed pursuant to the Clean Water Act of 1977 (Public Law 92-500), as amended, and the Marine Protection, Research, and Sanctuaries Act of 1972 (Public Law 92-532), as amended.

The **Evaluation Procedures** (Part II of this document), and the **Disposal Site Management Plan** (Part III of this document), are the result of the Grays Harbor and Willapa Bay Dredged Disposal Analysis Study. The study has been a Federal-State cooperative effort between the U.S. Army Corps of Engineers, Environmental Protection Agency, Washington Department of Ecology and Washington Department of Natural Resources to establish evaluation procedures for dredged material proposed for unconfined, open-water disposal at either public, multiuser estuarine or ocean disposal sites located at Grays Harbor and Willapa Bay. The study also established management standards and site use requirements applicable to multi-user aquatic disposal sites at Grays Harbor and Willapa Bay. A review and synthesis of studies conducted, information gathered and reviewed, and analyses performed during development of the evaluation procedures and the disposal site management plan is provided in this document.

Dredging is necessary to maintain waterways and harbors used for waterborne commerce and water-related industry shipping, and for new port and marina construction at Grays Harbor and Willapa Bay. In addition to federal navigation project-related dredging which is performed by the Corps of Engineers, a number of ports, maritime industries, and private interests perform dredging and dredged material disposal in these areas. Commercial navigation and recreational boating are important factors to the economic well-being of the Grays Harbor and Willapa Bay areas (see Figure 1-1). Dredging is necessary to keep shipping channels, harbors, berthing areas, and moorage basins open; and to construct new channels related to navigation facilities. Consequently, dredging in Grays Harbor and Willapa Bay has been a commonplace activity historically and is an ongoing necessity for the foreseeable future.

Five basic dredged material disposal options are possible. These include: unconfined, open-water; unconfined upland/nearshore; confined aquatic; confined nearshore; and confined upland. Of these options, the study focused primarily on unconfined, open-water disposal of materials dredged from Federal and non-Federal navigation projects. Unconfined, open-water

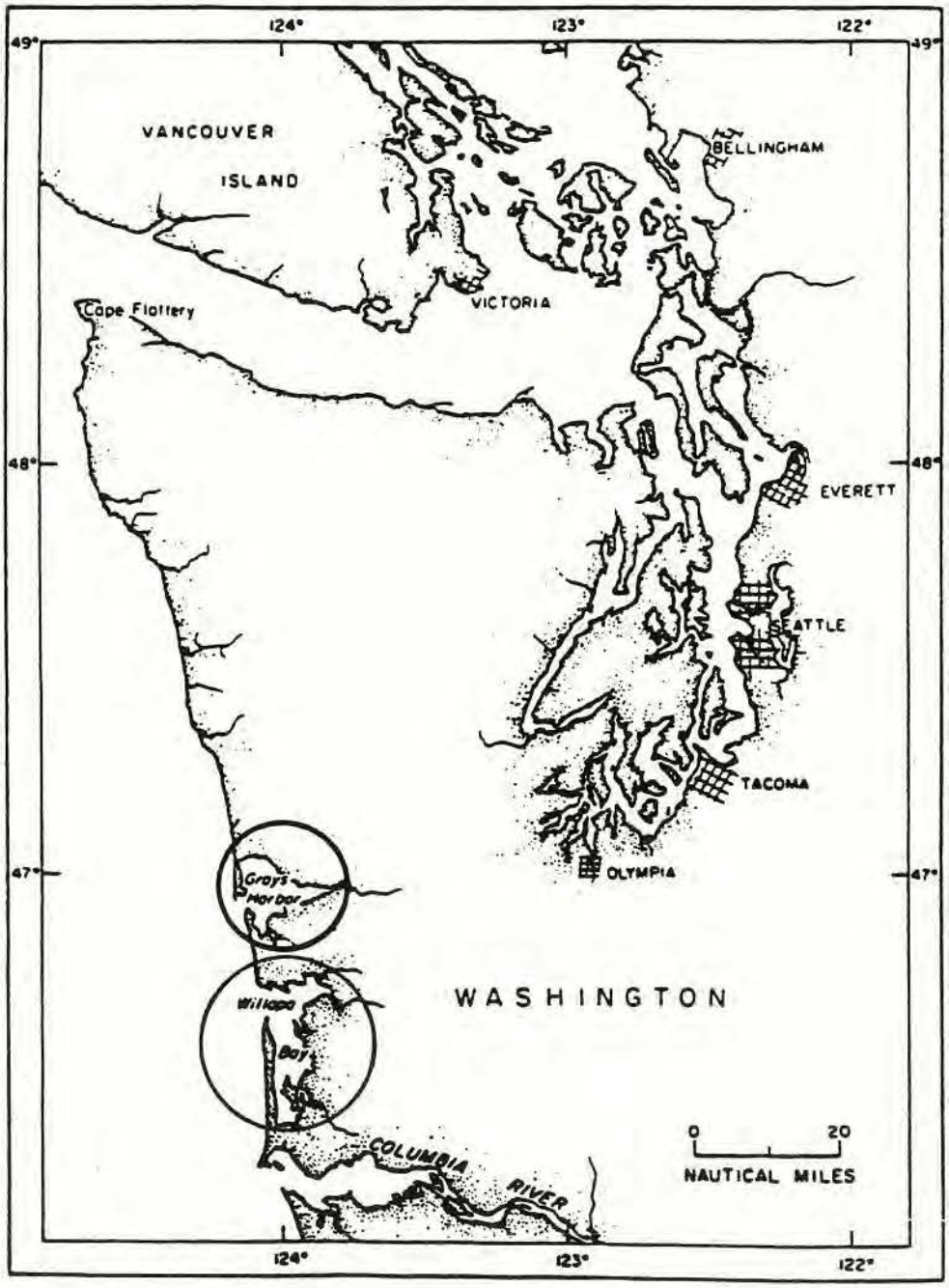


FIGURE 1-1
STUDY AREA

disposal occurs when material is allowed to free fall from barges or hoppers to the bottom. Open-water disposal sites are sited in areas which minimize conflicts with other aquatic land uses.

Cost effective disposal of dredged material is essential to the economy of the Grays Harbor and Willapa Bay region. Periodic dredging, including maintenance dredging of the Federal navigation channels at Grays Harbor and Willapa Bay, is necessary to maintain navigability. For relatively clean dredged material, without significant levels of chemicals of concern, disposal at unconfined, open-water sites is often the least costly and most convenient alternative. Beneficial uses of the material, including erosion control and use as fill material, are an attractive, if somewhat more expensive, option for disposal. The dredged material evaluation procedures (refer to Part II of this document) will be the basis for determining what materials will continue to be acceptable for unconfined, open-water disposal at designated estuarine and ocean disposal sites, all of which are dispersive in nature, and/or beneficial uses (refer to Part III of this document for disposal site management plan).

In May 1994, the Corps, EPA Region 10, Ecology and DNR, together with the Puget Sound Water Quality Authority, signed an interagency/intergovernmental agreement to establish a program to address a number of sediment management issues which extend beyond the immediate parameters of this study (IAG, 1994). Specific implementing actions that the agencies will pursue include development of a strategy for cleanup of contaminated sediments, development of an action plan for multiuser confined disposal sites, and definition of policies for beneficial use of dredged material. As these initiatives are completed, they will be incorporated into the the framework of the Grays Harbor and Willapa Bay Dredged Disposal Analysis program through the annual review program described in Paragraph 4.3 of this manual.

1.2 GRAYS HARBOR AND WILLAPA BAY DREDGED DISPOSAL ANALYSIS STUDY.

The Grays Harbor and Willapa Bay Dredged Disposal Analysis is a cooperative interagency/intergovernmental program established by the Seattle District, U.S. Army Corps of Engineers (Corps); Region 10, U.S. Environmental Protection Agency (EPA); Washington Department of Ecology (Ecology); and Washington Department of Natural Resources (DNR) as principal agencies. These four agencies have regulatory and proprietary responsibilities for dredged material evaluation and disposal in the state of Washington. The goal of the program is to provide the basis for publicly acceptable guidelines governing environmentally safe unconfined, open-water disposal of dredged material at existing public, multiuser estuarine and ocean disposal sites, thereby improving consistency and predictability in dredged material management. The establishment of evaluation procedures is necessary to ensure continued operation and maintenance of navigation facilities at Grays Harbor and Willapa Bay, to minimize delays in scheduled maintenance dredging, and to reduce uncertainties in regulatory activities.

The program itself represents an expansion toward a broader dredged material management program throughout the State of Washington. The studies undertaken and used in development of the program were geographically based in Grays Harbor and Willapa Bay. However, the program approach is derived from, and inspired by, similar regional programs, including the successful Puget Sound Dredged Disposal Analysis (PSDDA) program for the Puget Sound region of the state of Washington (briefly described in Paragraph 3.3).

Objectives of the Grays Harbor/Willapa Bay program are as follows:

- To define consistent and objective evaluation procedures for the dredged material being considered for disposal at existing estuarine and ocean unconfined, open-water disposal sites.

- To document appropriate disposal site use management considerations, including environmental monitoring, that define a management strategy to ensure continued operation of the existing unconfined, open-water disposal sites.

- To ensure that evaluation procedures and disposal site use management plans are consistent with existing applicable Federal and State laws and regulations, including mechanisms for periodic review and updating of program elements.

Study organization included a Policy Review Committee (PRC), a Technical Steering Committee (TSC), Study Manager, and two work groups.

a. <u>Policy Review Committee</u>. The PRC is chaired by the Corps and is comprised of the EPA Region 10 Administrator, the Corps' Seattle District Engineer, the Director of Ecology, and the DNR's Commissioner of Public Lands. The PRC's purpose is to provide periodic review of study progress, provide advice and policy guidance to the Technical Steering Committee and resolve conflicts which are not resolvable by the Technical Steering Committee, such that all four participating agencies are in agreement with the study products.

b. <u>Technical Steering Committee</u>. The TSC is chaired by the Corps and includes a senior staff representative from EPA Region 10, the Corps, Ecology, and DNR as full, voting members. Representatives from other agencies, Indian tribes, ports, interest groups, and individuals were invited and did participate in meetings. The purpose of the TSC was to provide study oversight and review of progress and products, advise the PRC, and assist in conflict resolution among participants.

c. <u>Study Management</u>. The Corps was responsible for day-to-day study management and administration, providing oversight of the study with close review of products and progress, advising the TSC, and coordinating work group activities.

d. Work Groups. Two work groups were formed to perform the study. The Evaluation Procedures Work Group (EPWG) was responsible for development of procedures and guidelines for assessing the quality of dredged material and delineating which materials are acceptable for unconfined, open-water disposal. The Management Plan Work Group (MPWG) was assigned responsibility for development of a management plan for each of the existing, designated estuary and ocean disposal sites at Grays Harbor and Willapa Bay. Technical staffs from each of the four principal agencies served on each work group. Many other parties, including representatives of the Port of Grays Harbor, Port of Peninsula, Port of Willapa Harbor, Washington Public Ports Association, Indian tribes, local governments, and other State of Washington and Federal agencies also participated in the work group activities. Working under the general guidance of the Study Manager, each work group used technical support from agencies and contractors to conduct studies and analyses needed to develop the dredged material management plan.

1.3 EVALUATION PROCEDURES WORK GROUP.

The objective of EPWG was to establish chemical and biological evaluation procedures as a basis for suitability determinations primarily related to unconfined, open-water disposal of dredged material in an environmentally safe manner by avoiding unacceptable adverse effects to human health and the environment. In achieving this goal, several important issues had to be addressed:

- ✓ What chemical and/or biological tests should be used to evaluate sediments?
- ✓ How should these tests be interpreted?
- ✓ What level of sediment chemical effects on biological resources should be considered acceptable?

Of paramount importance to EPWG was the necessity to take into full consideration all pertinent State and Federal laws, regulations, and guidance, including other regional dredged material management programs such as the Puget Sound Dredged Disposal Analysis (PSDDA) program. In doing so, EPWG attempted to identify the most reliable, recognized and cost effective sampling and analysis procedures for appropriately characterizing dredged material, and to incorporate these procedures into this document for application to both Grays Harbor and Willapa Bay. Chemical and biological tests and interpretation guidelines were developed for assessing the acceptability of dredged material for unconfined, open-water disposal. Application of these tests and guidelines will also provide preliminary information on the need for other disposal or management options, such as confined aquatic, nearshore, or upland disposal.

1.4 MANAGEMENT PLAN WORK GROUP.

The objective of MPWG was to formulate coordinated dredged material disposal site management plans for the existing, designated estuarine and ocean disposal sites at Grays Harbor and Willapa Bay. MPWG utilized the results of EPWG's deliberations regarding reference area sediments and evaluation procedures and guidelines to formulate appropriate disposal site management criteria to define a management strategy to ensure continued operation of the disposal sites. Disposal site management framework is presented in Part IV of the document.

1.5 EVALUATION PROCEDURES CONCEPTS.

Evaluation procedures comprise the sampling requirements, tests, and guidelines for test interpretation (i.e., "disposal guidelines") that are to be used in assessing the quality of dredged material and its acceptability for disposal. Evaluation procedures identify whether unacceptable adverse effects on biological resources or human health might result from dredged material disposal. A regulatory decision on acceptability of material for disposal is determined from the test results.

As previously noted, this document primarily addresses open-water disposal issues. However, the broad concept of evaluation goes beyond open-water disposal to include such alternatives as upland, nearshore, and confined aquatic disposal. Depending on the circumstances, these disposal options may be characterized as beneficial uses of dredged material, as well. From a regional perspective, we have relied upon open-water disposal to a considerable extent, particularly in recent years. This is due, in part, to a collective desire to avoid or minimize wetland filling. With few exceptions, sediments in the region have been deemed suitable for unconfined, open-water disposal. It is recognized that evaluation procedures applicable to upland, nearshore, and confined disposal, particularly as relates to contaminated sediments, need to be established. The neccessity for doing so is recognized and efforts are underway to set these procedures in place.

Dredged material containing high chemical concentrations that may result in unacceptable adverse effects must be placed in a confined disposal site (i.e., aquatic, upland, or nearshore). Likely effects are determined by conducting chemical and biological tests on the sediment prior to dredging. Material that is found to be unacceptable for unconfined, open-water disposal may or may not be acceptable for conventional upland/nearshore disposal, because of differing behavior of chemicals in upland and nearshore disposal environments. As a result, testing for disposal at upland and nearshore sites will differ from that for disposal in water, and test results for one environment are not directly transferable to the other.

There is no single best option when confined disposal is required. Although all options may be feasible, not all confined disposal options may be available to every dredging project. Additionally, confined disposal decisions will often revolve around the advantages and disadvantages of specific sites (e.g., proximity to resources). Besides availability and siting, the issues of cost and of the necessary degree of chemical isolation must be considered.

1.6 CRITICAL CHARACTERISTICS OF EVALUATION PROCEDURES.

Evaluation procedures comprise the complete process of dredged material assessment and incorporate a range of scientific and administrative factors. Beyond the decision to base dredged material evaluation on avoiding unacceptable adverse biological effects, effective evaluation procedures should also have certain characteristics. The following ten characteristics were used as standards for the development of the evaluation procedures:

- **Accountable** - The need for, and cost implications of, evaluation procedures must be justifiable to the individual permittee and to the public.

- **Flexible** - Evaluation procedures must be flexible enough to allow for variability in project and site-specific concerns and be adaptable to projects of any size.

- **Consistent** - Evaluation procedures must be able to be applied on a uniform basis regardless of project or site variability.

- **Cost Effective** - Evaluation procedures must be cost effective.

- **Objective** - Evaluation procedures must be clearly stated and logical, and must be able to be applied in an objective manner.

- **Revisable** - Evaluation procedures must be based upon best available information and must be revised to incorporate new information and management decisions.

- **Understandable** - Evaluation procedures must not be unnecessarily cumbersome or convoluted.

- **Technically Adequate** - Evaluation procedures must be adequate to make appropriate decisions concerning project dredging and disposal, including the capability to address the effects of chemicals of concern after dredged material is placed at the disposal site.

- **Timely** - Evaluation procedures must be designed and implemented to minimize processing time.

- **Verifiable** - To judge effectiveness, the implementation of the evaluation procedures must be verifiable by means of monitoring at the disposal sites.

a. <u>The Need for Consistency in Dredged Material Evaluation</u>. Regulatory consistency is important to the regulated community, demanded by local government agencies, and needed to obtain public acceptance. Though consistent and "objective" evaluation procedures may somewhat reduce flexibility and reliance on best professional judgement, they achieve agreement among the various regulatory agencies and allow the transfer of knowledge as staffs change. The approach used was to compile the consensus "best judgement" of professionals currently involved in dredged material management in the State of Washington and nationally and build this judgement into the procedures and guidelines presented in this manual.

b. <u>The Need for Flexibility in Application of Evaluation Procedures</u>. Although consistency is an important objective, EPWG recognized that flexibility must be maintained in the way the evaluation procedures and disposal guidelines are applied. When project-specific technical indications warrant, suitability determinations which deviate from those indicated by the guidelines presented in this manual may be made. Any such deviations will be based on best professional judgement and will be properly documented. The evaluation procedures will be applied and considered on a project-specific basis. Such management by exception will only be applied where it is in accordance with applicable federal and/or state law and regulations. In developing procedures for use everywhere in Grays Harbor and Willapa Bay, it was not possible to consider all individual project technical factors, or assess all the possible outcomes that might arise from the test results. Consequently, professional judgement is essential in reaching project-specific decisions. The evaluation procedures (including the disposal guidelines) require full consideration of all pertinent project factors. Flexibility will be provided "by exception." The guidelines are expected to apply in the majority of cases. Rather than integrating flexibility into the guideline statements (by showing ranges of values, or by using terms such as "may do"), "exceptions" to the guidelines are allowed with appropriate technical rationale and documentation, when such rationale warrants a different conclusion. A consensus between the Corps/EPA/Ecology/DNR will be required for use of this management by exception approach. Further, this exception approach will only be used where applicable federal and/or state law does not otherwise preclude its application.

A good example of how flexibility enters into the decision making process using evaluation procedures is the use of statistics and professional judgement in data interpretation. Statistics are primarily applied in the initial data analysis stage of the disposal guidelines. Statistical significance is used to determine if observed differences are "potentially real" when natural variability of the parameters being measured is considered. Ultimate data interpretation requires judgement on the part of a professional who is intimately familiar with the testing procedures, the project specifics, and the initial data analysis conclusions.

Analysis of data consists of a comparison to guideline values that are developed using statistical significance as a clear indicator of toxicity. However, ecological significance cannot be determined by this process. Determination of ecological significance requires both an understanding of the data and evaluation procedures, and evaluation of those test results based on best professional judgement. In addition to data analysis and interpretation, decisions on the acceptability of material for unconfined, open-water disposal may be further influenced by administrative considerations of factors such as magnitude of the proposed discharge, the degree of environmental risk that the discharge may present, and other project-specific features.

The full meaning of "statistical significance" was purposely not detailed in the guidelines. This provides some of the necessary flexibility to consider statistical confidence and magnitude of the apparent toxic response in interpreting whether test results indicate potential ecological significance.

1.7 STUDY PARTICIPANTS AND PUBLIC INVOLVEMENT.

a. Study Participants. As noted above in Section 1.1, a wide variety of interests participated in the scoping and conduct of the study. Representatives of the Corps' Seattle District, EPA Region 10, Ecology, and DNR met as necessary to coordinate the work group activities. Active participation by affected users was also obtained at the meetings via representatives of the ports, maritime industries, and other navigation project users. In addition, a number of federal, state and local agencies, Indian tribes, and special interest groups have participated in the study (Table 1-1). This participation has helped to ensure that the program reflects a balance of all appropriate views.

b. Public Involvement. With the exception of budgeting meetings, all TSC and EPWG meetings were open to the public. Working meetings, where technical staffs from one or more of the four principal agencies convened to research and write portions of the evaluation procedures, were not considered EPWG meetings and, consequently, were not announced formally to the public. TSC and EPWG meetings were held either at the Corps' Seattle office or in Olympia at either Ecology's Sediment Management Unit office or DNR's Division of Aquatic Lands office, on a rotational basis. The draft manual was distributed for public review and comment on July 6, 1994. Comment letters received from the public were carefully considered during preparation of the final document.

The following three public involvement objectives were established in order to ensure that the public was informed, that the public had an opportunity to play a meaningful role in the study process, and that issues of concern to the public were properly addressed:

- To adequately inform the public during the study of its scope, objectives, and procedures.

TABLE 1-1
PRINCIPAL STUDY PARTICIPANTS

AGENCY	REPRESENTATIVE
U.S Army Corps of Engineers, Seattle District	David Kendall, Ph.D. David Fox Steven Babcock Patrick Cagney Stephanie Stirling Frank Urabeck Lauran Cole-Warner John Wakeman Robert Parker Alex Sumeri Hiram Arden
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Washington Department of Ecology	Tom Elwell Russ McMillan Maria Peeler Keith Phillips Rick Vining Mike Palko
Washington Department of Natural Resources	Philip Hertzog Gene Revelas Desiree Turner Betsy Striplin David Jamison, Ph.D. Anne Morgan
Washington Public Ports Association (WPPA)	Eric Johnson
Port of Grays Harbor	Cliff Muller, Tom Evans Eric Johnson (WPPA)
Port of Peninsula	Eric Johnson (WPPA)
Port of Willapa Harbor	Eric Johnson (WPPA)
National Marine Fisheries Service	David Miller
U.S. Fish and Wildlife Service	Gwill Ging
Quinault Indian Nation	Bruce Jones, Paul Huffman
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Science Applications International Corporation	John Lunz
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6. AUTHOR(S)
Babcock, Steven D.; Barton, Justine; Cagney, Patrick; Elwell, Thomas; Fox, David F.; Kendall, David R.; Revelas, Gene; and Turner, Desiree

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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U.S. Environmental Protection Agency, Region 10, Seattle
Washington Department of Ecology, Olympia, WA
Washington Department of Natural Resources, Olympia, WA

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
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11. SUPPLEMENTARY NOTES

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Approved for public release; distribution unlimited. Copies available from Seattle District, U.S. Army Corps of Engineers, P.O. Box 3755, Seattle, WA 98124-2255, ATTN: Dredged Material Management Office, 206-764-3768

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13. ABSTRACT *(Maximum 200 words)*

This manual addresses (1) the development of comprehensive evaluation procedures governing sampling, sediment testing, test interpretation (disposal guidelines) for determining the suitability of dredged material primarily for unconfined, open-water disposal and (2) the formulation of a dredged material disposal site management plan that will ensure adequate controls and public accountability for disposal of material at designated multiuser estuarine and ocean dredged material disposal sites at Grays Harbor and Willapa Bay, Washington. The regulatory program established by the study will provide the basis for publicly acceptable guidelines governing environmentally safe disposal at the existing estuarine and ocean disposal sites, thereby improving consistency and predictability in dredged material management.

14. SUBJECT TERMS
Dredging, dredged material management, ocean disposal, estuarine disposal, chemical testing, biological testing.

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- To provide opportunities for public input and opinions to be expressed during the study via scoping sessions and technical work groups.

- To accurately reflect and incorporate public concerns for environmental protection of the aquatic ecosystem as well as the economic well-being of marine communities.

1.8 REGULATORY/PROPRIETARY AUTHORITIES.

Responsibilities of each of the regulatory agencies under Sections 401 and 404 of the Clean Water Act (CWA), as amended, and Sections 102 and 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA), as amended, will be fulfilled in accordance with each agency's authorities and policies. The Grays Harbor and Willapa Bay program will be cooperatively implemented through the regulatory process and will be applied by each regulatory agency consistent with applicable authorities, policies, and related guidance. The dredged material evaluation procedures and disposal site management plan provide the basis for an overall approach which can meet the requirements of CWA Section 401 and Section 404 and MPRSA Section 102 and Section 103, as amended. Applicable national guidance documents include the jointly prepared Environmental Protection Agency/Corps of Engineers national ocean disposal testing manual, entitled *Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual*, dated February 1991 (referred to as the "Green Book"), and the jointly prepared EPA/Corps inland testing manual, entitled *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (Draft)*, dated June 1994 (referred to as the "Inland Testing Manual").

a. <u>Corps of Engineers</u>. The Corps of Engineers' requirements for the evaluation of dredged material proposed for unconfined, open-water disposal at estuarine disposal sites, as specified in subpart G of the CWA Section 404(b)(1) Guidelines, will be met primarily by the Section 404 components of the evaluation procedures. The Section 404 components of the evaluation procedures will be applied consistent with the draft Inland Testing Manual. The Corps will address other aspects of the Section 404(b)(1) compliance, such as impacts on navigation and national commerce and avoidance and minimization of impacts, including mitigation of unavoidable impacts and alternatives analysis, as well.

Requirements for the evaluation of dredged material proposed for unconfined, open-water disposal at ocean disposal sites, as specified in MPRSA Section 103, will be met by the Section 103 components of the evaluation procedures. These components will be applied consistent with the process described in the Green Book.

b. <u>Environmental Protection Agency</u>. EPA will rely on the evaluation procedures as the basis for preventing significant degradation of the aquatic environment as required by the CWA Section 404(b)(1) and MPRSA Section 102 guidelines. These procedures represent the testing approaches and procedures, allowed under the guidelines, which EPA would require

during the evaluation of dredged material. Other aspects of the Section 404(b)(1) and Section 102 compliance, such as avoidance and minimization of impacts, including mitigation of unavoidable impacts and identification/designation/management of sites, will also be addressed by EPA.

c. **Washington Department of Ecology.** Ecology will apply the appropriate evaluation procedures in assessing applications for CWA Section 401 Water Quality Certification. Initially, the evaluation procedures will be treated as guidelines. However, the evaluation procedures may later be adopted as State regulation under the Dredged Material Management Standards/Dredged Material Management Plan now being developed by Ecology.

d. **Washington Department of Natural Resources.** Whereas the Corps, EPA, and Ecology act as regulators of dredging and environmental quality, DNR acts as the manager and trustee of the state-owned aquatic land on which the estuarine disposal sites at Grays Harbor and Willapa Bay are located. DNR works closely with the Corps, EPA, and Ecology to operate and manage the estuarine open-water disposal sites. DNR also plays a lead role, in concert with and on behalf of the other three agencies, to monitor the estuarine disposal sites to ensure that they are operating in an environmentally sound manner.

e. **Other Regulatory Requirements.** Requirements of other regulatory agencies may require applicants to obtain other permits. These may include Hydraulic Project Approval from the Washington Department of Fish and Wildlife, a Shorelines Substantial Development Permit (or waiver) from the local shorelines jurisdiction, and other pertinent state and local permits. This document does not provide instructions for obtaining those permits.

CHAPTER 2
DREDGING IN GRAYS HARBOR AND WILLAPA BAY

2.1 HISTORICAL PERSPECTIVE.

Dredging in the study area runs the gamut for size, frequency and disposal of dredged material. Both bays offer the opportunity to dispose of dredged material at either in-bay or ocean disposal sites. Typically, Grays Harbor dredging involves frequent, large volume federal channel maintenance projects associated with small to moderate size industrial (berthing area) projects. Willapa Bay, in contrast, has less frequently dredged projects, either for maintenance of the federal navigation channels or to remove shoaling in the few marinas. Established estuary and ocean dredged material disposal sites and their management are described in Part III of this manual.

a. <u>Grays Harbor, Chehalis River and Hoquiam River</u>. The Grays Harbor, Chehalis River and Hoquiam River project for navigation (adopted 3 June 1896 and modified by subsequent acts) consists of deep and shallow draft navigation channels, turning basins, North and South jetties, revetment and groins for erosion protection at Point Chehalis, and a breakwater, entrance, and access channels at Westport Marina (Westhaven Cove) (see Figure 2-1).

- The U.S. Army Corps of Engineers (Corps) was first authorized by Congress to investigate the improvement of navigation in Grays Harbor in 1896 (see Rivers and Harbors Act of June 3, 1896). The first projects were begun in 1905 when a jetty system and dredged channels were constructed to stabilize the entrance bar and channel; maintenance of a navigation channel has been an annual activity since.

- Some early records of dredged material disposal in Grays Harbor are incomplete and do not provide a clear description of where disposal sites were and how often they were used. Apparently a large portion of Moon Island was created with dredged material along with what is now known as the Bowerman Basin Refuge. In addition, the shorelines in Hoquiam and Aberdeen were filled for urban development (dating back to the early 1900's). Throughout the inner harbor, dredged material was deposited at the most convenient locations via pipelines (usually into coastal wetlands and embayments).

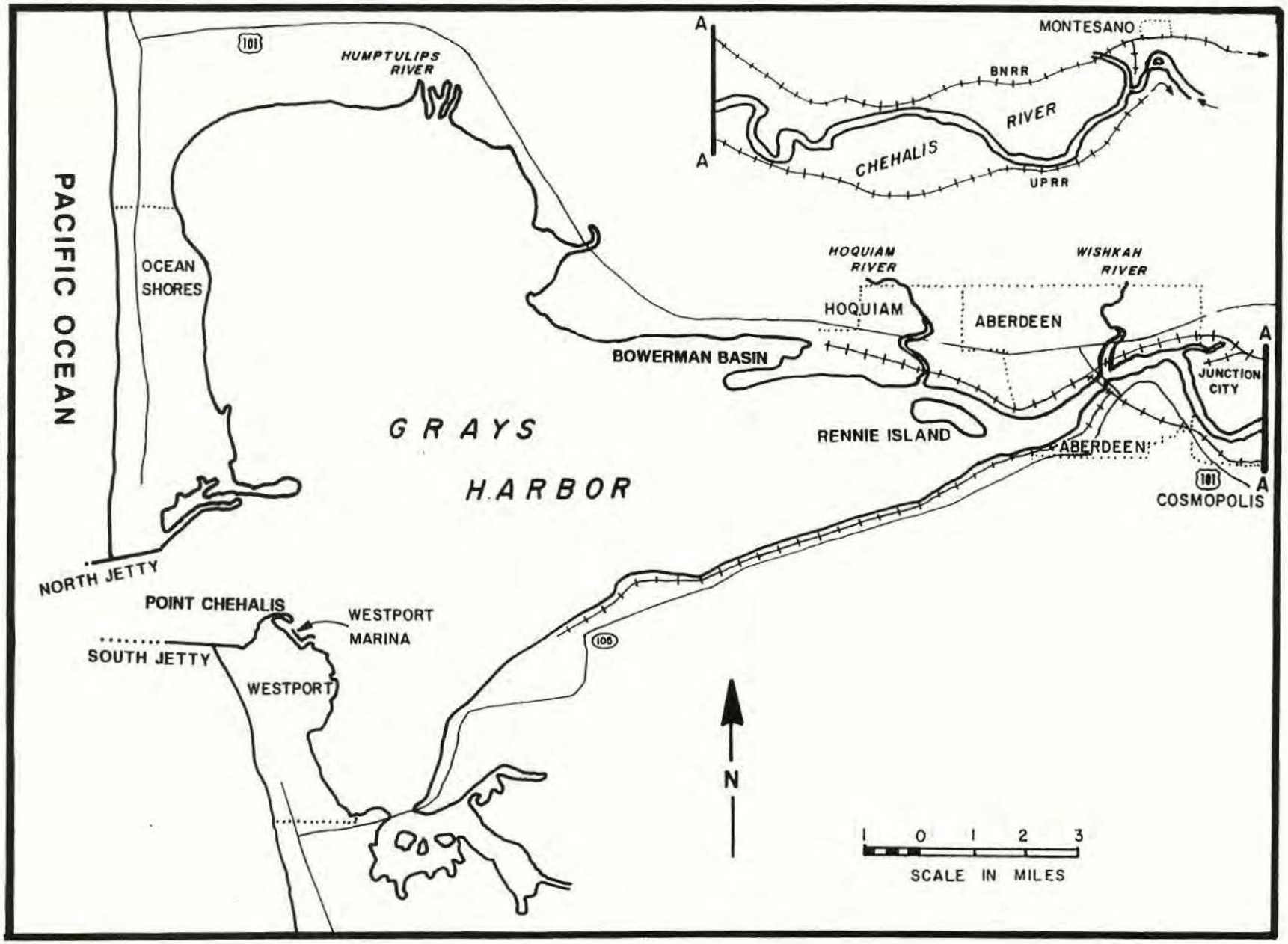

FIGURE 2-1
GRAYS HARBOR

- Past records show that between 1940 and 1976 approximately 3,850 acres of intertidal lands in Grays Harbor were used as dredged material disposal sites. The disposal of material usually resulted in the transformation of these areas into uplands. This represents approximately 11.5 percent of the total intertidal lands in the estuary, which averages out at about 110 acres of wetland loss per year. Conservative estimates indicate that at least 1,540 acres of wetlands have been filled and lost as aquatic habitat.

- The placement of dredged material also inadvertently created wetlands when subtidal and intertidal mudflats were filled, bringing the elevation of the subsurface high enough to support salt marsh habitat. The classic example is Bowerman Basin, west of Hoquiam, which was recently purchased by the U.S. Fish and Wildlife Service for the purposes of creating a wildlife refuge.

- Since the advent of the Clean Water Act and the development of the Section 404 permit process, the use of wetlands and intertidal areas has been heavily discouraged. Since 1975, only 38.1 acres of wetlands have been permitted for use as disposal sites under Section 10/404 procedures in Grays Harbor, and these losses occurred in the early years of the Section 404 program. Wetlands and intertidal lands are no longer used for dredged material disposal; disposal now occurs in subtidal or deeper habitats.

b. <u>Willapa River and Harbor and Naselle River</u>. Congress authorized the Corps in the early 1900's to study Willapa Bay for navigation improvements mainly to meet the needs of the developing port city at Raymond. The existing Willapa Bay Project was adopted by Congress as a Corps project in 1917 and has been modified several times since then. The adopted project consists of the following features (see Figure 2-2):

- A channel 26 feet deep and at least 500 feet wide over the outer bar at the mouth of Willapa Bay (Outer Bar Channel).

- A channel 24 feet deep and 200 to 300 feet wide from deep water in Willapa Bay to Raymond, including a cutoff channel 3,100 feet long at the Narrows, and a closing dike at Mailboat Slough (Inner Bay Channel).

- A channel 150 feet wide up the South Fork to the deep basin above Cram Lumber Mill, and up the North Fork to the 12th Street turning basin (Willapa River Channel).

- The project also includes maintaining channels for small craft navigation at Bay Center, Tokeland and Nahcotta.

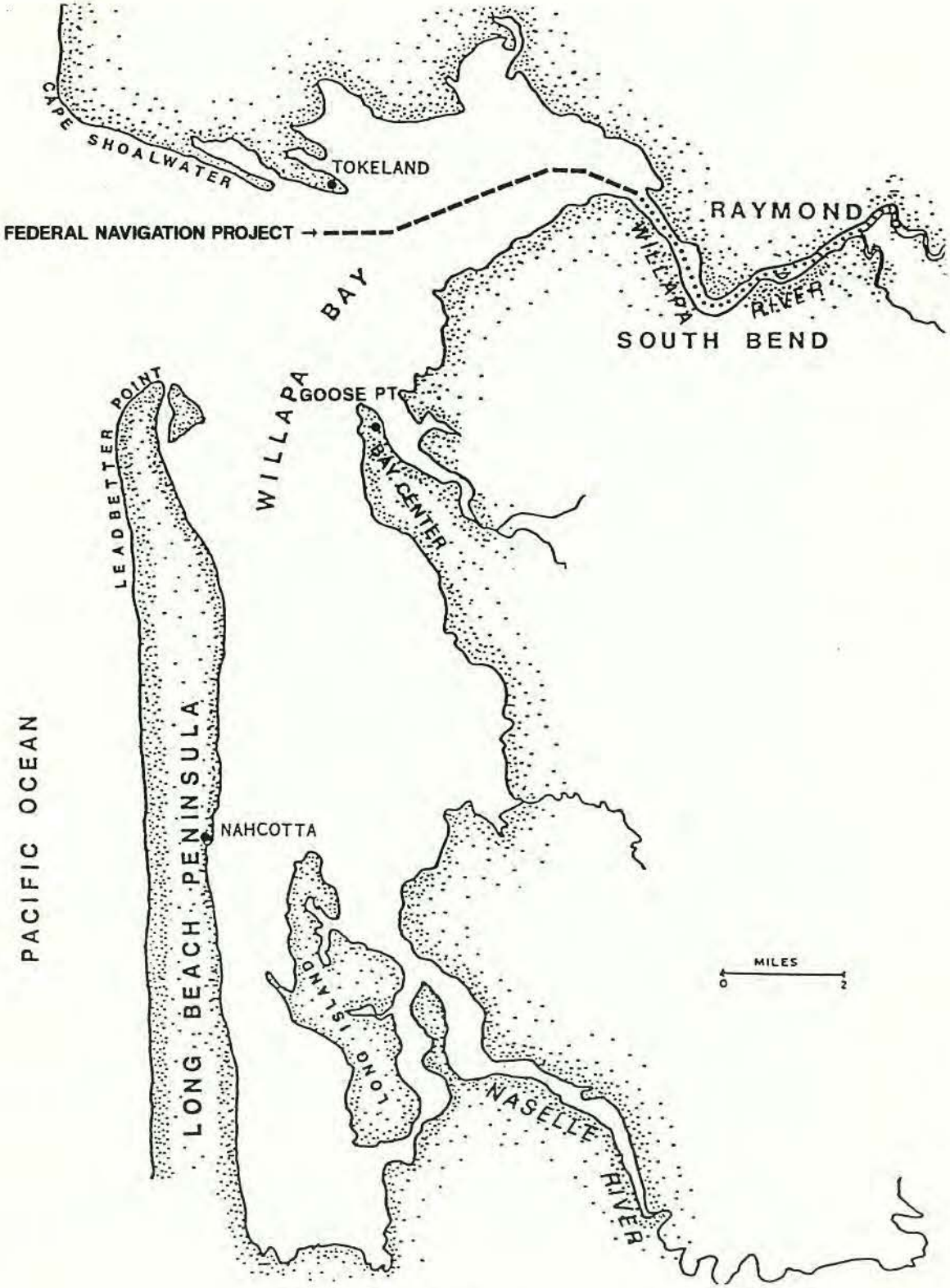

FIGURE 2-2
WILLAPA BAY

Despite the hopper maintenance dredging that took place at the Outer Bar Channel, the 26 foot channel depth was not maintained. Hopper dredging typically took place in July or August. With the first winter storms however, the unimproved channel (without jetty structures) was typically observed to shift and shoal. This usually occurred in November, making navigation over the outer bar unsafe, requiring channel dredging the following summer.

In 1976, the Corps determined that deep draft commerce was declining and maintenance of the Outer Bar and river channel reaches for deep draft authorized depths could not be economically justified (Corps, 1976). At the same time, the Corps determined that maintenance of a shallow draft channel to a depth of 17 feet and a width of 200 feet in order to provide safe passage for commercial fishing vessels based in Willapa Bay was economically justifiable. Since 1957, natural shoaling depths of the outer bar have not been less than 17 feet, and since 1974 no dredging of the Outer Bar Channel has been performed.

Prior to 1970, most of the dredged material was disposed of just inside the harbor mouth. Also during this time, about 7 miles of the river navigation channel below Raymond was periodically hydraulic pipeline dredged for maintenance. Most of the dredged material was placed in confined areas along the river channel, resulting in some intertidal areas. Many of the filled areas have since been developed.

2.2 GRAYS HARBOR FEDERAL PROJECTS.

a. <u>Grays Harbor Navigation Improvement Project</u>. The Grays Harbor Navigation Improvement Project (widening and deepening) was authorized by Public Law (PL) 99-662 in November 1986. Construction began in 1989 and was mostly completed in 1991. The project, in general, included:

- Widening and deepening 23.5 miles of the existing 30-foot-deep channel to a depth of 36 feet (46 feet deep across the ocean bar). A total of 11.3 million cubic yards (CY) of sediment was dredged.

- Widening and deepening of the Cow Point turning basin and widening only of the Elliott Slough turning basin.

- Deepening local ship berths.

- New maintenance dredging of 1.17 million CY (in addition to existing maintenance dredging of 1.68 million CY) in the first year after construction, decreasing for the next 4 years to new maintenance dredging of 0.77 million CY in years 5 to 50 (due to a 400,000 CY decrease in Bar Reach and Entrance Reach maintenance dredging during first 4 years after construction).

- Selection and formal designation of two ocean disposal sites for the disposal of dredged material.

The sediments dredged as part of widening and deepening were suitable for disposal at six designated disposal sites: The 3.9-mile SW and the 8.0-mile WNW ocean disposal sites; the Point Chehalis and South Jetty estuarine disposal sites; and the Slip 1 and Commerce Street confined disposal sites.

The project consists of nine reaches, described as follows (see Figure 2-3):

(1) Bar Reach. About 1 mile of the Outer Bar Reach was dredged to attain a 1,000-foot-wide by 46-foot-deep channel. Sand in the Outer Bar Reach was dredged with hopper dredge for 4 months from June to September (1990), with disposal of 1,206,000 CY in water deeper than 120 feet at the 3.9-mile SW ocean disposal site. This volume includes 500,000 CY of new advance maintenance material. Annual maintenance dredging of the channel since the widening and deepening increased from 0 to 452,000 CY of material in 1991 and to 636,422 CY in 1992. Annual maintenance dredging is estimated at 500,000 CY of material, with disposal at the 3.9 Mile SW ocean disposal site or at approved beneficial use projects.

(2) Entrance Reach. The 4.0-mile-long Entrance Reach was widened and deepened from the existing 250-foot-wide by 30-foot-deep channel to a tapered channel 1000 to 600 feet wide by 46 to 38 feet deep with disposal of 396,000 CY of new advance maintenance material at the South Jetty disposal site (completed in 1990). Maintenance dredging of the channel consisted of the removal of 452,000 CY of material in 1991 and 361,597 CY in 1992. This figure is expected to decrease annually to an estimated 200,000 CY, with disposal of maintenance material at the South Jetty disposal site.

(3) South Reach. The 4.3-mile-long South Reach was deepened from the existing 350-foot-wide by 30-foot-deep channel to a 350-foot-wide by 36-foot-deep channel, with channel bends widened to 450 feet. Approximately 1,468,000 CY of construction material plus 215,000 CY of existing maintenance during construction (EMDC) material was disposed of at the Point Chehalis disposal site (1990). Annual maintenance dredging of the channel totaled 477,000 CY of material in 1991 and 692,799 CY in 1992. Annual maintenance dredging is expected to decrease to an estimated 520,000 CY, with disposal at the Point Chehalis disposal site or at approved beneficial use projects.

(4) Crossover Reach. The 2.8-mile-long Crossover Reach was deepened from the existing 350-foot-wide by 30-foot-deep channel to a 350-foot-wide by 36-foot-deep channel, with channel bends widened to 450 feet. Approximately 1,668,000 CY of construction material and 191,000 CY of EMDC material was disposed of at the Point Chehalis disposal site. Annual maintenance dredging of the channel was 57,000 CY of material in 1991 and 420,579 CY in 1992. Annual maintenance dredging is expected to be around 550,000 CY, with disposal at the Point Chehalis disposal site.

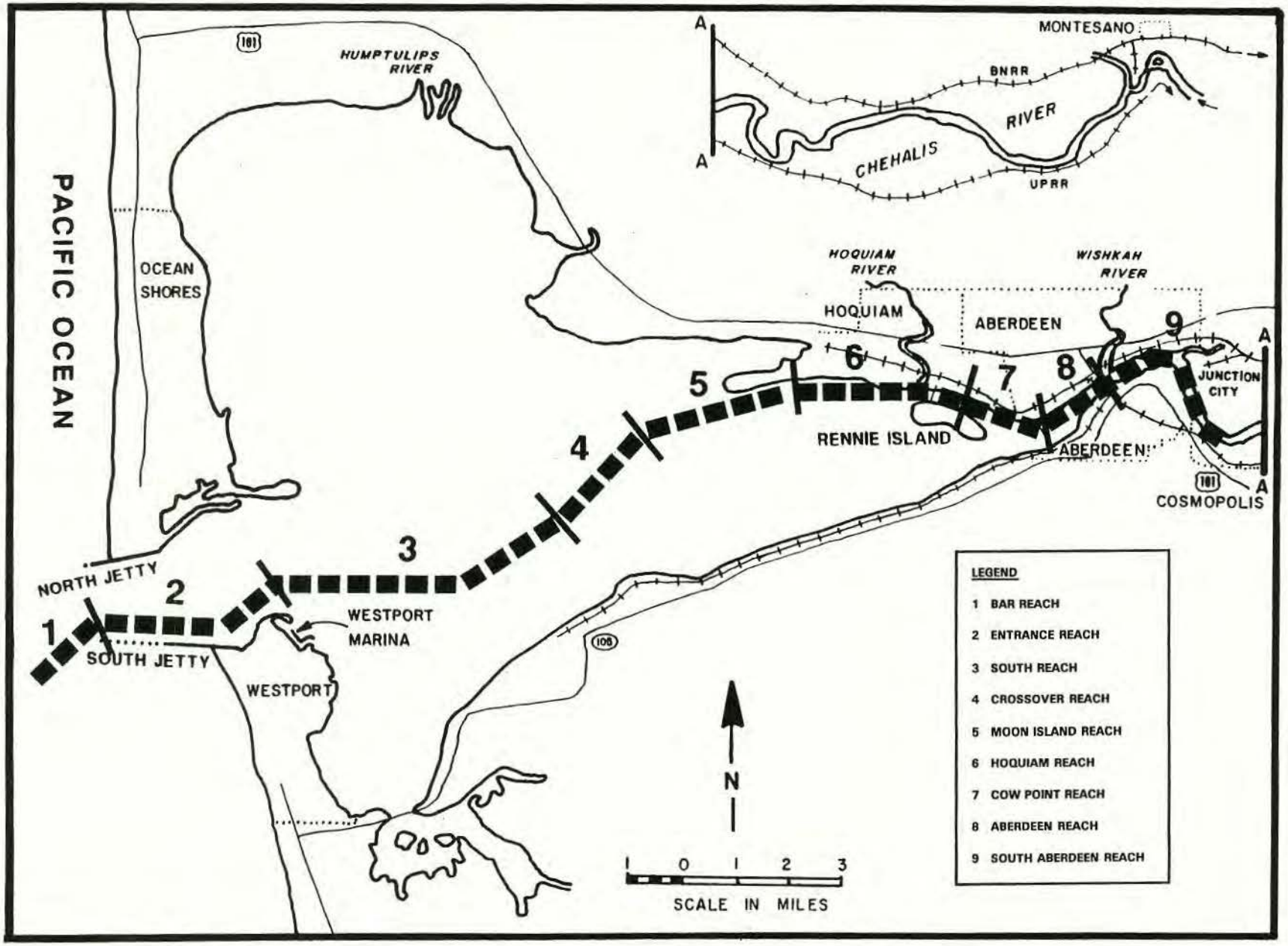

FIGURE 2-3
GRAYS HARBOR NAVIGATION IMPROVEMENT PROJECT

(5) **Moon Island Reach.** The 2.7-mile-long Moon Island Reach was deepened from the existing 350-foot-wide by 30-foot-deep channel to a 350-foot-wide by 36-foot-deep channel. Approximately 922,000 CY of construction material plus 195,000 CY of EMDC material was disposed of at the South Jetty disposal site (1990). Maintenance dredging of the channel was 158,000 CY of material in 1991 and 87,091 CY in 1992. Annual maintenance dredging is expected to be around 120,000 CY to 150,000 CY, with disposal at the Point Chehalis disposal site.

(6) **Hoquiam Reach.** The 2.8-mile-long Hoquiam Reach was deepened from the existing 350-foot-wide by 30-foot-deep channel to a 350-foot-wide by 36-foot-deep channel. Approximately 1,081,000 CY of construction material was disposed at the 8.0-mile WNW ocean disposal site in 1990. Maintenance dredging of the channel was 56,000 CY of material in 1991 and 244,350 CY in 1992. Annual maintenance dredging is expected to range from 90,000 CY to 180,000 CY, with disposal at the South Jetty and Point Chehalis disposal sites.

(7) **Cow Point Reach.** The 1.4-mile-long Cow Point Reach was deepened from the existing 350-foot-wide by 30-foot-deep channel to a 350-foot-wide by 36-foot-deep channel; the channel upstream of the Cow Point turning basin and adjacent to the Port of Grays Harbor Terminal 4 remained 550 feet wide. Approximately 1,442,000 CY of material was dredged in 1990 with disposal at the Port of Grays Harbor Commerce Street confined disposal site and the Port's Slip 1 confined disposal site. The remaining sandy silt was disposed of along with 367,000 CY of EDMC material at the 8-mile WNW ocean disposal site (1991). The existing Cow Point turning basin was enlarged from 800 feet wide by 30 feet deep to 900 feet wide by 36 feet deep (width dimension includes channel width). Maintenance dredging of the channel reach consisted of 619,000 CY of material in 1991 and 1,003,388 in 1992. Annual maintenance dredging of 430,000 CY to 880,000 CY is estimated, with disposal at the South Jetty and Point Chehalis disposal sites.

(8) **Aberdeen Reach.** The 1.5-mile-long Aberdeen Reach has not been completed and construction is likely not to begin until an unspecified date. It is proposed to be widened and deepened from the existing 200-foot-wide by 30-foot-deep channel to a 250-foot-wide by 36-foot-deep channel. Sandy silts in the Aberdeen Reach will be dredged with disposal of 880,000 CY of construction material plus 10,000 CY of EMDC material at the 8.0-Mile WNW ocean disposal site. An additional 33,000 CY will be dredged from between the existing railroad and highway bridges at the upstream end of the Aberdeen Reach after the railroad bridge is removed and the highway bridge fenders are modified. Biennial maintenance dredging is expected to increase from the existing 20,000 CY to 40,000 CY, with disposal at the Point Chehalis disposal site.

(9) **South Aberdeen Reach.** The 2.3-mile-long South Aberdeen Reach has not been completed and is likely not to begin construction until an unspecified date. It is proposed to be widened and deepened from the existing 200-foot-wide by 30-foot-deep channel to a 300-foot-wide by 36-foot-deep channel between the highway bridge and the Elliott Slough turning basin and a 250 foot wide by 36 foot deep channel upstream of the Elliott Slough turning

basin to approximately 1,000 feet upstream of the Weyerhaeuser berths. Silty sands in the South Aberdeen reach will be dredged with disposal of 1,170,000 CY construction material plus 35,000 CY berth material plus 20,000 CY of EMDC material at the Point Chehalis and South Jetty disposal sites. The existing Elliott Slough turning basin will be enlarged from 550 feet wide by 30 feet deep to 750 feet wide by 30 feet deep (width dimension includes channel width; channel portion of turning basin will be dredged to 36 feet). Maintenance dredging of the existing reach has been approximately biennial (60,000 CY in 1988; 54,000 CY in 1990; and 58,873 CY in 1992). It is expected to increase to approximately 40,000 CY (biennially) after completion of the widening and deepening project.

b. **Westport Marina.** The Corps maintains two 16-foot depth entrance channels to the marina. The Port of Grays Harbor is the non-federal sponsor of the marina.

2.3 GRAYS HARBOR NON-FEDERAL PROJECTS.

a. **Weyerhaeuser Bay City Dock.** The Bay City facility was constructed in 1969 and annual maintenance dredging has occurred since 1978. The most recent permit issued for this project (1992) authorized 5 years of maintenance dredging of approximately 12,000 cubic yards with disposal at South Jetty or Point Chehalis estuarine disposal sites or at the 3.9 mile ocean disposal site.

b. **Port of Grays Harbor Berth Areas.** The Port annually dredges several of its docking berths. Terminal 1 (T-1) was recently reauthorized via CWA Section 404 permit (1990) to continue maintenance dredging for 9 years at approximately 25,000 CY annually with disposal at South Jetty, Point Chehalis, or 3.9 mile ocean site. T-2 was reauthorized for 80,000 CY annually with disposal in the same locations. T-2 and T-4 were also authorized for an emergency dredging in 1992 because of unforeseen rapid siltation (caused by the temporary failure of the T-4 automated anti-siltation system) in early 1992. The Port was authorized to begin maintenance dredging early for T-2 and was allowed a one time dredging project in T-4 for 5,000 CY.

c. **Citifor, Inc.** The Citifor, Inc. (previously Roderick Lumber) Dock is located on the Chehalis River. A permit was issued in 1991 for annual maintenance dredging of 30,500 CY for 5 years. Disposal is at Point Chehalis, South Jetty, or 3.9 mile ocean site.

d. **Rayonier Berthing Area.** The Rayonier site is located in Hoquiam. A permit was issued in 1991 for 20,000 CY of one time dredging with disposal at South Jetty or Point Chehalis.

2.4 WILLAPA BAY FEDERAL PROJECTS.

a. **Bay Center Marina.** The Bay Center Marina is maintenance dredged every 3 to 4 years ranging between 30,000 to 50,000 CY of material which are disposed at the Goose Point disposal site. Persistent shoaling of an area west of Goose Point may require more frequent dredging, possibly every two years. The Port of Willapa Harbor is the non-federal sponsor of the marina project.

b. **Tokeland Marina.** The Tokeland Marina is maintenance dredged every 3 to 4 years of approximately 30,000 CY with open water disposal at the Cape Shoalwater disposal site. The Port of Willapa Harbor is the non-federal sponsor of the marina project.

c. **Nahcotta Marina.** The Federal entrance channel at the Nahcotta Marina has not been maintenance dredged by the Corps since it's initial construction in 1958. The marina was maintenance dredged in 1986 by the Port of Peninsula, local sponsor of the project, and disposed at an upland rehandling site. The Port of Peninsula is the non-federal sponsor of the marina project.

d. **Outer Bar Channel.** The federal channel has not been maintenance dredged since 1974. recent shoaling on the bar channel, and a difficult channel alignment, has resulted in reported vessel groundings and increased interest in maintenance dredging. The Port of Willapa Harbor is the non-federal sponsor of the project.

e. **Inner Bay Channel and Willapa River Channel.** The federal channels have not been dredged since 1976, and future dredging may be necessary to maintain adequate depths for shallow draft navigation. The Port of Willapa Harbor is the non-federal sponsor of the project.

CHAPTER 3
EXISTING DREDGED MATERIAL MANAGEMENT FRAMEWORK

3.1 FEDERAL REGULATIONS.

The U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) share the federal responsibility for regulating the discharge of dredged material. The Clean Water Act (CWA) governs discharges of dredged material into "waters of the United States," including all waters landward of the baseline of the territorial sea. The Marine Protection, Research, and Sanctuaries Act (MPRSA) governs the transportation of dredged material seaward of the baseline (in ocean waters) for the purpose of disposal. In addition, all activities regulated by these statutes must comply with the applicable requirements of the National Environmental Policy Act (NEPA), as well as other federal laws, regulations and Executive Orders which apply to activities involving the discharge of dredged material.

a. **Clean Water Act Section 404/Rivers and Harbors Act Section 10.** The Corps administers a regulatory program under Section 10 of the Rivers and Harbors Act of 1899 which requires approval by the Secretary of the Army of construction activities in navigable waters. The Corps also has the primary responsibility for the CWA Section 404 regulatory permit program. Section 404 of the Federal Water Pollution Control Act Amendments (1972), as amended by the Clean Water Act of 1977, requires a permit for the discharge of dredged or fill material into the waters of the United States. These permits, known as Section 10/404, may be processed concurrently when both dredging and disposal/filling are necessary, as is often the case with in-water or nearshore disposal.

The Clean Water Act (CWA) applies to "waters of the United States." This is a broader authority than suggested in the Rivers and Harbors Act Section 10. CWA Section 502(7) defines "navigable waters" to mean "the waters of the United States, including the territorial seas." The Corps' administrative definition of "waters of the United States" extends to all waters, including lakes, streams, mudflats, wetlands and sloughs, "the use, degradation or destruction of which" could affect interstate or foreign commerce. This definition includes wetlands adjacent to these waters. Section 404, therefore, covers more than Section 10.

All parties, including federal agencies, are subject to regulation under Section 10 and Section 404. Though the Corps does not issue itself a permit, these same regulations govern the Corps' own dredging and disposal activities.

- **Section 10.** A Section 10 permit is required for any dredging activity in navigable waters, regardless of the location of the disposal site. For purposes of Section 10, navigable waters generally are those U.S. waters below the mean high water mark, or those used or usable for interstate or foreign commerce.

■ **Section 404.** A Section 404 permit is required only for point source discharges of dredged or fill material into navigable waters or wetlands. A Section 404 permit is required when dredged material is disposed in either an aquatic or nearshore environment. It is also required when dredged material will be hydraulically placed in an upland environment and effluent from the disposal will be returned to navigable waters. This can occur where dredged material that is not de-watered is placed in nearshore or upland disposal sites.

Under Section 404(c), the Administrator of the Environmental Protection Agency (EPA) has developed, in conjunction with the Secretary of the Army, guidelines for evaluating specific proposed aquatic or nearshore disposal sites. EPA retains oversight authority regarding the Corps' decision to issue a permit and may veto permit approval if it concludes that the discharge of dredged or fill materials would have an "unacceptable adverse effect" on municipal water supplies, shellfish beds and fisheries, wildlife, or recreational areas.

The 404 Guidelines evaluate potential disposal sites based on potential impacts on the physical, chemical, and biological characteristics of the aquatic environment. The 404 Guidelines specify four conditions for any permit:

1. There must be no other practicable alternatives that would have less adverse impacts on the aquatic environment.

2. The disposal must not result in violations of applicable state water quality standards, toxic effluent standards, or marine sanctuary requirements.

3. The disposal must not cause or contribute to significant degradation of the waters of the United States.

4. The permit applicant must show that all appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic environment.

After considering the 404 Guidelines and input from U.S. Fish and Wildlife Service and others, the Corps makes a final decision based on whether the activity to be permitted is in compliance with 404(b)(1) guidelines. Thereafter, a review is conducted and findings made whether the proposed activity would be in the "public interest." In contrast, the Corps decision to issue a Section 10 permit is based solely on this "public interest" review. Public interest review also includes compliance with other federal laws. The Corps has substantial authority to require mitigation to avoid, minimize, rectify, reduce, or compensate for resource losses. In addition, Corps regulations require that the Corps consider more than 30 federal environmental laws, regulations, policies and executive orders. Unless "categorically excluded," the Corps must prepare a NEPA environmental assessment (EA). An EA determines whether the proposal could have "significant environmental impacts" requiring more detailed study in an environmental impact statement.

Numerous state and federal agencies, Indian tribes, and other interested parties may review and comment on the Corps permit decision. These parties may also use the Corps permit public notice to instigate their own permit or review programs. In Washington, the Department of Ecology collects input from other state agencies and comments officially to the Corps on the state's position. In addition, Ecology comments on coastal management consistency and issues or denies 401 certification (see paragraph 3.2 b.).

b. Marine Protection, Research, and Sanctuaries Act of 1972. The Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972, as amended (Public Law 92-532), specifies that all proposed operations involving the transportation and dumping of dredged material into ocean waters (beyond the three-mile limit) have to be evaluated to determine the potential environmental impact of such activities. Section 103 of the MPRSA appoints the Corps the permitting agency, subject to EPA review. Regulations are at 40 CFR 220-228. The criteria call for no unacceptable adverse effects. A testing manual has been jointly issued by EPA and the Corps as EPA-503/8-91/001 (commonly referred to as the "Green Book"). A "tiered" testing approach is employed.

c. Coastal Zone Management Act of 1972. The Coastal Zone Management Act (CZMA) of 1972, as amended (Public Law 92-583), declared a national interest in the effective management, beneficial use, protection and development of the coastal zone. The law grants to state and local governments the primary responsibility for planning and regulation of land and water uses in the coastal zone. States are charged with developing and administering land and water use management programs for the coastal zone. Federal development projects, including dredging projects, within the coastal zone must be consistent, to the maximum extent practicable, with the approved state programs. For non-federal projects, a required Corps permit cannot be issued until the State of Washington has concurred that the project is in compliance with the approved coastal zone management plan or until the State has waived its right to do so.

d. Endangered Species Act of 1973. Section 8 of The Endangered Species Act of 1973, as amended, requires Federal agencies to ensure their actions do not jeopardize endangered or threatened species or their critical habitats. If a project would likely affect an endangered species, consultation with U.S. Fish and Wildlife Service and National Marine Fisheries Service is required to conserve such species and their critical habitats.

3.2 WASHINGTON STATE REGULATIONS.

a. Sediment Management Standards. The State of Washington has adopted Sediment Management Standards (SMS) as Chapter 173-204 Washington Administrative Code (WAC). The SMS were promulgated for the purpose of reducing and ultimately eliminating adverse effects on biological resources and significant health threats to humans from surface sediment contamination. They apply to marine, low salinity, and freshwater surface sediments within the state of Washington.

The SMS provide two levels of effects specific to the contamination of marine sediments: a "No Adverse Effects" criteria (defined as the Sediment Quality Standard, or SQS) and a "Minor Adverse Effects" criteria (defined as the Cleanup Screening Level, or CSL). These criteria guide decisions pertaining to sediment cleanup and source control actions.

The SQS represents the goal to be attained by all marine sediments. However, it is recognized that this goal (i.e, "No Adverse Effects") may be impractical to achieve in all cases. The CSL represents an acceptable upper limit (i.e., "Minor Adverse Effects" level) of chemical contamination.

Sediments with concentrations of chemicals between SQS and CSL will be designated as areas or station clusters of low concern (a cluster = three or more contiguous samples). Areas of low concern are to be dropped from any further consideration for active cleanup, unless new information indicates an increase of contamination at the area in question.

Final decisions about sediment cleanup are driven by exceedances of the CSL. Sediments with average concentrations or bioeffects greater than the CSL may be subject to sediment cleanup. The extent of cleanup is based on considerations of environmental, technical, and cost factors.

b. Section 401 Certification Program. Section 401 of the Clean Water Act requires state certification that any federally-permitted project discharging into U.S. waters will not violate state water quality standards which are based on federal water quality criteria. For non-federal dredging, Section 401 certification is a precondition to compliance with Section 404 guidelines and is required before receiving a Section 404 permit for disposal of dredged or fill material. The Section 401 certification is required when dredged material is to be placed in an aquatic or nearshore environment, or when dredged material is hydraulically placed in an upland environment where return flows may affect navigable waters. Navigable waters under the Section 401 certification are generally interpreted broadly, including wetlands, mudflats, sloughs, and other areas also considered under the Section 404 review.

The Washington State Department of Ecology is the agency for certifying under Section 401 that a proposed discharge will comply with state water quality standards. Under the Section 401 certification program, Ecology certifies and may condition the Section 404 permit. Ecology may use any requirement or policy of state law that protects aquatic habitat in conditioning the Section 404 permit under Section 401. In situations where the state has no jurisdiction (i.e., not state waters), EPA provides Section 401 certification. EPA may also comment on compliance with state and federal water quality under Section 401.

c. Hydraulics Project Approval. A State Hydraulics Project Approval permit is required for actions affecting the natural flow of waters. This generally means any action in saltwater or a stream below the ordinary high water mark. The permit application must be acted upon by the Washington Department of Fish and Wildlife (WDF&W) within 30 days after

receipt of the full permit application, including determination of compliance under SEPA. WDF&W is concerned with impacts on food-fish and shellfish associated with in-water or nearshore disposal of dredged material.

d. Aquatic Lands Act. The Aquatic Lands Act, RCW Chapter 79.90, gives the Department of Natural Resources (DNR) proprietary authority to manage the state-owned aquatic lands in trust for the public. In accordance with the Act, and implementing regulations cited as Chapter 332-30 WAC, DNR has the power to lease state-owned aquatic lands for development and charge a fee for the use of aquatic lands for discharge of dredged material. Aquatic or nearshore disposal sites can be subject to DNR's management. However, DNR does not directly control upland disposal of dredged material, except on state-owned lands.

e. Shoreline Management Act. The Washington Shoreline Management Act, RCW Chapter 90.58, requires a permit for any "substantial development" within the shorelines of the state. The Act defines "shorelines of the state" to include designated water bodies and their submerged beds within the state's territorial limits and all land areas 200 feet landward of ordinary high water and adjacent wetlands. Local jurisdictions have responsibility for overseeing compliance with Washington State's Shoreline Management Act of 1971. Ecology's Shorelands Program oversees and reviews municipalities' plans and decisions as well as provides an avenue for appeals.

Local Shoreline Master Programs have been adopted as state regulations under the Administrative Procedures Act. These state regulations, as well as others affecting the quality of the shoreline environment, were approved by the Secretary of Commerce as the state's Coastal Zone Management Program. Thus, in Washington, a local Shoreline Permit which has been issued and survived any appeal is the mechanism for determining compliance with Federal Coastal Zone Management Act.

Preferential uses for shorelines are (in their order of preference):

1. Recognize and protect the state-wide interest over local interest
2. Preserve the natural character of the shoreline
3. Result in long-term over short-term benefit
4. Protect the resources and ecology of the shoreline
5. Increase public access to publicly-owned areas of the shorelines
6. Increase recreational opportunities for the public in the shoreline
7. Provide for any other element as defined in (the Act) deemed appropriate or necessary.

The affected local jurisdiction may issue a shoreline substantial development permit if the proposed use is consistent with both the local Shoreline Master Program and the policies of the Shoreline Management Act. Local zoning and land use requirements are integrated with the Shoreline Master Program process.

3.3 REGIONAL PROGRAMS.

a. **Puget Sound Dredged Disposal Analysis (PSDDA).** The PSDDA program is a cooperative interagency/intergovernmental activity for managing relatively clean sediments dredged to develop and maintain navigation and commerce activities in Puget Sound. The PSDDA program was initiated through a four-and-one-half year study which began in 1985 and was completed in 1989. The effort focused on issues pertaining to unconfined, open-water disposal of relatively clean dredged material. Developed in response to public and agency concerns about water and sediment quality and the long-term health of Puget Sound, the study's goal was to provide the basis for publicly acceptable and environmentally safe management plans governing unconfined open-water dredged material disposal. The study was undertaken as a cooperative planning effort by the Corps of Engineers, Environmental Protection Agency, Washington Department of Ecology and Washington Department of Natural Resources.

PSDDA resulted in the formulation of explicit evaluation procedures for dredged material being considered for unconfined, open-water disposal, designation of dispersive and non-dispersive disposal sites, and a management plan for each designated disposal site. The four PSDDA agencies cooperate closely in the implementation of the evaluation procedures and management plans and the PSDDA approach has resulted in a predictable, consistent program for the management of dredged material.

b. **EPA Region 10.** EPA Region 10 encompasses the states of Washington, Oregon, Idaho, and Alaska. At the Federal level, Region 10 and the Districts of the Corps' North Pacific Division traditionally have coordinated closely on dredging and dredged material disposal. Testing and management of dredged material in Region 10 have utilized a tiered approach for more than a decade, employing most of the technical procedures described in the new national guidance documents and is deemed to be consistent with national guidance. Sampling and analysis, specific test requirements, and interpretation of test results are worked out with and agreed to by both Region 10 and appropriate agencies for all regulatory actions and Federal projects. The specific process for Grays Harbor and Willapa Bay presented in this document is consistent with, and augments, Region 10's existing program.

CHAPTER 4
GRAYS HARBOR/WILLAPA BAY PROGRAM DEVELOPMENT

4.1 PROGRAM APPROACH.

Given the need for maintenance dredging at Grays Harbor and Willapa Bay, both in the Federal channels and in the numerous regulated projects such as port and commercial facilities and marinas, the question was how to proceed. Dredged material evaluation procedures are needed to provide consistency among these various projects and to allow dredged material testing to occur in a timely manner, consistent with the plethora of existing Federal and State regulations and programs which pertain to dredging and dredged material disposal. A disposal site management plan is needed to document use of existing dredged material disposal sites and to define disposal site management practices, site management responsibilities, physical site monitoring requirements, and operational requirements of users.

The Corps, EPA, Ecology, and DNR have enjoyed an excellent working relationship in the area of dredged material management. In Puget Sound, the four agencies administer the Puget Sound Dredged Disposal Analysis (PSDDA) program, a regional program established in 1988. The PSDDA program is now well established and meets the needs described above for the Puget Sound region. In Grays Harbor and Willapa Bay, the same four agencies administer a dredged material management program. Pending adoption of the present program, interim evaluation guidelines established in July 1992 were applied by the agencies (Interim Evaluation Guidelines, 1992). All three programs (PSDDA, Grays Harbor/Willapa Bay Interim Evaluation Guidelines, and the program established by this manual) are consistent with applicable Federal and State laws and regulations. The Grays Harbor/Willapa Bay program is also consistent with what has been required of regulated dredging projects in these areas in the past four years.

A program approach that is not only consistent with applicable Federal and State laws and regulations, but which also has a proven track record, was an important consideration in formulating an approach for Grays Harbor and Willapa Bay. In addition to accounting for differences in site conditions between Grays Harbor and Willapa Bay, the adopted approach had to be designed so as to be applicable to both estuarine and ocean dredged material disposal sites in both areas, as well.

The PSDDA program approach was an obvious starting point in the agencies' quest to develop a program for Grays Harbor and Willapa Bay. PSDDA has succeeded in bringing order, predictability, and consensus to dredged material management in Puget Sound. It has also served as a model for similar regional programs. Because it meets all applicable Federal and State guidelines and regulations, and has proven to be very workable and publicly acceptable, the basic PSDDA framework has been adapted to Grays Harbor and Willapa Bay. Adaptation of the PSDDA framework will ensure timely, consistent, and cost-effective dredged material evaluations and disposal at unconfined, open-water disposal sites.

4.2 CONSISTENCY WITH EXISTING STATUTORY AND REGULATORY FRAMEWORKS.

The Grays Harbor and Willapa Bay program is consistent with existing statutory and regulatory frameworks which govern dredged material management. Such guidance and programs are generally described in Chapter 3. Specifically, the Grays Harbor and Willapa Bay program constitutes regional documentation, with specific local dredged material testing and management guidance, to implement the following national and state guidance.

a. National Guidance on Ocean Disposal. Current national guidance on dredged material testing for ocean disposal is contained in: the Marine Protection, Research, and Sanctuaries Act of 1972, as amended; the Ocean Dumping Regulation (40 CFR 227); and the February 1991 joint EPA/Corps manual entitled *Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual* (commonly referred to as the "Green Book"). This guidance prescribes a regional testing framework guiding dredged material suitability evaluations for disposal into ocean waters for Federal dredging projects and regulatory actions. The general guidance provided by the Green Book is intended for use to evaluate dredged material compliance with the United States ocean dumping regulations. It includes sampling protocols, chemical analytical methods, biological test methods, a tiered testing procedure, identified chemicals of concern, biological tests using "appropriately sensitive organisms," and quality assurance/quality control (QA/QC) requirements.

b. National Guidance on Inland and Near Coastal Waters Disposal. Current national guidance on dredged material testing for estuarine and riverine disposal is contained in: the Clean Water Act of 1977, as amended; and the May 1976 joint EPA/Corps manual entitled *Ecological Evaluation of Proposed Discharge of Dredged or Fill Material into Navigable Waters*. When approved, a draft Inland Testing Manual jointly prepared by the EPA and Corps will replace the May 1976 manual, which will no longer be applicable. The draft Inland Testing Manual is entitled *Evaluation of Material Proposed for Discharge in Inland and Near Coastal Waters - Testing Manual*. It will follow from the Clean Water Act Section 404(b)(1) Guidelines, providing general guidance through the provisions of 40 CFR 230, Subpart G, on how to evaluate the acceptability of dredged material for disposal in inland and near coastal waters. Where possible and appropriate, consistency is being sought between the new Inland Testing Manual and the Green Book.

c. State of Washington Dredged Material Management Guidance. The State of Washington has adopted Sediment Management Standards as Chapter 173-204 WAC and plans to adopt Dredged Material Management Standards as Chapter 173-227 WAC. Dredged material discharge activities subject to certification actions by the State of Washington under Section 401 of the Clean Water Act are subject to those portions of the Sediment Management Standards in WAC 173-204-400 through 173-204-410 and 173-204-420.

4.3 ANNUAL PROGRAM REVIEW.

a. Purpose. Recurring annual reviews of the evaluation procedures and disposal site management plans are critical to the viability of the Grays Harbor/Willapa Bay program and will be undertaken once the procedures have been adopted and applied by the four regulatory agencies. In certain instances during development of the procedures, data were not sufficient to fully resolve key issues, or to fully judge the impact of the proposed procedures. Consequently, the annual review process is essential to incorporate what is learned after implementation, allowing appropriate adjustments and updates to the Evaluation Procedures Manual to be made. Program review will be conducted in conjunction with the PSDDA program annual review.

The reviews will consider the information obtained from implementing the program, changes in both national and state guidance, and scientific and technological advances in sediment sampling and analysis, test species and protocols, and the like. Lessons learned from other regional programs, such as PSDDA, will be considered during these periodic reviews.

b. Biennial Reports. The agencies will produce a biennial report for Grays Harbor and Willapa Bay in conjunction with reporting for the PSDDA program. A single report will be written and will include the following elements:

- Corps of Engineers - Summary and analysis of the application of the evaluation procedures to projects in Grays Harbor and Willapa Bay, including sampling and testing data and costs associated with these activities.

- Department of Natural Resources - Summary of dredging and disposal activities.

- Department of Ecology - Compilation of issues which have arisen in the previous year and proposed resolutions.

c. Review Meetings. An annual review meeting covering Grays Harbor and Willapa Bay issues will be held in conjunction with the PSDDA annual review meeting. Issue papers and status reports will be presented by the agencies and other interested parties. The annual review forum allows public input and peer review and is used to institute changes in the evaluation procedures and dredged material management program. Meeting invitations are sent to all involved and interested parties.

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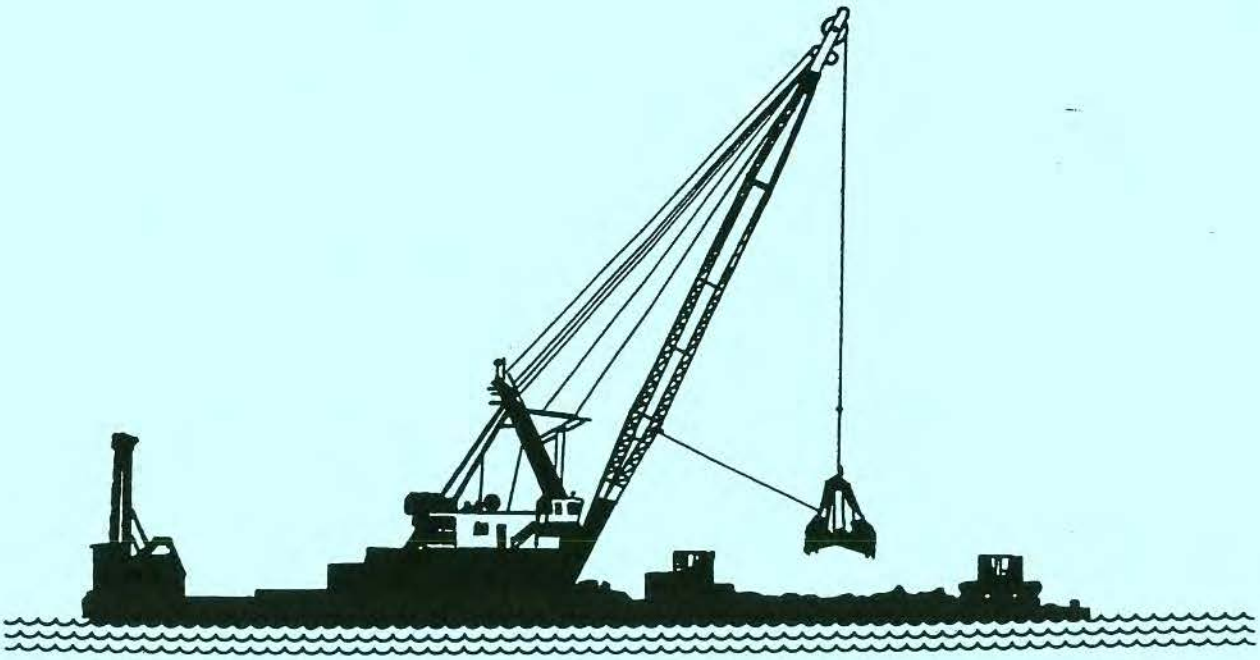
PART II

EVALUATION PROCEDURES



CHAPTER 5
PROCESS OVERVIEW

To facilitate the process of obtaining a Section 10/404/103 permit and getting the necessary sediment evaluation performed, this chapter describes the overall regulatory process (Section 5.1), the dredged material evaluation process (Section 5.2), the development of the sampling and analysis plan (Section 5.3), the DNR site-use permit (Section 5.4), the dredging quality control plan (Section 5.5), and the role of the Corps' Dredged Material Management Office (Section 5.6). Appropriate flow diagrams are included, to illustrate the processes.

5.1 THE REGULATORY PROCESS.

If maintenance dredging will be conducted during the upcoming year, the dredging proponent needs to determine whether a new permit from the Corps of Engineers or Ecology will be required. This determination is made by checking the expiration date on the existing permit. Unless all projected dredging can be completed before the expiration date, a new permit will be required. For federal navigation project maintenance dredging, a determination is made whether a new Public Notice is required or an extension of the Water Quality Certification.

Figure 5-1 illustrates the regulatory process when a new permit is required. In this case, there are two separate, but intertwined, processes which occur. The first is the routine regulatory permitting process which consists of the following steps:

- ☞ Submission of a complete Section 10/404/103 permit application to the Regulatory Branch of the Seattle District office of the Corps of Engineers.
- ☞ Preparation and distribution of a Public Notice by the Corps with a 30-day comment period.
- ☞ Review and incorporation of comments from other agencies by the Corps.
- ☞ Issuance of a Water Quality Certification (or Modification) and Hydraulic Project Approval by the State of Washington (for Section 10/404 permits only).
- ☞ Issuance of the Section 10/404/103 permit.

The second process consists of the evaluation of the sediments proposed for dredging. The dredged material evaluation process is required for every dredging cycle and is intertwined with the regulatory process as shown in Figure 5-1. The second process contains the following steps:

- ☞ Contact the Seattle District Dredged Material Management Office (DMMO) (see Section 5.6).

- ☞ Conduct sediment testing if necessary (see Section 5.2).

- ☞ Preparation of a suitability determination by DMMO and signed by the agencies.

The two processes are connected via communication which occurs between the Corps' Regulatory Branch and the Corps' DMMO. When the Regulatory Branch receives a permit application, the project manager forwards a copy to the DMMO which then begins the dredged material evaluation process. **The dredging proponent can save some time at this step by both submitting a permit application to the Regulatory Branch <u>AND</u> directly contacting the Dredged Material Management Office.** Whether testing is required or not for the current dredging cycle, a suitability determination will be drafted by the DMMO and signed by the agencies. A copy of the suitability determination will be provided to the Regulatory Branch project manager who may then issue a public notice. A signed suitability determination is normally required before a public notice may be issued.

Figure 5-2 illustrates the regulatory process when a new permit is not required. In this case, the dredging proponent should contact the Dredged Material Management Office to determine the testing needs for the upcoming cycle of dredging. As in the preceding case, whether or not testing is required, a suitability determination will be drafted by the DMMO and signed by the agencies. Once the suitability determination is signed, the dredging proponent can proceed to obtain a DNR site-use permit and then dredge.

For those dredging cycles in which sediment testing is not required, the suitability determination will include: (1) the volume to be dredged; (2) the disposal site to be used; (3) indicate when testing was last conducted; (4) indicate how the recency and frequency guidelines apply to the current dredging cycle; (5) summarize previous testing data as necessary; and (6) note any known incidents (i.e., a spill) that have occurred which might impact the quality of sediment to be dredged.

Applicants considering beneficial use projects are encouraged to coordinate with the Corps' DMMO and with other resource agencies early in the dredged material evaluation process.

5.2 THE DREDGED MATERIAL EVALUATION PROCESS.

Figure 5-3 illustrates the dredged material evaluation process; it is an expansion of the simple hexagonal block from Figures 5-1 and 5-2. The following steps comprise this process:

- ✓ Use chapter 7 of this manual to determine project-specific sampling and analysis requirements. The Dredged Material Management Office may be contacted for assistance.

- ✓ Use chapters 6, 7, 8, 9 and 10 of this manual to develop a sampling and analysis plan (SAP) for sediment evaluation (see Section 5.3 for more detailed information).

- ✓ Submit the SAP to DMMO.

- ✓ DMMO coordinates review of the SAP by the other regulatory agencies.

- ✓ DMMO sends a SAP approval letter to the dredging proponent.

- ✓ Field sampling and laboratory testing are conducted.

- ✓ The dredging proponent submits a final report to the agencies. All required DAIS data must be submitted to the DMMO with the final report (submittal of the DAIS data prior to the final report will speed the suitability determination process). All QA2 data must be submitted to Ecology. Cost data are optional but it is highly recommended that these data be submitted to the DMMO at the same time as the final report. See Chapter 12 for a more detailed description of the data required.

- ✓ DMMO coordinates review of the testing data with the regulatory agencies.

- ✓ DMMO drafts and the agencies sign a suitability determination for disposal.

Figure 5-4 presents the tiered testing decision diagram which will be followed for dredged material evaluations in Grays Harbor and Willapa Bay. Time can be saved by compressing tiers II and III; that is, by conducting concurrent chemical and biological testing. It is not anticipated that dredging projects in Grays Harbor or Willapa Bay will need to enter Tier IV. If Tier IV testing is needed, it will need to be specially designed with or by the regulatory agencies.

5.3 DEVELOPMENT OF THE SAMPLING AND ANALYSIS PLAN.

A well-designed sampling and analysis plan (SAP) is essential when evaluating the potential impact of dredged material discharge upon the aquatic environment. The SAP is submitted to the Corps' Dredged Material Management Office (DMMO) for coordinated review and approval by regulatory agencies before any sampling is initiated, as shown on Figure 5-3. The SAP should contain the following information in enough detail to allow the regulatory agencies to determine the adequacy of the SAP. This coordination, including full and open disclosure of information, can reduce the chance of having to repeat costly procedures and can assist in keeping projects on schedule:

- Tier I information, including site history, current site use, identification of sources of contamination, and past permitting (including NPDES permits as well as dredging).

- Project description, including a plan view of the site, one or more cross-sections of the dredging prism, type and volume of sediment.

- The personnel involved with the projects and their respective responsibilities, including project planning and coordination, field sampling, chemical and biological testing labs, QA management and final report preparation.

- Computation of sampling and analysis requirements, formulation of a conceptual dredging plan, identification of dredged material management units, allocation of field samples and development of a compositing plan.

- Sample procedures, including field sampling schedule, sampling technology, positioning methodology, decontamination of equipment, sample collection and handling protocols, core logging, sample extrusion, sample compositing and subsampling, sample transport and chain of custody.

- Physical and chemical laboratory testing, including grain-size analysis, sediment conventionals, chemicals-of-concern, extraction/digestion methods, analysis methods, holding time requirements and quality assurance requirements.

- Biological testing, including holding time requirements, proposed testing sequence, bioassay protocols and quality assurance requirements.

- Reporting requirements, including the sediment characterization report, DAIS data, QA2 data for SEDQUAL and cost data.

An example of a sampling and analysis plan is available from the DMMO in both hardcopy and WordPerfect® format. This document can be modified to meet the needs of a specific dredging project. The DMMO can provide any additional assistance needed in the development of a SAP.

5.4 THE DNR DISPOSAL SITE USE AUTHORIZATION.

A disposal site use authorization must be obtained from DNR prior to disposal of dredged material at the Point Chehalis, South Jetty, Cape Shoalwater or Goose Point sites. Processing of the application for a site use authorization can be accomplished by DNR in as little as 2-3 weeks. This relatively quick processing time is possible, however, only if the applicant has all necessary permits and necessary documents in hand when they apply to DNR for site use authorization. Because of the nature of dredging in Grays Harbor and Willapa Bay, with most

material found suitable for open-water disposal and with rapid shoaling at some sites, it is permissible to apply for the DNR authorization at any time during the process described in Figures 5-1 and 5-2. The DNR application can be processed up to the point of receiving the final DNR signature on the authorization. This signature can be obtained only after all other permits have been issued (or, if no permit is required, a suitability determination has been signed) and takes a week or less if all the other DNR paperwork has been completed. Dredging proponents are encouraged to contact DNR early in the process to avoid delays after other permits and/or a suitability determination have been obtained (see also Paragraph 13.3 d.).

5.5 THE DREDGING QUALITY CONTROL PLAN.

Prior to dredging, a dredging quality control (QC) plan must be submitted to the Enforcement Section of the Seattle District Regulatory Branch, which will coordinate review of this document with DNR and Ecology. Timing of submittal is as shown on Figures 5-1 and 5-2. The dredging quality control plan should provide the following information:

- Project description.
- Dredging and disposal schedule.
- Dredging method and procedures, including measures to control or minimize potential water quality impacts.
- Disposal method and procedures.
- Disposal site coordinates.
- Disposal positioning methodology.
- Disposal data recording and reporting.
- Debris removal plan.
- Tug operator's name and telephone number.

5.6 THE ROLE OF THE DREDGED MATERIAL MANAGEMENT OFFICE.

The Corps' Dredged Material Management Office (DMMO) provides a "one-stop" shop for dredged material evaluations. The staff is available to answer questions related to dredged material evaluations, assist in the development of sampling and analysis plans, and help trouble-

shoot during sediment sampling and testing (see DMMO on Figures 5-1, 5-2, and 5-3). The DMMO coordinates SAP and data reviews with the other regulatory agencies which jointly administer the Grays Harbor and Willapa Bay Dredged Disposal Analysis program (EPA Region 10, Ecology and DNR) and prepares the SAP approval letter and drafts the suitability determinations. The DMMO also interfaces with the Corps' Regulatory Branch and provides them consulting services on dredged material management issues. **Any questions, problems or issues related to dredged material management should be directed to the DMMO, via phone, fax, or mail at:**

Department of Army
Seattle District, CENPS-OP-DMMO
P.O. Box 3755
Seattle, WA 98124-2255
Telephone: (206) 764-3768/764-6550/764-6945
Fax: 206-764-6602

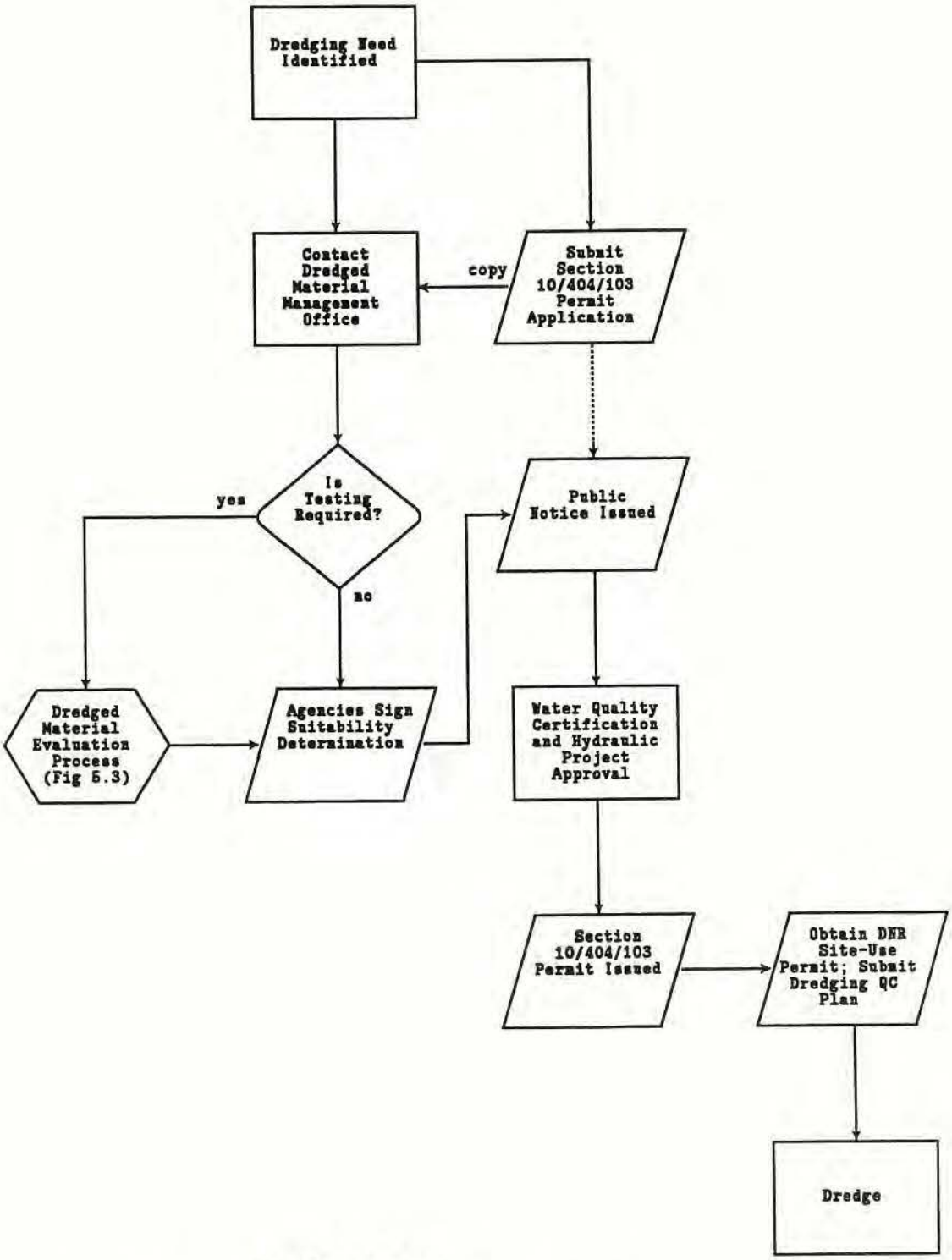


FIGURE 5-1
SECTION 10/404/103 REGULATORY PROCESS
(NEW PERMIT REQUIRED)

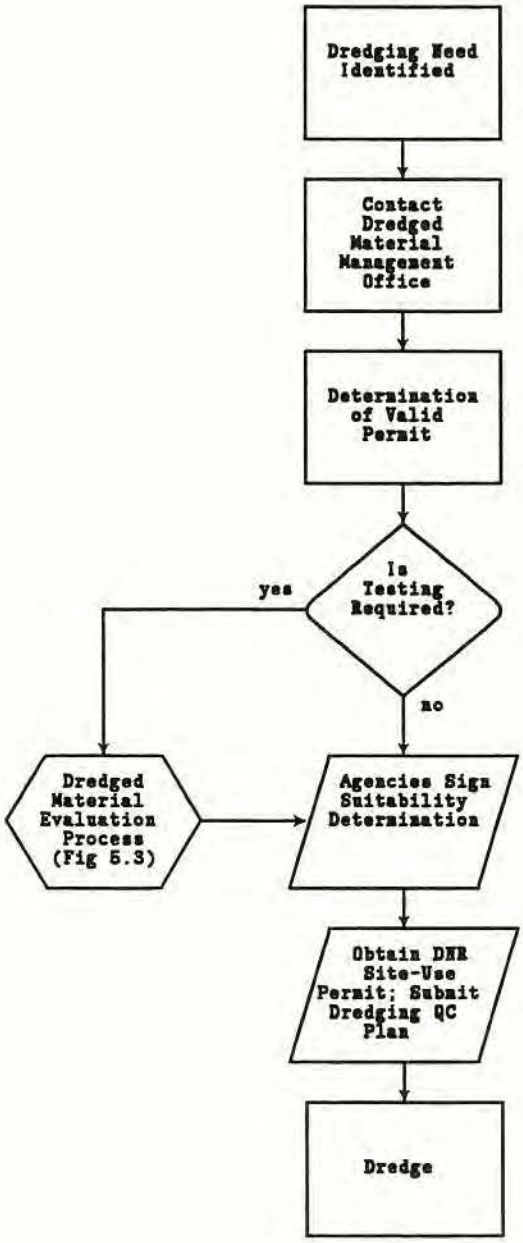


FIGURE 5-2
SECTION 10/404/103 REGULATORY PROCESS
(NEW PERMIT NOT REQUIRED)

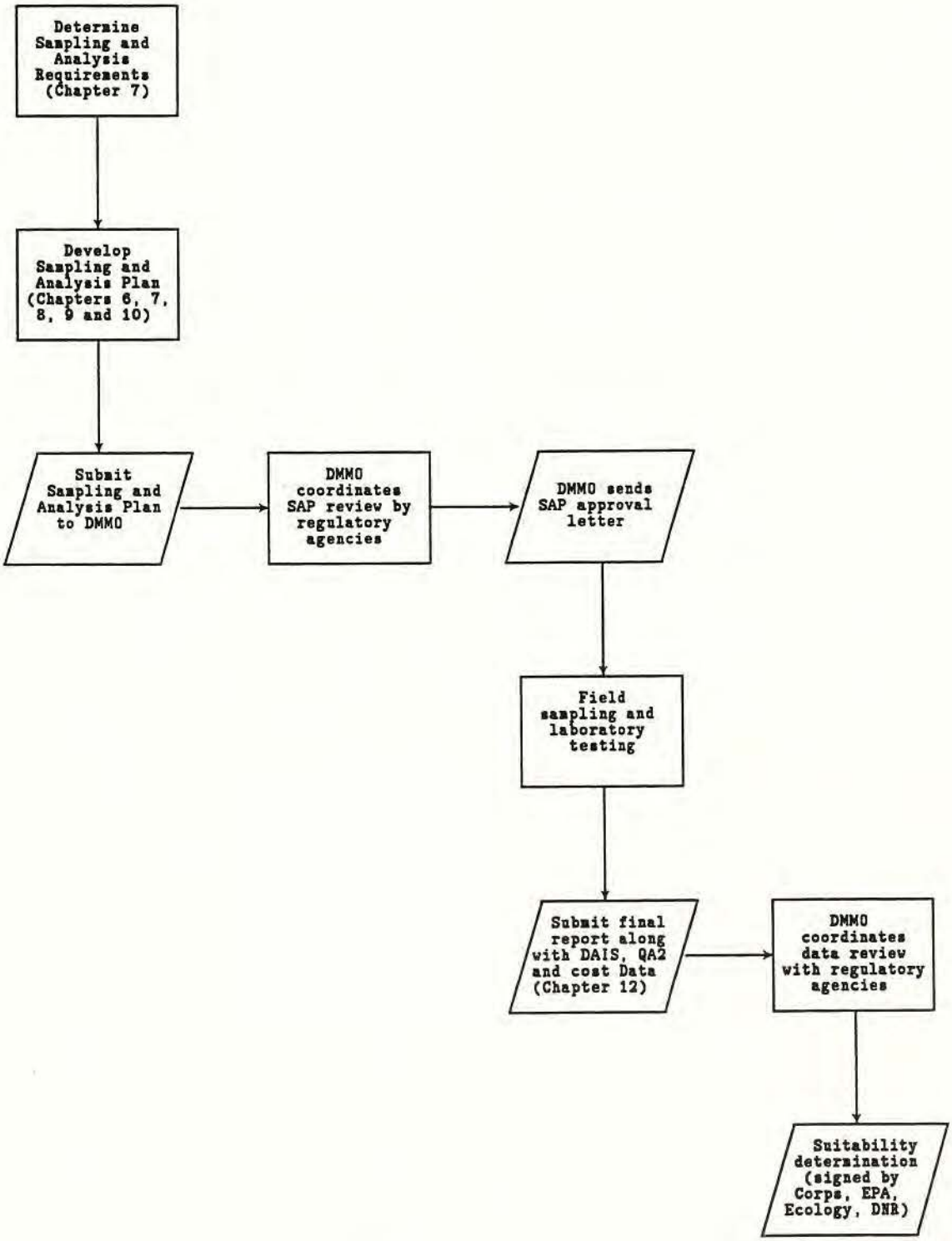


FIGURE 5-3
DREDGED MATERIAL EVALUATION PROCESS

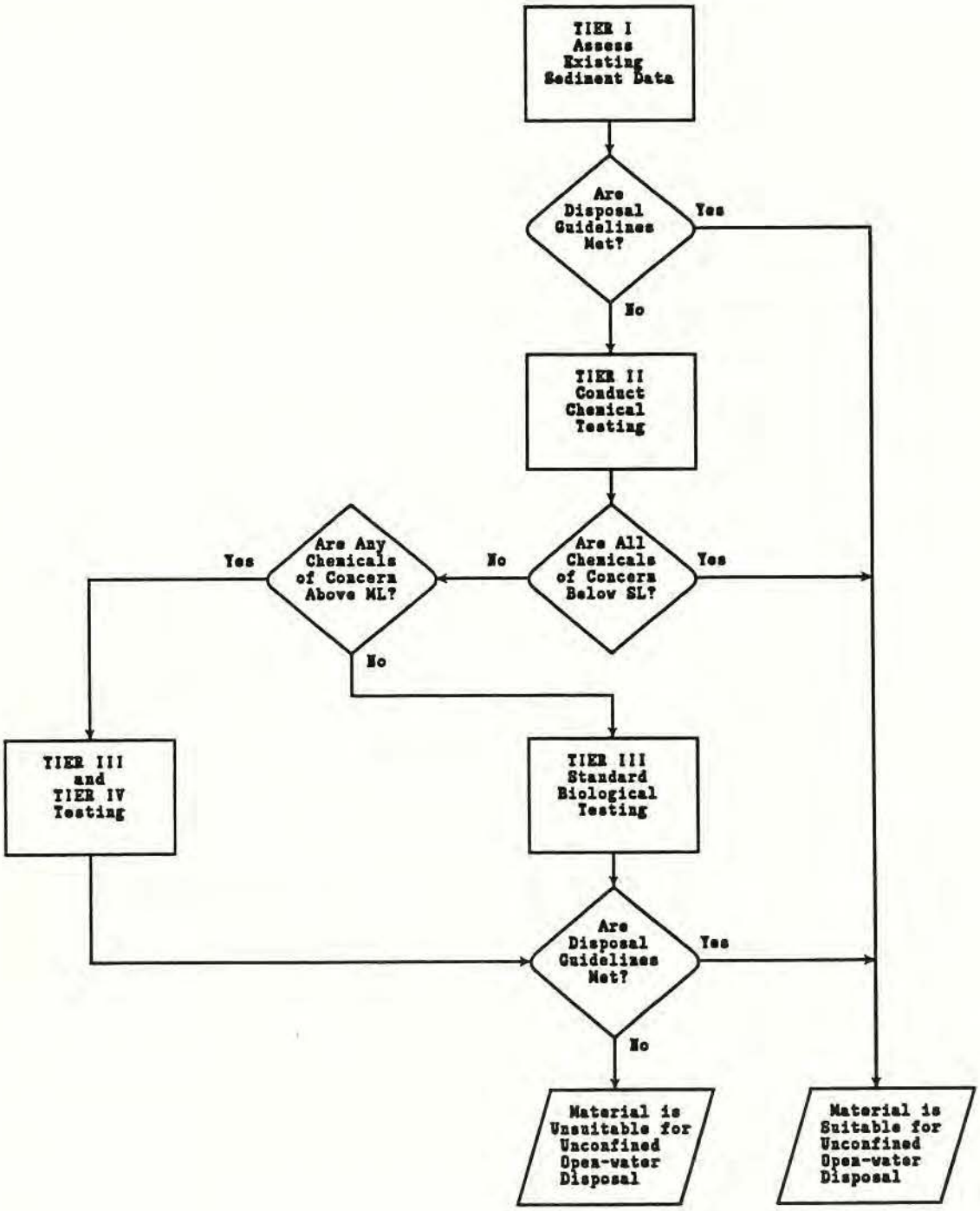


FIGURE 5-4
TIERED TESTING DECISION DIAGRAM

CHAPTER 6
TIER I EVALUATION/SITE HISTORY

A Tier I evaluation of existing information provides the basis of the sampling and analysis plan (SAP) and initial project design. It should be included in the SAP. Tier I is a comprehensive analysis of all existing and readily available, assembled, and interpreted information on the proposed dredging project, including a site history and all previously collected physical, chemical and biological data. The type and amount of information required for a Tier I evaluation will vary according to the size and complexity of the project and the history of the dredging site.

6.1 SITE HISTORIES.

The history of a project area plays a pivotal role in project evaluation and sampling plan development. The purpose of the site history is to document past and present sources of potential contamination to dredged material proposed for open water-disposal. A site history characterizes known activity at the dredging site, in near-shore areas, and on adjacent properties. It identifies past activities, and describes the type of contamination which may have resulted from those activities.

The following outline identifies the type of information that may be necessary in a site history for a large, complicated site. Smaller projects in areas of lower concern will require less information. For most projects, site histories do not need to extend beyond two to three pages. A reasonable effort should be made to obtain data. It is recognized that certain types of data may not be readily available but the effort to obtain it should be documented. Information available in agency files does not need to be regathered, but should be referenced and summarized. Emphasis should be placed on those activities which took place since the last dredging cycle, and any previous sampling data is crucial to the site history and should be summarized in the sampling and analysis plan.

The site history for a large, complicated project should include:

- A map showing the site's location, layout, storm drainage, outfalls, and special aquatic sites such as eelgrass or wetlands.
- Current site use.
- Industrial processes at or near the site (and hazardous substances used/generated).
- Outfall information, such as type, volume, NPDES data.

- Spill events.
- History of site ownership and land uses.
- Adjacent property use, especially those up-gradient or up-current/upstream.
- Site characteristics that could affect movement of contaminants.
- Results of any previous sampling and testing.
- Any dredging activity and data/information from that activity.

6.2 SOURCES OF INFORMATION.

There are a wide variety of information sources for site histories. Potential sources include:

- Current and previous property owners.
- Aerial photographs (past and present).
- Real estate and Sanborn fire insurance maps.
- Zoning, topographic, water resource, and soil maps.
- Agency records, such as NPDES permit files, contaminated site lists (state and federal), aquatic leases, previous permits, etc.
- Land use records.
- Knowledgeable persons at or near the site (managers, employees, adjacent property owners).
- City atlases (Kroll and Metsker).

Not all sources are needed for all projects, and the type and extent of sources consulted will vary. Smaller projects and those with less complicated source histories would generally require less documentation but should always include enough information to enable the agencies to adequately address sampling and testing issues. Dredging proponents can contact the Dredged Material Management Office to determine the level of effort required for their specific project. The DMMO will coordinate with the other agencies as necessary to determine project-specific requirements.

CHAPTER 7
DETERMINING PROJECT-SPECIFIC SAMPLING AND ANALYSIS REQUIREMENTS/DEVELOPING THE SAMPLING PLAN

The following steps should be followed in the development of a sampling plan for the full characterization (FC) of project sediments: 1) determine the rank for the project; 2) determine the volume of material to be dredged; 3) determine the required number of samples and analyses based on the volume and rank; 4) develop a conceptual dredging plan; and 5) develop a sampling plan which defines dredged material management units based on the calculated number of analyses and the conceptual dredging plan, allocates the required number of samples, and presents a compositing plan. These steps should be documented in the sampling and analysis plan developed for review by the agencies.

7.1 AREA AND PROJECT-SPECIFIC RANKING.

A dredging area, or a specific project, may be assigned to one of four possible ranks: *high*, *moderate*, *low-moderate*, and *low*. In that order, these ranks represent a best professional judgement of concern or potential risk *by the agencies*, typically reflective of a scale of decreasing potential for adverse biological effects or decreasing concentration of chemicals of concern. Therefore, the lower the rank, the less intense the sampling and testing requirements need to be to adequately characterize the dredged material. The ranking system is based on two factors:

- The available information on chemical and biological-response characteristics of the sediments.
- The number, kinds, and proximity of chemical sources (existing and historical).

For those dredging projects with sufficient historical data, the assigned ranking is based on the available chemical and biological data for project sediments. This information is assumed to provide sufficient evidence of the impacts of the existing and historical chemical sources. For those projects lacking sufficient historical data, the number, kinds and proximity of chemical sources are the major factors driving the assigned rank. Table 7-1 defines the ranking guidelines.

a. **Area Rankings.** Certain categories of areas or use activities are assigned a general rank, based upon the nature and extent of possible sources of chemicals of concern that could impact sediments needing to be dredged. In the absence of sediment quality data to the contrary, urban and industrialized areas are initially ranked *high*. Marinas, fueling and ship berthing facilities, construction facilities, and sediments located close to moderate-sized sewer outfalls are initially ranked *moderate*. High energy areas that are characterized by coarse-

grained material (sand and gravel) and are distant from potential sources of chemicals of concern are initially ranked *low-moderate* or *low*. Initial rankings are shown on Table 7-2.

TABLE 7-1
RANKING GUIDELINES

RANK	GUIDELINES
Low	Few or no sources of chemicals of concern, data are available to verify low chemical concentrations (typically below a level predicted to result in significant biological effects) and no significant response in biological tests.
Low-Moderate	Available data indicate a "low" rank, but there are insufficient data to confirm the ranking.
Moderate	Available data indicate chemical concentrations within a range associated historically with some potential for causing adverse biological impacts but for which there were no significant responses in the last two cycles of biological tests. **or** Sources exist in the vicinity of the project, or there are present or historical uses of the project site, with the potential for producing chemical concentrations within a range associated historically with some potential for causing adverse biological impacts.
High	Many known chemical sources, high concentrations of chemicals of concern, and/or significant responses in at least one of the last two cycles of biological tests. (When a "high" rank is indicated for an area based on preliminary data, then a "high" rank is assigned to the area as a protective measure. That is, there is no rank of "high-moderate").

b. <u>Project-Specific Rankings</u>. To facilitate the determination of sampling requirements, initial rankings for maintenance dredging projects in specific reaches of Grays Harbor and Willapa Bay were determined by comparing project-specific data against the ranking guidelines in Table 7-1. Two primary sources of information for this exercise were the *Chemical and Biological Literature Inventory, Grays Harbor and Willapa Bay* (BCI, 1991) and data generated through recent testing of dredged material in both estuaries. Other rankings, such as for marinas and fueling facilities, are based on a higher potential for sources of chemicals of concern in the sediments. Initial project-specific rankings are shown on Table 7-2.

TABLE 7-2
INITIAL RANKINGS FOR GRAYS HARBOR AND WILLAPA BAY
(RELATIVE TO POTENTIAL FOR PRESENCE OF CHEMICALS OF CONCERN)

GRAYS HARBOR	WILLAPA BAY
High Ranking: Port of Grays Harbor Terminal 2 [1] Urban and Industrialized Areas	**High Ranking:** Urban and Industrialized Areas
Moderate Ranking: Marinas Fueling and Berthing Facilities Construction Facilities Near Moderate-sized Sewer Outfalls	**Moderate Ranking:** Tokeland Marina Other Marinas Fueling and Berthing Facilities Construction Facilities Near Moderate-sized Sewer Outfalls
Low-Moderate Ranking: Rayonier Dock [2] Port of Grays Harbor Terminal 4 [3] Citifor Dock [3] Weyerhaeuser Bay City Dock	**Low-Moderate Ranking:** None
Low Ranking: Port of Grays Harbor Terminal 1 Bar Reach — Entrance Reach South Reach — Crossover Reach Moon Island Reach — Hoquiam Reach Cow Point Reach — Aberdeen Reach South Aberdeen Reach	**Low Ranking:** Bay Center Bay Center Entrance Channel Bay Center Entrance Channel Bar Willapa Bar Toke Point Channel

[1] Based on ML exceedance in 1992. Testing in 1994 resulted in no SL exceedances. One additional round of testing required to downrank.

[2] Data from the most recent testing cycle indicates that this project could potentially be ranked low. An additional testing cycle is needed to confirm the low rank.

[3] Chemical testing conducted in 1989 and 1991 indicates that this project could potentially be ranked low. Safety-net biological testing is needed to confirm the low rank.

c. **Re-ranking of Areas/Projects/Project Reaches.** Modifications of the initial rankings can occur as the result of additional testing. An area, project, or project reach can be ranked higher (e.g., from low-moderate to moderate) based on the results of a single testing period. However, consistent results from two testing periods are required before a ranking can be lowered (e.g., from high to moderate). Projects and project reaches may be ranked lower for a one-time dredging event based on the results of a partial characterization (see Section 7.6). However, two testing cycles will be required to lower the rank on a longer-term basis.

7.2 CALCULATING THE VOLUME OF DREDGED MATERIAL.

Where possible, the physical geometry and volume of sediments proposed for dredging should be determined from a pre-sampling bathymetric survey. The dredging volume calculation should include side slopes and sediments anticipated to slough from under piers and wharfs. For dredging projects which occur infrequently, the dredging prism should be divided between a "surface" layer (generally four feet in depth) and a "subsurface" layer consisting of everything below the surface layer. The volumes comprising each of these layers should be calculated. For projects which are dredged more frequently, the entire dredging prism may be considered homogeneous and the volume need not distinguish between surface and subsurface layer.

Dredging contracts routinely include "overdepth" material that is often 1-3 feet below the required dredging depth (except for very small projects where it may be decided to minimize overdepth volume for cost control). The volume of overdepth material will be included in permit applications, if such volumes are likely to be dredged. Additionally, the overdepth volume will be included in the calculation of the requirement for sampling and analysis and disposal site use fees.

It is recognized that some areas in Grays Harbor, particularly the federal navigation channel, are characterized by rapid shoaling during winter storm events. Since sampling and testing are required to be conducted prior to dredging, it is likely that only a fraction of the sediments to be dredged will have been deposited at the project site at the time of sampling. In such instances, records from previous dredging events should be used to determine the volume of sediments likely to be dredged. Sampling and testing requirements will be based on this estimated volume.

7.3 FULL CHARACTERIZATION SAMPLING AND ANALYSIS REQUIREMENTS.

The number of samples to be taken and the number of analyses conducted to fully characterize the sediments for any given project should be sufficient to allow for an adequate assessment of a project, and should be cost-effective. Minimum sampling and analysis guidelines for dredged material evaluation are defined. The following guidelines specify a

maximum volume of dredged material that can be represented by a single sample and by a single analysis. They are considered "minimum" guidelines in that the dredger may opt, or regulatory agencies may require, additional samples or analyses if warranted.

a. **Dredged Material Management Units.** In determining the number of samples and analyses that would be required for characterizing project sediments, the concept of "dredged material management units" (DMMU) is used. A DMMU is the smallest volume of dredged material that is truly dredgeable (i.e., capable of being dredged independently from adjacent sediments) and, consequently, for which a separate disposal decision can be made by the agencies. Thus, a given volume of sediment can only be considered a management unit if it is capable of being dredged and managed separately from all other sediment in the project. The DMMU is represented by an analysis. The decision on acceptability or unacceptability of material for unconfined, open-water disposal is made on individual management units independently of other management units within the project, and based on the results of the analysis representing that DMMU.

Table 7-3 presents the maximum volumes of sediment associated with a DMMU that may be characterized by a single analysis based on area ranking and depth. For example, in a high ranked area with less than a 4-foot cut depth, one analysis is required for every 4,000 CY of material to be dredged. In an area with a low ranking and below the 4-foot cut depth, one analysis is required for every 72,000 CY of material to be dredged.

TABLE 7-3
DREDGED MATERIAL MANAGEMENT UNITS

PROJECT RANK	HETEROGENEOUS		HOMOGENEOUS (Average)
	SURFACE	SUBSURFACE	
Low	48,000 CY	72,000 CY	60,000 CY
Low-moderate	32,000 CY	48,000 CY	40,000 CY
Moderate	16,000 CY	24,000 CY	20,000 CY
High	4,000 CY	12,000 CY	8,000 CY

For projects which are dredged frequently (within the frequency guidelines - see Section 7.8), or areas which rapidly and routinely shoal, the sediments are expected to be relatively homogeneous and the distinction between surface and subsurface sediments becomes less important. In this case, DMMU volumes are based on the average of surface and subsurface maximum allowable volumes. The proposed dredging volume will be divided by this average volume to determine the number of DMMUs. Grab samples are considered adequate to characterize homogeneous sediments.

b. Sampling Intensity. The maximum volume of sediment that may be represented by a single sediment sample is presented in Table 7-4. Sampling intensity varies with project rank. Samples may be obtained by a number of different methods, including grabs and cores. A single core (e.g., 12 feet in length) may be divided into several samples (e.g., three samples each 4 feet in length). For projects in areas ranked low or low-moderate, a single sediment sample will be taken for every 8,000 CY of material to be dredged above and below the 4-foot depth. For projects in areas ranked high or moderate, a single sediment sample will be taken for every 4,000 CY.

TABLE 7-4
SAMPLING GUIDELINES FOR DREDGED MATERIAL

PROJECT RANK	MAXIMUM VOLUME OF SEDIMENT REPRESENTED BY EACH SAMPLE (cubic yards)	
	VOLUME ABOVE 4-FOOT CUT DEPTH	VOLUME BELOW 4-FOOT CUT DEPTH
Low	8,000	8,000
Low-moderate	8,000	8,000
Moderate	4,000	4,000
High	4,000	4,000

c. Exceptions for Small Projects and High-Energy Areas.

For small projects, the cost of testing must be balanced against the environmental risks posed by a very small volume of dredged material. Small projects represent low potential risk that unacceptable adverse effects will result at the disposal site from the specific and/or cumulative discharges. As a result, a small volume of sediment to be removed at a dredging site can obviate the need for testing.

To clearly define what constitutes a small project, there are two key qualifiers. First, intentional partitioning of a dredging project to reduce or avoid testing requirements is not acceptable. Second, recognizing that multiple small discharges can cumulatively affect the disposal site, "project volumes" are defined in as large a context as possible. One example of this latter qualifier is recurring maintenance dredging of a small marina where "project volume" will be the projected dredging volume over 5 years. Another example is multiple-project dredging contracts where a single dredging contractor conducts dredging for several projects under a single contract or contract effort. Again, the "project volume" will be summed across all projects (as will any sampling and compositing efforts prior to testing).

(1) "No-Test" Volumes for Small Projects. For small projects in low, low-moderate, or moderate ranked areas, volumes for which no testing need be conducted are shown in Table 7-5. In the absence of specific, conclusive evidence of unacceptable material, projects with these or lesser volumes would be categorically considered suitable for unconfined, open-water disposal. For low-ranked areas, the "no test" volume is equal to the dredged material sampling unit (i.e., 8,000 CY). For low-moderate and moderate rankings, the "no test" volume of 500 CY is representative of the capacity of smaller barges. For high-ranked areas there is not a "no test" volume.

(2) Reduced Testing for Projects Exceeding the "No Test" Volume But Less Than the DMMU.

(a) For small projects (less than 500 CY) located in high-ranked areas, some testing will be required. The dredger will have the option to conduct either a single chemical analysis for all chemicals of concern (without the required QA/QC replication), or to conduct bioassays (amphipod and one additional bioassay) on a single sample (without chemistry, but with appropriate bioassay replicates). For the chemistry option, the "maximum levels" will be used as "acceptable/unacceptable" values. The dredger will still have the additional option to conduct standard and Tier IV biological testing if the material exceeded the ML values. (A single ML exceedance of less than 100% will require standard biological testing only).

(b) For small low-moderate and moderate-ranked projects above the "no-test" volume, and high-ranked projects between 500-4,000 cubic yards, standard chemical testing must be conducted, but if biological testing is needed, only two bioassays will be required (Table 7-6). These will include the 10-day amphipod test and one other bioassay from the standard suite. For projects in low-ranked areas that exceed 8,000 CY and require biological testing based on chemical test results, the full biological testing suite will be conducted. This is because low-ranked areas are not expected to exceed the chemical "screening levels," which is one of the reasons why the "no test" volume is set so high relative to other area rankings.

TABLE 7-5
"NO TEST" VOLUMES FOR SMALL PROJECTS

PROJECT RANK	"NO-TEST" VOLUME
Low	Less than 8,000 CY
Low-moderate	Less than 500 CY
Moderate	Less than 500 CY
High	Not applicable

TABLE 7-6
REDUCED TESTING REQUIREMENTS FOR SMALL PROJECTS ABOVE "NO TEST" VOLUME BUT LESS THAN DMMU

PROJECT RANK	VOLUME	REQUIRED BIOLOGICAL TESTS[1]
Low	>8,000 CY	Standard Biological Testing
Low-moderate	500-4,000 CY	Amphipod and One Other Bioassay
Moderate	500-4,000 CY	Amphipod and One Other Bioassay
High	0-500 CY	see narrative
High	500-4,000 cubic yards	Amphipod and One Other Bioassay

[1] Chemical tests are required of all such projects, with the exception of high-ranked projects less than 500 cubic yards. Biological tests as listed are required if chemical results indicate that the dredged material contains chemical concentrations above the screening levels.

(3) **No-test Guidelines for High Energy Areas.** Dredged material that may be excluded from testing, and circumstances when this may be allowed, are described in the regulations for both the Marine Protection, Research, and Sanctuaries Act (40 CFR 227.13) and Clean Water Act (40 CFR 230.60). Generally, relatively larger grained material (e.g., sand and gravel) from high energy environments that are removed from contaminant sources fall under exclusion criteria. Sediment management takes these considerations into account during the level of concern assessment. In practice, these considerations are part of the ranking process and, hence, testing intensity, as well as frequency of testing requirements. Exclusion criteria will be, and have been, employed on a case-by-case basis in Grays Harbor and Willapa Bay.

7.4 CONCEPTUAL DREDGING PLAN.

A project-specific conceptual dredging plan needs to be prepared which takes into consideration the depth and physical characteristics of the sediments, side slopes and overdepth, practicable dredge cut widths and depths, dredging along pier faces, other physical and logistical constraints, available dredging methods and equipment, and conventional construction practices at similar dredging projects.

While construction-level detail is not required at this point in the process, a realistic conceptual dredging plan will aid in the delineation of dredged material management units and avoid the situation in which a regulatory determination could negatively impact the ability to dredge the project.

7.5 FULL CHARACTERIZATION SAMPLING PLAN DEVELOPMENT.

Once the sampling and analysis requirements have been calculated and a dredging plan conceived, a sampling plan must be developed which delineates the DMMUs, proposes locations for the collection of field samples, and establishes a compositing scheme to characterize the DMMUs, if applicable. In developing a sampling and compositing plan, and defining dredged material management units, it is important to ensure that dredged material acceptability decisions be fully reflective of the dredging plan, i.e., that the management units be truly "dredgeable". If an individual DMMU (represented by one or more core sections) is found unsuitable for unconfined open water disposal, then that DMMU must be capable of being dredged independently from adjacent sediments. Additional analyses beyond the minimum number may be required to achieve an appropriate dredging plan (e.g., where different sediment types warrant separate samples).

It is not necessary or always desirable to restrict the volumes characterized by each individual sample or DMMU in the field to the maximums found in Table 7-4 and Table 7-5. The required number of samples and DMMUs are determined through the use of these tables. The calculated number of samples and DMMUs are then distributed to the actual dredging prism in a manner consistent with the definition of a DMMU and any project-specific constraints. Ideally, the maximum volumes from these tables will be carried through to the actual field situation but this will not always be possible. Best professional judgement is necessary in the allocation of DMMUs and the development of a sampling and compositing plan. A case study example is presented in PSDDA EPTA-Phase I, page II-50 to II-58 (see U.S. Army Corps of Engineers et al, 1988).

It is also important to note that the 4-foot cut (for non-homogeneous sediments) need not be carried through to the actual dredging plan. The 4-foot cut is used solely as a guideline to establish the minimum number of required analyses. The actual dredging cuts will depend on the geometry of the dredging prism and project-specific physical, environmental and logistical constraints.

The selection of sampling locations and the development of a compositing scheme should provide an accurate representation of the condition of each DMMU. In general, samples should be uniformly distributed across the dredging prism. However, special circumstances, such as the presence of sources of contamination, may dictate otherwise. The location of point sources in the vicinity of the project must be taken into consideration when locating field samples, but "worst-case" sampling should not be the goal of full characterization (it is the goal of partial characterization sampling; see Section 7.6). Tier I information, including the location of point sources, should be included in the sampling and analysis plan and should support the sampling locations selected to ensure representative sampling of the proposed dredged sediments.

7.6 DOWNRANKING OPTION (PARTIAL CHARACTERIZATION).

A dredging proponent may choose to do a partial characterization (PC) of project sediments. A PC is most frequently done on larger projects and is based on the chemical analysis of a limited number of samples. If the PC data indicate that the project has been over-ranked, then down-ranking may be permitted for a subsequent full characterization (FC). Down-ranking may substantially reduce the overall cost of sampling and testing for a large project.

A PC is designed to be simple and economical. A PC is not a substitute for an FC, but is only a means for establishing a "reason to believe" that a lower ranking is appropriate. A PC must provide sufficient information to support a decision to re-rank a project. PC results are used to downrank a project on a one-time basis only. Two cycles of testing are required for a longer term downranking.

a. Development of a PC Sampling and Analysis Plan. A sampling and analysis plan must be developed for a PC. The PC plan must be submitted to the DMMO, who in turn will coordinate agency review with EPA, Ecology and DNR representatives.

The following PC guidelines are appropriate for most dredging projects. However, because anomalies may exist for a given project, the agencies reserve the right to depart from these guidelines if conditions so warrant (e.g. complex chemical source environment, ambiguous and/or highly variable characterization data, etc). As with all aspects of the dredged material evaluation process, professional judgment will be an important factor in the decision-making process. The dredger should coordinate with the DMMO in the development of an adequate PC plan.

b. Sampling Requirements for a Downranking. The number of samples required for a downranking is based on a percentage of the number of samples that will be required for an FC. A dredger may elect to downrank up to two levels by increasing the sampling intensity. No compositing of samples is allowed. PC sampling station delineation must be approved in advance by the agencies and should represent "worst-case" sampling relative to the location of local point sources.

For the option of lowering a rank one level, ten percent of the FC minimum surface sample requirement must be analyzed for a PC. A minimum of two samples must be analyzed for this option. For the option of lowering a ranking two levels, 20 percent of the FC minimum surface sample requirement must be analyzed for a PC. At least three samples must be analyzed for this option. A dredger has the option of performing a PC on subareas of a dredging project. Subareas must be selected with the approval of the agencies. A minimum of two samples is required for each subarea. Although a PC is most frequently done on surface sediments, a dredger may be required to perform subsurface sampling and analysis during a PC if there is reason to believe that subsurface sediments are contaminated relative to sediments in the upper 4 feet of the dredging prism.

Partial characterization data for a given sampling station may also be used, in some limited cases, in partial fulfillment of FC requirements. The strategy for doing so must be clearly stated in the PC sampling and analysis plan and approved by the agencies.

c. **Ranking Guidelines Based on PC Data.** The downranking of a project (or subarea) will be based on the results of the sample having the highest level of chemicals of concern. Ranking guidelines based on PC data will be as shown in Table 7-7:

TABLE 7-7
RANKING GUIDELINES BASED ON PARTIAL CHARACTERIZATION DATA

RANKING	PC GUIDELINE
High	At least one chemical > ML
Moderate	At least one chemical > (SL +ML)/2 and ≤ML
Low-moderate	At least one chemical > SL and ≤ (SL + ML)/2
Low	All chemicals ≤ SL

PC samples must be analyzed for the full list of chemicals of concern (see Table 9-1) and sediment conventionals. PC data may also be used as a "reason to believe" test to screen out certain chemicals of concern. If a chemical is not found in the PC and is not available from nearby sources, it may be deleted from the FC.

7.7 RECENCY GUIDELINES.

A key consideration in determining whether available data are adequate for project review is the recency of the information. "Recency" guidelines for existing information refer to the duration of time for which chemical and biological characterization of a given sediment (that

might be dredged) remains adequate and valid for decisionmaking without further testing. These guidelines are based on the number and operating status of chemical sources near the area to be dredged, on whether the sediment is close to the sediment-water interface or not, and on how well previous samples describe the current conditions at the project site. With older data there is increased potential for a "changed condition" that could alter its validity. Data must be sufficiently recent to be considered representative of the material to be dredged.

The ranking system for dredging projects takes into consideration both the sources of contamination and historical chemical and biological testing data (which are considered an integrated reflection of the effects of sources on the project area). Therefore, the recency guidelines are based on the project rank. For high-ranked projects, the recency guidelines allow characterization data to be valid for a period of 2 years. The recency guideline for moderate, low-moderate and low-ranked projects is 5, 6, and 7 years, respectively.

The recency guidelines do not apply when a known "changed" condition has occurred (e.g., accidental spills or new discharges have occurred since the most recent samples were obtained). For subsurface sediments, the potential for contamination from groundwater sources must be considered.

7.8 FREQUENCY GUIDELINES.

A related case involves repeat dredging that occurs more frequently in an area than the recency guidelines period. Because recency guidelines do not apply to material dredged in a "non-sampling year" (e.g., year 1-4 of a 5-year recency period), a separate "frequency" guideline was developed. This guideline requires two cycles of sampling and testing of all projects before the frequency guidelines take effect. The quality of the chemical and biological data from these testing cycles must meet the requirements established in this document.

The time durations for the frequency guidelines are the same as for the recency guidelines: 2 years for high-ranked areas; and 5, 6, and 7 years for moderate, low-moderate, and low-ranked areas, respectively. However, a biological testing failure will automatically result in a need to conduct testing <u>every</u> dredging cycle.

For several projects in Grays Harbor, at least two cycles of testing have already been conducted. For those projects, the frequency guidelines are already in effect. Post-1986 data, collected since the establishment of standard protocols by PSEP, will generally be of adequate quality to be considered part of the two-cycle guideline.

For the maintenance dredging of the Federal navigation project at Grays Harbor (a low-ranked area), testing will be conducted every 6 years. To avoid large annual fluctuations in testing costs for a project of this magnitude, testing for three different sub-areas will be rotated on a two-year cycle. This will result in a predictable, manageable and level annual budget.

7.9 SAFETY-NET BIOLOGICAL TESTING.

To avoid a situation where a chemical-of-concern not on the standard list is present at a concentration high enough to cause biological effects, "safety-net" biological testing will be required of a limited number of DMMUs for low-ranked areas. Biological testing will consist of the 10-day amphipod test and one other bioassay from the standard suite. Twenty percent of project DMMUs, representing the finest-grained material, should be tested (minimum of one DMMU). If there are exceedances of the screening levels for any DMMUs, triggering biological testing, these DMMUs will fulfill the requirement for safety-net testing as long as the twenty-percent guideline is followed. The frequency of safety-net testing for low-ranked projects is 6 years.

If all chemicals-of-concern are below the screening level, yet the safety-net biological testing indicates a potential for adverse biological effects, best professional judgement will need to be applied in resolving the apparent conflict between the chemical and biological testing data. Additional chemical or biological testing may be needed to determine the nature of the problem.

7.10 NEW SEDIMENT SURFACE EXPOSED BY DREDGING.

Dredging operations can alter the condition of the surface sediments in the dredging area by exposing new sediments to direct contact with biota and the water column. Because the exposed surfaces may result in greater surface sediment chemical concentrations than existed before dredging, this aspect of dredging must be considered in project planning, review, and decision making.

A variety of options were considered for decision criteria regarding material that might be left following a dredging operation. At a minimum, the new exposed surfaces will be sampled to a depth of one foot below overdepth and the composited sample will be archived. Chemical analysis of this material will only be required if the sediment above the proposed exposed surface indicates potentially elevated chemical concentrations.

Several options for disposition of, and responsibility for, material that might be left following a dredging operation were discussed. Resolution of this issue is as follows, with three separate cases considered:

1. <u>Sediment with elevated chemical concentrations may be present adjacent to a dredging area, but in an area that is not proposed to be dredged</u>. In such cases, the dredger has no requirement under the Grays Harbor/Willapa Bay program to address the fate of the sediment in the adjacent area.

2. The dredging operation may result in exposure of sediment that has higher chemical concentrations than the sediment that was dredged. The concentration of chemicals in the exposed sediment could:

   a. be less than the chemical ML for unconfined, open-water disposal;

   b. exceed the chemical ML for unconfined, open-water disposal, but not the cleanup screening level (CSL) for chemical contamination prescribed in the State of Washington Sediment Management Standards; or

   c. exceed the CSL, as well as the chemical ML for unconfined, open-water disposal. The dredger may be required to over-dredge or cap the exposed sediment if chemical concentrations in the sediment exceed the CSL. Final decisions pertaining to the need to over-dredge or to cap will be based upon the results of bioassay tests specified in the Sediment Management Standards (see Chapter 9).

3. The dredging operation may leave material that contains lower chemical concentrations than was initially present. In this case, the dredger has no requirement under the dredging program concerning the fate of the exposed sediments. However, there may be other regulatory programs that require additional evaluation and/or dredging in this and the other cases. For example, the dredger may be determined to be responsible for discharge of the chemicals of concern and be required under a State or Federal regulation to conduct additional dredging as a remedial measure.

CHAPTER 8
SAMPLING

8.1 TIMING OF SAMPLING.

When required, sampling and testing must be coordinated in advance of dredging to allow time for chemical testing, possible biological testing, and data review. Sampling and analysis prior to dredging prevents a situation where the testing data show sediments to be unacceptable for open-water disposal after disposal occurs.

Areas that receive large volumes of material due to shoaling during winter storm events also need to be sampled prior to dredging. Because these sediments are typically dredged within a short time after rapid sediment deposition, sampling and testing may be conducted at a site in advance of deposition of a significant volume of sediments that will need to be dredged. This sampling strategy assumes that winter storm event-deposited sediments will have a chemical composition very similar to the sediments that were deposited at the time sampling and testing was conducted in advance of dredging. This strategy is a compromise which included consideration of the need to provide representative sampling and the need to provide an evaluation process adaptable to the fast shoaling pattern found for many projects in Grays Harbor. This compromise will also help avoid reliance on "emergency dredging" whereby sediment sampling and testing is not possible prior to dredging. Accordingly, the number of DMMUs and samples will be based on historical dredging volumes.

Pre-sampling surveys should be conducted to provide information on current shoaling patterns and volumes of sediment present at the time of sampling. **The timing of sampling should be coordinated with the DMMO.**

8.2 SAMPLING APPROACH.

If full characterization sampling and analysis are required for a project, the applicant will be required to sample the sediment for chemical, and if necessary, biological, analyses. There are three sampling approaches which the dredging proponent may take:

Alternative #1: Collect sufficient sediment for all chemical and biological tests potentially required. Run these tests concurrently.

Alternative #2: Collect sufficient sediment as above, but archive adequate sediment for biological testing pending the results of the chemical analysis.

Alternative #3: Collect only enough sediment to conduct the chemical analyses, and, if biological testing is required, re-sample the site.

The sampling approach should be clearly documented in the sampling and analysis plan. The selection of either alternative #1 or #2 is encouraged because they provide chemical and biological data on sub-samples of a single homogenized sediment. These alternatives are also advantageous because they both preclude the cost involved with collection of additional sediment. Alternative #1 is the least time consuming, and is likely the most economical when the need for biological testing is expected. For alternative #2, the biological samples must be stored using Puget Sound Protocols to allow chemical tests to be completed first. For alternative #3, biological analysis can proceed without re-analysis of sediment chemistry. Biological samples must be taken from the same stations as the sediment chemistry samples.

In general, 6 liters of homogenized sample will be needed to provide adequate volume for physical, chemical, and standard biological analysis. Bioassay analysis requires approximately 4 liters and chemical analysis requires approximately 1 liter of sediment. The additional liter should be archived for contingency. Bioaccumulation testing would require an additional 8 liters of sediment beyond the 6 liters identified here. If there is any reason to suspect that subsurface sediments are contaminated, refer to Sections 4.3 and 8.6.

8.3 POSITIONING METHODS.

A precision navigation system should be used to record all sediment sampling locations to a geodetic accuracy of ± 2 meters. In addition, all samples should be obtained as close as possible to the target locations provided in the project sampling plan. Such accuracy can be obtained with a range of positional hardware, such as microwave trisponders, differential GPS, electronic measuring devices, etc. The exact positioning system to be used and associated QA/QC procedures should be documented in the project sampling plan.

Sampling location data will be entered into the Dredged Analysis Information System (DAIS) in the form of latitudes and longitudes referenced to North American Datum of 1983 (NAD 83) which is considered equivalent to the World Geodetic System 1984 (WGS 84). If sampling locations are referenced to a local coordinate grid, the local grid should be tied to NAD to allow conversion to latitudes and longitudes. Latitudes and longitudes referenced to the North American Datum of 1927 (NAD 27) can easily be transformed to NAD 83.

The use of a standard horizontal datum will allow dredging data to be displayed and analyzed using geographic information system (GIS) software. Spatial distribution of chemicals of concern and trend analysis are among the many possible GIS applications in Grays Harbor and Willapa Bay.

8.4 SAMPLING METHODS.

The goal of sediment sampling for characterization of each individual dredged material management unit is to collect a sample (or a number of composited samples) which will be representative of the DMMU. The accuracy of this representation can be increased vertically by taking core samples from the sediment/water interface down to the maximum proposed depth of dredging and horizontally by increasing the number of samples taken. The agencies have established minimum sampling requirements (see Chapter 7) based on volumetric measurements. The type of sampling required, however, depends on the type of project. The sampling methodology to be used should be presented in the sampling and analysis plan along with the rationale for its use.

a. Core Sampling. For projects which are dredged infrequently (less than once every 5-7 years) and for new-work dredging, the proponent will be required to take core samples from the sediment/water interface down to the maximum depth of dredging because of the greater stratigraphic heterogeneity expected at a project which has seen sediment deposition over a relatively long timeframe. In high-ranked areas, full length cores will also be required because the possibility exists that more heavily contaminated sediments have been recently buried by cleaner sediments. In high-ranked areas, cores will have to penetrate deep enough to obtain a sample of the sediments which will be left in place after dredging (see Section 4.3).

There are numerous methods available for obtaining core samples including impact corers, hydraulic push corers, Gus samplers, augers with split spoons or Shelby tubes, jet samplers, etc. The methodology chosen will depend on availability, cost, efficacy, and anticipated sediment recoveries.

b. Grab Sampling. It is anticipated that sediments in frequently dredged areas will be relatively homogeneous. Therefore, for frequently dredged projects which are not in high-ranked areas, grab samples will be considered adequate to represent the dredged material, even if shoaling results in sediment accumulation greater than four feet. The minimum number of grab samples required will be calculated from the tables in Chapter 7.

8.5 SAMPLE COLLECTION AND HANDLING PROCEDURES.

Proper sample collection and handling procedures are vital to maintain the integrity of the sample. If the integrity of the sample is compromised, the analysis results may be skewed or otherwise unacceptable. Sample collection and handling include procedures for decontamination, sampler deployment, sample logging, sample extrusion, compositing, sample transport, chain of custody, archiving and storage, all of which need to be treated in the sampling and analysis plan. The reader is urged to consult *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound* (Tetra Tech 1986) for detailed guidance on sample handling procedures. The following paragraphs provide general guidance.

a. Decontamination Procedures. It is recommended that sampling containers be decontaminated by the laboratory or manufacturer prior to use. It is also recommended that all sampling equipment and utensils, such as spoons, mixing bowls, extrusion devices, sampling tubes and cutter heads, etc., be made of non-contaminating materials and be thoroughly cleaned prior to use. The intention is to avoid contaminating the sediments to be tested, since this could possibly result in dredged material, which would otherwise be found acceptable for open-water disposal, being found unacceptable. While not strictly required, an adequate decontamination procedure is highly recommended. The dredging proponent assumes a higher risk of sample contamination by not following an established protocol. The following procedure has been used successfully for other dredging projects:

- Wash with brush and Alconox soap.
- Double rinse with distilled water.
- Rinse with nitric acid.
- Rinse with metal-free water.
- Rinse with methanol.

While methylene chloride has been used extensively in the past as an organic solvent, and is recommended by PSEP, its use is discouraged by the dredging regulatory agencies because of its status as a potential carcinogen and its impact on the ozone layer.

After decontamination, sampling equipment should be protected from recontamination. Any sampling equipment suspected of contamination should be decontaminated again or rejected. If core sampling is being conducted, extra sampling tubes should be available on-site to prevent interruption of operations should a sampling tube become contaminated. Sampling utensils should be decontaminated again after all sampling has been conducted for a DMMU to prevent cross-contamination. Disposable gloves are typically used and decontaminated or disposed of between DMMUs.

b. Sample Collection. Sampling procedures and protocols will vary depending on the sampling methodology chosen. Whatever sampling method is used, measures should be taken to prevent contamination from contact with sources of contamination such as the sampling platform, grease from winches, engine exhaust, etc. Core sampling methodology should include the means for determining when the core sampler has penetrated to the required depth. If the core is driven beyond the proposed dredging depth, the core logging must be adequate to allow the proper core section to be taken post-sampling for inclusion in the sample composite. The sampling location must be referenced to the actual deployment location of the sampler, not another part of the sampling platform such as the bridge of a sampling vessel.

c. Volatiles and Sulfides Sub-sampling. The volatiles and sulfides sub-samples should be taken immediately upon extrusion of cores or immediately after accepting a grab sample for use. For composited samples, one core section or grab sample should be selected for the volatiles and sulfides sampling. Sediments which are directly in contact with core liners or the sides of the grab sampler should not be used.

Two separate 4-ounce containers should be completely filled with sample sediment for volatiles. No headspace should be allowed to remain in either container. Two samples are collected to ensure that an acceptable sample with no headspace is submitted to the laboratory for analysis. The containers, screw caps, and cap septa (silicone vapor barriers) should be washed with detergent, rinsed once with tap water, rinsed at least twice with distilled water, and dried at $>105°$ C. A solvent rinse should not be used because it may interfere with the analysis.

To avoid leaving headspace in the containers, sample containers can be filled in one of two ways. If there is adequate water in the sediment, the vial should be filled to overflowing so that a convex meniscus forms at the top. Once sealed, the bottle should be inverted to verify the seal by demonstrating the absence of air bubbles. If there is little or no water in the sediment, jars should be filled as tightly as possible, eliminating obvious air pockets. With the cap liner's PTFE side down, the cap should be carefully placed on the opening of the vial, displacing any excess material.

For sulfides sampling, 5 mls of 2 Normal zinc acetate per 30-g of sediment should be placed in a 4-ounce sampling jar. The sulfides sample should be placed in the jar, covered, and shaken vigorously to completely expose the sediment to the zinc acetate.

The volatiles and sulfides sampling jars should be clearly labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, and initials of person(s) preparing the sample, and referenced by entry into the log book. The sulfides sampling jars should indicate that zinc acetate has been added as a preservative.

d. <u>Sampling Logs</u>. As samples are collected, and after the volatiles and sulfides sub-samples have been taken, logs and field notes of all samples should be taken and correlated to the sampling location map. The following should be included in this log:

- Date and time of collection of each sediment sample.
- Names of field supervisors and person(s) collecting and logging in the sample.
- Weather conditions.
- The sample station number and individual designation numbers assigned for individual core sections.
- Quantitative notation of apparent resistance of sediment column to coring.
- The water depth at each sampling station. This depth should then be referenced to mean lower low water (MLLW NAD 83) through the use of an on-site tide gage.

- Length, depth interval (referenced to the sediment/water interface) and percent recovery of core sections.

- Physical sediment description, including type, density, color, consistency, odor, stratification, vegetation, debris, biological activity, presence of an oil sheen or any other distinguishing characteristics or features.

- Any deviation from the approved sampling plan.

e. **Extrusion, Compositing and Sub-sampling.** Depending on the sampling methodology and procedure proposed, sample extrusion, compositing and subsampling may take place at different times and locations. If core sampling is conducted, these activities can either occur at the sampling site (e.g., on board the sampling vessel) or at a remote facility. Grab samples will be processed immediately upon sampling. If cores are to be transported to a remote facility for processing, they should be stored at 4°C onboard the sampling vessel and during transport. The cores should be sealed in such a way as to prevent leakage and contamination. If the cores will be sectioned at a later time, thought needs to be given to core integrity during transport and storage to prevent loss of stratification. For cores or split-spoon sampling, the extrusion method should include procedures to prevent contamination.

For composited samples, representative volumes of sediment should be removed from each core section or grab sample comprising a composite. The composited sediment should be mixed until homogenized to a uniform color and consistency, and should continue to be stirred while individual samples are taken of the homogenate. This will ensure that the mixture remains homogenous and that settling of coarse-grained sediments does not occur.

At least 6 liters of homogenized sample needs to be prepared to provide adequate volume for physical, chemical and biological laboratory analyses. Bioassays require approximately 4 liters while chemical testing requires approximately 1 liter of sediment. Both chemistry and bioassay samples should be taken from the same homogenate. Portions of each composite sample will be placed in appropriate containers obtained from the chemical and biological laboratories. See Table 8-1 for container and sample size information. In high-ranked areas, the sample taken from the foot beyond the dredging overdepth should be placed in a 250 ml glass jar and frozen for possible future analysis.

After compositing and subsampling are performed, the sample containers should be refrigerated or stored on ice until delivered to the analytical laboratory. The samples reserved for bioassays should be stored at 4°C in a nitrogen atmosphere, i.e., nitrogen gas in the container headspace, for up to 56 days pending initiation of any required biological testing. Each sample container should be clearly labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, and initials of person(s) preparing the sample, and referenced by entry into the log book.

f. **Sample Transport and Chain-of-Custody Procedures.** Sample transport and chain of custody procedures should follow the PSEP protocols, which include the following guidelines:

- If sediment cores are taken in the field and transported to a remote site for extrusion and compositing, chain of custody procedures should commence in the field for the core sections and should track the compositing and subsequent transfer of composited samples to the analytical laboratory. If compositing occurs in the field, chain-of-custody procedures should commence in the field for the composites and should track transfer of the composited samples to the analytical laboratory.

- Samples should be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24.

- Individual sample containers should be packed to prevent breakage and transported in a sealed ice chest or other suitable container.

- Ice should be placed in separate plastic bags and sealed, or blue ice used.

- Each cooler or container containing sediment samples for analysis should be delivered to the laboratory within 24 hours of being sealed.

- A sealed envelope containing chain-of-custody forms should be enclosed in a plastic bag and taped to the inside lid of the cooler.

- Signed and dated chain-of-custody seals should be placed on all coolers prior to shipping.

- The shipping containers should be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.

TABLE 8-1
SAMPLE STORAGE CRITERIA

SAMPLE TYPE	HOLDING TIME	SAMPLE SIZE[1]	TEMPERATURE[2]	CONTAINER	ARCHIVE[3]
Particle Size	6 Months	100-200 g (150 ml)	4°C	1-liter Glass (combined)	X
Total Solids	14 Days	125 g (100 ml)	4°C		
Total Volatile Solids	14 Days	125 g (100 ml)	4°C		
Total Organic Carbon	14 Days	125 g (100 ml)	4°C		
Ammonia	7 Days	25 g (20 ml)	4°C		
Metals (except Mercury)	6 Months	50 g (40 ml)	4°C		
Semi-volatiles, Pesticides and PCBs	14 Days until extraction 1 Year until extraction 40 Days after extraction	150 g (120 ml)	4°C -18°C		
Total Sulfides	7 Days	50 g (40 ml)	4°C[4]	125 ml Plastic	
Mercury	28 Days	5 g (4 ml)	-18°C	125 ml Glass	
Volatile Organics	14 Days	100 g (2-40 ml jars)	4°C	2-40 ml Glass	
Bioassay	8 Weeks	4 liters	4°C[5]	5-1 liter Glass	
Bioaccumulation	8 Weeks	16 liters	4°C[5]	16-1 liter Glass	

[1] Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.
[2] During transport to the lab, samples will be stored on ice. The mercury and archived samples will be frozen immediately upon receipt at the lab.
[3] For every DMMU, a 250 ml container is filled and frozen to run any or all of the analyses indicated.
[4] The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate for every 30 g of sediment.
[5] Headspace purged with nitrogen.
[6] 8 liters per bioaccumulation test species.

- Upon transfer of sample possession to the analytical laboratory, the chain-of-custody form should be signed by the persons transferring custody of the sample containers. The shipping container seal should be broken and the condition of the samples should be recorded by the receiver.

- Chain-of-custody forms should be used internally in the lab to track sample handling and final disposition.

8.6 SAMPLING OF SEDIMENT EXPOSED AFTER DREDGING.

The sediment which will be exposed after dredging must meet the State of Washington Sediment Management Standards (SMS). In high-ranked areas, or where the exposed sediment is anticipated to be contaminated above the in situ sediment standard for chemical concentrations established by the SMS, a sample from the first foot below the dredging overdepth must be collected and archived. This will allow possible future analysis to evaluate chemical concentrations in the newly exposed sediment if this is deemed necessary by the agencies.

The archived sediment must be frozen. Because the holding time for mercury will likely be exceeded, and sediments for volatiles analysis cannot be frozen, mercury and the volatile chemicals-of-concern will not need to be analyzed for the archived sediments unless these chemicals are anticipated to be a problem in the newly-exposed sediments. In this case, analysis will need to occur immediately.

CHAPTER 9
TIER II CHEMICAL TESTING

Consistent with the tiered testing approach, and following an assessment of existing information in Tier 1, chemical testing of the dredged material may be required. Chemical analysis includes both the measurement of "conventional" parameters and the measurement of concentrations of chemicals which have been identified as chemicals of concern for Grays Harbor/Willapa Bay dredged material.

9.1 SEDIMENT CONVENTIONAL PARAMETERS.

"Conventional" parameters are required to be measured to further characterize the sediment in the management unit and to provide information to aid in interpreting chemical and biological tests. Conventionals that will be measured include:

- Total volatile solids (TVS).
- Grain size.
- Total organic carbon (TOC).
- Percent solids (Total solids).
- Total sulfides.
- Ammonia.
- pH.

9.2 SEDIMENT CONVENTIONALS TESTING PROTOCOLS.

Sediment sampling and chemical testing procedures to be used are generally those summarized in the latest version of *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*, prepared for PSEP. Protocols for analysis of most conventional sediment parameters measured under the Grays Harbor and Willapa Bay testing program will be those recommended by PSEP for analysis of Puget Sound sediments (Tetra Tech, 1986). Measurement of grain size will follow the techniques indicated in the *Recommended Protocols*, but is specified to require a Number 230 (62.5 um mesh) sieve to be used in the determination of percent fines. (The ASTM sieves do not usually include this mesh size.) Ammonia analysis should be conducted according to standard EPA/Corps procedures

(Plumb, 1981). Detailed methods for analyzing TOC samples may be found in the 18th Edition of Standard Methods for Examination of Water and Wastewater (Franson, 1992). Method 5310B is recommended, slightly modified for sediment samples. A description of the modified TOC method is provided as a clarification in the proceedings from the PSDDA Fifth Annual Review Meeting (Bragdon-Cook, 1993)). Reports detailing conventional tests should report detection limits and report QA/QC.

9.3 STANDARD LIST OF CHEMICALS OF CONCERN.

Chemical testing, when required, will generally involve analysis for 56 chemicals of concern (see Table 9-1). Table 9-1 also presents guideline values for each chemical. Use of the guideline values is discussed in the following section. The chemicals of concern list was developed using historical data, recent dredging project data, and existing activities information from Grays Harbor and Willapa Bay. Chemicals on the Washington State Sediment Management Standards list were also included. The chemicals of concern generally have the following characteristics:

- A demonstrated or suspected effect on ecology or human health (i.e., the focus of chemical concerns is on ultimate biological effects).
- One or more present or historical sources of sufficient magnitude to be of concern (i.e., relatively widespread distribution and high concentration when compared to natural conditions).
- A potential for remaining in a toxic form for long periods in the environment (persistence).
- A potential for entering the food web (bioavailability).

9.4 CHEMICALS OF CONCERN FOR LIMITED AREAS.

In addition to the list of standard chemicals of concern, there is a list of chemicals of concern that may need to be measured for dredging projects in limited areas. These chemicals include:

- Guaiacols.
- Resin Acids (may include abietic acid, dehydroabietic acid, dichlorodehydroabietic acid, isopimaric acid, and sandaracopimaric acid).
- Butyltins.

Butyltin testing is indicated in areas near boat and vessel maintenance and construction. A screening level of 30 ug/kg and a bioaccumulation trigger of 219 ug/kg have been established for tributyltin (TBT).

Guaiacols and chlorinated guaiacols are measured in areas where kraft pulp mills are located. Only guaiacols will be measured near sulfite pulp mills (chlorinated guaiacols are not expected in processes that do not involve bleaching).

9.5 DIOXINS/FURANS.

Recent data from dredging projects in Grays Harbor indicate low, but detectable, concentrations of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), in addition to other chemicals detected above levels of concern, in dredged material from some areas. PCDDs and PCDFs meet several of the requirements for listing as chemicals of concern in dredged material. These dioxin/furan compounds are documented to be highly toxic, are persistent in the environment, may bioaccumulate in animal tissues, and are listed as human teratogens and carcinogens.

Some applicants for Grays Harbor dredging projects will be required to perform dioxin/furan sediment analyses for background "reason to believe" information. This testing will generally be required when projects are in areas potentially impacted by known sources of dioxin/furan or in areas where the presence of dioxin/furan compounds has been demonstrated in past testing. It is anticipated that those projects indicating previously low levels of concern for dioxin/furan compounds will not need to provide dioxin/furan data on a routine basis in the future unless there is a reason to believe that existing conditions have changed.

In the case of dredging projects for which sediment concentrations of dioxin/furan compounds are of concern, in conjunction with other chemicals detected above levels of concern, the applicant will be required to conduct the standard suite of bioassays. The applicant may also be required to conduct bioaccumulation testing, with tissue analysis for PCDFs and PCDDs (see Paragraph 10.4 for further discussion). Test interpretation guidelines include both human health and ecological effects assessments. In situations in which only dioxins/furan compounds are present, national guidance will be followed; the applicant will contact the Corps' Dredged Material Management Office for applicable guidance. At the national level, the ongoing EPA/Corps of Engineers Task Group on Management of Dioxin Contaminated Dredged Material is working to develop an overall decision-making framework for managing dredged material contaminated with dioxins and/or furans. Any applicable guidance from the Task Group will be considered by the regulatory agencies.

TABLE 9-1
SCREENING LEVEL (SL), BIOACCUMULATION TRIGGER (BT), AND MAXIMUM LEVEL (ML) GUIDELINE CHEMISTRY VALUES
(Dry Weight Normalized)

Note: See footnotes at end of table.

CHEMICAL	CAS NUMBER[1]	SCREENING LEVEL	BIOACCUM TRIGGER	MAXIMUM LEVEL
METALS (ppm)				
Arsenic	7440-38-2	57	507.1	700
Cadmium	7440-43-9	0.96		9.6
Copper	7440-50-8	81		810
Lead	7439-92-1	66		660
Mercury	7439-97-6	0.21	1.5	2.1
Silver	7440-22-4	1.2	4.6	6.1
Zinc	7440-66-6	160		1600
Chromium				
ORGANICS (ppb)				
Total LPAH		610 / 5,200		6100
Naphthalene	91-20-3	210 / (2,100)		2100
Acenaphthylene	208-96-8	64 / 560		640
Acenaphthene	83-32-9	63 / 500		630
Fluorene	86-73-7	64 / 540		640
Phenanthrene	85-01-8	320 / 1,500		3200
Anthracene	120-12-7	130 / 960		1300
2-Methylnaphthalene	91-57-6	67 / 670		670
Total HPAH		1800 / 12,000		51000
Fluoranthene	206-44-0	630 / 1,700	4600	6300
Pyrene	129-00-0	430 / 2,600		7300
Benzo(a)anthracene	56-55-3	450 / 1,300		4500
Chrysene	218-01-9	670 / 1,400		6700
Benzofluoranthenes (b+k)	205-99-2 207-08-9	800 / 3,200		8000

Note: See footnotes at end of table. **TABLE 9-1 (continued)**

CHEMICAL	CAS NUMBER[1]	SCREENING LEVEL	BIOACCUM TRIGGER	MAXIMUM LEVEL
Benzo(a)pyrene	50-32-8	680/1600	4964	6800
Indeno(1,2,3-c,d)pyrene	193-39-5	69/600		5200
Dibenz(a,h)anthracene	53-70-3	120/230		1200
Benzo(g,h,i)perylene	191-24-2	540/320		5400
CHLORINATED HYDROCARBONS				
1,4-Dichlorobenzene	106-46-7	26	190	260
1,2-Dichlorobenzene	95-50-1	19	37	350
1,2,4-Trichlorobenzene	120-82-1	13		64
Hexachlorobenzene (HCB)	118-74-1	23	168	230
PHTHALATES				
Dimethyl phthalate	131-11-3	160	1168	
Diethyl phthalate	84-66-2	97		
Di-n-butyl phthalate	84-74-2	1400	10220	
Butyl benzyl phthalate	85-68-7	470		
Bis(2-ethylhexyl) phthalate	117-81-7	3100	13870	
Di-n-octyl phthalate	117-84-0	6200		
PHENOLS				
Phenol	108-95-2	120	876	1200
2-Methylphenol	95-48-7	20		72
4-Methylphenol	106-44-5	120		1200
2,4-Dimethylphenol	105-67-9	29		50
Pentachlorophenol	87-86-5	100	504	690
MISCELLANEOUS EXTRACTABLES				
Benzyl alcohol	100-51-6	25		73
Benzoic acid	65-85-0	400		690
Dibenzofuran	132-64-9	54		540
Hexachlorobutadiene	87-68-3	29	212	290
N-Nitrosodiphenylamine	86-30-6	28	161	220

Note: See footnotes at end of table. **TABLE 9-1 (continued)**

CHEMICAL	CAS NUMBER[1]	SCREENING LEVEL	BIOACCUM TRIGGER	MAXIMUM LEVEL
PESTICIDES				
Total DDT[2]	72-54-8 72-55-9 50-29-3	6.9	50	69
Aldrin	309-00-2	10	37	
alpha-Chlordane	12789-03-6	10	37	
Dieldrin	60-57-1	10	37	
Heptachlor	76-44-8	10	37	
gamma-BHC (Lindane)	58-89-9	10		
alpha-BHC	319-84-6			
beta-BHC	319-85-7			
1-Naphthenol				
Total PCBs	1336-36-3	130	38[3]	2500

[1] Chemical Abstract Service Registry Number.
[2] Includes 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT.
[3] This value is normalized to total organic carbon, and is expressed in ppm (TOC normalized).

Note: Blanks in the table indicate lack of a value for this chemical. Whether a value will be provided in future updates depends on the value. For example, in the case of bioaccumulation triggers, only chemicals known to bioaccumulate will have a trigger.

9.6 CHEMICAL TESTING PROTOCOLS.

Sediment sampling and chemical testing procedures for sediments to be used are generally those summarized in the latest version of *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*, prepared for PSEP. Metals and organics testing protocols will be those recommended by the PSEP for chemical analyses on Puget Sound sediments. For polychlorinated dioxins and furans, EPA SW846 high-resolution Method Number 8290 will be used, or an equivalent agency-approved method. Reports submitted detailing chemical tests will report detection limits and QA/QC.

9.7 CHEMICAL DISPOSAL GUIDELINES.

Chemical concentrations will be compared to two chemical guideline values presented in Table 9-1. First, a lower "screening level" (SL) has been defined for each chemical as a guideline to identify chemical concentrations below which there is no reason to believe that dredged material disposal would result in unacceptable adverse effects. For dredged material with chemical concentrations below the SL values, biological testing is not required to determine material suitability for unconfined, open-water disposal. Second, a higher "maximum level" (ML) has been defined for each chemical which corresponds to the concentration of a chemical in dredged material above which there is reason to believe that the material would be unacceptable for unconfined, open-water disposal.

For each management unit, the SL and ML guideline values will be used to determine whether biological testing is needed before a decision is made on the suitability for unconfined, open-water disposal. Four potential interpretations are possible:

- All chemicals are below their SLs; no biological testing is needed; the management unit is considered suitable for unconfined, open-water disposal.

- One or more chemicals are present at levels between SL and ML; standard biological testing is needed (see Chapter 10).

- A single chemical exceeds ML by less than 100 percent (i.e., less than twice the ML value); standard biological testing is needed (see Chapter 10).

- A single chemical exceeds ML by more than 100 percent (i.e., twice the ML value) or two or more chemicals are above the ML; no biological testing is needed; there is reason to believe the management unit is unacceptable for unconfined, open-water disposal. However, the dredger has the option described below to accept the indication of the ML or conduct additional biological testing (see Chapter 11).

When chemicals of concern exceed the ML values, the dredger has two options. First, he may elect to accept the indication of the ML and conclude that the material is unsuitable for unconfined, open-water disposal. Biological testing is not required for this decision. The second option is to conduct biological testing rather than rely on the indications of the chemical maximum level. For this option, the dredger would conduct the standard suite of bioassays, bioaccumulation, and other additional, more sensitive sublethal tests in order to determine final biological suitability of the material for unconfined, open-water disposal (see Chapter 11). Appropriate biological tests and test interpretation will be determined by the Corps, EPA, Ecology, and DNR on a project-by-project basis. It is not anticipated that dredger option testing, due to exceedances of ML, will be required in Grays Harbor and Willapa Bay based on existing data from past projects. However, the above discussion has been included in the unlikely case that highly contaminated material is proposed for dredging.

9.8 BIOACCUMULATION TESTING.

In addition to comparisons to SL and ML and subsequent determinations outlined above, bioaccumulation trigger values are used as guidelines for determining when bioaccumulation testing is required. These values are found in Table 9-1. If any chemical of concern exceeds the bioaccumulation trigger guideline value, additional information gained via bioaccumulation testing may be required in order to determine whether dredged material is suitable for unconfined, open-water disposal. Discussion on bioaccumulation testing is presented in Section 10-4.

9.9 DETECTION LIMITS.

In the case of undetected chemicals of concern, sample-specific detection limits will be used to determine biological testing requirements. The chemical disposal guidelines presented in Section 9.7 for detected chemicals of concern will apply equally to detection limits. The following scenarios are possible and need to be understood and handled appropriately:

a. One or more chemicals-of-concern (COC) have limits of detection exceeding screening levels while all other COCs are quantitated or have limits of detection at or below the screening levels: the requirement to conduct biological testing will be triggered solely by limits of detection. In this case the chemical testing subcontractor should do everything possible to bring limits of detection down to or below the screening levels, including additional cleanup steps, re-extraction, etc. This is the only way to prevent unnecessary biological testing. If problems or questions arise, the chemical testing subcontractor will be directed to contact the Dredged Material Management Office.

b. One or more COCs have limits of detection exceeding screening levels for a lab sample, but below respective bioaccumulation triggers (BT) and maximum levels (ML), and other COCs have quantitated concentrations above screening levels: The need to do bioassays is based on the detected exceedances of SLs and the limits of detection above SL become irrelevant. No further action is necessary.

c. One or more COCs have limits of detection exceeding SL and exceeding BT or ML, and other COCs have quantitated concentrations above screening levels: the need to do bioassays is based on the detected exceedances of SLs but all other limits of detection must be brought below BTs and MLs to avoid the requirement to do bioaccumulation testing or Tier IV testing. As in scenario "a" above everything possible should be done to lower the limits of detection.

d. One COC is quantitated at a level which exceeds ML by more than 100%, or more than one COC concentration exceeds ML: there is reason to believe that the test sediment is unsuited for open-water disposal without additional Tier IV testing data. In the absence of Tier IV data, problems with limits of detection for other COCs are irrelevant. No further action is necessary.

In all cases, to avoid potential problems and leave open the option for retesting, sediments or extracts should be kept under proper storage conditions until the chemistry data are deemed acceptable by the regulatory agencies.

CHAPTER 10
TIER III BIOLOGICAL TESTING

10.1 BIOLOGICAL TESTING OF DREDGED MATERIAL.

Tier III biological testing of dredged material will be required when chemical testing results indicate the potential for unacceptable adverse environmental or human health effects. The interpretation guidelines used to evaluate the test results define what is acceptable and unacceptable relative to unconfined open-water disposal. A standard suite of bioassays will be used to evaluate potential environmental effects, and to make a determination regarding the suitability of the dredged material for unconfined open-water disposal. Additionally, for certain chemicals known or suspected of being causative agents affecting human health or affecting ecological health in the marine environment, a bioaccumulation test will be required when these chemicals of concern are detected at concentrations high enough in dredged material to pose a potential human health risk or ecological risk to the disposal environment.

Ideally, bioassessment of the potential effects of dredged material disposal would include a determination of the short and long-term effects of environmental exposures of ecologically important species found near the disposal site to a representative sample of the material to be disposed. In practice, such bioassessment is difficult to simulate in the laboratory. Limitations on technical abilities to develop laboratory exposure environments and tests with benthic species found near disposal sites, and prohibitive costs in time and money to conduct such tests, make these efforts unrealistic. Consequently, the approach most often adopted is to expose representative marine species for relatively short periods of time (up to 10 days for acute toxicity; or somewhat longer exposures of up to 20 days to assess potential chronic/sublethal effects and 28 days to assess bioaccumulation effects) to different phases (primarily solid phase) of whole sediment samples of the dredged material.

In some cases, the species used in the assessment may be commonly associated with benthic communities or ecologically equivalent species found in and around the disposal site. More often than not, however, the species used are surrogates not found in the area of the disposal site. As a result, laboratory assessments are several steps removed ("remote") from conditions that will occur in the field. Because of the remoteness of the tests relative to the potential effects at the disposal site, the ecological meaning of the test results cannot be fully estimated at present. Therefore, though initial interpretive guidance is based on a statistical interpretation of the test results, additional professional judgment is required to determine how biological test results might relate to effects at the disposal site.

To assist regions of the country in developing and interpreting bioassays relative to dredged material evaluation, the Corps and EPA jointly produced technical guidance manuals for both in-bay estuarine disposal (Section 404 of the Clean Water Act) and ocean disposal (Section 103 of the Marine Protection, Research, and Sanctuaries Act), also known as the "Draft Inland Testing Manual" (EPA/COE, 1994) and "Green Book" (EPA/COE, 1991), respectively.

10.2 SOLID PHASE - ACUTE AND CHRONIC EVALUATION.

The standard suite of bioassays in tier III sediment evaluations is triggered by one or more exceedances of screening levels for chemicals of concern in the dredged material (see Table 9-1). Evaluation of broad national biological testing guidance found in the "Green Book" and "Draft Inland Testing Manual," as well as regional experience within other dredged material management programs such as PSDDA, were used to develop a list of standard bioassays. All of the proposed tests have been previously conducted on dredging projects within Grays Harbor/Willapa Bay, and have been used extensively in the PSDDA program over the past five years. Following is the list of standard bioassays for use in Grays Harbor and Willapa Bay. The biological testing suite of three bioassays discussed below addresses solid phase toxicity testing using whole sediment; a fourth solid phase test will be determined in the future. Implementation of a fourth test will use the Annual Review Meeting process (see discussion in Chapter 4) to allow public input and peer review prior to using the test in regulatory suitability determinations.

- ☞ 10-day amphipod acute mortality test.
  - *Rhepoxynius abronius*
  - *Ampelisca abdita*[1]
  - *Eohaustorius estuarius*[2]
- ☞ 20-day juvenile infaunal growth test.
  - *Neanthes arenaceodentata* (Los Angeles karyotype)
- ☞ Sediment larval test. (see next page)

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[1] may be substituted if test sediment contains greater than 60% fines.

[2] may be considered for substitution if test sediment contains greater than 60% fines and the salinity is less than 25 ppt.

☞ Sediment larval test.

- Echinoderm
  - *-Dendraster excentricus*[3]
  - *-Strongylocentrotus purpuratus*[4]
  - *-Strongylocentrotus droebachiensis*[4]

- Bivalve
  - *-Crassostrea gigas*[4]
  - *-Mytilus edulis*[4]

The protocols to be used to run the recommended bioassays are described by the Puget Sound Estuary Program (PSEP), and can be found in the March 1995 PSEP review draft report, entitled *Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments* (PSEP, March 1995). A general PSEP protocol describes the methods for setting up and conducting the juvenile infaunal bioassay known as the *Neanthes* 20-day growth test, with some minor changes implemented by the PSDDA program and the Washington State Sediment Management Standards program. Additional specifications on the test termination and counting procedures for the sediment larval test are provided in the June 15, 1990 PSDDA bioassay workshop minutes (Kendall, 1990).

The PSEP protocols describe field collection and processing methods, bioassay specific QA/QC, and data reporting procedures. Also, general protocols are provided for field collection of surficial test sediments and for general QA/QC procedures that apply to all sediment bioassays.

a. Quality Assurance/Quality Control. The following QA/QC guidelines apply to the standard suite of solid phase bioassays:

- Negative Control and Reference Samples. For the amphipod and the juvenile infaunal species biological tests, a negative sediment control will be run with each test. For the sediment larval test, a negative seawater control is required. The negative control is intended to provide an estimate of test organism general health during the test exposure period. A reference sediment will be run with all three bioassays. The reference sediment will be collected from one of the reference sediment collection sites in Grays Harbor or Willapa Bay and should be compatible on a physical and grain size basis with the dredged material (see Section 10.5). The primary purpose of the reference sediment is to determine the response of the test organisms to sediments of physical characteristics similar to the proposed dredged material. The reference sediment should be run in-batch. For dredged material with relatively coarse-grained sediments

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[3] recommended species.

[4] acceptable species.

(> 80 % sand), the dredger can opt to rely solely on a control sediment[5] (acting as both reference and control). General guidance for the proper collection of reference area samples is provided in the 1993 PSDDA annual review meeting minutes (Fox, 1993). Reference and control sediments, as well as dredged material being tested, may contain live organisms. If visual inspection of these sediments confirms this, the bioassay lab conducting the test should remove macrobenthic organisms by press-sieving the sediments through a 1-mm mesh sieve. The material remaining on the sieve should then be noted and discarded. The sieved sediments should then be used as soon as practical after macroinvertebrate removal.

- Quality Control Limits for the Negative Control Treatment. All three bioassays have negative control performance standards that must be met (see Table 10-1). In the amphipod and juvenile infaunal bioassay tests, control mortality over the exposure period should be less than or equal to 10 percent (absolute). This represents a generally accepted level of mortality of test organisms under control conditions, where the bioassay (in terms of test organism health) is still considered a valid measure of effects of the test treatments. If control mortality is greater than 10 percent, the bioassay test will generally have to be repeated, although that determination must be made in consultation with the agencies through the Corps' Dredged Material Management Office. For the sediment larval test, the performance standard for the seawater negative control combined endpoint (mortality + abnormality) is 30 percent.

- Quality Control Limits for the Reference Treatment. Performance guidelines for bioassays follow general Puget Sound Estuary Program quality control limit specifications for reference sediments as follows (see Table 10-1): the mean amphipod test mortality for the reference sediment should not exceed 20 percent absolute over the mean control sediment mortality. For the juvenile infaunal growth test, the reference sediment mean growth rate should be greater than or equal to 80 percent of the control sediment's mean growth rate at the end of the exposure period. The seawater-normalized combined endpoint (mortality + abnormality) observed in the reference sediment for the sediment larval test should not exceed 35 percent. Failure to meet the reference sediment performance standard for a bioassay may require that the bioassay be rerun with a new reference sediment. If a quality control guideline is exceeded for a reference sediment, the Corps' Dredged Material Management Office should be contacted as soon as possible to coordinate this issue with the agencies for a decision to retest or not, utilizing the latest available information on reference area performance.

- Reference Toxicant. An appropriate reference toxicant must be run with each batch of test sediments to assess the test organism sensitivity. The LC_{50} or EC_{50} must be within the 95 percent confidence interval of responses expected for the toxicant used.

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[5] for *Rhepoxynius abronius* and *Neanthes arenaceodentata*.

■ Water Quality Monitoring. Temperature, aqueous salinity, pH, and dissolved oxygen should be monitored on a daily basis for the amphipod and sediment larval tests, and every three days for the 20-day *Neanthes* growth test. Total sulfides and ammonia should be measured at test initiation and termination for all three tests. Interstitial salinity should be measured prior to test initiation. The test protocols for each of these bioassays specify acceptable ranges for these parameters. Water quality data can be critical in the interpretation of bioassay results.

TABLE 10-1
SOLID PHASE BIOASSAY PERFORMANCE STANDARDS

PARAMETER	AMPHIPOD BIOASSAY	SEDIMENT LARVAL BIOASSAY	*NEANTHES* 20-DAY GROWTH TEST
Negative control performance	Mortality ≤ 10 %	CMA[1] ≤ 30 %	Mortality ≤ 10 % Growth rate[3] ≥ 0.72
Reference sediment performance	Reference mortality minus control mortality ≤ 20 %	NCMA[2] ≤ 35 %	Mean individual growth rate[3] ≥ 80 % of control

[1] Combined mortality and abnormality.
[2] Normalized combined mortality and abnormality (see text).
[3] Expressed as mg/individual-day (dry weight)

b. Bioassay Interpretive Criteria. The response of bioassay organisms exposed to the tested dredged material representing each management unit will be compared to the response of these organisms in both control and reference treatments to determine whether the material is suitable for unconfined, open-water disposal relative to the Clean Water Act (CWA) Section 404(b)(1) Guidelines and the Marine Protection, Research, and Sanctuaries Act (MPRSA) Section 103 Guidelines (see Table 10-2).

The determination of a "statistically significant" response involves two conditions: first, that the response in the tested dredged material management unit must be greater than 20 percent different from the control response; and second, that a statistical comparison between mean test and mean reference responses must show a significant difference. For the latter determination, the appropriate method is a statistical comparison which involves:

☞ Testing for homogeneity of variances in the test and reference treatments;

☞ An arcsine transformation of the data if variances are found to be non-homogeneous, followed by retesting for homogeneity of variances; and

☞ Performance of a statistical comparison between test and reference responses after homogeneity of variances has been tested.

If they are homogeneous, a single-tailed Student's "t" comparison is used to test the null hypothesis that the mean responses are equal. If they are not homogeneous after transforming the data, either a parametric "approximate t" test or a nonparametric Mann-Whitney test should be used to test the null hypothesis.

(1) Single-Hit Failure. When **any one** biological test shows a test sediment response relative to the negative control and reference sediment which exceeds the bioassay-specific response guidelines relative to the reference, and which is "statistically significant" from the reference, the dredged material management unit is judged to be unsuitable for unconfined open-water disposal (see Table 10-2).

- Amphipod Bioassay. For the amphipod bioassay, mean test mortality greater than 20 percent absolute over the mean negative control response, and greater than 10 percent absolute over the mean reference sediment response, and statistically different from the reference (alpha = 0.05), is considered a "hit".

- Juvenile Infaunal Growth Test. Juvenile *Neanthes* growth test results that show a mean test individual growth rate less than 80 percent of the mean negative control growth rate, and less than 70 percent (relative) of the mean reference sediment growth rate, and statistically different from the reference (alpha = 0.05), is considered a "hit".

- Sediment Larval Bioassay. For the sediment larval bioassay, test and reference sediment responses are normalized to the negative seawater control response. This normalization is performed by dividing the number of normal larvae from the test or reference treatment at the end of the exposure period by the number of normal larvae in the seawater control at the end of the exposure period, and multiplying by 100 to convert to percent. The normalized combined mortality and abnormality (NCMA) is then 100 minus this number. If the mean NCMA for a test sediment is greater than 20 percent, and is 15 percent absolute over the mean reference sediment NCMA, and statistically different from reference (alpha = 0.10), it is considered a "hit".

(2) Two-Hit Failure. When **any two** biological tests (amphipod, juvenile infaunal biomass, or sediment larval) show test sediment responses, which are less than the bioassay specific guidelines noted above for a single-hit failure, but are significantly different from the reference sediment, the dredged material management unit is judged to be unsuitable for unconfined open-water disposal.

This interpretation of solid phase biological test results will be used for both the CWA Section 404(b)(1) evaluation/Section 401 water quality certification process, and for the MPRSA Section 103 evaluation process.

TABLE 10-2
SOLID PHASE BIOASSAY INTERPRETIVE GUIDELINES FOR SINGLE-HIT FAILURES [1]

INTERPRETIVE COMPARISON	AMPHIPOD BIOASSAY	SEDIMENT LARVAL BIOASSAY	*NEANTHES* 20-DAY GROWTH TEST
Test response comparison to negative control	Test sediment mortality minus control mortality > 20 %	Test sediment NCMA > 20 %	Mean test sediment individual growth rate < 80 % of mean control individual growth rate
Test response comparison to reference sediment	Test sediment mortality minus reference mortality > 10 %	Test sediment NCMA minus reference NCMA > 15 %	Mean test sediment individual growth rate < 70 % of reference
Statistical comparison to reference sediment (see text)	Statistical significance ($p < 0.05$)	Statistical significance ($p < 0.10$)	Statistical significance ($p < 0.05$)

[1] Test sediment responses which are less than the interpretative criteria shown in Table 10-2 for a "single-hit" failure, but exhibit a response greater than 20% over the control, and are significantly different from the reference sediment are interpreted as a "two-hit" response, requiring another "hit" (single or double) to judge a DMMU unsuitable for unconfined open-water disposal.

Alternative bioassay interpretation guidelines (e.g., PSDDA nondispersive guidelines) may be utilized by the agencies exercising best professional judgement on a case-by-case basis when (1) chemistry results for a given DMMU show that all chemicals are below the lowest apparent effects thresholds (LAETs); or (2) bioassay responses observed are suspected of reflecting nontreatment effects (grain size, ammonia, sulfides, etc.). The rationale for using alternative interpretation guidelines will be documented by the Dredged Material Management Office and approved by the agencies in the suitability determination memorandum for the project.

c. **Illustration of Solid Phase Interpretation Guidelines.** Following is an example of the application of the solid phase interpretation guidelines to three DMMUs. Results for the negative control and the reference sediment are included for comparison to test sediment treatments and to illustrate the application of performance standards. Results have been expressed as means plus or minus the standard deviation.

Table 10-3 illustrates that the performance standards for the negative control and reference sediment were met for all three bioassays, and that the results were acceptable for decision making.

Test DMMU-1 shows that all three biological responses were within the guidelines for suitable material. The amphipod test mortality was less than 10 percent over reference; sediment larval normalized combined mortality and abnormality was less than 15 percent over reference; and *Neanthes* growth rate was greater than 70 percent of reference. None of these were significantly different from reference. This DMMU would be suitable for unconfined, open-water disposal (UCOWD).

Test DMMU-2 illustrates an example of a two-hit bioassay failure. Both the amphipod and sediment larval responses are less than the single-hit response guideline, but are significantly different than reference responses, and therefore considered hits under two-hit guidelines. The *Neanthes* growth rate response is greater than 70 percent of reference and is not significantly different than reference. This DMMU would be judged to be unsuitable for UCOWD based on the significance of the amphipod and sediment larval responses relative to reference sediments.

Test DMMU-3 illustrates an example of a single two-hit response with no corroborating hits from the other two bioassays. It shows an amphipod response less than 20 percent over the control response, less than 10 percent over reference and not statistically different from reference. The sediment larval response is greater than 20 percent over control but is less than 15 percent over reference and not statistically different from reference. In the *Neanthes* test, the growth rate response is greater than 70 percent of the reference, but is statistically different from reference (two-hit response, requiring another bioassay hit for DMMU failure). This DMMU would be judged suitable for UCOWD because there are no corroborating hits from the other two bioassays.

DMMU-4 exhibits "single hits" for all three bioassays, each exceeding the numerical comparison guidelines for the negative control and reference and are statistically different from reference sediments. The individual results for each of these bioassays fails disposal guidelines for UCOWD for the "single-hit" response, and this DMMU is unsuitable for UCOWD.

d. <u>Amphipod Species Substitution</u>. *Rhepoxynius abronius* has been shown to be responsive to high percent fines in sediments, particularly high clay content sediments, and has been shown to exhibit mortalities greater than 20 percent in clean, reference area sediments (DeWitt <u>et al</u>, 1988; Fox, 1993). Applicants may wish to consider substituting *Ampelisca abdita* for *Rhepoxynius abronius* when fines exceed 60 percent. *Ampelisca* is relatively grain-size-insensitive to concentrations of fines greater than 60 percent. When testing fine-grained sediments (> 60 percent) where interstitial salinities are substantially below 25 ppt, dredging applicants may propose substituting *Eohaustorius estuarius* for *R. abronius*. This species is relatively insensitive to salinity changes and effects of grain size. Any proposed species substitutions must be coordinated through the Dredged Material Management Office for approval by the agencies prior to use, and the rationale for the substitutions must be documented in the sampling and analysis plan for the proposed dredging project.

TABLE 10-3
HYPOTHETICAL PROJECT INTERPRETATION EXAMPLE

TREATMENT	AMPHIPOD TEST (% mortality)	SEDIMENT LARVAL TEST (% NCMA)	NEANTHES GROWTH TEST (mg/individual-day) (% of reference)	DMMU SUITABILITY FOR UCOWD
Negative control	4 ± 1	0[1]	0.7 ± 0.06 3 ± 1 % mortality[2]	-
Reference sediment	16 ± 4	7 ± 3	0.66 ± 0.07	-
DMMU-1	17 ± 5 ns	10 ± 4 ns	0.62 ± 0.06 ns (93.9%)	Suitable
DMMU-2	25 ± 2 *	21 ± 3*	0.59 ± 0.05 ns (89.4%)	Unsuitable
DMMU-3	19 ± 3 ns	21 ± 6 ns	0.55 ± 0.1 * (75.8%)	Suitable
DMMU-4	33 ± 4 *	36 ± 4 *	0.41 ± 0.08 * (62.1%)	Unsuitable

[1] For clarity the negative seawater control has been normalized (i.e., set to zero). The actual combined mortality and abnormality for the seawater control was 23%. Therefore, the seawater control met its performance standard of ≤ 30% combined mortality and abnormality.

[2] The test met the performance standard of ≤ 10% mortality.

ns - not statistically significant.

* - statistically significant response relative to the reference sediment. Shaded portions of the table highlight test results which indicate that the DMMU is considered a hit under either the single-hit or two-hit guidelines for unconfined open-water disposal.

10.3 WATER COLUMN BIOASSAY TESTING.

The Tier III evaluation of dredged material may include an evaluation of potential water column effects using echinoderm or bivalve larvae, when warranted. Water column testing for biological effects is not routinely required for regulated or federal dredging projects evaluated under CWA Section 404 or MPRSA Section 103 for either in-bay estuarine or ocean disposal. This test will need to be conducted only when the water quality certification agency (Washington Department of Ecology for Section 404/401 permits or the Environmental Protection Agency for Section 103 ocean disposal permits) requires an assessment of potential water column toxicity effects relative to a particular chemical of concern.

In the event that water column testing is required, the echinoderm/bivalve larval test will be conducted to evaluate water column effects. The appropriate assessment is described in the "Green Book" (EPA, Corps, 1991) and draft Inland Testing Manual (EPA, Corps, 1994). The interpretation guidelines specified in either manual will be used, depending on whether the ultimate disposal environment proposed is in the Section 103 (ocean) or in 404 (fresh water, estuarine, or near coastal) waters. Protocols for the larval water column test utilizing the PSEP protocol should follow the test specification requirements described in the draft 1994 "Inland Testing Manual" (Appendix E). The following species may be used for the larval water column bioassay test:

- Echinoderm
  - *Dendraster excentricus*[1]
  - *Strongylocentrotus purpuratus*[2]
  - *Strongylocentrotus droebachiensis*[2]

- Bivalve
  - *Crassostrea gigas*[2]
  - *Mytilus edulis*[2]

10.4 BIOACCUMULATION TESTING.

The Green Book and draft Inland Testing Manual provide for a Tier II estimate of bioaccumulation potential (i.e., theoretical bioaccumulation potential) for non-polar organic compounds as a first step, table top exercise. Plausible exposure scenarios, using the theoretical bioaccumulation potential (TBP) approach, were developed during planning of the PSDDA program. The outcome of these assessments were the bioaccumulation triggers of chemicals likely to be assimilated in marine tissue. These "reason-to-believe" triggers serve as a surrogate for the TBP approach outlined in the Green Book and draft Inland Testing Manual. When non-polar organic compounds (other than those on our existing list of chemicals of concern) are identified for individual projects, the TBP model will be run for those compounds.

Body burdens of chemicals are of concern for both ecological and human health reasons. A bioaccumulation test in Tier III will normally only be conducted on those dredged materials in which a "reason to believe" has been established that specific chemicals of concern may be accumulated in the tissues of target organisms. Following the tier II evaluation of chemicals of concern, bioaccumulation testing evaluating exposures to two species will be required when any given sediment chemical level exceeds any bioaccumulation trigger value established under the PSDDA program (see Table 9-1 or Table 10-4). These values establish the "reason to believe"

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[1] recommended species.

[2] acceptable species.

levels for chemicals likely to bioaccumulate. Bioaccumulation of compounds listed in Table 10-4 should be detectable, following a 28-day exposure period, even though steady state may not have been reached. The purpose of a Tier III bioaccumulation test is not to determine steady state bioaccumulation rate (this is accomplished in Tier IV), but to assess the potential for bioaccumulation (i.e., bioavailability). For many chemicals, it can be assumed that a 28-day exposure is sufficient for a steady state concentration to have been reached. Although time series testing is a component of Tier IV bioaccumulation testing, it may also be appropriate in Tier III, for instances where the octanol/water partitioning coefficients (K_{ow}) for organic compounds are greater than 5.5 (see Table 10-4).

A Tier III 28-day bioaccumulation test will conduct an evaluation with both an adult bivalve (*Macoma nasuta*) and an adult polychaete (*Nereis virens* or *Arenicola marina*). The draft Inland Testing Manual requires two bioaccumulation tests utilizing species from two different trophic niches representing a suspension-feeding/filter-feeding and a burrowing deposit-feeding organism. The proposed testing species suite will fulfill this requirement. The test exposure duration will be 28 days utilizing the EPA protocol (Lee et al. 1989), after which a chemical analysis will be conducted of the tissue residue to determine the concentration of selected chemicals of human health concern, and to assess ecological effects through a statistical comparison with a suitable reference area sediment. Protocols for tissue digestion and chemical analysis will follow the PSEP-recommended procedures for metals and organic chemicals.

Selection of an appropriate species is an important consideration before undertaking a Tier III bioaccumulation test. Studies have shown that the time required for any given species to achieve a steady-state tissue concentration of a chemical of concern may vary, or are not well substantiated (see Table 10-5) (Windom and Kendall, 1979; Rubenstein, Lores, and Gregory, 1983). As such, for a given chemical triggering a Tier III bioaccumulation test, the agencies should consider selecting a species that will assimilate the target chemical near its steady state concentration (e.g., if known) within the exposure period or consider extending the exposure period.

TABLE 10-4
SEDIMENT CHEMISTRY TRIGGER VALUES FOR BIOACCUMULATION TESTING

CHEMICAL	log K_{ow}[1]	CONCENTRATION[2]
METALS (ppm dry weight basis)		
Arsenic	N/A	507.1
Mercury	N/A	1.5
Silver	N/A	4.6
ORGANIC COMPOUNDS (ppb dry weight basis)		
Fluoranthene	5.5	4,600
Benzo(a)pyrene	6.0	4,964
1,2-Dichlorobenzene	3.4	37
1,4-Dichlorobenzene	3.5	190
Dimethyl phthalate	1.6	1,168[3]
Di-n-butyl phthalate	5.1	10,220[3]
Bis(2-ethylhexyl) phthalate	4.2	13,870[3]
Hexachlorobutadiene	4.3	212
Phenol	1.5	876
Pentachloropenol	5.0	504
N-Nitrosodiphenylamine	3.1	161
Tributyltin	--	219
Total DDT	(5.7 - 6.0)[5]	50
Aldrin	3.0	37[3]
Chlordane	6.0	37[3]
Dieldrin	5.5	37[3]
Heptachlor	5.4	37[3]
Total PCBs	(4.0 - 6.9)[5]	38[4]

[1] Octanol/Water Partitioning Coefficients (log K_{ow}) for organic chemicals of concern in Grays Harbor and Willapa Bay.

[2] Concentration = 0.7 × (ML-SL) + SL. When the concentration of any chemical is above this value, bioaccumulation testing is required.

[3] These chemicals do not have an ML value. Therefore, the concentration = ((10SL-SL) × 0.7) + SL = 7.3 × SL.

[4] This value is normalized to Total Organic Carbon and is expressed in ppm (TOC normalized).

[5] Range of individual congeners making up total.

Note: Polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) may also require bioaccumulation testing, although no bioaccumulation trigger has been established for PCDDs and PCDFs. The requirement to conduct bioaccumulation testing will be made by the agencies utilizing best professional judgement after reviewing the Tier II data.

TABLE 10-5
PERCENT OF STEADY-STATE TISSUE RESIDUES OF SELECTED METALS AND NEUTRAL ORGANICS FROM 10 AND 28 DAY EXPOSURES TO BEDDED SEDIMENT[1]

COMPOUND	% OF STEADY STATE[2] TISSUE RESIDUE		SPECIES	ESTIMATED BY	REFERENCES[3]
	10-DAY	28-DAY			
METALS					
Copper	75	100	*Macoma nasuta*	G[5]	Lee (unpublished)
Lead	81	100	*Macoma nasuta*	G	Lee (unpublished)
Cadmium	17	50	*Callianassa australiensis*	G	Ahsanulla et al., 1984
Mercury	ND[4]	ND[4]	*Neanthes succinea*	G	Kendall, 1978
ORGANICS					
PCBs					
Aroclor 1242	18	87	*Nereis virens*	G	Langston, 1978
Aroclor 1254	12	82	*Macoma balthica*	G	Langston, 1978
Aroclor 1254	25	56	*Nereis virens*	K[6]	McLeese et al., 1980
Aroclor 1260	53	100	*Macoma balthica*	G	Langston, 1978
Total PCBs	21	54	*Nereis virens*	G	Pruell et al., 1986
Total PCBs	48	80	*Macoma nasuta*	G	Pruell et al., 1986
Total PCBs	23	71	*Macoma nasuta*	G	Boese (unpublished)
PAHs					
Benzo(a)pyrene	43	75	*Macoma inquinata*	G	Augenfield et al., 1982
Benzo(bk)fluoranthene	71	100	*Macoma nasuta*	G	Lee (unpublished)
Chrysene	43	87	*Macoma inquinata*	G	Augenfield et al., 1982
Fluoranthene	100	100	*Macoma nasuta*	G	Lee (unpublished)
Phenanthrene	100	100	*Macoma inquinata*	G	Augenfield et al., 1981
Phenanthrene	100	100	*Macoma nasuta*	G	Lee (unpublished)
Pyrene	84	97	*Macoma nasuta*	G	Lee (unpublished)

Note: See footnotes at end of table.

TABLE 10-5 (Continued)

COMPOUND	% OF STEADY STATE[2] TISSUE RESIDUE		SPECIES	ESTIMATED BY	REFERENCES[3]
	10-DAY	28-DAY			
TCDD/TCDF					
2,3,7,8-TCDD	6	22	*Nereis virens*	G	Pruell et al., 1990
2,3,7,8-TCDD	63	100	*Macoma nasuta*	G	Pruell et al., 1990
2,3,7,8-TCDF	43	62	*Nereis virens*	G	Pruell et al., 1990
2,3,7,8-TCDF	92	100	*Macoma nasuta*	G	Pruell et al., 1990
MISCELLANEOUS					
4,4-DDE	20	50	*Macoma nasuta*	G	Lee (unpublished)
2,4-DDD	31	56	*Macoma nasuta*	G	Lee (unpublished)
4,4-DDD	32	60	*Macoma nasuta*	G	Lee (unpublished)
4,4-DDT	17	10	*Macoma nasuta*	G	Lee (unpublished)

[1] Modified from draft Inland Testing Manual (Table C), using data updated from Boese and Lee (1992).

[2] Steady-state values are estimates, as steady-state is not rigorously documented in these studies.

[3] See Boese and Lee (1992) for complete citations.

[4] ND = Not Determined. Observed AFs (accumulation factor) for field tissue levels compared with sediment levels (normalized to dry weight) averaged 4 for this species, but ranged from 1.3 to 45 among other benthic macroinvertebrate species. Laboratory 28-day exposures to bedded sediment indicated uptake fit a linear regression model over the exposure period and experimental conditions. Tissue levels observed (*N. succinea)* at 28 days amounted to only 2.5 % of the total sediment-bound Hg potentially available.

[5] G = Steady-state residue estimated by visual inspection of graphs of tissue residue versus time.

[6] K = Steady-state residue estimated from a 1st-order kinetic uptake model.

A particularly vexing problem with tissue chemistry data, which must be addressed prior to statistical analysis of test results, is what to do with tissue concentrations which are quantitated below the detection limit. Such non-numeric data cannot be statistically analyzed unless numeric values are substituted for the less-than detection limit observations. Techniques for handling less-than data are currently being evaluated by the Corps of Engineers, and recommendations will be published as a future appendix to the Inland Testing Manual and updates to this manual. Until such recommendations are promulgated, substituting one-half the detection limit for each less-than observation should be utilized.

Test interpretation guidelines, including both human health and ecological effects assessments are discussed below:

♦ Human Health. For the bioaccumulation test, the results are compared to guideline values to determine exceedance of allowable tissue residue concentrations. If the 28-day bioaccumulation test results in tissue levels greater than the FDA action levels specified in Table 10-6, the sediment will generally be considered unsuitable for unconfined, open-water disposal. On an interim basis chemicals of concern without FDA action levels will be evaluated by the agencies using best professional judgement and risk assessment approaches to evaluate the observed tissue levels.

The current human health sediment criteria utilized by the PSDDA program were generally developed for deep-water disposal sites somewhat removed from natural resources and human resource conflict areas, and as such are not considered to be appropriate or protective of human health if applied to Grays Harbor and Willapa Bay. It is anticipated that future human health sediment criteria under development by Ecology and the Department of Health may significantly alter the human health chemical of concern list and criteria trigger and action levels used in regulating dredged material and contaminated sediments. Development of these criteria are mandated as part of the State of Washington's Sediment Management Standards Program (SMS, WAC 173-204). The standards developed must consider the adverse impacts of contaminated sediments on the environment (aquatic, and other organisms) and on human health. The proposed criteria are being developed and are expected to be in draft form sometime during 1995 for review. Subsequent to adoption and rule-making by Ecology through the legislative process, the new criteria may be implemented in Puget Sound, Grays Harbor and Willapa Bay, to replace the interim guidelines specified in Tables 10-4 and 10-6.

Interpretation of test results requires an evaluation of the statistical significance of the mean bioaccumulation of contaminants in animals exposed to dredged material compared to a specified action level or standard. If the mean tissue concentration of one or more contaminants of concern is greater than or equal to the applicable action level, then no statistical testing is required. The conclusion is that the dredged material does not meet the guidelines associated with the particular action level. If the mean tissue concentration of a chemical of concern is less than the applicable action level, than a confidence-interval approach is used to determine if the mean is significantly less than the action level. One-tailed t-tests are appropriate since there is concern only if bioaccumulation from the dredged sediment is not significantly less than the action level. The one-sample t-test approach depicted on the following page is appropriate to allow independent decisions to be made on each dredged material management unit tested:

$$t = \frac{\bar{x} - actionlevel}{\sqrt{\frac{s^2}{n}}}$$

where "$\bar{x}$", "s^2", and "n" refer to the mean, variance, and number of replicates for contaminant bioaccumulation from the proposed dredged material.

♦ Ecological Effects. The results of a Tier III 28-day bioaccumulation test will be compared directly with reference results for statistical significance. If the results of a statistical comparison show that the tissue concentration of the chemical(s) of concern tested in sediments is statistically different (t-test, alpha level of 0.05) from the reference sediment, the dredged material will generally be considered unsuitable for unconfined open-water disposal. Significant bioaccumulation of chemicals of concern in bioaccumulation test species relative to reference areas may demonstrate a concern for potential food web effects.

The five factors summarized below will be reviewed as part of the regulatory assessment process when bioaccumulation of contaminants in dredged material tests shows statistically significant accumulation of one or more chemicals of concern in tissues relative to the reference sediment. In reviewing these factors, the best regional guidance will be consulted to assess the relative importance of each factor to the regulatory decision.

(1) How many contaminants demonstrate bioaccumulation from dredged material relative to reference sediments?

(2) What is the magnitude of the bioaccumulation from dredged material compared to reference sediments?

(3) What is the toxicological importance of the contaminants (e.g., do they biomagnify or have effects at low concentrations?). Examples of contaminants with biomagnification concerns are DDT, PCB, Hg/MeHg, and possibly dioxins and furans.

(4) What is the potential for the identified contaminants to biomagnify within aquatic food webs? (see Kay, 1984).

(5) What is the magnitude by which contaminants found to bioaccumulate in tissues exceed the tissue burdens of comparable species found at or in the vicinity of the disposal site?

TABLE 10-6
FOOD AND DRUG ADMINISTRATION (FDA) ACTION LEVELS FOR POISONOUS AND DELETERIOUS SUBSTANCES IN FISH AND SHELLFISH FOR HUMAN FOOD

CHEMICAL	TISSUE GUIDELINES (ppm wet weight)
METALS	
Arsenic	TBD[1]
Mercury (Methyl Mercury)	1.0
Silver	TBD
ORGANIC COMPOUNDS	
Fluoranthene	TBD
Benzo(a)pyrene	TBD
1,2-Dichlorobenzene	TBD
1,4-Dichlorobenzene	TBD
Dimethyl phthalate	TBD
Di-n-butyl phthalate	TBD
Bis(2-ethylhexyl) phthalate	TBD
Hexachlorobutadiene	TBD
Phenol	TBD
Pentachloropenol	TBD
Ethylbenzene	TBD
N-Nitrosodiphenylamine	TBD
Total DDT + DDE	5.0
Aldrin	0.3
Chlordane	0.3
Dieldrin + Aldrin	0.3
Heptachlor + Heptachlor Epoxide	0.3
Total PCBs	2.0

[1] No FDA Action Level established. "TBD" = To Be Determined, using best professional judgement and best available guidance.

Note: Tributyltin, polychlorinated dibenzodioxins, and polychlorinated dibenzofurans are additional compounds for which bioaccumulation testing could be required. Interpretation will utilize most current advisory guidelines and best professional judgement.

If results of the bioaccumulation test in Tier III are found to be equivocal, or there is a concern that steady state body burdens in test organisms were not achieved (see Table 10-5), further testing may be required in Tier IV before a regulatory decision can be made on the suitability of the dredged material for unconfined open-water disposal. An exposure period of 28 days may be insufficient for the test species selected to achieve a steady state tissue concentration in a normal Tier III bioaccumulation test. For example, studies have demonstrated that for congeners of DDT, 28 day exposures in *Macoma nasuta* resulted in tissue accumulations amounting to between 10% and 60% (Lee, unpublished data) of the steady state tissue residue expected. For chemicals such as DDT, a Tier IV bioaccumulation approach may be necessary to estimate the steady state tissue concentrations required to make a regulatory decision.

10.5 REFERENCE SEDIMENT COLLECTION SITES.

Bioassays must be run with a reference sediment which is well-matched to the test sediments for grain-size, and other sediment conventionals such as total organic carbon if possible. The *Grays Harbor and Willapa Bay Dredged Material Management Study: Expanded Reference Area Sediments* final report (SAIC, 1993) identified sites suitable for reference sediment collection. Table 10-7 contains information about each of the sites which are recommended for use. Reference sediment collection locations for Grays Harbor and Willapa Bay are shown on Figures 10-1 and 10-2, respectively.

TABLE 10-7
REFERENCE SEDIMENT COLLECTION SITES

PARAMETER	STATION					
	3.9 MILE ODMDS	WBS5	WBS7	GHS4	GHS6	GHS7
Location	SE of 3.9 Mile Site[2]	Grassy Point	Bay Center	Stearns Bluff	Elk River	North Bay
GPS Latitude[1]	46° 51.00'	46° 38.04'	46° 37.90'	46° 55.73'	46° 52.52'	47° 00.35'
GPS Longitude[1]	124° 13.73	124° 01.78'	123° 56.80'	123° 59.03'	124° 04.78'	124° 05.79'
Loran-C TD (Y)	28117.0	28008.9	27991.5	28093.5	28095.5	28142.4[3]
Loran-C TD (Z)	41905.2	41931.4	41945.6	41951.2	41932.1	41934.4[3]
Fines (%)	10	0	35-52	12	2	7-59
TOC (%)	0.10	0.02	0.51-1.0	0.25	0.06	0.15-1.1

[1] World Geodetic Survey 1984 (WGS84).
[2] Station 4 from 3.9-Mile ODMDS site.
[3] Location of the sample with the highest fines content.

The selection criteria used for these sites included sediment chemistry, bioassays and benthic community structure. None of the selected sites contained COCs above screening level and benthic communities were normal at these sites. There were no bioassay hits for any of the sites except for WBS7, which exhibited marginal hits in the sediment larval bioassay in two separate rounds of testing. Because of the difficulties encountered in finding reference sites with high fines-content, WBS7 was not rejected from use. WBS7 performed well for all other bioassays in both rounds of testing and the mortality exhibited in the sediment larval test is not thought to be due to chemical toxicity.

The sampling protocol used for the collection of a reference sediment can affect its performance during biological testing. The following guidelines should be followed when collecting reference sediments:

- Use experienced personnel.
- Follow PSEP protocols.
- Sample from biologically active zone.
- Avoid anoxic sediment below the Redox Potential Discontinuity (RPD) horizon.
- Use wet-sieving method.
- Fix sulfides sample with zinc acetate.

Wet-sieving is imperative in finding a good grain size match with the test sediment. Wet-sieving is accomplished using a 63-micron (#230) sieve and a graduated cylinder; 100 ml of sediment is placed in the sieve and washed thoroughly until the water runs clear. The volume of sand and gravel remaining in the sieve is then washed into the graduated cylinder and measured. This represents the coarse fraction; the fines content is determined by subtracting this number from 100. Because of the wide heterogeneity of grain size at sites like WBS7 and GHS7 it may be necessary to perform the wet-sieving in several places before a reference sediment with the proper grain size is found.

It should be noted that wet-sieving results will not perfectly match the dry-weight-normalized grain size results from the laboratory analysis, but should be relatively close. It is requested that wet-sieving results be submitted along with the laboratory data so that a regression line for each embayment can be developed which more accurately predicts the dry-weight fines fraction from the wet-sieving results found in the field.

Tides can greatly influence reference area sampling in Grays Harbor. Sampling is best performed within two hours of high tide. Because of difficulties that might be encountered navigating the channels through the mudflats, we recommend sampling during daylight hours.

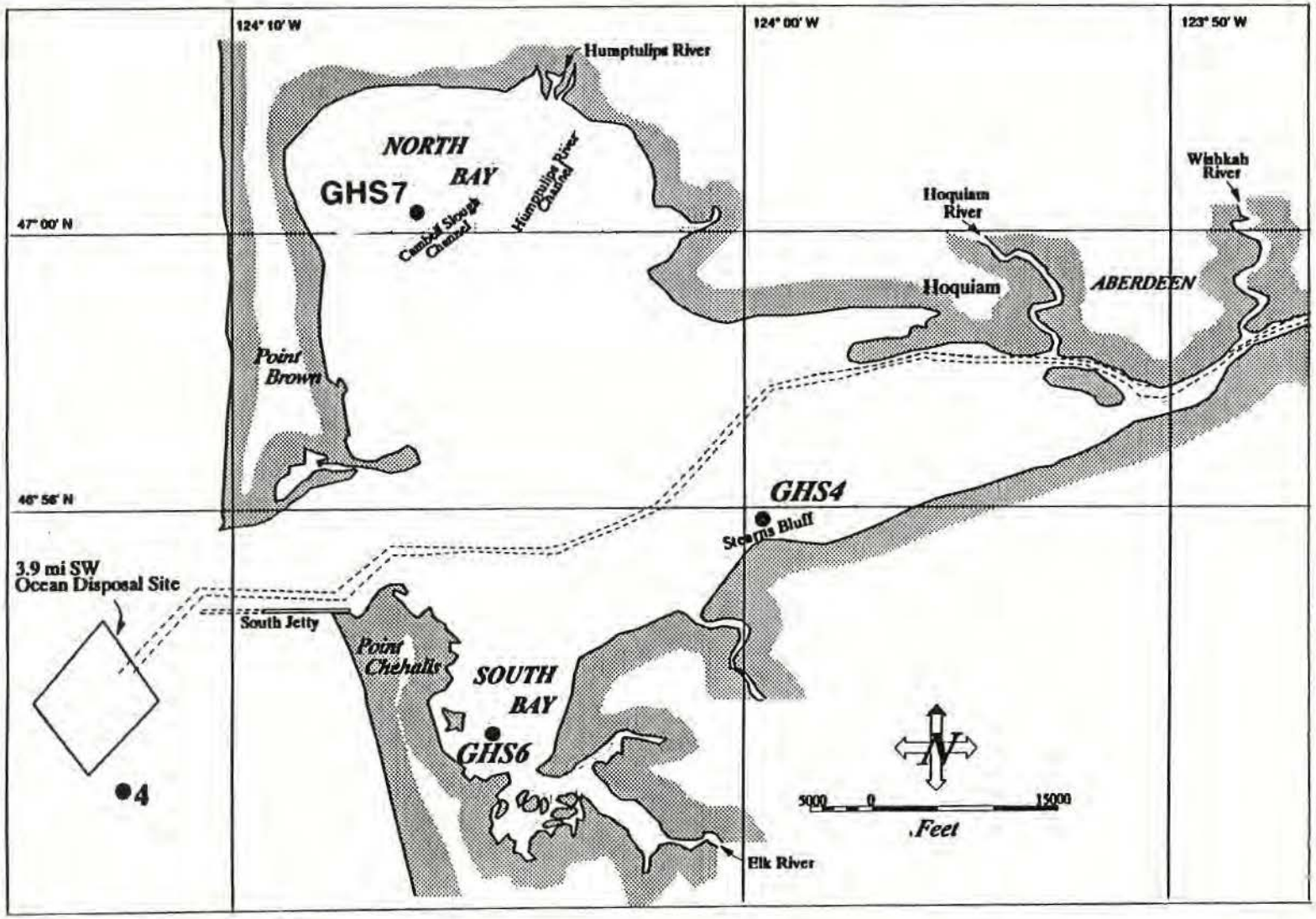


FIGURE 10-1
GRAYS HARBOR REFERENCE SEDIMENT COLLECTION LOCATIONS

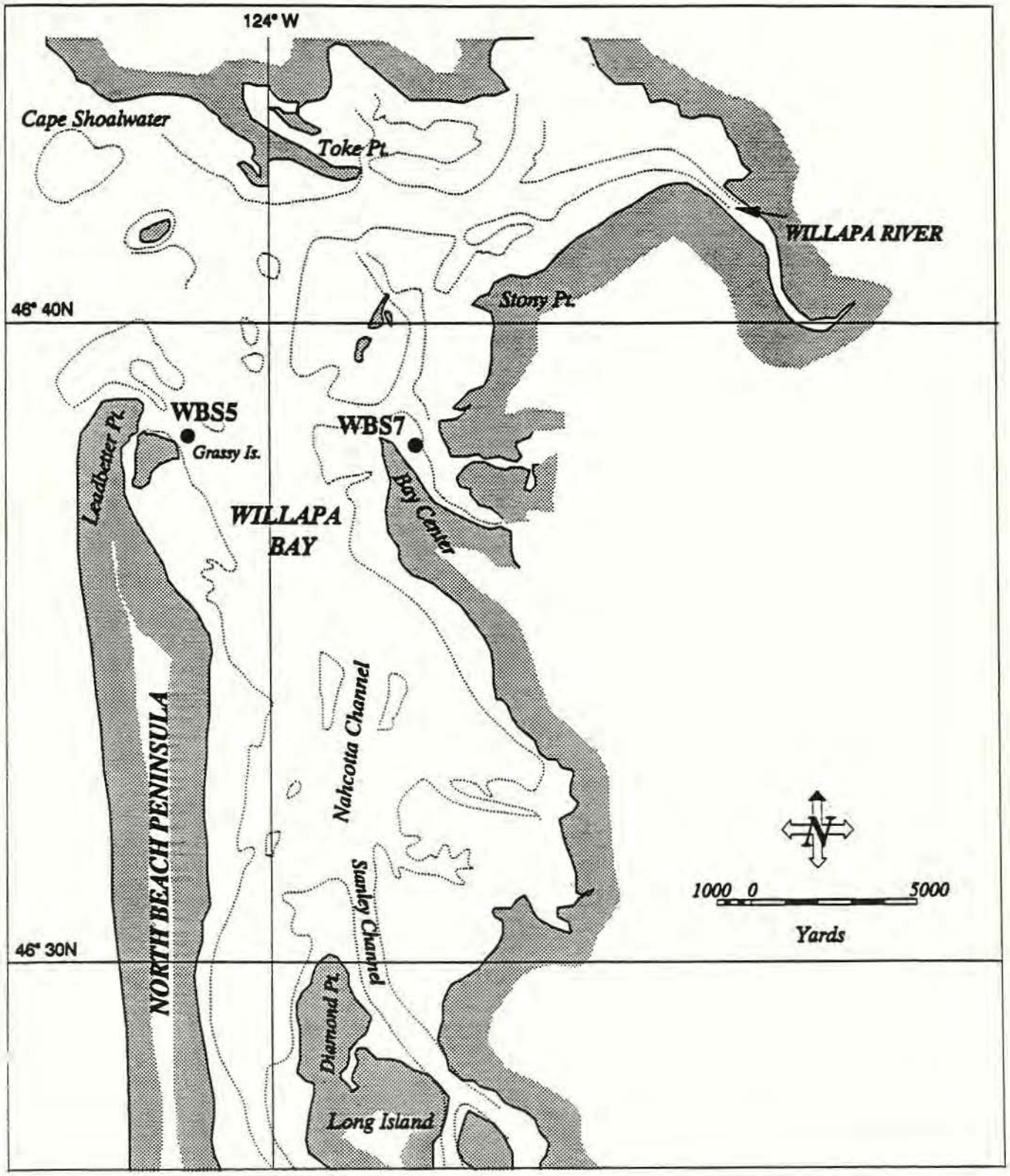


FIGURE 10-2
WILLAPA BAY REFERENCE SEDIMENT COLLECTION LOCATIONS

CHAPTER 11
TIER IV EVALUATIONS

Tier II and III evaluations of dredged material may result in a requirement to conduct a Tier IV assessment in order to make a determination of dredged material suitability. Also, if two or more chemicals of concern during a Tier II evaluation exceed the maximum level (ML) guidelines, or any one chemical exceeds the ML by more than 100 percent, the material would generally be considered unsuitable for unconfined open-water disposal unless a Tier IV evaluation is accomplished. A Tier IV evaluation is considered a special, non-routine evaluation and will require discussions among the agencies and the dredging proponent to determine the specific testing or assessment requirements. Alternative analyses which may be conducted in this tier may include any or all of the following.

11.1 STEADY STATE BIOACCUMULATION TEST.

In a Tier IV evaluation, bioaccumulation testing may be necessary to determine, either by time-sequenced laboratory bioaccumulation testing (Lee et al., 1989) or by collection of field samples, the steady state concentrations of contaminants in organisms exposed to the dredged material as compared with organisms exposed to the reference material. Testing options may also include longer time-sequenced laboratory exposures (exposures longer than 28 days may be necessary to reach a steady state concentration). Tier IV evaluations of data collected would follow the interpretation guidance specified in Section 10-4 (also, see Appendix D of the draft Inland Testing Manual).

a. Time-Sequenced Laboratory Testing. This test is designed to detect differences, if any, between steady-state bioaccumulation in organisms exposed to the dredged sediments and steady-state bioaccumulation in organisms exposed to the reference sediments. If organisms are exposed to biologically available contaminants under constant conditions for a sufficient period of time, bioaccumulation will eventually reach a steady-state in which maximum bioaccumulation has occurred, and the net exchange of contaminant between the sediment and organism is zero.

The necessary species, apparatus and test conditions for laboratory testing are the same as those utilized for the Tier III bioaccumulation test. Tissue sub-samples taken from separate containers during the exposure period provide the basis for determining the rate of uptake and elimination (depuration) of contaminants. From these rate data, the steady state concentrations of contaminants in the tissues can be calculated, even though the steady state may not have been reached during the actual exposure. For the purposes of conducting this test, steady state is defined as "the concentration of contaminant that would occur in tissue after constant exposure conditions have been achieved."

An initial time-zero sample is collected for each species for tissue analysis. Additional tissue samples are then collected from each of the five replicate reference and dredged-material exposure chambers at intervals of 2, 4, 7, 10, 18, and 28 days. Alternative time intervals may be proposed by the agencies. It is critical that sufficient tissue is available to allow the interval body burden analyses at the specified detection limits for the chemical(s) of concern.

A determination is then made based on the magnitude of bioaccumulation from the dredged material, its comparison with the FDA action levels (or best professional judgement for chemicals with no FDA action levels) found in Table 10-6 (or future Human Health Guidelines promulgated by the Washington State Department of Ecology and Department of Health), and a statistical comparison of test sediment organisms with reference organisms at steady state body burdens.

Calculating steady-state concentrations following time-sequenced testing should follow data analysis procedures outlined in the Corps/EPA draft Inland Testing Manual (Appendix D, Paragraph D3.2.1, pages D-47 to D-51). It is important to remember that these data are very expensive to obtain, because of the extensive number of chemical analyses required, and the data should be carefully and correctly analyzed.

b. <u>Field Assessment of Steady State Bioaccumulation</u>. Measuring concentrations in field-collected organisms may be considered as an alternative, if steady state is not reached in laboratory exposures. A field sampling program designed to compare dredging and reference tissue levels of the same species allows a direct comparison of steady state contaminant tissue levels. This may be in practice difficult to accomplish, because the same species in similar size ranges must be available for collection from both the dredging site and a suitable reference area to enable a statistical comparison of the tissue levels between the two areas.

The assessment involves measurements of tissue concentrations from individuals of the same species collected within the boundaries of the dredging site and a suitable reference site. Collecting sufficient numbers of individuals of the same relative size ranges and biomass of the same species to enable tissue analyses at the reference and dredging site can make this type of assessment problematic. A determination is made based on a statistical comparison on the magnitude of contaminant tissue levels in organisms collected within the boundaries of the reference site, compared with organisms living within the area to be dredged.

A field assessment should only be allowed where the quality of the sediment to be dredged can be shown not to have degraded or become more contaminated since the last dredging and disposal operation.

11.2 HUMAN HEALTH/ECOLOGICAL RISK ASSESSMENTS.

When deemed appropriate by the agencies, a human health and/or ecological risk assessment may be required to evaluate a particular chemical of concern, such as dioxin, mercury, PCBs, etc.. In the case of chemicals like dioxin, national guidance is in a rapid state of flux, and project specific risks to human health or ecological health should be evaluated using the best available current technical information and risk assessment models.

11.3 OTHER CASE-SPECIFIC STUDIES.

Biological effects tests in Tier IV should only be used in situations that warrant special investigative procedures. To address unique concerns special studies not formally approved for use may be recommended to evaluate a specific dredged material issue. The nature and details of these studies would have to be worked out on a case by case basis through a consensus process with the agencies and dredging proponent.

This may include chronic/sublethal tests, field studies such as benthic infaunal studies, experimental studies such as *in situ* toxicity tests or toxicity identification evaluations (TIE procedure; see Ankley et al, 1992), risk assessments and/or no effects levels for aquatic life. In such cases, test procedures have to be tailored for specific situations, and general guidance cannot be offered. Such studies, when conducted, require design, and evaluations specific to the need arising, with the assistance of administrative and scientific expertise from the agencies, and other sources as appropriate.

As part of the annual review process, the agencies will continually evaluate new tests and evaluation procedures that have been peer reviewed and are deemed ready for use in the regulatory evaluation of dredged material. The agencies will subsequently make recommendations about their potential implementation and use in Grays Harbor and Willapa Bay.

Prediction of the movement of contaminants from sediment into and through pelagic food webs is technically challenging and should only be dealt with in a Tier IV evaluation, if deemed necessary. General approaches may be explored which bracket likely concentrations of specific contaminants at different trophic levels based on an empirical model derived from a variety of marine food webs (Young, 1988). Other methods may be recommended, such as bioenergetic based toxicokinetic modeling, if deemed appropriate to address a particular concern.

11.4 CHRONIC/SUBLETHAL TESTS.

While there currently do not exist any nationally approved chronic/sublethal tests to assess dredged material, regionally developed and approved tests may be used to evaluate chronic effects in Tier III or Tier IV, as part of a biological effects testing suite utilizing other suitable species. Chronic sublethal responses to sediment are currently available in Tier III, in addition to the end-point of survival, for the sediment larval bioassay (abnormality response), and for the amphipod bioassay (*Rhepoxynius abronius*: emergence and reburial response), although they are not currently part of the normal regulatory interpretation guidelines.

The *Neanthes* 20-day biomass test was developed by the PSDDA program as a chronic/sublethal bioassay and has been approved by the EPA Region 10 Administrator and the Corps Seattle District Engineer. The test has been used in the PSDDA program as a Tier III test since 1992. The test is also included as one of the allowable tests under the State of Washington's Sediment Management Standards. Further, the test has been used effectively in sediment assessments in Oregon and Alaska. The endpoint for the *Neanthes* bioassay as currently used in the PSDDA program is growth rate over a 20-day period for newly emerged juveniles (2 weeks post-emergence).

CHAPTER 12
SUBMITTAL OF SAMPLING AND TESTING DATA

Upon completion of sampling and testing, data submittal is comprised of four elements:

- A sediment characterization report.
- Data required for the Corps' Dredged Analysis Information System (DAIS).
- Data required for Ecology's Sediment Quality database (SEDQUAL).
- Sampling and testing cost data (optional).

12.1 SEDIMENT CHARACTERIZATION REPORT.

The sediment characterization report should include the following items:

- Quality assurance report documenting deviations from the sampling and analysis plan and the effects of quality assurance deviations on the testing results.
- A plan view showing the actual sampling locations.
- The sampling coordinates in latitude and longitude.
- Methods used to locate the sampling positions within an accuracy of $\pm$ 3m.
- The compositing scheme.
- The type of sampling equipment used, the protocols used during sampling and compositing and an explanation of any deviations from the sampling plan.
- Sampling logs with sediment descriptions.
- Chain-of-custody procedures used, and explanation of any deviations from the sampling plan.
- Chemical and biological testing results, including quality assurance data (NOTE: QA2 data defined in Paragraph 12.3 should not be included in this report). Chemical testing results shall be presented in the same order as the list of chemicals of concern presented in Table 9-1. Explanation of deviations from the analysis plan.

12.2 DREDGED ANALYSIS INFORMATION SYSTEM (DAIS).

The Dredged Analysis Information System (DAIS) was developed by Seattle District to manage data generated through the implementation of PSDDA. Within DAIS, an environmental information module manages physical, chemical and biological testing data associated with both dredged material characterization and post-disposal monitoring. An administrative module tracks permit data, suitability determinations, disposal volumes, and cost data.

DAIS includes a variety of standard reporting options, including summary reports, automated quality assurance flagging, and comparisons of chemical concentrations to regulatory guidelines. An export module allows direct data transfers to the Department of Ecology's sediment quality database system (see paragraph 12.3). DAIS data are GIS-compatible which provides the ability to do spatial data analysis.

The types of data anticipated to be generated through the implementation of the Grays Harbor and Willapa Bay management plans are identical to the PSDDA data currently tracked with DAIS. Therefore, Grays Harbor and Willapa Bay data will be managed using the DAIS system. A checklist of required DAIS data has been compiled and will be furnished to the dredging proponent as part of the sampling and analysis plan approval process.

The Corps will perform a quality assurance evaluation of all sediment test data entered into DAIS, including checks on completeness, accuracy, precision and laboratory contamination. This level of quality assurance is referred to as QA1.

12.3 SEDIMENT QUALITY DATABASE (SEDQUAL).

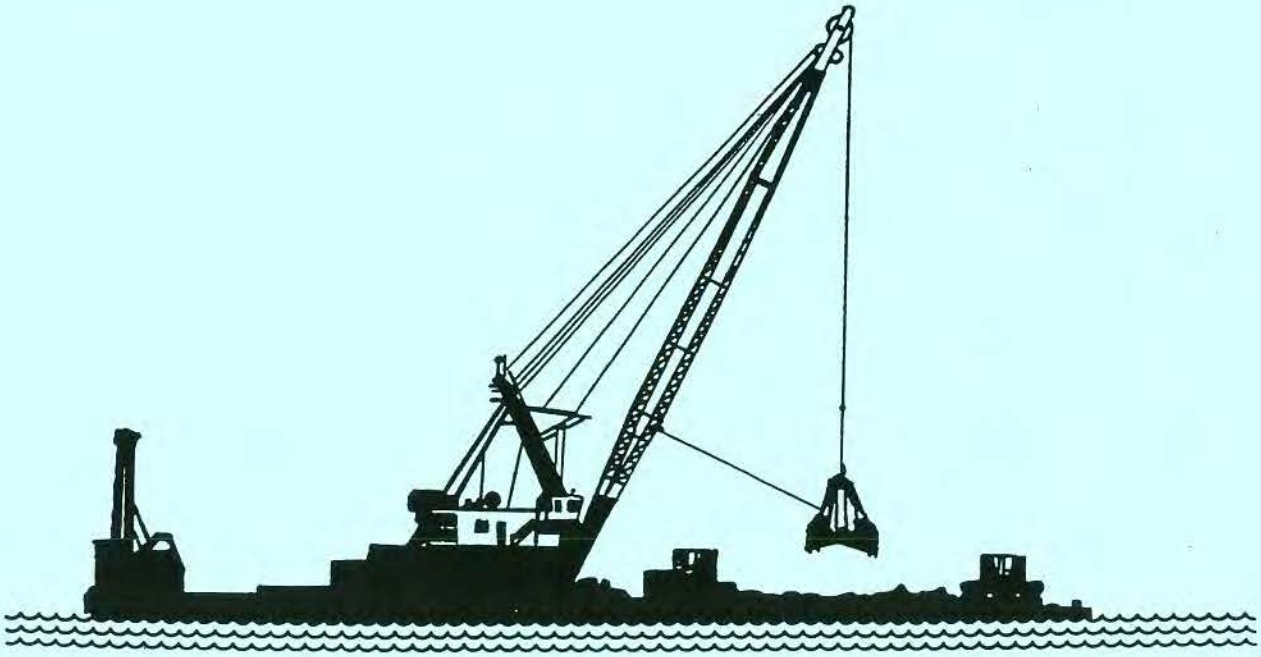
The Department of Ecology uses the sediment quality (SEDQUAL) database to develop and update the AET values upon which SLs, BTs and MLs are based. Data entered into DAIS will be converted to SEDQUAL format and provided to Ecology for direct import into SEDQUAL. In addition to the DAIS data, Ecology requires additional quality assurance data which is needed to fully validate the chemical and biological testing data used to update the AETs. This includes information such as chromatograms, calibration curves, etc., and is referred to as QA2. Hardcopy QA2 data should be submitted to the DMMO which will then pass this data on to the Sediment Management Unit at Ecology. Alternatively, the QA2 data may be sent directly to Ecology with a copy of the transmittal letter provided to the DMMO. Requirements for QA2 data have also been compiled and will be furnished to the dredging proponent.

12.4 SAMPLING AND TESTING COSTS.

The submittal of sampling and testing costs is encouraged for all dredging projects in Grays Harbor and Willapa Bay. While voluntary, this data is vital in tracking trends in costs and will provide dredging proponents with information useful in planning future dredging. The Corps will report on sampling and testing costs in its biannual report. A cost data form has been created by the DMMO for cost data submittals.

PART III

DISPOSAL SITE MANAGEMENT



CHAPTER 13
STATE AND FEDERAL DISPOSAL SITES

13.1 DISPOSAL SITE DESIGNATION.

In accordance with applicable federal and state guidelines and siting authorities, a number of public, multiuser unconfined open-water disposal sites have been previously identified and designated at both Grays Harbor and Willapa Bay. Dredged sediments have typically been found to be relatively clean, such that they have been determined to be suitable for disposal at the unconfined open-water disposal sites. Likewise, the sediments have been suitable for use in beneficial use projects.

a. **State 404 CWA Disposal Sites.** The Department of Natural Resources (DNR) has previously identified and designated public, mulituser unconfined open-water disposal sites on State-owned aquatic lands. These estuarine sites, located at both Grays Harbor and Willapa Bay, are managed, as well, by DNR. Site selection was accomplished by an inter-agency committee chaired by DNR and comprised of representatives from several State and Federal agencies. The overall objective of the site selection process is to reduce the potential impact of open-water disposal on natural systems and to minimize any disruption to normal human activity known to occur at or near the sites. Corps approval of disposal site use depends on a finding of compliance with the CWA Section 404(b)(1) Guidelines. The environmental acceptability of the Grays Harbor estuarine sites for federal project use was recently reaffirmed by the Corps in the EIS for the Grays Harbor Widening and Deepening project. Continued use of the Grays Harbor and Willapa Bay estuarine disposal sites is subject to DNR obtaining a shoreline master use permit from the county having jurisdiction over the area.

b. **Federal MPRSA Disposal Sites.** EPA has authority under Section 102 to designate ocean disposal sites. Ocean disposal sites at Grays Harbor and Willapa Bay have been so-designated. EPA regulations (40 CFR 220-229) contain the procedures and criteria for evaluating ocean disposal activities and the designation of ocean disposal sites under the MPRSA. Only Parts 220 and 225 and portions of Parts 227 and 228 apply to ocean disposal of dredged material. The Corps is required to use EPA-designated sites for ocean disposal to the extent feasible. Section 103 authorizes the Corps, where use of an EPA-designated site is not feasible or a site has not been designated by EPA, to select ocean disposal sites for project-specific use. However, EPA has final approval on individual disposal permits for such sites. (Reference EPA Guidance Manual, December 1992).

Title V of the Water Resources Development Act of 1992 changed EPA's role in the Corps' administrative process for MPRSA Section 103 activities. Title V requires that EPA develop site management plans in conjunction with the Corps for all ocean dredged material disposal sites. Title V also requires that all sites designated after January 1, 1995 have site management plans. Existing sites must have management plans by January 1, 1997. A

memorandum of understanding (MOU), to address the new requirements of Title V, is being developed by the Corps and EPA. The MOU will address site designations, management monitoring, enforcement, and ocean dumping activities reporting. Modifications to the disposal site management plans set forth in this manual necessitated by the EPA/Corps MOA will be addressed through the annual review program described in Chapter 4.

13.2 ESTABLISHED DISPOSAL SITES.

There are established public, multiuser sites for unconfined, open-water disposal of dredged material at both Grays Harbor and Willapa Bay. The estuarine sites have been designated in accordance with Section 404 of the Clean Water Act; the ocean sites have been designated in accordance with Section 102 of MPRSA. There are presently two estuarine sites and two ocean sites at Grays Harbor and two estuarine sites and one ocean site at Willapa Bay. All disposal sites are located in high energy, highly dispersive areas where dredged material placed at the site is known to be rapidly transferred offsite. The dredged material evaluation procedures used to assess the technical suitability of the material for unconfined, open-water disposal are designed to ensure that unacceptable adverse effects will not result from dredged material disposal at the designated sites. This more restrictive disposal guideline is described in Part II of this document.

a. Grays Harbor. The designated dispersive dredged material disposal sites at Grays Harbor are as follows (see Figure 13-1):

- Point Chehalis. The Point Chehalis site is an estuarine site located inside the mouth of Grays Harbor adjacent to the Entrance Reach of the Federal navigation channel off Point Chehalis. The 2,000-foot by 5,000 foot rectangular-shaped site has water depths exceeding 50 feet.

- South Jetty. The South Jetty site is an estuarine site located inside the mouth of Grays Harbor adjacent to the Entrance Reach of the Federal navigation channel adjacent to the exposed portion of the South Jetty. The 800-foot by 3,000-foot rectangular-shaped site has water depths exceeding 50 feet.

- 3.9-Mile SW. The 3.9-Mile SW site is an ocean site located within the southwest navigation lane leading to the entrance to Grays Harbor and is 3.9 nautical miles southwest of the harbor entrance. The site is shaped like a parallelogram and has an area of 1.66 statute miles^2 (1.25 nautical miles^2). The short sides of the site are approximately 6,000 feet long; the long sides, 8,000 feet long. The shoreward edge of the site lies along the 90-foot depth contour, and approximately one-third of the site is deeper than the 120-foot contour.

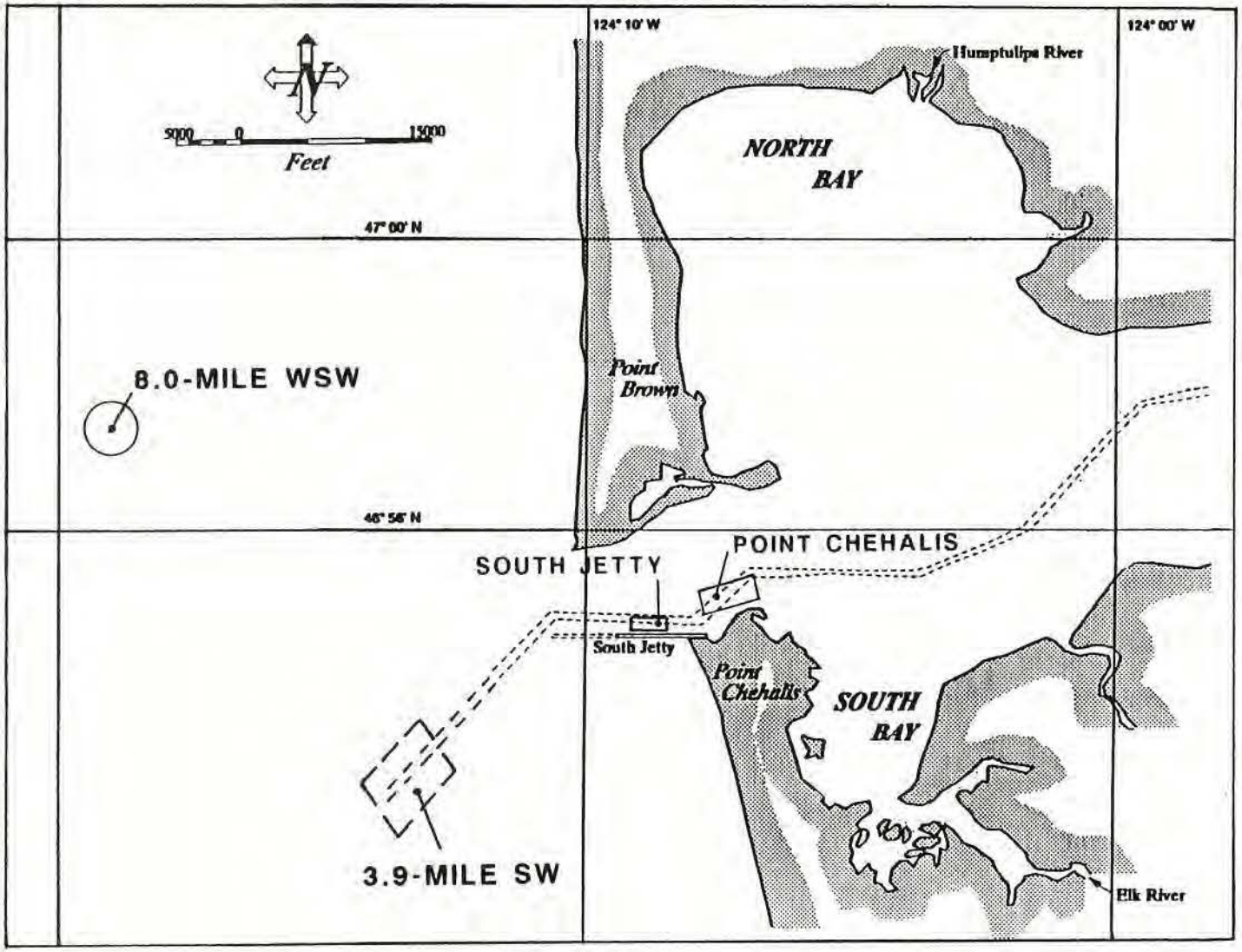


FIGURE 13-1
GRAYS HARBOR DREDGED MATERIAL DISPOSAL SITES

- 8.0-Mile WSW. The 8.0-Mile WSW site is an ocean site located 8 statute miles (7.1 nautical miles) west-northwest of the entrance to Grays Harbor. The site is circular with a radius of 0.40 statute mile (1,800 feet) and an area of 0.5 statute miles^2. Across the site, depth increases gradually from 140 to 160 feet. At this time, disposal of dredged material is not anticipated after completion of construction of the Grays Harbor Widening and Deepening project.

b. Willapa Bay. The designated dispersive dredged material disposal sites at Willapa Bay are as follows (see Figure 13-2):

- Cape Shoalwater. The Cape Shoalwater site is an estuarine site located west of Toke Point in Willapa Harbor, in the channel thalweg northeast of U.S. Coast Guard Buoy Number 10. The circular-shaped site has a 900-foot radius, with water depths at the site ranging from 50 to 68 feet.

- Goose Point. The Goose Point site is an estuarine site located approximately 1.8 nautical miles northwest of Goose Point in Willapa Harbor at latitude 46° 38′ 52″ N, longitude 123° 59′ 54″ W. The circular-shaped site has a 900-foot radius, with water depths at the site averaging between 30 and 48 feet.

- Interim Ocean. The Interim Ocean site is an ocean site located about 3.5 nautical miles west of the entrance to Willapa Bay in 40 to 60 feet of water. The site is approximately 5 nautical miles in length along a line between latitude 46° 44′ N, longitude 124° 10′W and latitude 46° 39′N, longitude 124° 09′ W. The site was designated an interim ocean dredged material disposal site (ODMDS) by EPA in 1977, in accordance with criteria set out in the MPRSA of 1972. A determination whether the site should receive final designation as an ODMDS is pending. Section 102(c) of the MPRSA of 1972, as amended by Section 506(a) of the Water Resources Development Act of 1992 (Public Law 102-580), requires that dredged material disposal sites receive a final designation before a permit for dumping pursuant to the MPRSA can be issued. Final designation would make this site available for disposal of dredged material on a permanent basis.

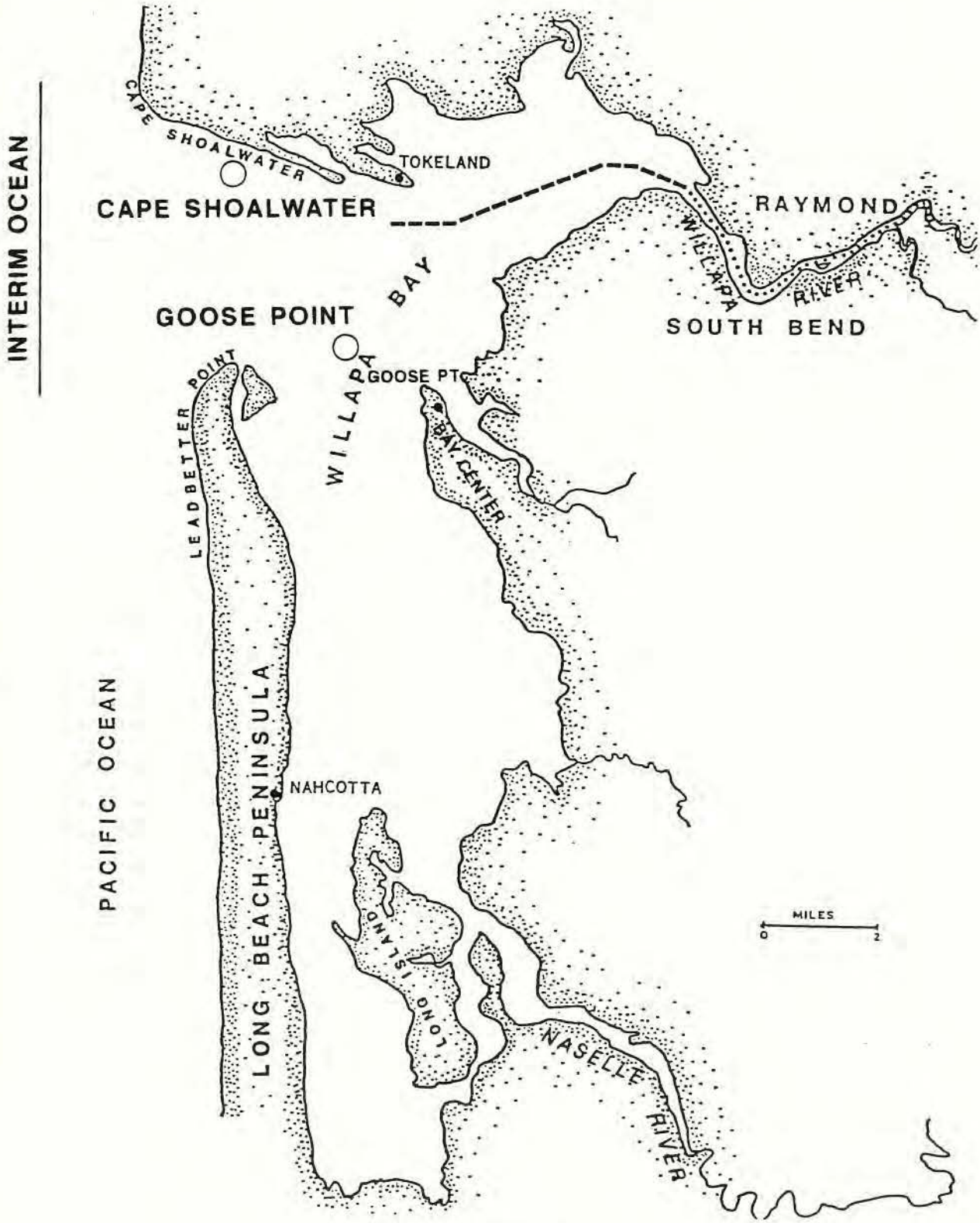


FIGURE 13-2
WILLAPA BAY DREDGED MATERIAL DISPOSAL SITES

13.3 PERMITS FOR SITE USE.

Due to the overlapping authorities of Federal, State, and local jurisdiction, a number of agencies regulate or manage open-water disposal of dredged material. The permitting process requires close interagency coordination and is distributed among several agencies:

- U.S. Army Corps of Engineers (Corps).
- U.S. Environmental Protection Agency (EPA).
- Washington Department of Ecology (Ecology).
- Washington Department of Natural Resources (DNR).
- Washington Department of Fish and Wildlife (WDF&W).
- Local Governments.

The EPA and other Federal and State agencies become involved through the Corps' permitting process. The permitting authorities for dredging and dredged material disposal are described below.

a. **U.S. Army Corps of Engineers.** Under Section 404 of the Clean Water Act (CWA), The Corps is required to regulate disposal of dredged or fill material in the waters of the United States. The purpose of the CWA is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. The CWA prohibits the discharge of dredged or fill material except in compliance with Section 404. The Corps discharges dredged material at particular sites through application of Section 404 (b)(1) "Guidelines for Specification of Disposal Sites for Dredged or Fill Material" (40 CFR 230).

Under Section 10 of the Rivers and Harbors Act of 1899, the Corps is required to regulate the dredging, disposal, and performance of most work in the navigable waters of the United States. This work includes the installation of structures such as bridges or navigation channels.

(1) Non-Corps Projects. After the Corps' District Engineer determines that an application is acceptable, a Public Notice is issued to all known interested individuals, groups, and governmental agencies for their comment. The District Engineer may hold a public hearing(s) to provide a forum for interested parties to express their views on the permit application. The Corps provides the comments to the applicant to allow an opportunity to resolve or rebut the comments or objections.

The District Engineer's decision to issue a permit is based on an evaluation of the probable impact of the proposed activity on the public interest and compliance with the Section 404(b)(1) Guidelines. A permit will be granted unless the District Engineer determines that the project would be contrary to the public interest.

(2) Corps Projects. Corps projects which involve discharge into navigable waters are subject to the same evaluation procedures as non-Corps projects: the Corps issues a Public Notice and may schedule a public hearing(s). Generally, a Corps project has a local sponsor who, by Congressional authorization, is required to furnish dredged material disposal areas. The local sponsor frequently performs ancillary maintenance dredging work that is combined into the Corps' Public Notice. When open water disposal is used, the local sponsor will seek the appropriate approvals. For projects where no local sponsor exists, the Corps will seek the appropriate approvals.

(3) Regional Permits. The Corps District Engineer can issue two types of regional permits for certain categories of work, including dredging and disposal of dredged materials. Both types of regional permits are reserved for categories of work that would cause only minimal individual and cumulative impacts on the environment. One type of regional permit authorizes a category (or categories) of activities which are similar in nature. The other type of regional permit avoids unnecessary duplication of regulatory control exercised by other Federal, State and local agencies.

The Corps District or Division Engineer has the authority to override a regional permit and require an individual application and review if it is determined that the project would cause unacceptable individual and cumulative impacts to the environment.

Section 103 of the MPRSA assigns to the Corps the specific responsibility to authorize the transport of dredged material for disposal at a designated ocean dredged material disposal sites. In evaluating proposed ocean disposal activities, the Corps is required to apply the criteria at 40 CFR 227 and 228 relating to the effects of the proposed ocean disposal. If EPA determines that the criteria at 40 CFR 227 and 228 are not met, disposal may not occur without a waiver of the criteria by the EPA Administrator (40 CFR 225.2 (e)). (Reference EPA Guidance Manual, December 1992).

b. <u>Environmental Protection Agency</u>. EPA has several roles under Section 404 of the CWA. First, EPA has the responsibility for developing the Section 404(b)(1) Guidelines in conjunction with the Corps. Second, EPA reviews the Corps' Public Notice and gives comments to the Corps. Third, the EPA Administrator, via Section 404(c), may prohibit the specification of a discharge site, or restrict its use, if it is determined that discharge would have an unacceptable adverse effect on fish and shellfish areas, municipal water supplies, wildlife, or recreation areas. In addition, under 40 CFR 230.80, EPA and the Corps may jointly provide advance identification of suitable or unsuitable disposal sites.

Section 102 of the MPRSA requires EPA, in consultation with the Corps, to develop environmental criteria for the evaluation of proposed ocean disposal activities. EPA regulations (40 CFR 220-229) contain the procedures and criteria for evaluating ocean disposal activities and the designation of ocean disposal sites under the MPRSA. Only Parts 220 and 225 and portions of Parts 227 and 228 apply to ocean disposal of dredged material.

c. Washington Department of Ecology. Ecology has the responsibility for certifying compliance with Section 401 of the CWA. This certification is required from any applicant for a Federal permit to conduct an activity that may result in discharge into State Waters. Compliance with Section 401 also ensures that any discharge will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA and relevant State laws.

Ecology's Public Notice for the CWA and the Coastal Zone Management Act (CZMA) certification are mailed together with the Corps' Public Notice. If a project involves disposal in water, data on the sediments is required. After the review of the available data, the application for Water Quality Certification and CZMA consistency determination is approved or denied. The project applicant has the responsibility to provide a copy of the Water Quality Certification and CZMA decision to DNR and the Corps before these agencies can, respectively, issue a disposal site use permit and Section 10 and 404 permits.

Ecology coordinates the final overall State of Washington response to the Corps' Public Notice. To fulfill this responsibility, Ecology sends a "State Response letter" to the Corps after receiving comments from interested State agencies. This letter describes the State's concerns, and recommends approval or denial of the Corps permit.

All dredging projects also require a Water Quality Modification from Ecology. This grants the applicant a short term modification from compliance with the State of Washington's water quality standards. The modification will be issued simultaneously with the Water Quality Certification but is issued only for a one year period. Accordingly, a annual review and reapplication is necessary.

Ecology also establishes guidelines for State/local administration of the Washington Shoreline Management Act (SMA). Ecology ensures that permits issued by local governments are consistent with the SMA. If a permit does not appear to be consistent, Ecology may appeal the permit to the Shorelines Hearing Board.

d. Washington Department of Natural Resources. DNR acts as the proprietor and manager of State-owned aquatic lands, which include all subtidal lands within three miles of the Washington coastline. For each open-water disposal site located on state lands, DNR is required by the Shoreline Management Act to obtain a Shoreline Substantial Development (SSD) permit from the local jurisdictions (in this case, Grays Harbor and Pacific counties). This permitting process allows for public review at the local level, including private interests and government agencies. As the SSD permit applicant, DNR is also lead agency under SEPA.

DNR issues dredged material disposal site use authorizations for each disposal operation under WAC 332-30-166. DNR sends the proponent an application upon their request. The proponent submits the disposal site use application to DNR. DNR does not issue the authorization until the applicant has obtained all required regulatory permits (i.e., the Corps permit, Ecology's Water Quality Certification, and WDF&W's Hydraulic Project Approval.

As requirements of the dredged material disposal site use authorization, the proponent must submit a dredging plan of operation prior to disposal and pay a disposal site use fee (currently $0.10/cubic yard) to DNR. Disposal fees are placed in a dedicated fund which is used by DNR to finance its disposal site management activities (state-wide). During and after disposal, the proponent is required to submit disposal site use reports on a weekly basis and a summary report on a monthly basis.

Corps navigation projects are exempt from DNR's dredged material disposal site use authorization requirements. For Corps projects having local sponsors, the sponsors must obtain the disposal permit for their berthing area dredging volumes but not for federal channel dredging volumes. However, in the case of Corps projects without local sponsors, the Corps does obtain a registration number so DNR can track the overall site use.

Disposal site use authorizations are required for both initial navigation project dredging and subsequent maintenance dredging. DNR issues one authorization for project per dredging year. This allows DNR to track current site use.

e. **Washington Department of Fish and Wildlife.** The Washington Department of Fish and Wildlife (WDF&W) has the responsibility to issue a Hydraulic Project Approval (HPA) under a process outlined in Chapter 75.08.012 (The Fisheries Code), 75.20.100 RCW, and Chapter 220-100 WAC. WDF&W issues most HPAs in saltwater areas. The purpose of the HPA is to protect fish life.

Under RCW 75.20.100, WDF&W must approve or deny the HPA application within 45 days of receiving a complete application, providing the project has achieved State Environmental Policy Act (SEPA) compliance. WDF&W accepts the Corps' Public Notice as the application for the HPA.

f. **Local Governments.** Under the Shoreline Management Act (SMA), local governments have the responsibility for general land use planning for shoreline development. Local governments control shoreline land use planning through the issuance of Shoreline Substantial Development permits.

For state-designated disposal sites, DNR obtains one shoreline permit from Grays Harbor County for the Grays Harbor sites and one permit from Pacific County for the Willapa Bay sites. DNR has the responsibility for insuring that site users comply with the requirements of the shoreline permits as well as with DNR's disposal permit. Once shoreline permits are granted, no further regulatory actions involving local governments are required for site use.

CHAPTER 14
PERMIT COMPLIANCE INSPECTION.

14.1 COMPLIANCE MONITORING.

Permit compliance monitoring is verification that the requirements of open-water disposal permits and authorizations are met. Compliance verification is required by permits issued by the Corps under Section 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act, Ecology's Water Quality Certification, WDF&W's Hydraulic Project Approval, DNR's site use authorization, and the local Substantial Shoreline Development permit. These permits are discussed in Chapter 13.

Most compliance inspections on Grays Harbor and Willapa Bay dredging and disposal operations will be on a periodic, spot-checking basis. Spot checking allows flexibility to tailor the permit compliance policy to the needs of each operation. The spot checking philosophy assumes that operators, working under the permit, will generally follow approved practices. However, spot checking also assumes that some operators may be less experienced than others with handling serious problems and agency concerns.

Under this philosophy, operators are required to file routine reports and immediately report any on-site problems to the appropriate regulatory agency. The agencies would periodically check the dredging operation different stages: dredging and material handling (to verify type of material discharged at the disposal site), transporting to the disposal site, disposal site location, etc. If material that is unsuitable for unconfined, open-water disposal is known to exist at the dredging site, special practices or more frequent monitoring could be required.

14.2 AGENCY RESPONSIBILITIES.

As discussed in Chapter 13, the agencies involved in permitting open-water disposal are the Corps of Engineers; the Environmental Protection Agency; the Washington Departments Ecology, Natural Resources, and Fish and Wildlife; and local governments. Each of these agencies has separate authorities to verify compliance to dredging and disposal related permits.

a. **Corps of Engineers.** The Corps' Regulatory Branch is lead on inspecting dredging and disposal operations on Corps projects. The Corps has the authority to inspect dredging and disposal operations for compliance with Section 404 and Section 10 permit terms and conditions. Currently, the Corps verifies permit compliance for non-Corps dredging activities, as well. Although the Corps normally funds inspections, the Corps has the authority to condition permits to require permittees to pay inspection expenses (Section 9701 of Public Law 97-258, 31 U.S.C.A. 9701). The Corps also relies on Ecology to verify compliance for non-Corps projects.

The Seattle District's Operations Division administers Corps-funded navigation project maintenance dredging and associated dredged material disposal and complies with established guidelines for inspecting disposal site use.

b. **Environmental Protection Agency.** EPA does not verify compliance at the dredging sites or at the open-water disposal sites. EPA does, however, notify the appropriate authorities when made aware of a potential violation of a dredging or disposal permit.

c. **Washington Department of Ecology.** Ecology periodically spot-checks dredging site compliance with Section 401 Water Quality Certifications and Water Quality Modifications. The frequency of checking is based on the potential of re-suspending or transferring contaminated material at individual sites. In some cases, Ecology requires the permittee to monitor water quality conditions at the dredge site as a condition of the Water Quality Certification/Modification.

d. **Washington Department of Natural Resources.** DNR has the authority to inspect projects for disposal site use authorization compliance. However, DNR primarily relies on the Corps and Ecology for project inspection. To verify proper use of a disposal site, DNR requires the dredger to complete Disposal Site Use and Monthly Summary forms which document the location and volume of all disposal activity.

e. **Local Governments.** Shoreline Management agencies generally inspect for compliance only when there is a report of a violation.

CHAPTER 15
VIOLATIONS

15.1 NATURE OF VIOLATIONS.

There are many potential violations of a dredging or an open-water disposal site use permit. Violations could include the character of the material dumped, positioning at the disposal site, or violations of water quality standards. These violations could be evidenced at either the dredging site, during transport to the disposal site, or at the disposal site itself.

At the dredging and disposal site, a violation would occur if unsuitable material is not separated from the suitable material during the dredging and disposal operation. The character of the material will be controlled by permit conditions which specify the location and depth of suitable material at the dredging site.

In transport, violations could occur if dredge material sloughs off a barge or if material were disposed of at a non-approved site.

At the disposal site, violations could occur through improper positioning at the site, floating debris, use of unauthorized equipment, improper disposal time, or excessive noise.

15.2 TYPES OF AGENCY ACTION AGAINST VIOLATORS.

Possible enforcement actions vary with severity of the violation and with the authority of the agency involved. Penalty actions currently available include:

- Stop work orders from agencies.
- Civil court or federal court orders requiring stop work and/or remedial action.
- Suspension, modification, or revocation of permits.
- Civil, criminal, or federal court penalties and/or imprisonment.
- Withdrawal or cancellation of proprietary authorization for use of a disposal site
- Assessment of damage to the land.

The agencies have the following specific enforcement authorities:

a. **Corps of Engineers.** The Corps has authority for issuing penalties under the Rivers and Harbors Act of 1899 and the Clean Water Act. The Corps' authority under these regulations is briefly described below.

Under the Section 10 of the Rivers and Harbors Act of 1899, the Corps may issue criminal fines, issue cease and desist orders to operators, or require remedial work. Section 10 violations may be prosecuted for criminal penalty.

Section 12 of the Rivers and Harbors Act of 1899 provides criminal penalties for Section 10 violations which include imposition of fines not less than $500 nor greater than $2,500, or imprisonment not exceeding one year, or both. A 1984 amendment to Federal Criminal Law established a fine increase up to $100,000 for all criminal misdemeanors.

Under Section 404 of the Clean Water Act, the Corps may issue cease and desist orders to operators and pursue civil and criminal penalties against violators (including remedial action, injunctions, and/or imprisonment).

Section 301 of the Clean Water Act prohibits the discharge of dredged material into waters of the United States, including adjacent wetlands, without having first obtained the necessary permits. Section 309 provides both criminal and civil penalties for violation of Section 301. The civil penalties include imposition of fines up to $10,000 per day of violation. Criminal penalties consist of fines up to $25,000 per day of violation, or for imprisonment of not more than one year, or both.

The Corps may refuse payment to contractors who violates the terms of a contract.

b. **Environmental Protection Agency.** EPA has authority for issuing penalties under the Clean Water Act. EPA's authority under the CWA is briefly described below.

Under Section 308 of the Clean Water Act, EPA can issue a request for information order. Under Section 309 of the Clean Water Act, EPA may issue an administrative order requiring the operator to cease and desist operations and/or pursue remedial action. In addition, EPA may refer to the U.S. Attorney to pursue civil/criminal penalty, remedial action, injunctions, and/or imprisonment.

Section 301 of the Clean Water Act prohibits the discharge of dredged material into waters of the United States, including adjacent wetlands, without having first obtained the necessary permits. Section 309 provides both criminal and civil penalties for violation of Section 301. The civil penalties include imposition of fines up to $10,000 per day of violation. Criminal penalties consist of fines up to $25,000 per day of violation, or for imprisonment of not more than one year, or both.

The Corps, EPA, and U.S. Coast Guard work cooperatively to enforce MPRSA provisions. Sections 105 (Penalties) and 107 (Enforcement) of MPRSA assign various responsibilities related to enforcement activities. The Coast Guard's specified role is to conduct surveillance and other activity to prevent the unlawful transportation of material for dumping, or unlawful dumping, and to supply information and evidentiary material to EPA or the Attorney General for penalty assessment and prosecution. To implement its enforcement authority under MPRSA, the Corps has promulgated regulations for its Section 103 permit program that are codified in 33 CFR 326. It is important that EPA work closely with the Corps, as EPA has the responsibility to assess administrative penalties for MPRSA violations. (Reference U.S. EPA Guidance Manual, December 1992).

c. **Washington Department of Ecology.** Under RCW 90.48 of the Water Pollution Control Act, Ecology can issue an order to require an operator to cease and desist operations, submit remedial action plans, or implement other means to prevent potential violations. A Notice of Violation can include cease and desist of operations, fines, remedial action, and recovery of costs for environmental resource damage.

Ecology may withdraw the Section 401 Water Quality Certification/Modification, thereby nullifying the Corps 404 permit. The withdrawal of the water quality certification could lead to either an order for further action or a notice of violation.

d. **Washington Department of Natural Resources.** Under the WAC 332-30 Aquatic Land Management Section 166, DNR can revoke proprietary authorization for disposal site use and assess a fine for violations.

e. **Washington Department of Fish and Wildlife.** Under the Hydraulic Code Rules (WAC 220.110.030(19)(c)), a WDF&W patrol officer may issue a warning or citation in response to a violation of the Hydraulic Project Approval. A violation of the HPA is a gross misdemeanor punishable by fine or imprisonment.

f. **Local Governments.** To enforce Shoreline Management Act provisions and prevent conflict with the shoreline program, a local government attorney or State Attorney General may bring injunctive, declaratory, or other actions in response to permit violations. Willful violation is a gross misdemeanor punishable by a fine of not less than $25 and not more than $1,000 and/or up to 90 days in jail. Repeated violations carry heavier fines.

g. **U.S. Coast Guard.** Under Section 307 of the Clean Water Act, the Coast Guard may issue administrative fines for oil spills. The Coast Guard may also refer to the U.S. Attorney for civil and/or criminal penalty and/or remedial action.

h. **NEPA and SEPA.** In addition to the above, the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) provisions relating to environmental impact statements may be used. If false claims are made in NEPA/SEPA documentation, this information could be used with the above authorities to strengthen enforcement actions. Permit conditions applied pursuant to SEPA are enforced in the same manner as if they were enforced under the underlying permit authority.

15.3 INTERAGENCY COORDINATION.

As the agencies responsible for compliance inspections, DNR, Ecology, and the Corps will coordinate with each other and other agencies to respond effectively to violations. DNR will report any violations of disposal site use to Ecology and the Corps. DNR will rely on those agencies to pursue appropriate civil and/or criminal penalties. Where damage to State-owned aquatic land can be shown, DNR will seek damages from the operator and revoke the disposal site use authorization.

CHAPTER 16
DISPOSAL SITE ENVIRONMENTAL MONITORING

16.1 NEED FOR AND OBJECTIVES.

The primary function of disposal site environmental monitoring is to ensure compliance of designated estuarine disposal sites with applicable CWA Section 404(b)(1) guidelines and designated ocean dredged material disposal sites with MPRSA Section 102 guidelines and to field verify predictions of site conditions following disposal. The quality of dredged material that will be acceptable for disposal at the disposal sites influences monitoring requirements.

This chapter presents the key features of the overall monitoring plan for the designated estuarine and ocean disposal sites. The Grays Harbor sites are shown on Figure 13-1 and include two dispersive estuarine sites (Point Chehalis and South Jetty site) and two dispersive ocean dredged material disposal sites (Southwest Navigation Lane site (hereinafter called the 3.9-Mile SW site) and 8.0-Mile WNW site). The Willapa Bay sites are shown on Figure 16-2 and include two dispersive estuarine sites (Cape Shoalwater site and Goose Point site) and one dispersive ocean dredged material disposal site (Interim Ocean site).

16.2 MONITORING PLAN.

Dispersive sites are located in high energy areas of high bottom currents where dredged material placed at the site is known to be rapidly dispersed and transferred offsite. This precludes practical monitoring for chemically-induced biological effects. Therefore, the only parameter that can be measured at the sites is the physical situation on site (i.e., verification of dispersion). Accordingly, a more restrictive disposal guideline is prescribed for dredged material released at the dispersive sites. Given the assumption that disposal will be limited to dredged material that is consistent with disposal guidelines, biological monitoring during actual disposal operations is not prescribed.

The monitoring plan for each dispersive site is to continue performing periodic physical monitoring, designed to verify that there is no significant long-term mounding of dredged material resulting from disposal which could present a hazard to navigation. This monitoring will be accomplished using precision vertical soundings, so as to detect any mounding of dredged material on the bottom within the perimeter of the disposal site. Bathymetric surveys will continue to be conducted by the Corps, to ascertain whether any material placed at the dispersive sites remains on site and to determine the size and shape of any long-term disposal mound at each site. Mounding has not previously been detected, due to the high bottom currents found at the active disposal sites. Monitoring will confirm that this trend continues.

As new information is developed during the monitoring program and other studies, both here and in other parts of the country, elements of the monitoring program may be modified to reflect this new information. Details of the prescribed environmental monitoring for each designated disposal site are presented below:

a. Point Chehalis Site. The Point Chehalis site is an estuarine site located inside the mouth of Grays Harbor adjacent to the Entrance Reach of the Federal navigation channel off Point Chehalis (see Figure 13-1).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

b. South Jetty Site. The South Jetty site is an estuarine site located inside the mouth of Grays Harbor adjacent to the Entrance Reach of the Federal navigation channel adjacent to the exposed portion of the South Jetty (see Figure 13-1).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

c. 3.9-Mile SW Site. The 3.9-Mile SW site is an ocean site located 3.9 nautical miles southwest of the harbor entrance at Grays Harbor, at the outer base of the ocean bar (see Figure 13-1).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

d. 8.0-Mile WSW Site. The 8.0-Mile WSW site is an ocean site located 8 miles west-northwest of the harbor entrance at Grays Harbor (see Figure 13-1).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine significant mounding has occurred over time. Following completion of construction of the Grays Harbor Widening and Deepening project, no further disposal of dredged material is anticipated by EPA. In August 1992, a survey of the disposal site was conducted by the Corps, where 2.83 million cubic yards of silty dredged material dredged in 1990 from Grays Harbor Navigation Improvement project was disposed. the survey included monitoring for the remaining mound of material and chemical sampling.

e. **Cape Shoalwater Site.** The Cape Shoalwater site is an estuarine site located west of Toke Point in Willapa Harbor, in the channel thalweg northeast of U.S. Coast Guard Buoy Number 10 (see Figure 13-2).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

f. **Goose Point Site.** The Goose Point site is an estuarine site located approximately 1.8 nautical miles northwest of Goose Point in Willapa Harbor at latitude 46° 38′ 52″ N, longitude 123° 59′ 54″ W (see Figure 13-2).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

g. **Interim Ocean Site.** The Interim Ocean site is an ocean site located about 3.5 nautical miles west of the entrance to Willapa Bay. The site is approximately 5 nautical miles in length along a line between latitude 46° 44′ N, longitude 124° 10′W and latitude 46° 39′N, longitude 124° 09′ W (see Figure 13-2).

During monitoring, vertical soundings over continuous transects will be made at the site at 100 meter spacing. The transects will begin and end 100 meters outside the perimeter of the disposal site. The information will be maintained by the Corps of Engineers and compared to profiles of previous site monitoring to determine if a significant change has occurred over time.

16.3 AGENCY RESPONSIBILITIES AND FUNDING.

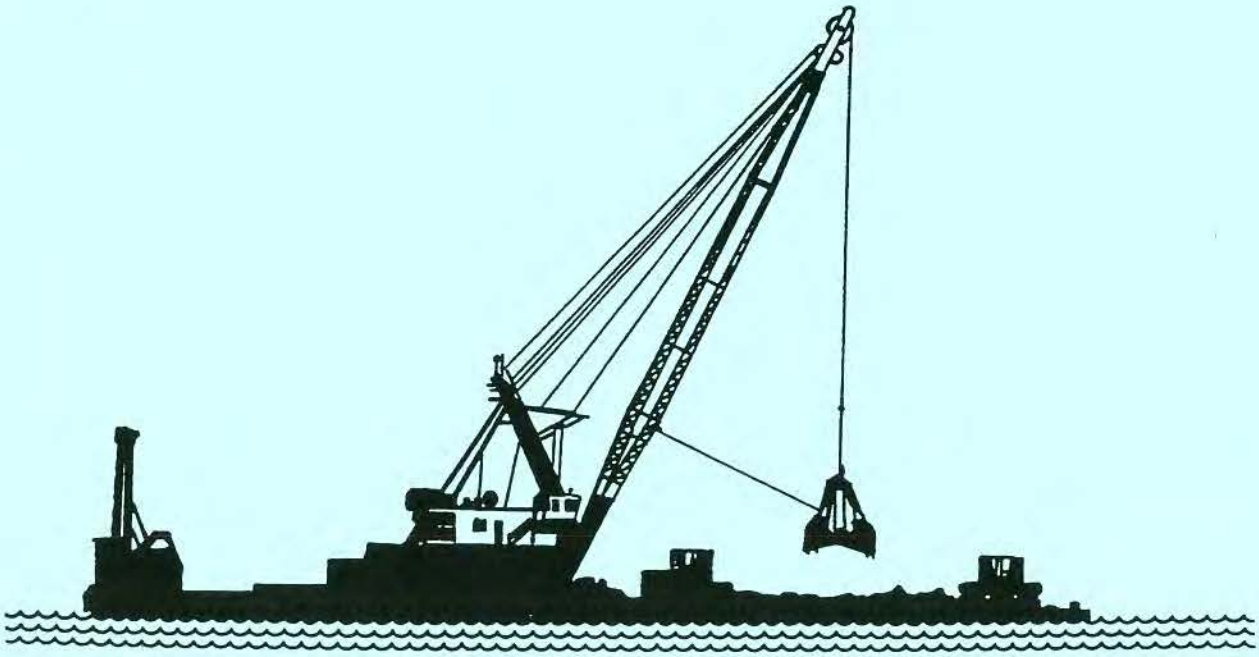
The Corps of Engineers will generally be responsible for funding and accomplishing disposal site physical monitoring, including the collection and analysis of physical data, summarizing and reporting these data, and inputing data to DAIS (see Paragraph 12.2).

Timing and frequency of physical monitoring of estuarine sites will be coordinated with DNR and reports will be provided to DNR, EPA, and Ecology for technical review. Monitoring of estuary sites will be accomplished within available funds. Timing and frequency of physical monitoring of ocean sites will be coordinated with EPA and reports will be provided to DNR, EPA, and Ecology for technical review. Monitoring of ocean sites will be as mutually agreeable to the Corps and EPA and accomplished within available funds.

The Department of Natural Resources will fund and prepare a summary report on dredging and disposal site use, for inclusion in the biannual reports described in Paragraph 4.3.

PART IV

REFERENCES



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