

controlled. Over the long term, controlling both upstream pollution and erosion will reduce problems associated with contaminated sediments, dredging, and disposal. Dredged material managers must become more involved in watershed planning to emphasize the importance of point and non-point source pollution controls to reduce harbor and channel sediment contamination.

In a number of areas in the United States, pollution control planning is done on an estuary-wide or watershed basis (e.g., the New York-New Jersey Harbor NEP). Port planning activities must be coordinated with these efforts to ensure that such regional plans consider and provide for the pollutant controls necessary to reduce sediment contamination. Additionally, existing efforts such as the Section 6217 Coastal Nonpoint Pollution Control Program, and revision and reauthorization of the Clean Water Act (CWA), as proposed by the Administration, will strengthen watershed planning efforts and further improve pollution controls.

✓ **Recommendation 7: Review the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies (P&G) to determine whether changes are needed to better integrate the economic and environmental objectives of National Economic Development (NED) and Environmental Quality (EQ).**

The existing P&G provides flexibility to incorporate environmental features into both new work and maintenance dredging projects. The Corps has issued guidance that provides for the formulation and implementation of projects for the environmentally beneficial use of dredged material; the Group believes that these efforts should continue. Concurrent with these ongoing actions, the Group supports the Administration's initiatives to examine the P&G to determine whether changes are needed to better measure and integrate the dual objectives of NED and EQ. The National Dredging Issues Team (described in Section 5.2) will coordinate with these efforts to ensure that the review includes consideration of dredging and beneficial use of dredged materials.

✓ **Recommendation 8: Revise the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) to ensure that the planning process outlined in the legislation provides for linkages with plans which address dredging issues.**

The MARAD/DOT will suggest changes during the reauthorization of ISTEA in 1997 which ensure that: 1) Metropolitan Planning Organizations (MPOs) consider waterside infrastructure requirements as well as landside needs when developing transportation plans; 2) a balance is sought between the mobility needs of freight and people; and, 3) local port development plans are considered in the preparation of regional and statewide transportation planning efforts.

The MPOs are the primary planning mechanism available to coordinate transportation needs and project prioritization within a state or region. Under the revised legislation, the MPOs will more fully consider the importance of moving freight/cargo and the roles that ports and water transportation routes play in doing so. The long-term coastal and dredging planning in an area would thus be linked to long-term intermodal trans-

portation planning for access to ports on both the land side and the water side. Other structures may also exist at the state level which can be linked to the dredging process.

5.2 Enhancing Coordination and Communication in the Dredging Project Development and Review Process

Problem Statement. While the existing dredging approval process works well for the majority of projects, for many projects the process may take too long and can be unpredictable. Contributing factors include inadequate communication with permit applicants on requirements, as well as inadequate coordination with the public regarding specific dredging/dredged material disposal projects. The project development and review process is a multi-disciplinary and multi-agency process involving a wide range of often competing interests and stakeholders. Open communications and early coordination are essential in this process. When coordination efforts fail, relationships among agencies may become adversarial, which further impedes (and raises the costs of) the review process. Mechanisms for resolving conflicts are imperfect and may cause disputes to fester for too long, alienating the participants. Decisions about O&M dredging also are impacted by these factors, specifically information sharing, inadequate communication with the public, and inadequate planning for dredged material disposal management.

Recommendations: The existing administrative procedures for developing and reviewing projects and reaching dredged material disposal decisions is basically sound, but aspects of that process require improvement. Most of these problems can be solved through early and vigorous stakeholder participation, improved and coordinated dredging policies and planning, and greatly expanded information sharing. The following recommendations have been proposed to address these problems in the dredging process.

✓ Recommendation 9: Establish a National Dredging Issues Team and Regional Dredging Issues Teams.

The Corps and EPA will establish or use existing teams to promote national and regional consistency on dredging issues and provide a forum for conflict resolution and information exchange early in the process. The teams will provide a mechanism for timely resolution of conflicts by involving all agencies, and maximizing interagency coordination. The National and Regional Dredging Issues Teams will not supersede the authority of any of the agencies involved in the dredging project review process. Rather the teams are intended to provide a forum for conflict resolution by mutual agreement. These teams will consist of appropriate agency decision makers and technical experts.

The National Dredging Issues Team will be chaired by EPA and the Corps and will include representatives from the DOC, the DOI, and the DOT. The national team will have two roles: 1) to review policies and procedures associated with the dredging process, including implementation of this action plan, and to develop guidance for interaction with the Regional Dredging Issues Teams; and 2) to oversee the resolution of issues elevated from the Regional Dredging Team level.

The Regional Dredging Issues Teams will include representatives from the appropriate governmental agencies. The teams will resolve local-level issues that arise during the permitting process, dredged material disposal management and planning, and new navigation project planning. The regional teams will review overall regional dredging issues and specific projects as necessary to improve coordination and resolve controversies; assure that necessary local agreements are completed and implemented; serve as a forum for information exchange among and provide guidance to local/regional dredged material planning groups (identified in Section 5.1) on the development of long-term dredged material management plans; and refer interagency policy, technical, and institutional issues to the national team for resolution, on a timely basis. Issues and conflicts associated with specific projects that cannot be resolved by the regional teams also may be elevated to the national team.

✓ **Recommendation 10: Schedule pre-application meetings among the Corps, the applicant, the EPA, other interested Federal agencies and relevant state agencies for dredging projects that are potentially controversial or that may involve significant environmental issues.**

The Corps will schedule the meetings as necessary. Pre-application meetings can ensure that, by the time the project is ready for public notice, the applicant has submitted a complete and technically adequate application. This can occur because the pre-application meetings will provide a prospective applicant with an indication of the completeness of the project application, an indication of what anticipated environmental and health impacts are of most concern, an understanding of testing requirements for contaminated sediments, and mitigation concepts that could aid planning and expedite application reviews. The pre-application process is intended to help applicants identify the information needed by the Agencies to complete the review process. However, *even if a pre-application meeting is held* an applicant may be required to submit additional information to complete the permit evaluation or to meet other statutory requirements (e.g., NEPA).

In addition, if testing indicates that disposal may result in adverse impacts and/or that the dredged material should be specially managed (e.g. capped) and the results were not available and not provided in the original public notice for the project, the Corps will issue a second public notice. This supplemental public notice will improve coordination among Federal, state, and local agencies, and the concerned public, and provide the Corps with useful data on comments that specifically address potential contaminant-related impacts and management strategies to address them.

✓ **Recommendation 11: Develop and distribute a permit application checklist which identifies the information required from the applicant.**

In coordination with appropriate resource agencies, the Corps will develop the checklist with a twofold function: to determine what information is needed to make up a "complete" application and to highlight areas of concern. The checklist will provide permit applicants with a means to conduct a preliminary evaluation of the completeness of their own applications, which in turn will result in more complete and technically

adequate applications. The checklist will also facilitate the Corps' review of applications as the applications will be more consistent and predictable. Developing a checklist with input from multiple agencies will also provide agencies with a common vehicle for evaluating applications and communicating with each other. Ideally, the checklist will be used to consolidate information and, therefore, reduce the administrative burden. This document will also provide examples of how key information and testing results will be presented. This will promote consistency and clearly communicate the Federal government's expectations from private permit applicants.

- ✓ **Recommendation 12: Develop or revise the procedures for coordinating inter-agency review at the regional level to define the process by which various Federal parties coordinate on dredging projects.**

Federal Agency field offices involved in the dredging project review process will develop or revise, as appropriate, local procedures to establish clear obligations and responsibilities, including the exchange of information, analytical standards for evaluating dredging proposals, and obligations for timely responses. The local procedures will also establish the roles and responsibilities of the Regional Dredging Issues Teams and define procedures for communicating and resolving interagency disagreements which may arise during the process. This should include identifying agency decision makers for dredging issues to minimize the potential for duplicative or inconsistent comments from the agencies. In addition, the local procedures will encourage the Regional Dredging Issues Teams to coordinate with local dredged material management planning groups. These procedures could be completed under the umbrella of existing CWA 404(q) MOAs or through development of MOAs specific to dredged material disposal.

- ✓ **Recommendation 13: Establish a national MOA to clarify roles and coordination mechanisms between the EPA and the Corps.**

The EPA and the Corps will develop the MOA which will address dispute resolution, disposal site monitoring responsibilities, permit review roles, enforcement, and coordination to address sampling and testing plans in a timely fashion. Implementation of this MOA will help the two agencies more efficiently execute their responsibilities for dredged material management.

5.3 Addressing Scientific Uncertainties About Dredged Material

Problem Statement: Dredging results in large volumes of material that must be disposed in an environmentally-sound manner. As emphasized earlier, decisions about dredged material management must be made early in the planning process as uncertainty and controversy over dredged material disposal can result in delays and inefficiencies in developing and maintaining the nation's ports.

While the existing testing regime takes the complexities of sediment chemistry and the environmental conditions specific to each disposal site into account, and provides much information about the effects of dredged material disposal on the environment, uncertainties

in scientific evaluations will always exist. The goal is not only to minimize the uncertainties associated with assessment tools but also to understand those uncertainties so they can be considered when making risk-management decisions. The dredging process is not alone in its effort to determine how to address scientific uncertainty and use it in risk management; it is an area being addressed by every regulatory program.

Some ecological and human-health effects are relatively easy to measure and evaluate (e.g., observed mortality of laboratory test animals); other effects are more difficult to evaluate (e.g., bioaccumulation of contaminants in test animal tissues). Risk managers must accurately assess a wide range of acute, sublethal, and chronic effects data to make the most practicable decisions that adequately protect ecosystems and human health. This work is complicated by testing endpoints which range from reproductive and growth inhibition to endocrine disruption and genotoxicity, and by the understanding that bioaccumulative compounds might not necessarily have "safe" levels.

Regulatory authorities such as the EPA are now combining assessment tools to make risk-based evaluations and management decisions. However, the risk assessment process itself is more complicated and less intuitive to many in the regulated community who are accustomed to using single-number criteria for decision making. Risk assessment tools require calculations, data, and assumptions that are used in an iterative manner.

Risk assessment methods and risk management guidance for protecting human health and the environment, and for making regulatory determinations, are being developed by EPA under the Risk Assessment Framework. As the guidance develops, dredged material managers should continue to base their site-specific decisions on information gathered from the variety of assessment tools available to them.

Recommendations: Risk assessment and risk management methodologies can provide a comprehensive approach to evaluating dredged material and available disposal options. EPA and the Corps should work with the Risk Assessment Framework and risk management guidance to determine how they are best applied to the dredging program.

The following three recommendations will improve our understanding of the scientific uncertainties surrounding dredged material management planning and allow us to incorporate uncertainty analysis into these decisions.

✓ **Recommendation 14: Clarify and improve the guidance used to evaluate bioaccumulation of contaminants from dredged materials.**

The EPA and the Corps will evaluate the dredging program under the Risk Assessment Framework and other risk management guidance to develop a technical framework for the dredging program to assess potential human health and ecological risks associated with bioaccumulation. The EPA and the Corps will gather and organize available information and research so that decision makers can access and use the material when developing dredged material management plans. The emphasis will be on providing permit reviewers with practical and useable field guidance that can be used to interpret the environmental significance of laboratory bioaccumulation data.

- ✓ **Recommendation 15: Identify the practical barriers to managing contaminated sediments and ways to overcome the barriers.**

The Corps and the EPA will publish guidance identifying technical, operational, institutional, and regulatory barriers to managing contaminated sediments and proposing environmentally appropriate "best practices" to overcome those barriers, including use of confined disposal facilities, subaqueous isolation (i.e., capping) and decontamination and other state-of-the-art technologies. The Corps and the EPA will capitalize on a number of existing Federal efforts to manage contaminated sediments (e.g., ARCS, SITES, NY/NJ Harbor demonstration projects, and the National Academy of Sciences Study, *Management and Remediation of Contaminated Marine Sediment*).

- ✓ **Recommendation 16: Identify means to reduce the volume of material which must be dredged.**

The Corps and the EPA will continue to coordinate with other Federal agencies, particularly the U.S. Coast Guard, MARAD, and the private sector on reducing the need for dredging. For example, at a predominantly export port, inbound channel lanes can be shallower than outbound lanes, and at multi-channel ports, improved vessel-traffic control might be used to restrict, or prioritize, deep channel use to deep-draft vessels during certain tidal periods. State-of-the-art marine engineering technologies (such as use of ship simulators to assist in channel design and NOAA's real-time reporting of water-level measurements to maximize use of existing channel depths) can also be used to reduce dredging needs. The Corps and EPA will follow-up with appropriate technical guidance for use by their field offices and ports.

5.4 Funding Federal Dredged Material Disposal Projects Consistently and Efficiently

Problem Statement. There is no consistent policy on requiring cost-sharing for the use of open-water, upland, and confined disposal facilities. Federal and non-Federal cost-sharing responsibilities for dredged material disposal vary from project to project, region to region, and port to port depending on when the project was authorized. For example:

- The RHA of 1970 authorized the Corps to construct, operate, and maintain confined disposal facilities in the Great Lakes and their connecting channels, with local interests generally bearing no costs. In contrast, navigation projects authorized since 1986 require the non-Federal sponsor to provide upland and confined disposal facilities.
- As a general rule, open-water disposal costs are either cost shared (new projects) or borne by the Federal government and reimbursed through the Harbor Maintenance Trust Fund (maintenance) while land and diking costs for upland and confined disposal costs are largely non-Federal burdens. This inconsistency creates a strong economic incentive for a non-Federal sponsor to urge use of open water disposal sites instead of upland and nearshore sites which must be paid for by the sponsor.

In addition to these complications, some of the Federal resource agencies which implement dredging and dredged material management programs and policies are facing significant staff

and financial resource constraints. These agencies need to access a reliable, available funding base to implement dredging programs and policies. A particular problem is resources for managing ocean disposal sites. Some believe that the Harbor Maintenance Trust Fund (HMTF), which provides funds to maintain deep-draft Federal channels and harbors, provides such a resource base.

While the Corps does use the fund for this purpose, it can only do so within budgetary ceilings. Although the HMTF shows a "surplus" of about \$300 million (in part due to the absence of authorizing legislation for NOAA to receive \$45.5 million per year from the Trust Fund), this surplus is currently factored into the calculation of the Federal budget deficit and, under the strict requirements of the Administration's and the Congress' expenditure limits, expenditures of HMTF monies are limited by mandatory budget ceilings. Therefore, any additional expenditures from the HMTF must be offset by spending cuts in other programs.

Recommendations: Consistent funding and development of dredging projects will result in: increased efficiency and increased predictability of the dredging project review process; and, increased beneficial use of dredged material. The following recommendations are proposed.

✓ **Recommendation 17: Revise WRDA to establish consistent Federal-local sponsor cost sharing, across all dredged material disposal methods.**

The Corps will recommend to the Administration changes to the appropriate legislation. Current cost sharing formulas for both new navigation projects and maintenance dredging provide for Federal cost sharing (new projects) and Federal funding (maintenance) when open-water disposal is used, but generally require local sponsors to pay all costs for land and diking when upland and confined disposal facilities are used. This inconsistency creates an incentive for open-water disposal and discourages more costly projects where beneficial uses of dredged materials produce environmental benefits. This recommendation would reduce inconsistencies. A more coherent policy will provide for more uniform Federal participation in all disposal alternatives.

✓ **Recommendation 18: Study the feasibility of a fee for open-water disposal for non-Federal dredging projects.**

The EPA will study the need for and feasibility of imposing a user fee on the open-water disposal of dredged material to cover the cost of disposal site management. At a minimum, such a fee should cover the cost of ocean disposal site management. The WRDA 92 mandated that management plans be developed for each disposal site; however, to date no appropriations have been made to develop or implement such plans. These plans are to include, among other things, a baseline study; a monitoring program; consideration of anticipated site use and closure data (if applicable), and the need for post-closure site management; and, a schedule for review and revision of the plan.

Because dredged material management should be consistent between ocean and inland waters, the study will look at the need for and feasibility of a user fee applying to all aquatic disposal sites, not just ocean sites. In addition, those entities most impacted by

the fee, and the size of the fee will be examined. The feasibility of using fees only at the site where they were collected will be evaluated as part of this process.

The 18 recommendations listed above represent practical and productive improvements to the dredging process. Exhibit 1 presents a summary table listing each recommendation. Each of the recommendations will be implemented by the Federal agencies which participated in the Group.

6.0 CONCLUSION

The recommendations presented in this action plan will demonstrably improve the regulations and planning procedures which currently govern dredging and dredged material disposal projects in the United States. Existing regulatory, procedural, and philosophical obstructions to the dredging process can be overcome with methodical identification and resolution of specific problem elements. The recommendations will result in improvements in agency communication, gains in scientific research, equitable project funding, and new outreach activities for non-agency groups and individuals. This will measurably change how essential dredging projects are planned and conducted.

Changes to the organization and prioritization of national and regional dredging policies and practices may be ultimately required to resolve some of the more problematic dredging sites and controversies. However, codifying new legislation and realigning agency missions and resources are certain to be difficult and time consuming. It is far more timely and efficient to address key impediments within the existing regulations and agency framework.

The Federal Agencies which participated in the Group that developed this paper are committed to implementing each of the above recommendations and operating a dredging process that is efficient and predictable, and fosters both economic growth and environmental protection for the Nation.

Exhibit 1: Summary Listing of Recommendations

Rec. No.	Recommendation	Lead Agency	Time Frame	Page No.
Strengthening Planning Mechanisms for Dredging and Dredged Material Management				
1	Create and/or augment regional/local dredged material planning groups to aid in the development of regional dredged material management plans.	Corps	Short Term	8
2	Identify the characteristics of successful Federal/state/local partnerships for use in developing dredged material management planning efforts.	Corps, EPA, NOAA, MARAD	Short Term	9
3	Develop public outreach and education programs to facilitate stakeholder involvement.	All Agencies	Short Term	9
4	Provide guidance to relevant Agency field offices, state and local agencies, and the general public on opportunities for beneficial use of dredged material.	Corps, EPA	Short Term	10
5	Update guidance on disposal site monitoring requirements and procedures.	EPA, Corps	Short Term	10
6	Ensure that dredged material management planners work with pollution control agencies to identify point and nonpoint sources of sediment and sediment pollution and to implement watershed planning.	EPA, Corps	Short Term	10
7	Review the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies (P&G) to determine whether changes are needed to better integrate the economic and environmental objectives of National Economic Development (NED) and Environmental Quality (EQ)	Corps	Long Term	11
8	Revise the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) to ensure that the planning process outlined in the legislation provides for linkages with plans which address dredging issues.	MARAD	Long Term	11
Enhancing Coordination and Communication in the Dredging Project Approval Process				
9	Establish a National Dredging Issues Team and Regional Dredging Issues Teams.	Corps, EPA	Short Term	12
10	Schedule pre-application meetings among the Corps, the applicant, the EPA, other interested Federal agencies and relevant state agencies for dredging projects that are potentially controversial or that may involve significant environmental issues.	Corps	Short Term	13

Exhibit 1: Summary Listing of Recommendations

Rec. No.	Recommendation	Lead Agency	Time Frame
11	Develop and distribute a permit application checklist which identifies the information required from the applicant.	Corps	Short Term
12	Develop or revise the procedures for coordinating inter-agency review at the regional level to define the process by which various Federal parties coordinate on dredging projects.	Corps, EPA, FWS, NOAA	Short Term
13	Establish a national MOA to clarify roles and coordination mechanisms between the EPA and the Corps.	EPA, Corps	Short Term
Addressing Scientific Uncertainties About Dredged Material			
14	Clarify and improve the guidance used to evaluate bioaccumulation of contaminants from dredged materials.	EPA, Corps	Short Term
15	Identify the practical barriers to managing contaminated sediments and ways to overcome the barriers.	Corps, EPA	Short Term
16	Identify means to reduce the volume of material which must be dredged.	Corps, EPA	Short Term
Funding Dredging Projects Consistently and Efficiently			
17	Revise WRDA to establish consistent Federal-local sponsor cost sharing, across all dredged material disposal methods.	Corps	Long Term
18	Study the feasibility of a fee for open-water disposal for non-Federal dredging projects.	EPA	Long Term

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

APPENDIX E

**San Francisco Regional Dredging Quantity Estimate,
Dredging Project Profiles, and Placement Site Profiles**

*Appendix E, LTMS EIR/EIS Analysis of San Francisco Regional
Dredging Quantity Estimate, Dredging Project Profiles, and
Placement Profiles*

Long-Term Management Strategy

*Environmental Impact Statement and Environmental Impact Report
Identify, Array, and Evaluate Preliminary Data
Contract No. DACW07-92-D-0007, Delivery Order No. 0018*

Submitted to:

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TABLE OF CONTENTS

INTRODUCTION	1
ANALYSIS OF HISTORIC SAN FRANCISCO BAY REGION DREDGING RECORDS	1
SCREENING AND REDUCTION OF HISTORIC DREDGING RECORDS	4
Dedicated Disposal Sites	6
Regional Changes Over Time	7
Military Base Closures	7
ESTIMATE OF FUTURE NEW WORK DREDGING QUANTITIES	10
PROJECTED SAN FRANCISCO BAY REGION DREDGING QUANTITY ESTIMATE	11
PROJECTED QUANTITY ESTIMATE OF UNSUITABLE DREDGED MATERIAL	13
RECOMMENDATION FOR IMPROVING FUTURE REGIONAL DREDGING ESTIMATES	13

TABLES

Table 1. Summary of Historic San Francisco Bay Region Maintenance and New Work Dredging Quantities	3
Table 2. Historic San Francisco Bay Region Maintenance Dredging Quantities (New Work Quantities Removed)	5
Table 3. Historic (1967 to 1993) San Francisco Bay Region Maintenance Dredging Quantities (New Work, Dedicated Disposal Sites, and Base Closures Removed)	9
Table 4. Summary of Future New Work Dredging Quantities	10
Table 5. Projected San Francisco Bay Region Dredging Quantity	12

LTMS EIR/EIS ANALYSIS OF SAN FRANCISCO REGIONAL DREDGING QUANTITY ESTIMATE, DREDGING PROJECT PROFILES, AND PLACEMENT SITE PROFILES

INTRODUCTION

For the San Francisco Bay Region (Bay Region), the LTMS has used a planning estimate of 400 million cubic yards of dredging over the next 50 years, or 8 million cubic yards per year.

The goal of this analysis is to improve upon this LTMS planning estimate by analyzing previous studies, historic dredging records, regulatory trends, proposed military base closures, and proposed future deepening and new work projects.

ANALYSIS OF HISTORIC SAN FRANCISCO BAY REGION DREDGING RECORDS

The following LTMS studies and related documents that report or evaluate reported dredged material quantities are used in this analysis:

- Dredging and Disposal Road Map (August 1993), San Francisco Bay Conservation and Development Commission, and U.S. Army Corps of Engineers, San Francisco District;
- San Francisco Bay Dredging Records 1985 - 1993, July 1993, U.S. Army Corps of Engineers, San Francisco District;
- Sediment Budget Study for San Francisco Bay - Final Report, February 1992, Ogden Beeman and Associates (data from 1955 to 1990);
- Reported Dredging Quantity Files provided by the U.S. Army Corps of Engineers, San Francisco District.

These four information sources were compared, cross checked, and used to develop a comprehensive data base of the historic dredging quantities for the 30 dredging projects analyzed in this study (29 major projects and a summary of other small projects). Conflicting information was resolved to the extent possible with the information available in these reports, and within the time allowed by the level of effort for this work.

The available data from all sources was used to the extent possible. Data reported prior to 1955 was removed for the projects that are located in areas significantly affected by Sacramento-San Joaquin Delta (Delta) outflows, such as the Suisun Bay Channel and the Pinole Shoal Channel, due to the significant reductions in Delta outflows (and related reductions in sediment transport) from water resources developments in the Sacramento and San Joaquin River Basins that began in 1955 and will likely continue into the future.

The initial analysis of the historic dredged material quantities included:

- Summing the individual dredging event quantities for each project to obtain the total quantity dredged for that project;
- dividing the total quantity dredged for each project by the entire duration of the project record including null quantities for years during which no activity was reported, to obtain the average annual dredging quantity for that project;
- dividing the total quantity for each project by the number of dredging events to obtain the average dredging event quantity for each project.

The resulting data is summarized in Table 1, which displays the total, average annual and average event dredging quantities for all 30 projects, and the sum of the total and average annual quantities for all projects. The result of this analysis is that the reported average annual dredged quantity for all 30 projects investigated in this study is approximately 6.84 million cubic yards per year.

Table 1. Summary of Historic San Francisco Bay Region Maintenance and New Work Dredging Quantities

Project No.	Project Name	Number of Dredging Events	Years Covered By Dredging Records	Average Dredging Frequency (4) (Years)	Total Dredged Quantity (CY)	Average Annual Dredged Quantity (5) (CY)	Average Dredged Quantity Per Event (6) (CY)
1	New York Slough (1)	-	-	-	-	-	-
2	Suisun Bay Channel	28	55-90	1	5,291,042	151,173	188,966
3	Concord NWS	13	57-81	2	670,335	27,931	51,564
4	Suisun Slough Channel	19	12-90	4	2,833,877	36,332	149,151
5	Mare Island Strait	39	55-93	1	59,780,419	1,573,169	1,532,831
6	Mare Island Naval Shipyard	24	55-90	1	14,484,444	413,841	603,519
7	Napa River	3	62-88	9	1,652,575	63,561	550,858
8.a	Petaluma River (Across the Flats)	6	41-88	8	2,998,445	63,797	499,741
8.b	Petaluma River (Channel)	19	37-88	3	2,898,665	56,837	152,561
9	Pinole Shoal	16	57-91	2	9,657,741	284,051	603,609
10	Richmond Inner/Outer Harbor	38	55-93	1	29,333,712	771,940	771,940
11	Point Molate NFD	19	56-92	2	2,689,877	74,719	141,572
12	Chevron (2)	-	-	-	-	-	-
13.a	San Rafael Creek (Across the Flats)	11	42-91	4	1,502,838	30,670	136,622
13.b	San Rafael Creek (Channel)	13	31-91	5	1,431,977	23,866	110,152
14	Treasure Island NS	2	70-85	8	763,713	50,914	381,857
15	Port of San Francisco (2)	-	-	-	-	-	-
16.a	San Francisco Bar (San Francisco Harbor)	18	75-93	1	11,642,282	646,793	646,793
16.b	San Francisco Harbor (Islais Creek and San Francisco Airport Channel)	14	55-86	2	2,170,787	70,025	155,056
17	USCG, Yerba Buena Island (2)	-	-	-	-	-	-
18	Oakland Harbor	59	31-92	1	35,983,835	589,899	609,896
19	Alameda NAS	25	59-92	1	21,978,188	666,006	879,128
20	Redwood City	38	31-93	2	18,132,293	292,456	477,166
21	Hunters Point NSY	6	72-89	3	838,163	49,304	139,694
22.a	San Leandro Marina (Main Access Channel) (3)	-	-	-	-	-	-
22.b	San Leandro Marina (Interior Access Channels)	3	78-89	4	717,429	65,221	239,143
23	Moffett Field NAS	3	69-92	8	231,859	10,081	77,286
24	Oakland NSC	8	56-91	4	4,413,204	126,092	551,651
25	Larkspur Ferry Channel (2)	-	-	-	-	-	-
26	ARCO (2)	-	-	-	-	-	-
27	Unocal (2)	-	-	-	-	-	-
28	Shell Oil (2)	-	-	-	-	-	-
29	Exxon (2)	-	-	-	-	-	-
30	Summary of Other Small Projects	26 (7)	55-93	N/A	26,658,411	701,537	N/A
Totals					258,756,111	6,840,213	N/A

(1) Included in Suisun Bay Channel

(2) Included in Summary of Other Small Projects

(3) Included in San Leandro Marina (Interior Access Channel)

(4) Average Dredging Frequency = (Year of Most Recent Record-Year of First Record)/Number of Dredging Events

(5) Average Annual Dredged Quantity = (Total Quantity Dredged)/(Year of Most Recent Record-Year of First Record)

(6) Average Event Dredged Quantity = (Total Quantity Dredged)/Number of Dredging Events

(7) Number of Years of Record

CY =Cubic Yards