DREDGED MATERIAL MANAGEMENT PROGRAM BIENNIAL REPORT

Dredging Years 1998/1999

March 2000

PREPARED BY THE DMMP AGENCIES

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EPA
Region 10

DREDGED MATERIAL MANAGEMENT PROGRAM
BIENNIAL REPORT

Dredging Years 1998/1999

Puget Sound
Dredged Disposal Analysis

Grays Harbor/Willapa Bay Evaluation Procedures

Lower Columbia River Evaluation Framework
(Washington)

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TABLE OF CONTENTS

LIST OF TABLES iv

LIST OF FIGURES v

LIST OF ACRONYMS vi

PREFACE vii

CHAPTER 1 - DMMP EVALUATION ACTIVITIES 1

A. INTRODUCTION 1
B. DY98/99 PROJECTS 1
C. SUMMARY AND ASSESSMENT OF DY98/99 DATA 23

CHAPTER 2 - DISPOSAL SITE USE AND MONITORING 39

A. DISPOSAL ACTIVITY AND SITE USE 39
B. DISPOSAL SITE MONITORING 49

APPENDIX A - PROJECT-SPECIFIC NARRATIVES 56

APPENDIX B - EVALUATION GUIDELINES 57

APPENDIX C - DY98/99 EVALUATION GUIDELINE EXCEEDANCES.....59

LIST OF TABLES

		Page
Table 1-1	DY98/99 DMMP Evaluation Activities	4
Table 1-2	DY98/99 Project Ranking	8
Table 1-3	DY98/99 Projects - Approved Sampling Plans	10
Table 1-4	DY98/99 Project Sampling	14
Table 1-5	DY98/99 Biological Testing Data	19
Table 1-6	DY98/99 Suitability Determinations	20
Table 1-7	DMMP Chemical Testing Summary	25
Table 1-8	DY98/99 Bioassay "Hits"	26
Table 2-1	Disposal Site Activity Summary-DY98	42
Table 2-2	Disposal Activity by Jurisdiction and Site, DY98	43
Table 2-3	Disposal Site Activity Summary-DY99	46
Table 2-4	Disposal Activity by Jurisdiction and Site, DY99	47

LIST OF FIGURES

		Page
Figure 1-1	DY98/99 Project Locations	2
Figure 1-2	Project Size Testing Cost	29
Figure 1-3	Chemistry Testing Cost	30
Figure 1-4	Bioassay Testing Costs	31
Figure 1-5	Processing Time	36
Figure 2-1	Dredging Year 1998 Disposal Volumes	41
Figure 2-2	Dredging Year 1998 Disposal Volumes, Grays Harbor	44
Figure 2-3	Dredging Year 1999 Disposal Volumes	45
Figure 2-4	Dredging Year 1999 Disposal Volumes, Grays Harbor	45
Figure2-5a	1998 Commencement Bay Site SVPS Survey	52
Figure2-5b	Rosario Strait Site Bathymetric Surveys, 1989-1999	53
Figure 2-6	Cumulative Disposal Volumes, 1989-1999	54
Figure 2-7	Cumulative Disposal Volumes, 1989-1999, Grays Harbor	55

LIST OF ACRONYMS

AET	Apparent Effects Threshold
BT	Bioaccumulation Trigger
COC	Chemical of Concern
CWA	Clean Water Act
CY	Cubic Yard
DAIS	Dredged Analysis Information System
DMMO	Dredged Material Management Office
DMMU	Dredged Material Management Unit
DNR	Washington Department of Natural Resources
DY	Dredging Year
EPA	Environmental Protection Agency
EPTA	Evaluation Procedures Technical Appendix
FC	Full Characterization
GIS	Geographic Information System
HPA	Hydraulic Project Approval
HPAH	High-molecular-weight PAH
LPAH	Low-molecular-weight PAH
ML	Maximum Level
MPR	Management Plan Report
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
PAH	Polynuclear Aromatic Hydrocarbon
PC	Partial Characterization
PCBs	Polychlorinated Biphenyls
PPB	Parts Per Billion
PPM	Parts Per Million
PSDDA	Puget Sound Dredged Disposal Analysis
PSEP	Puget Sound Estuary Program
QA/QC	Quality Assurance/Quality Control
SAP	Sampling and Analysis Plan
SDM	Suitability Determination
SMARM	Sediment Management Annual Review Meeting
SMS	Sediment Management Standards
SL	Screening Level
TOC	Total Organic Carbon
USACE	US Army Corps of Engineers
UCOWD	Unconfined Open Water Disposal
WDFW	Washington Department of Fish and Wildlife

CHAPTER 1

DREDGED MATERIAL MANAGEMENT PROGRAM (DMMP) EVALUATION ACTIVITIES

A. INTRODUCTION

This chapter summarizes the application of DMMP (Lake Washington, Puget Sound, Grays Harbor and Willapa Bay, Lower Columbia River) evaluation guidelines for Dredging Years 1998 and 1999. A dredging year includes all projects evaluated between June 16 of a given year and June 15 of the following year (DY98 = June 16, 1997 - June 15, 1998; DY99 = June 16, 1998 - June 15, 1999). Tables related to project-specific ranking, sampling, testing, and suitability determinations are presented in the first part of this chapter. The second half of the chapter presents an overall assessment of these activities and data. Where projects involved unusual circumstances or the application of best professional judgment by the agencies, more detailed descriptions are provided in Appendix A.

During DY98/99 there were twenty-nine projects at some stage of the DMMP evaluation process. Table 1-1 provides a complete summary of these projects/activities. Activities occurring in other dredging years are indicated by parentheses.

Of the projects listed in Tables 1-1a and 1-1b, five had suitability determinations completed or applications withdrawn by June 15, 1998 and are considered DY98 projects for the purposes of this chapter. Sixteen projects had either suitability determinations completed or applications withdrawn by June 15, 1999. These are considered DY99 projects. DY98 and DY99 project locations in Puget Sound can be seen in Figures 1-1a and 1-1b respectively, projects located in Grays Harbor and Willapa Bay are shown in Figure 1-1c.

B. DY98/99 PROJECTS

Ranking

Each of the DMMP projects discussed herein come from within one of three jurisdictional areas: Puget Sound (PSDDA), Grays Harbor/Willapa Bay and the Lower Columbia River. Each jurisdiction has specific guidance which explains requirements for evaluating dredged material and disposal assessment. Sampling and analysis requirements under the PSDDA program are fully explained in the 1988 Phase I Evaluation Procedures Technical Appendix (EPTA) and the 2000 PSDDA Users

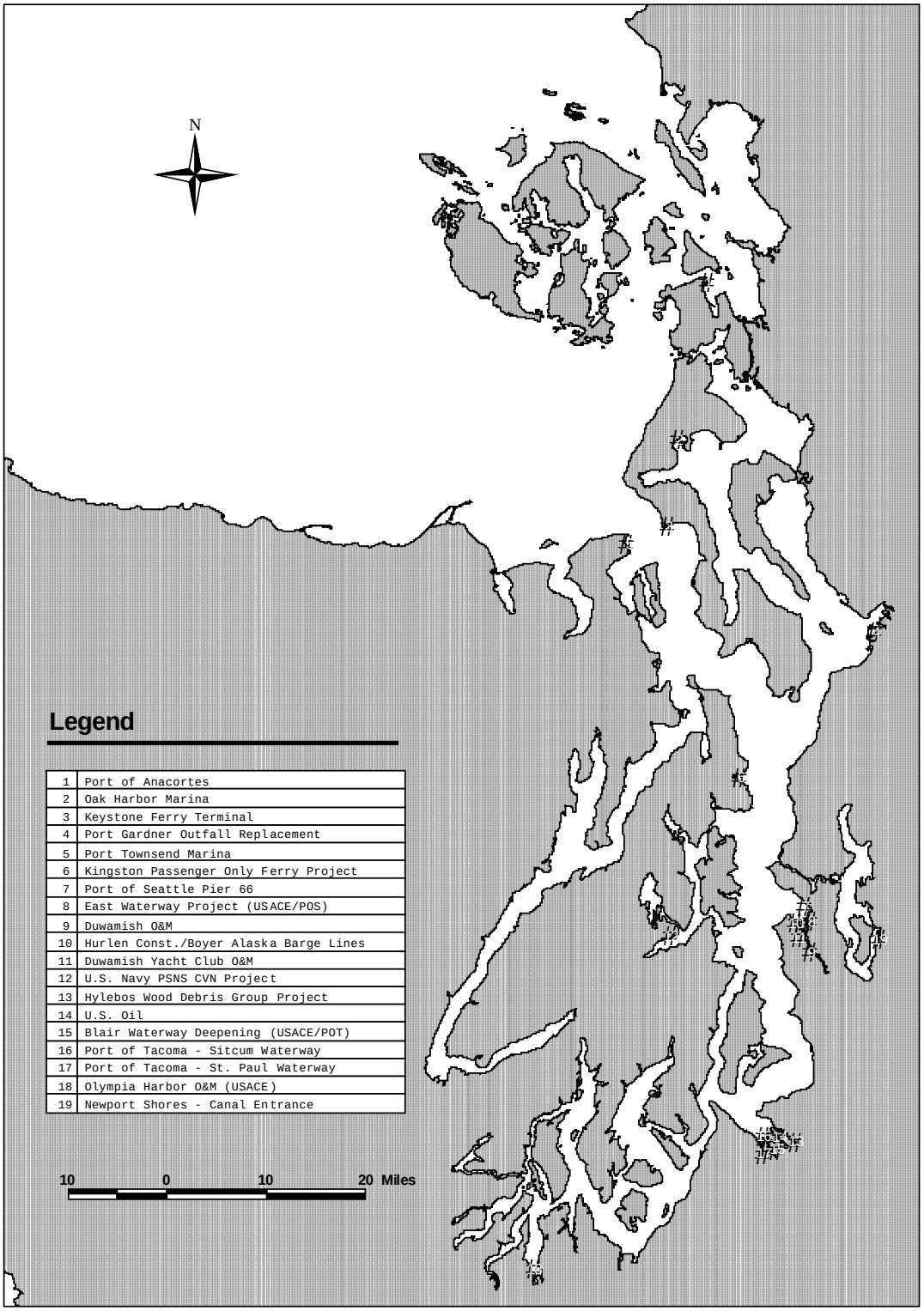

Figure 1-1a Dredging Year 1998/1999 DMMP Project Locations

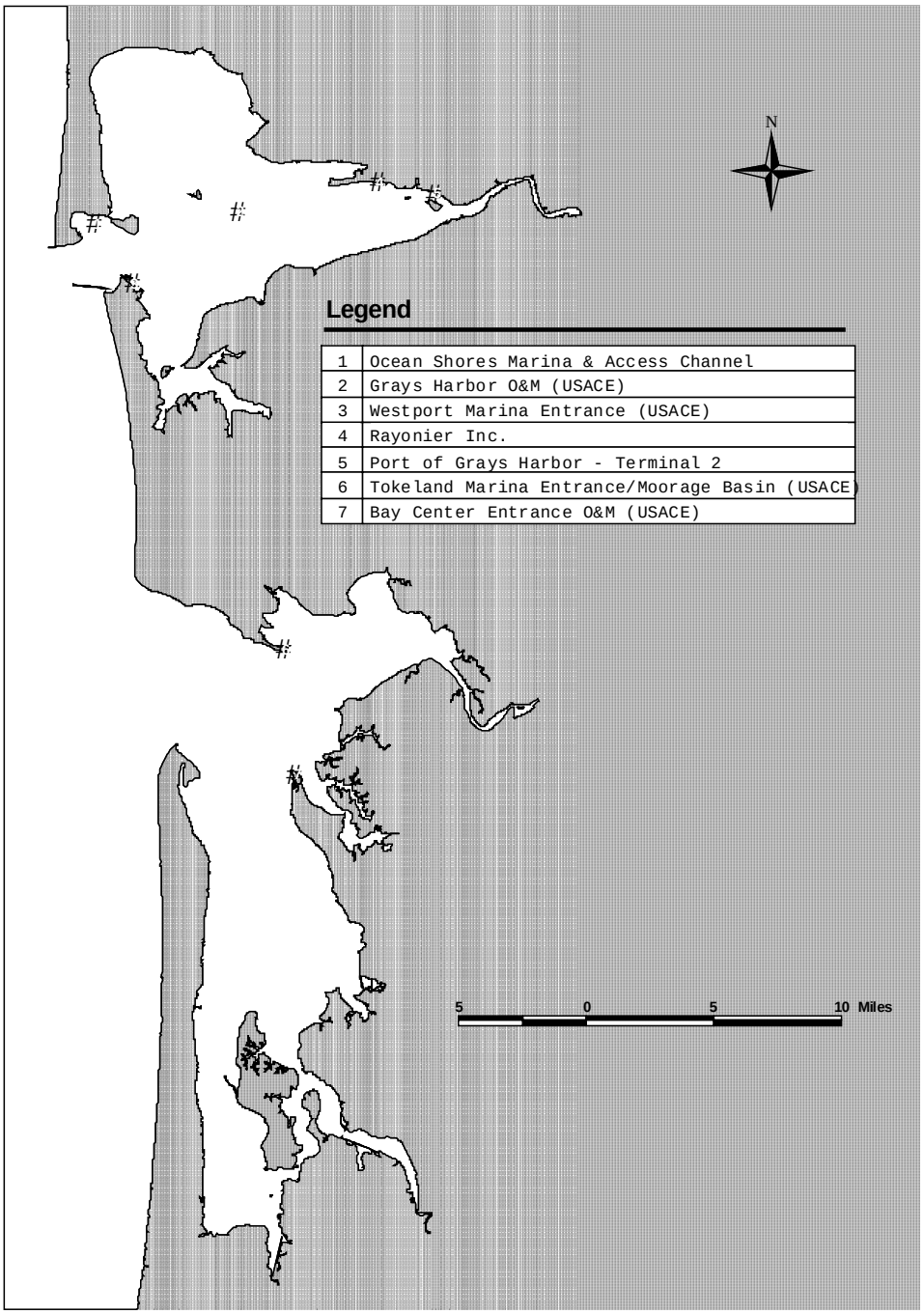

Figure 1-1b Dredging Year 1998/1999 DMMP Project Locations

Table 1-1a. DY98 DMMP EVALUATION ACTIVITIES

PROJECT	Disposal Jurisdiction	Project Volume (cy)	Ranking Determination	Sampling Plan Review	Suitability Determination
Port of Grays Harbor, Terminal 2 (Frequency Determination)	GH	40,000	98	frequency[1]	98
Rayonier Inc./Grays Harbor Dock	GH	25,000	98	98	98
Union Bay (Ralph Swanson)	PSDDA	990	98	no test[2]	98
USACE, Tokeland Marina	WB	76,000	98	98	98
US Oil Company	PSDDA	15,071	98	98	98

CR = Columbia River
GH = Grays Harbor
WB = Willapa Bay
PSDDA = Puget Sound Dredged Disposal Analysis
NCD = Nearshore confined disposal

[1] No testing required under frequency guidelines.
[2] No testing required under small projects guidelines.

Table 1-1b. DY99 DMMP EVALUATION ACTIVITIES

PROJECT	Disposal Jurisdiction	Project Volume (cy)	Ranking Determina-tion	Sampling Plan Review	Suitability Determination
Duwamish Yacht Club	PSDDA	24,000	99	99	99
Hurlen Construction / Boyer Alaska Barge Lines[3]	PSDDA	15,100 / 8,000	98	98	99
Kimberly Clark (Port Gardner Outfall Replacement)	PSDDA	29,700	99	99	99
Longview Fibre	CR	210, 000	99	99	99
Newport Shores/Canal Entrance	PSDDA/BU[4]	9,000	98	98	pending
Oak Harbor Marina (volume revision)	PSDDA	12,000	(96)[5]	(96)	(97)/99[6]
Ocean Shores Marina and Access Channel	GH	241,920	99	99	99
Port of Anacortes/Curtis Wharf Volume Revision	PSDDA	45,000	(97)	(97)	(97)/99[7]
Port of Anacortes	PSDDA	256,000	99	99	pending
Port of Seattle, Pier 66	PSDDA	1,700	99	99	(00)
Port of Tacoma, Sitcum Waterway	PSDDA	144,000	98	98	99
Port of Tacoma, St. Paul Waterway	PSDDA	525,000	99	99	(00)
Port Townsend Marina	PSDDA	4,000	99	99	99
USACE/Port of Seattle, East Waterway Stage II	PSDDA	618,120	96	99	(00)
USACE, Bay Center Entrance Channel	WB	15,000	99	no test[8]	99
USACE, Blair Waterway Deepening	PSDDA	1,140,000	98	98	99
USACE, Duwamish	PSDDA	83,000	99	99	99
USACE, Grays Harbor O&M	GH	2,120,000	98	98	99
USACE, Lake Crockett (Keystone Ferry Terminal)	PSDDA/BU	25,000	99	no test[7]	99
USACE, Olympia Harbor	PSDDA	624,271	99	99	(00)
USACE, Westport Marina (Westhaven Cove)	GH	23,000	98	98	99
US Navy, PSNS Navigation Dredging	PSDDA	368,050	99	99/(00)	(00)[9]

[3] Hurlen Construction and Boyer Alaska were permitted separately but characterized under one SDM.
[4] BU = beneficial use
[5] Activities notes in parentheses occurred outside DY 98/99.
[6] Initial SDM covered 27,000 cy; 99 letter SDM covered increased amount of 12,000 cy.
[7] Initial SDM covered 32,700 cy; 99 SDM covered increased amount of 45,000 cy.
[8] No test due to meeting site-specific exclusionary guidelines (low fines, high energy, low contaminant sources).
[9] Initial SDM 8/99. Retesting initiated 2/2000, Final SDM expected during 3/2000.

Wood Debris Group/Hylebos Waterway Project	PSDDA	110,700	99	(00)	pending
WDOT, Kingston Ferry Terminal	PSDDA	4,500	99	99	99

Manual. Sampling and analysis requirements in Grays Harbor and Willapa Bay are explained in the Dredged Material Evaluation Procedures and Disposal Site Management Manual, Grays Harbor and Willapa Bay, Washington.[10] Sampling and analysis requirements for projects occurring within the Columbia River are found in the November 1998 Dredged Material Evaluation Framework – Lower Columbia River Management Area.[11] The PSDDA and Columbia River Users Manuals can be accessed via the internet from the Corp's Dredged Material Management Office home page, at <http://www.nws.usace.army.mil/dmmo/homepage.htm>. A revised and updated version of the Grays Harbor Willapa Bay Users Manual is expected to be added to the same web site by mid-2000.

Under the specific jurisdictional guidelines summarized above, the initial appraisal of a proposed dredging project requires a careful examination of all existing sediment quality data within the dredging area. An initial area ranking is based on a "reason to believe" that chemicals of concern may or may not be present in the project area. The "agencies"[12] have established ranks for general areas within each jurisdiction (e.g., Elliott Bay/PSDDA) and activities (e.g., marinas) based on historical data or awareness of active sources of contamination. In the absence of project-specific data, representatives of the "agencies" apply an initial ranking based on guidance contained in the jurisdictional specific documents (PSDDA Users Manual, Chapter 3; Grays Harbor/Willapa Bay Users Manual, Chapter 7; Columbia River Users Manual, Chapter 5).

Guidelines for all three jurisdictional areas allow for a reconsideration of the initial ranking if the historical data at the site are adequate, or if the applicant conducts a partial characterization (PC) as described within each Users Manual to survey sediments in the project area for the area specific chemicals of concern. If the PC chemistry data support a lower ranking, sampling and analysis requirements for surface and subsurface sediments may be reduced during the full characterization (FC), commensurate with the revised ranking requirements. Chemicals of concern may also be eliminated for analysis during the FC, based on the PC data. Table 1-2 contains the initial and full characterization rankings of all DY98/99 projects. The "initial rank" was taken from the respective jurisdictional guidance rankings that were in effect at the time of project initiation. The "full characterization" rank was the rank actually used in the full characterization of project sediments. Note that the PSDDA Users Manual has recently been updated, and the "initial rank" has been changed on those projects with new data supporting changed ranks.

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[10] henceforth referred to as the Grays Harbor/Willapa Bay Users Manual.
[11] henceforth referred to as the Columbia River Users Manual
[12] refers to regulatory agencies (Corps, EPA, Washington State Department of Ecology) or agency with jurisdiction over dredging and disposal actions (Washington Department of Natural Resources) responsible for implementing the PSDDA program, Grays Harbor/Willapa bay dredged material management plan, and the Columbia River dredged material evaluation framework.

Table 1-2a. DY98 PROJECT RANKING

PROJECT	Disposal Jurisdiction	Location	Waterbody	Initial Rank	Full Characterization Rank
Port of Grays Harbor, Terminal 2	GH	Aberdeen	Chehalis River	H	LM[13]
Rayonier Inc./Grays Harbor Dock	GH	Hoquiam	Grays Harbor	LM	LM
Union Bay (Ralph Swanson)	PSDDA	Seattle	Lake Union	M	M[14]
USACE, Tokeland Marina	WB	Tokeland	Willapa Bay	L/M	L/M
US Oil Company	PSDDA	Tacoma	Blair Waterway	H	H

L = Low
LM = Low/Moderate
M = Moderate
H = High
E = Meets Exclusionary guidelines

[13] No testing required under frequency guidelines.
[14] No testing required under small projects guidelines.

Table 1-2b. DY99 PROJECT RANKING

PROJECT	Disposal Jurisdiction	Location	Waterbody	Initial Rank	Full Characteriza-tion Rank
Duwamish Yacht Club	PSDDA	Seattle	Duwamish River	H	H
Hurlen Construction / Boyer Alaska Barge Lines	PSDDA	Seattle	Duwamish River	H	H
Kimberly Clark (Port Gardner Outfall Replacement)	PSDDA	Everett	Port Gardner Bay	M	M
Longview Fibre	CR	Longview	Columbia River	E/M	E/M
Newport Shores/Canal Entrance	PSDDA/BU	Newport	Lake Washington	M	M
Oak Harbor Marina	PSDDA	Oak Harbor, Whidbey Is.	Oak Harbor Bay	M	M
Ocean Shores Marina and Access Channel	GH	Ocean Shores	Grays Harbor	L/M	L/LM
Port of Anacortes	PSDDA	Anacortes	Guemes Channel	M	M
Port of Anacortes/Curtis Wharf Volume Revision	PSDDA	Anacortes	Guemes Channel	M	M[15]
Port of Seattle, Pier 66	PSDDA	Seattle	Elliott Bay	H	H
Port of Tacoma, Sitcum Waterway	PSDDA	Tacoma	Sitcum Waterway	L	L
Port of Tacoma, St. Paul Waterway	PSDDA	Tacoma	St. Paul Waterway	H	LM
Port Townsend Marina	PSDDA	Port Townsend	Port Townsend Harbor	M	M
USACE, Bay Center Entrance Channel	WB	Bay Center	Willapa Bay	L	L[16]
USACE, Blair Waterway Deepening	PSDDA	Tacoma	Blair Waterway	H	L
USACE, Duwamish	PSDDA	Seattle	Duwamish River	LM/H	LM/H
USACE, Grays Harbor O&M	GH	Grays Harbor	Chehalis River Grays Harbor	L	L
USACE, Lake Crockett (Keystone Ferry Terminal)	PSDDA	Whidbey Is.	Admiralty Bay	L	L[11]
USACE, Olympia Harbor	PSDDA	Olympia	Budd Inlet	L	L
USACE/Port of Seattle, East Waterway Stage II	PSDDA	Seattle	East Waterway	H	H

[15] Increase in previously tested project volume; no additional sampling done.
[16] No test due to meeting site-specific exclusionary guidelines (low fines, high energy, low contaminant sources).

Table 1-2b, continued. DY99 PROJECT RANKING

PROJECT	Disposal Jurisdiction	Location	Waterbody	Initial Rank	Full Characteriza-tion Rank
USACE, Westhaven Cove Marina	GH	Westport	Grays Harbor	M	M
US Navy, PSNS Navigation Dredging	PSDDA	Bremerton	Sinclair Inlet	H	H
Wood Debris Group/Hylebos Waterway Project	PSDDA	Tacoma	Hylebos Waterway	H	H
WDOT, Kingston Ferry Terminal	PSDDA	Kingston	Appletree Cove, Puget Sound	M	M

Table 1-3a. DY98 PROJECTS - APPROVED SAMPLING PLANS

PROJECT	Rank	Total Volume (cy)	Surface Volume (cy)	Number of Surface Samples	Number of Surface DMMUs	Subsurface Volume (cy)	Number of Subsurface Samples	Number of Subsurface DMMUs
Rayonier Inc./Grays Harbor Dock (frequency determination)	LM	175,000[17]	175,000	4	1	-	-	-
USACE, Tokeland Marina	L/M	76,000	76,000	16	4	-	-	-
US Oil Company	H	15,071	11,140	8	4	3,931	2	1

[17] Volume includes 20,000-25,000 cy maintenance dredging every 18 months, until DY2005.

Table 1-3b. DY99 PROJECTS - APPROVED SAMPLING PLANS

PROJECT	Rank	Total Volume (cy)	Surface Volume (cy)	Number of Surface Samples	Number of Surface DMMUs	Sub-surface Volume (cy)	Number of Sub-surface Samples	Number of Sub-Surface DMMUs
Duwamish Yacht Club	H	24,000	24,000	12	6	-	-	-
Hurlen Construction/Boyer Alaska Barge Lines	H	23,100	23,100	12	6	-	-	-
Kimberly Clark (Port Gardner Outfall Replacement)	M	29,700	17,600	5	2	12,100	5	1
Longview Fibre	E/M	210,000	210,000	11	5	-	-	-
Ocean Shores Marina and Access Channel	L/LM	241,920	155,300	19	4	86,600	19	2
Port of Seattle, Pier 66	H	1,700	1,700	3	1	-	-	-
Port of Tacoma, Sitcum Waterway	L	144,000	144,000	18	3	-	-	-
Port of Tacoma, St. Paul Waterway	LM	455,000	455,000	5	2	-	-	-
Port Townsend Marina	M	4,000	4,000	3	1	-	-	-
USACE, Blair Waterway Deepening	L	1,140,000	1,140,000	60	10	-	-	-
USACE, Duwamish	LM/H	83,000	63,442	12	9	19,039	5	1
USACE, Grays Harbor O&M	L	2,120,000	2,120,000	26	4	-	-	-
USACE, Westhaven Cove Marina	M	23,000	23,000	6	2	0	0	0
WDOT, Kingston Ferry Terminal	M	4,500	4,500	2	1	0	0	0

One out of five DY98 projects (Port of Grays Harbor, Terminal 2) and one out of sixteen DY99 (Ocean Shores Marina) projects had rankings adjusted based on presentation of additional data. In both cases, the rankings were adjusted downward. For the Terminal 2 project, the lower ranking allowed the Port of Grays Harbor to get a frequency determination on their terminal maintenance, reducing the frequency of testing. For the Ocean Shores Marina project, the lower ranking allowed the marina to take fewer samples to characterize the marina portion of the material.

Sampling and Analysis Plans

Approved sampling and analysis plans are required before applicants collect representative sediment samples for either a PC or FC. The applicant or dredging consultant receives guidance in sampling plan development[18] based on the ranking which has been assigned to the proposed project. A conceptual dredging plan and representative sampling plan are established in close coordination with the Corps of Engineers Dredged Material Management Office (DMMO). Protocols for station positioning, decontamination, field sampling, sample compositing, chemical analysis, biological testing, QA/QC and data submittal are all included in the sampling and analysis plan. Once completed, DMMO coordinates review and approval of the plan with the DMMP agencies.

Table 1-3 contains data related to sampling plans approved for DY98/99 projects. Application of specific jurisdictional sampling and analysis requirements resulted in the number of field samples and dredged material management units (DMMUs) formulated for each of the projects. Descriptions of those projects for which no testing was required, or for which best professional judgment was applied, are discussed in the project descriptions in Appendix A.

Sampling

Table 1-4 contains data related to sampling efforts during DY98/99. Two general requirements existing within all three jurisdictions are to sample to the depth of dredging (including overdepth)[19], and to provide positioning data to a minimum precision of one-tenth of a second, latitude and longitude.

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[18] templates for large project and small project sampling and analysis plan development are contained on the Seattle District Dredged Material Management Office homepage at the following address: http://www.nws.usace.army.mil/dmmo/homepage.htm (select hypertext: toolbox).

[19] this requirement is less stringent in Grays Harbor/Willapa Bay in areas with high shoaling rates, which have been previously characterized to the limits of the dredging prism, and for areas generally meeting either Section 404 or Section 103 exclusionary criteria. In these cases sampling of the surface layer with a Van Veen grab is generally allowed.

TABLE 1-4a. DY98 PROJECT SAMPLING

PROJECT	GRAIN SIZE PERCENTAGES				SAMPLING EQUIPMENT	MAXIMUM SEDIMENT DEPTH (FT)	MEAN SEDIMENT DEPTH (FT)
	GRAVEL > 2 mm	SAND .063 - 2mm	SILT .004 - .063mm	CLAY < .004 mm			
Rayonier Inc./Grays Harbor Dock	<0.1	56	28	16	Van Veen grab	0.5	0.5
USACE, Tokeland Marina	<1-3	8-32	39-58	27-34	Van Veen grab	0.5	0.5
US Oil Company	<1-6	22-82	13-71	1-5	Vibracorer	13	5.3

TABLE 1-4b. DY99 PROJECT SAMPLING

PROJECT	GRAIN SIZE PERCENTAGES				SAMPLING EQUIPMENT	MAXIMUM SEDIMENT DEPTH (FT)	MEAN SEDIMENT DEPTH (FT)
	GRAVEL > 2 mm	SAND .063 - 2mm	SILT .004 - .063mm	CLAY < .004 mm			
Duwamish Yacht Club	0	7-22	67-74	9-19	Vibracorer	4.1	4.0
Hurlen Construction/Boyer Alaska Barge Lines	0-1	21-70	22-61	5-18	Vibracorer	4.4	3.6
Kimberly Clark (Port Gardner Outfall Replacement)	1-33	66-96	1-2	<1-1	Vibracorer	12	12
Longview Fibre	0-5	35-97	0-8	0-58	PONAR grab	0.5	.05
Ocean Shores Marina and Access Channel	0-7	2-24	52-67	24-35	Vibracorer	7	5
Port of Tacoma, Sitcum Waterway	0	3-22	57-69	21-32	Vibracorer	13.0	12.8
Port Townsend Marina	1	87	6	6	piston corer	5	4
USACE, Blair Waterway Deepening	<1	30-53	36-55	11-20	Van Veen grab	0.5	0.5
USACE, Duwamish	0-3	21-94	2-64	1-16	Vibracorer	12	3.5
USACE, Grays Harbor O&M	<1-5	83-91	1-8	4-8	Van Veen grab	0.5	0.5
USACE, Westhaven Cove Marina	3-8	48-62	22-34	8-15	Vibracorer	3	3
WDOT, Kingston Ferry Terminal	0.5	91.3	5.1	3.1	Vibracorer	6	~4

For the majority of the projects listed in the table, the maximum sediment depths correspond to both the actual length of the deepest boring as well as to the maximum depth of the dredging prism, including overdepth. In high-ranked areas there is an additional requirement to provide an archived sample from the one foot of sediment beyond the dredging prism ("Z" sample). This additional depth is not reflected in the table.

A variety of positioning techniques were used to provide the required precision. Great emphasis is placed on positioning in order to provide high-quality data. Precise positioning is important to provide repeatability in sampling and to provide data which can be utilized in a geographical information system (GIS).

Chemical Testing

Chemical testing was conducted for three projects in DY98 and thirteen projects in DY99. During DY98 one project (Union Bay) did not require chemical testing based on PSDDA small project guidelines, and one project (Grays Harbor Terminal 2) did not require chemical testing under frequency guidelines. For another project (Oak Harbor Marina), the agencies used previous data to allow an increase in the project volume with no further testing. In DY99, two projects (Bay Center Entrance Channel and Keystone Ferry Terminal) met guidelines for site-specific exclusion from chemical testing in their respective jurisdictions.

In general, the QA/QC for projects undergoing testing was excellent, and acceptable by the DMMP agencies for regulatory decision-making. A complete listing of PSDDA sediment guideline value exceedances for DY98/99 is included in Appendix C.

Biological Testing

Biological testing data summaries can be found in Table 1-5. No biological testing was done for any project in DY98, but four projects underwent biological testing in DY 99. Two of those DY98 projects used tiered testing, performing biological tests on only those DMMUs that had exceedances of SLs. The other two project proponents opted for concurrent biological testing, because of a reason-to-believe that at least one COC would exceed SL, and to save time in the testing process.

DMMP regulatory use of the saline Microtox® test has been suspended since DY94 for regulatory decision-making. This suspension remains in force pending commitment of agency resources to effectively evaluate the continued use of this test, or a suitable replacement test, within each dredging/disposal jurisdiction.

No bioaccumulation testing was conducted on any project during the DY 98/99 biennium.

Suitability Determinations

A suitability determination outlines the evaluation procedures used in the characterization of project sediments, summarizes chemical and biological testing data and associated QA/QC issues, and documents the interpretation of testing results. The suitability determination is a technical memorandum, drafted by the Corps' DMMO and signed by DMMP representatives from the Corps of Engineers, Environmental Protection Agency, Department of Ecology and Department of Natural Resources. The suitability determination documents the suitability of proposed dredged sediments for open-water disposal at either one of the eight PSDDA sites, or two estuarine and one ocean sites in both Grays Harbor and Willapa Bay, or at appropriate inwater sites in the Columbia River. It does not, however, constitute final project approval by the agencies. Comprehensive agency comments on the overall project are provided through the regulatory public notice and review process.

Table 1-6 contains information taken from the suitability determinations for each of the projects which completed their DMMP review during DY98/99. For the five projects receiving suitability determinations in DY98, no material was found unsuitable for unconfined-open-water disposal under PSDDA, Grays Harbor/Willapa Bay, or Columbia River evaluation guidelines. In DY99, only one PSDDA project (out of 17 DMMP projects receiving suitability determinations) had one or more DMMU found unsuitable for unconfined open-water disposal.

Table 1-5. DY99 BIOLOGICAL TESTING DATA (no biological testing done in DY 98)

PROJECT	Number of biological analyses	Number of analyses failing bioassays	Number under-going concurrent testing	Number under-going tiered testing	Bioassays Conducted			Control Sediment Location	Reference Sediment Location
					Amphipod	Sediment Larval	20-day Growth		
Hurlen Construction/ Boyer Alaska Barge Lines	4	0	0	4	*Aa*	not done (out of season)	*Na*	Narragansett Bay, MA	Carr Inlet
USACE, Duwamish	10	0	10	0	*Ee*	*Mg*	*Na*	Beaver Creek, OR	Carr Inlet
USACE, Grays Harbor O&M	2	0	0	2	*Ra*	*De*	*Na*	Yaquina Bay, OR	GHS7
USACE, Westhaven Cove Marina	2	0	2	0	*Ra*	*De*	*Na*	Yaquina Bay, OR	GHS7

Aa = Ampelisca abdita
De = Dendraster excentricus
Ee = Eohaustorius estuarius
Mt = Mytilus trossulus
Mg = Mytilus galloprovincialus
Na = Neanthes arenaceodenta
Ra = Rhepoxynius abronius
Sp = Strongylocentrotus purpuratus

Table 1-6a. DY98 SUITABILITY DETERMINATIONS

PROJECT	Rank	Total Volume (cy)	No. of chemical analyses	No. of biological analyses	DMMUs Failing	Volume Failing (cy)	DMMUs Passing	Volume Passing (cy)	Proposed DMMP Disposal Site
Port of Grays Harbor, Terminal 2 (frequency determination)	LM	40,000	0	0	0	0	0	40,000	South Jetty/ Point Chehalis
Rayonier Inc./Grays Harbor Dock	LM	175,000	1	0	0	0	1	175,000	South Jetty / Point Chehalis
Union Bay (small project, no test)	M	990	0	0	0	0	0	990	Elliott Bay
USACE, Tokeland Marina	L/M	76,000	4	0	0	0	4	76,000	Goose Point
US Oil Company	H	15,071	5	0	0	0	5	15,071	Commencement Bay

Table 1-6b. DY99 SUITABILITY DETERMINATIONS

PROJECT	Rank	Total Volume (cy)	No. of chemical analyses	No. of biological analyses	DMMUs Failing	Volume Failing (cy)	DMMUs Passing	Volume Passing (cy)	Proposed DMMP Disposal Site
Duwamish Yacht Club	H	24,000	6	0	0	0	6	24,000	Elliott Bay
Hurlen Construction/ Boyer Alaska Barge Lines	H	23,100	6	4	2	7,550	4	15,550	Elliott Bay
Kimberly Clark (Port Gardner Outfall Replacement)	M	29,700	3	0	0	0	3	29,700	Port Gardner
Longview Fibre	E/M	210,000	5	0	0	0	5	210,000	Columbia River
Oak Harbor Marina	M	12,000	-	0			-	12,000	Rosario Strait/Port Gardner
Ocean Shores Marina and Access Channel	L/LM	241,920	6	0	0	0	6	241,920	Point Chehalis
Port of Anacortes/Curtis Wharf Volume Revision	M	45,000	0	0	0	0	0	45,000	Rosario Strait
Port of Tacoma/Sitcum Waterway	L	144,000	3	0	0	0	3	144,000	Commencement Bay
Port Townsend Marina	M	4,000	1	0	0	0	1	4,000	Rosario Strait/Port Gardner
USACE, Bay Center Entrance Channel	L	15,000	0	0	0	0	0	15,000	Sidecast
USACE, Blair Waterway Deepening	L	1,140,000	10	0	0	0	10	1,140,000	Commencement Bay

Table 1-6b. DY99 SUITABILITY DETERMINATIONS, cont.

PROJECT	Rank	Total Volume (cy)	No. of chemical analyses	No. of biological analyses	DMMUs Failing	Volume Failing (cy)	DMMUs Passing	Volume Passing (cy)	Proposed DMMP Disposal Site
USACE, Duwamish	LM/H	83,000	10	10	0	0	10	83,000	Elliott Bay
USACE, Grays Harbor O&M	L	2,120,000	4	2	0	0	4	2,120,000	South Jetty/ Point Chehalis
USACE, Lake Crockett (Keystone Ferry Terminal)	L	25,000	0	0	0	0	0	25,000	Beneficial use (beach nourishment)
USACE, Westhaven Cove Marina	M	23,000	2	2	0	0	2	23,000	Point Chehalis
WDOT, Kingston Ferry Terminal	M	4,500	1	0	0	0	1	4,500	Elliott Bay

C. SUMMARY AND ASSESSMENT OF DY98/99 DATA

Chemical Testing. Table 1-7 summarizes the chemical testing results from DY98 and DY99. Only five of the fifteen projects which underwent chemical testing had detected screening level exceedances of chemicals of concern. There were no undetected chemical exceedances of screening levels, bioaccumulation triggers, or maximum level guidelines. Only fifteen chemicals had screening level exceedances, whereas only one chemical exceeded the bioaccumulation trigger, and only one chemical had a chemical exceedance of maximum level.

Among the chemicals with chemical SL exceedances, only two chemicals (Phenanthrene and Fluoranthene) were detected in more than one project. Surprisingly, there were no SL exceedances of metals, chlorinated hydrocarbons, phthalates, phenols, and volatile organics among the DY98/99 projects. The chemicals most frequently exceeding SLs were Fluoranthene (5 DMMUs), Phenanthrene (3 DMMUs), and Pyrene (3 DMMUs). All things considered, the chemical testing results for these two dredging years were for some of the “highest” quality sediments tested during the eleven years of DMMP program implementation.

TABLE 1-7. DY98/99 CHEMICAL TESTING SUMMARY FOR DMMP PROJECTS

CHEMICAL OF CONCERN	# of Projects D>SL	# of DMMU D>SL	# of Projects D>BT	# of DMMU D>BT	# of Projects D>ML	# of DMMU D>ML	# of Projects U>SL	# of DMMU U>SL	# of Projects U>BT	# of DMMU U>BT	# of Projects U>ML	# of DMMU U>ML
LPAH												
Acenaphthene (1)	1	1			1	1						
Fluorene (1)	1	1										
Phenanthrene (1)	2	3										
Total LPAH (1)	1	1										
HPAH												
Benzo(a)anthracene	1	2										
Benzo(a)pyrene (1)	1	2										
Benzo(b+k)fluoranthenes (1)	1	1										
Chrysene (1)	1	2										
Fluoranthene	2	5	1	1								
Indeno(1,2,3-c,d)pyrene (1)	1	2										
Pyrene (1)	1	3										
Total HPAH (1)	1	2										
MISCELLANEOUS EXTRACTABLE												
Dibenzofuran (1)	1	1										
PESTICIDES, PCBs												
Total DDT	1	1										
Total PCBs	1	1										

Total Projects with Chemical Testing = 15 projects and 64 DMMUs

D = Detected U = Undetected SL = Screening Level BT = Bioaccumulation Trigger
(1) No BT exists

Biological Testing. Biological testing was only conducted on seventeen DMMUs among five projects during DY98/99. Table 1-8 depicts the number of hits that were recorded for each of the three bioassays among the thirteen nondispersive site DMMUs tested, and among the four dispersive site DMMUs tested. It denotes that only one two-hit nondispersive site response was recorded for the amphipod and sediment larval bioassays, and no hits were recorded for the dispersive site DMMUs (see Appendix B for bioassay interpretation guidelines). No single-hit responses were recorded among the DMMUs tested. No DMMUs failed either the non-dispersive or dispersive site bioassay testing guidelines.

Table 1-8. DY98/99 BIOASSAY HITS

BIOASSAY	Number of DMMUs Tested		Number of Hits Under the Two-Hit Rule		Number of Hits Under the One-Hit Rule	
	ND	D	ND	D	ND	D
Amphipod	13	4	1	0	0	0
Sediment Larval	13	4	1	0	0	0
Neanthes	13	4	0	0	0	0

Legend. ND = Nondispersive site interpretation guidelines; D = Dispersive site interpretation guidelines

Cost Analysis

Total Costs. Total sampling and testing costs are generally related to the size of the project and the rank. Larger projects have lower unit costs than smaller projects due to economy of scale. Area rank influences costs by requiring larger numbers of analyses (DMMU) relative to lower ranked projects. Figure 1-2 shows the relationship of average total cost per cubic yard to the total volume tested for all PSDDA projects submitting data from DY90 to DY99. The regression of these two variables resulted in a significant ($p<0.001$) correlation and regression equation noted in Figure 1-2, which can be used to estimate testing cost given the project size.

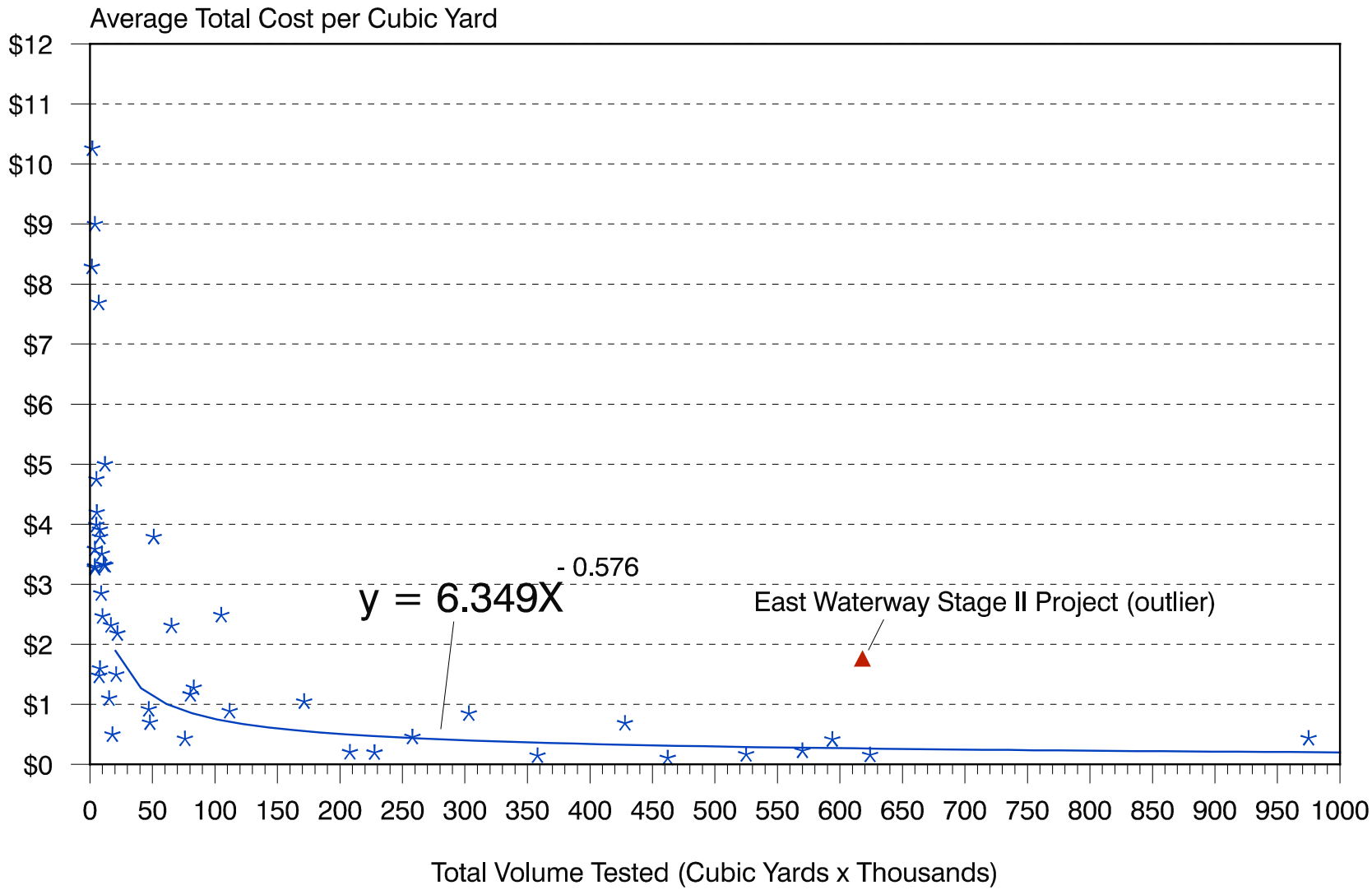
Testing Costs. Chemical testing costs are generally the most straightforward and readily discernible costs. Analytical laboratories performing DMMP analyses will provide quotes on unit costs. Average unit chemical testing costs (including QA/QC) for the past ten years are depicted in Figure 1-3 as a function of the number of analyses for the standard suite of chemicals and for the cost for the standard suite plus special chemicals such as dioxin and tributyltin. The scatter plot depicted shows that as the number of analyses increases beyond three the unit costs drop sharply and steadily decrease for the most part to a low of around $1200 to $1500 per analysis. Projects with one or

two analyses are especially costly, as the QA/QC costs cannot be distributed over several samples.

Evaluating bioassay costs shows that the unit costs relate well to the total number of analyses, as shown in Figure 1-4. There was a tremendous range in unit costs for projects with only one analysis, whereas the variability in unit costs dropped sharply with additional analyses.

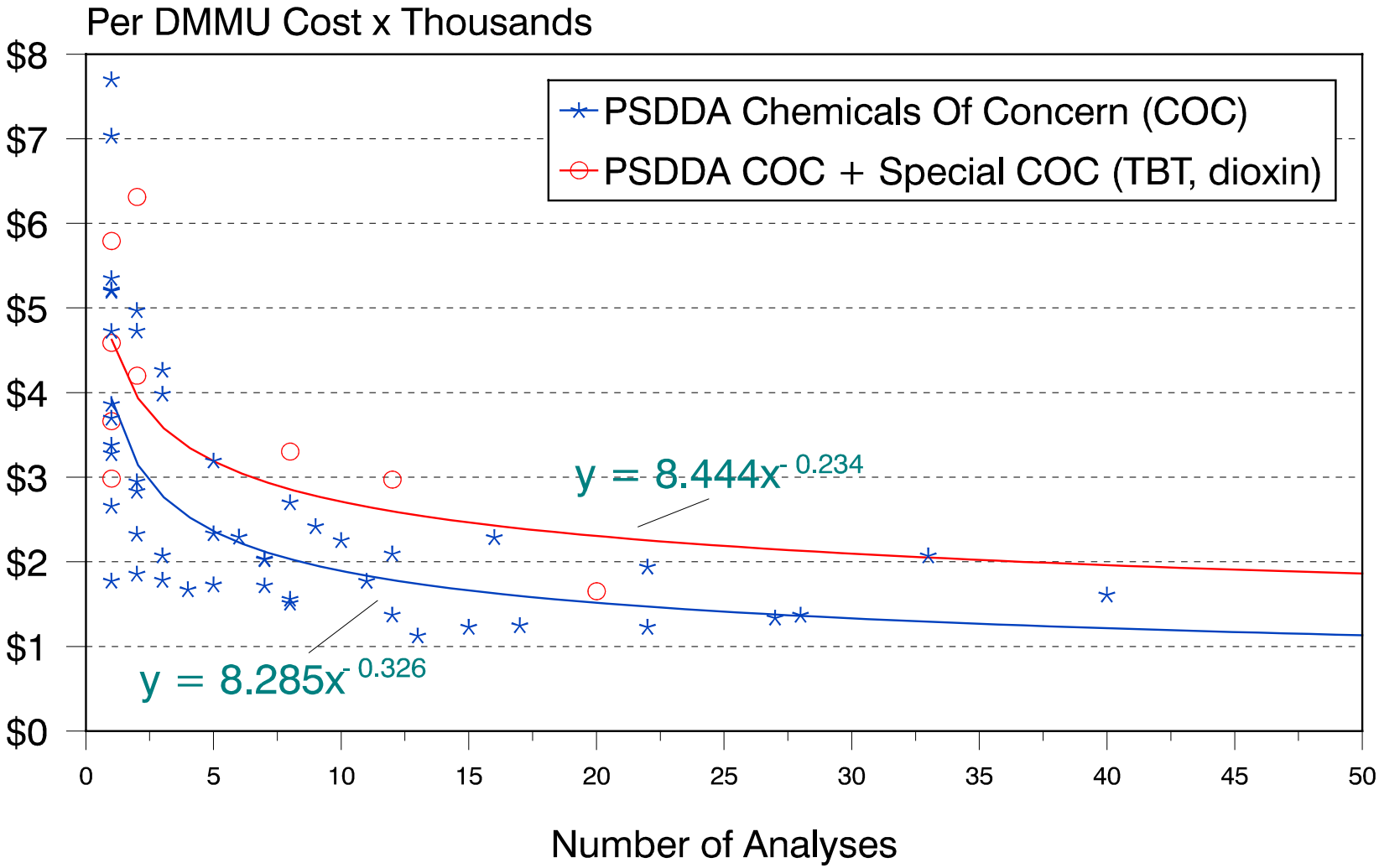
Bioaccumulation testing costs were analyzed for two recent dredging projects. The USACE/Port of Seattle East Waterway Stage I dredging project (formerly the Port of Seattle's T-18 Project conducted bioaccumulation on 10 DMMUs with an average unit cost of $14,300/DMMU. The second project was the USACE/Port of Seattle East Waterway Stage II dredging project, which conducted 25 bioaccumulation tests with an average bioaccumulation cost of $17,953/DMMU.

Figure 1-2. Project Size Testing Cost



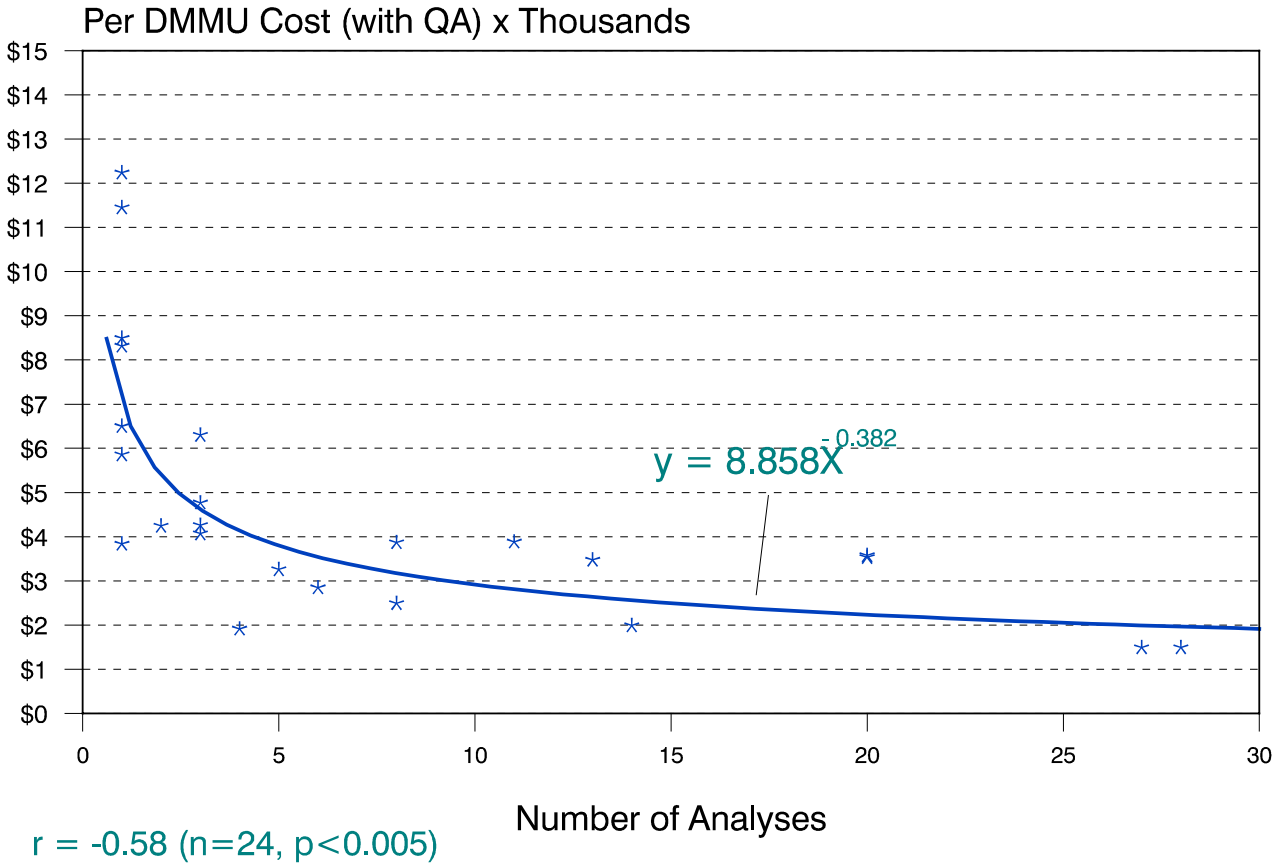
r=-0.51 (n=47, p<0.001); includes sampling and all testing costs

Figure 1-3. Chemistry Testing Cost



DMMP COC: r = -0.52 (n=48, p<0.001); DMMP COC + Special COC: r = -0.71 (n=9, p<0.05)

Figure 1-4. Bioassay Testing Costs



r = -0.58 (n=24, p<0.005)

Regulatory Processing

For the majority of dredging projects, DMMP sediment sampling and testing are a part of the regulatory requirements under Section 404 of the Clean Water Act, or under Section 103 of the Marine Protection, Research and Sanctuaries Act. For those dredging projects requiring sampling and testing, the regulatory process consists of a sequence of steps which must be taken before obtaining a permit. The majority of permit actions involve 404 jurisdiction, but the steps are similar for 103 actions. These are as follows:

(1) Prepare and submit application for permit.

(2) Prepare sampling and analysis plan (SAP) for characterization of proposed dredged material.

(3) Receive approval of SAP from DMMP agencies.

(4) Perform sampling and chemical/biological analysis and submit testing results.

(5) Receive suitability determination for open-water disposal from DMMP agencies.

(6) Complete application details required to issue public notice.

(7) Corps prepares and issues public notice.

(8) Corps transmits review comments to applicant after 30-day public comment period.

(9) Applicant provides Corps with responses to public comments.

(10) Corps completes public interest review, 404(b)1 evaluation, NEPA documentation and issues permit.

The average time requirements for steps 3 through 10 are included in Figures 1-5a and 1-5b, which were constructed using data from processing activities occurring in DY98/99 (this included public interest reviews and permitting actions for several dredging projects which did not require testing during this biennium). These steps and time requirements are discussed below.

(1) Permit Preparation and Submittal. An application for a Corps of Engineers Section 10/404 permit for dredging and dredged material disposal must be submitted before any DMMP processing may take place. An application number and Regulatory Branch Project Manager are assigned when an application is submitted and the Dredged Material Management Office

begins review of information relevant to the proposed dredging. Permit preparation is part of the regulatory process, but completely within the control of the permit applicant, so is not included in the analysis of processing time.

(2) Sampling and Analysis Plan Development. A sediment sampling and analysis plan must be developed and submitted to the DMMP agencies for review prior to commencement of field sampling. The time required for SAP development is highly variable and almost completely within control of the dredging applicant. In many cases a permit application is submitted at the same time as a draft SAP, while in other cases a permit application is submitted long before development of a SAP begins. Therefore, the time required for SAP development is difficult to quantify and was not included in Figures 1-5a and 1-5b.

(3) Sampling and Analysis Plan Approval. Once a sediment SAP has been submitted, the DMMO coordinates review with the other DMMP agencies: EPA, DNR and Ecology. An approval letter, which includes DMMP agency comments and recommends modifications to the SAP, is then sent to the applicant. Once these comments and modifications have been acknowledged by the applicant, via telephone, letter or e-mail, sampling and analysis may proceed. It is the goal of the DMMO to complete the review of SAPs within three weeks. During DY 98/99 the average time from the submittal of the final SAP for a project to SAP approval was 19 days.

(4) Sampling and Analysis. During this phase, field sampling and chemical/ biological analysis are completed following the protocols established in the approved SAP. Data are compiled and submitted in a hard copy report. These data are entered into the Dredged Analysis Information System by a Corps contractor. Sampling, testing and reporting consume a substantial portion of the DMMP Process time budget, averaging 94 days during DY98/99. This is one of the project phases with the highest degrees of variability, with sampling and analysis taking anywhere from 47 to 191 days during this 2 year time period. Factors influencing the time required for this phase include weather, sampling difficulties, laboratory capacity and turn-around, QA problems arising during chemical and biological testing, and report compilation time. Those projects which include bioassay or bioaccumulation testing usually are those with the longer turn-around times.

(5) Data Review. Once a full set of chemical/biological testing data is submitted along with the sampling report, the DMMO conducts a data review with the other DMMP agencies. The result of this review is the signing, by DMMP agency representatives, of a Memorandum for Record documenting the determination reached on the suitability/unsuitability of each of the dredged material management units defined in the approved SAP. The goal of the DMMO is to complete this review within three weeks

of data submittal. In DY98/99, the average time required was 18 days. In many cases, this review can be much shorter; time needed during this biennium ranged from 5 days to 66 days. The longest reviews usually involve complications such as a change in dredge volume or especially large or complex data sets.

(6) Complete Permit Application. Once the suitability determination has been signed, the DMMO informs the Corps Regulatory Branch project manager and preparations are made to issue a public notice. However, if project details have not been fully developed by this time, or if project plans are modified subsequent to the suitability determination, new drawings or other information may be required of the applicant prior to the preparation of the public notice. In other cases, a shorelines development permit may not have yet been obtained by the applicant and a decision may be made to wait to go out to public notice until the local shoreline jurisdiction has issued a permit. During DY98/99 the average time required for dredging project applicants to complete their permit application was 126 days. This time period was substantially longer than that needed in the last biennium, although the permit review period (see below) was, on average, much shorter.

(7) Prepare and Issue Public Notice. By regulation, the Regulatory Branch must issue a public notice within fifteen days of the completion of the permit application. For DY 98/99, the average time required for this step was 15 days.

(8) Public Comment Period and Transmittal of Review Comments. A DMMP project typically undergoes a 30-day public comment period. Comments received during this period are collated by the Corps and transmitted to the applicant for response. For DY98/99 projects, the average time required for the public comment period and transmittal of review comments was 45 days.

(9) Applicant Responds to Review Comments. The permit applicant is responsible for providing written responses to review comments and supporting data to the Corps before the Regulatory Branch project manager can complete a public interest review. The average time required for this step in DY98/99 was 13 days.

(10) Corps Completes Public Interest Review and Makes Permit Decision. The public interest review, including a Section 404(b)(1) alternatives analysis and NEPA evaluation, is completed and documented after the permit applicant provides responses to review comments. The Corps project manager prepares a permit decision upon completion of the public interest review.

This stage of the process may be very time consuming. Dredging and DMMP processing are often only part of complex projects. Other elements may be involved, such as wetland fills, eelgrass bed impacts or Endangered Species Act issues. Resolution of controversial issues such as these may consume substantial amounts of time. The time required to complete this phase is always highly variable, with a mean time in DY98/99 of 46 days. However, this time was much shorter than the average time (72 days) in the last biennium.

To improve regulatory response time, the Department of Ecology recommends that applicants seek a hydraulic project approval (HPA) from the Department of Fish and Wildlife, and resolve other problems as early as possible in the permit process.

The entire DMMP dredged material evaluation process, as depicted in Figure 1-5b, includes final sampling and analysis plan review and approval, field sampling and analysis, data review and completion of the suitability determination. The average time required for the DMMP dredged material evaluation process was 132 days (ranging from 71 to 248) in DY98/99, with the majority of that time taken up by sampling, testing, and data report preparation by the applicant. Note that Figure 1-5b shows the average time required for each of the three phases of the dredged material evaluation process, the sum of which does not equal the mean time for the entire process.

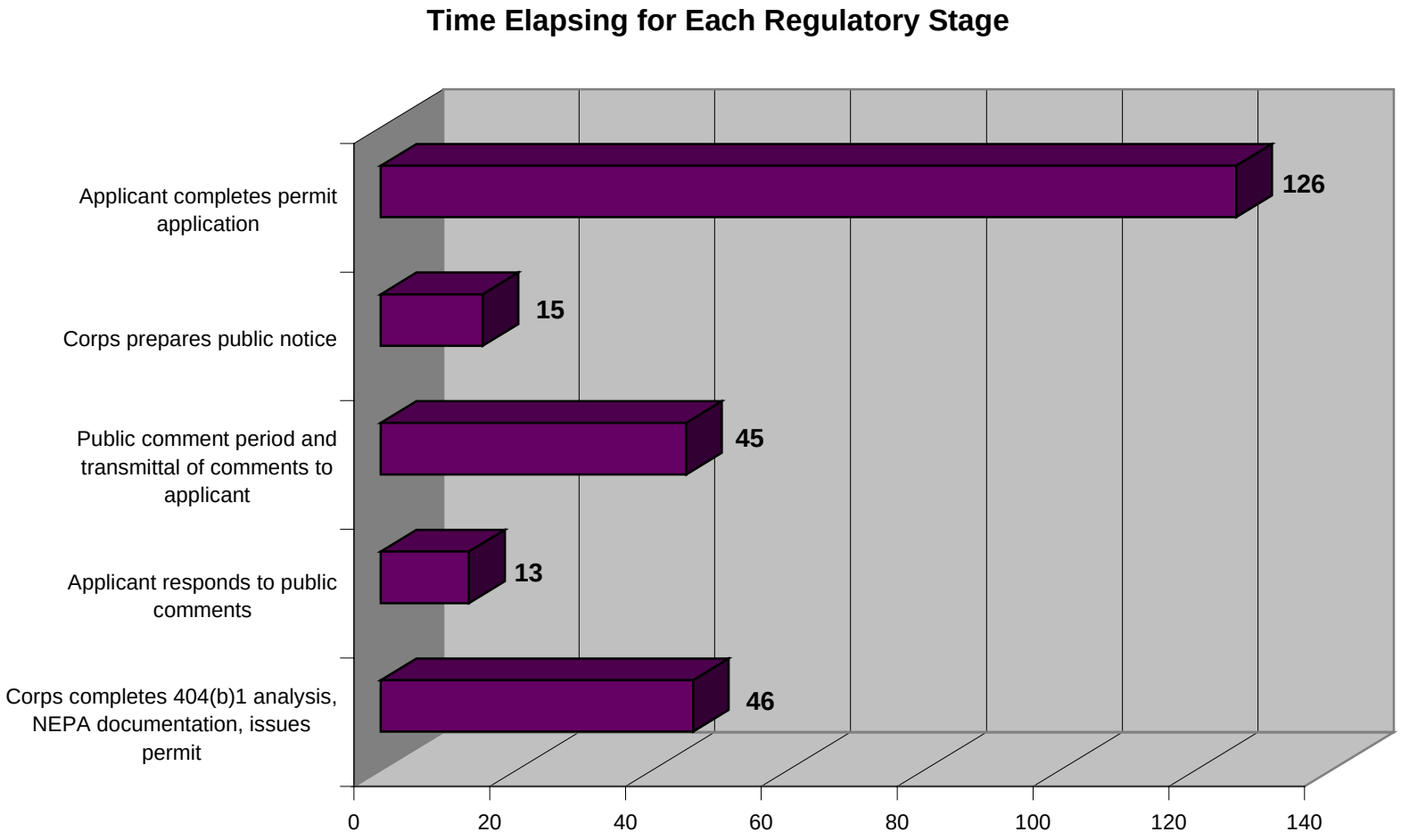


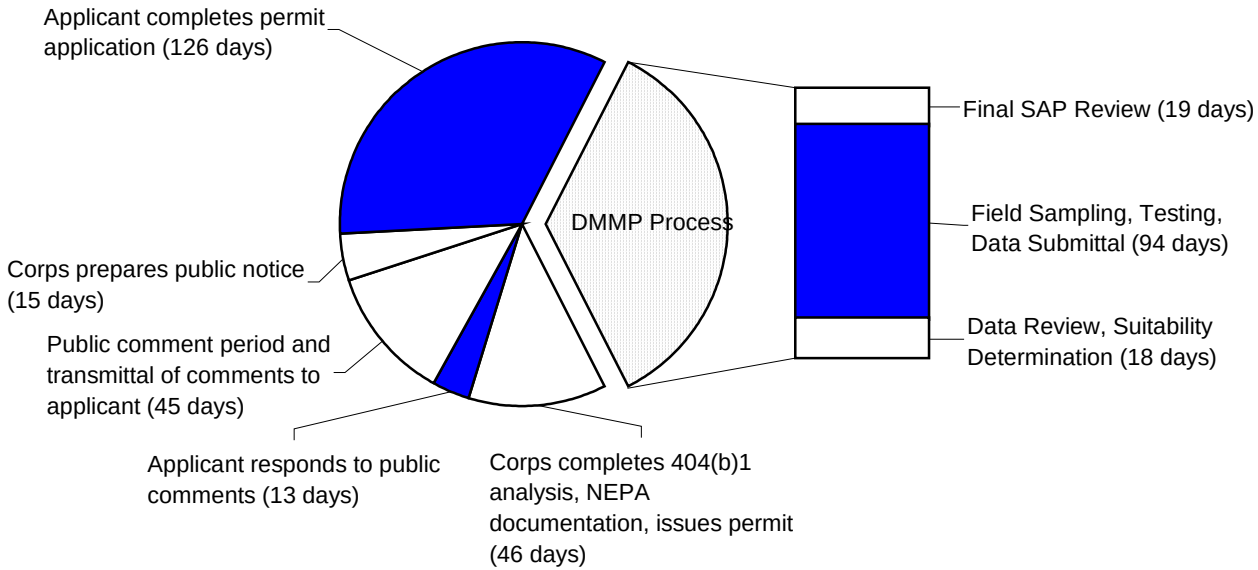
FIGURE 1-5a. Regulatory Processing Time

Means for DY98/99 Projects (days)

FIGURE 1-5b. Regulatory Processing Time

Means for DY98/99 Projects (days)

Processing Time Under Control of Applicant
(dark shaded areas are under applicant's control)



CHAPTER 2

DISPOSAL SITE USE AND MONITORING

A. DISPOSAL ACTIVITY AND SITE USE

The Washington Department of Natural Resources (DNR) issues site-use authorizations to project proponents who wish to dispose of dredged material at PSDDA and Grays Harbor/Willapa Bay (GH/WBDDA) unconfined, open-water disposal sites. These authorizations are issued for sediments which are 1) suitable for open-water disposal as determined by the Dredged Material Management Program (DMMP) evaluation process, and 2) associated with dredging projects which have received all required regulatory permits (e.g., CWA 404/401 permits). This section of the report describes the PSDDA and GH/WBDDA disposal activity for Dredge Years 1998 and 1999 (i.e., June 16, 1997 through June 15, 1998 and June 16, 1998 through June 15, 1999). This information is discussed by year and by individual disposal site.

Dredging Year 1998 (June 16, 1997 - June 15, 1998)

In DY98, a total of 862,205 cubic yards of dredged material was disposed at five PSDDA sites, while a total of 1,252,404 cubic yards was disposed at DNR managed sites on the coast (GH/WBDDA). Commencement Bay received the majority of the material, a total of 693,540 cubic yards. A total of 53,000 cubic yards were disposed at the Rosario Strait site, 4,000 cubic yards were disposed at the Port Townsend site, 1,200 cubic yards at the Bellingham Bay site, and 110,465 cubic yards at the Elliott Bay site. Willapa Bay had no disposals for this dredge year. These volumes are presented graphically in Figures 2-1 and 2-2, and are shown in Tables 2-1 and 2-2.

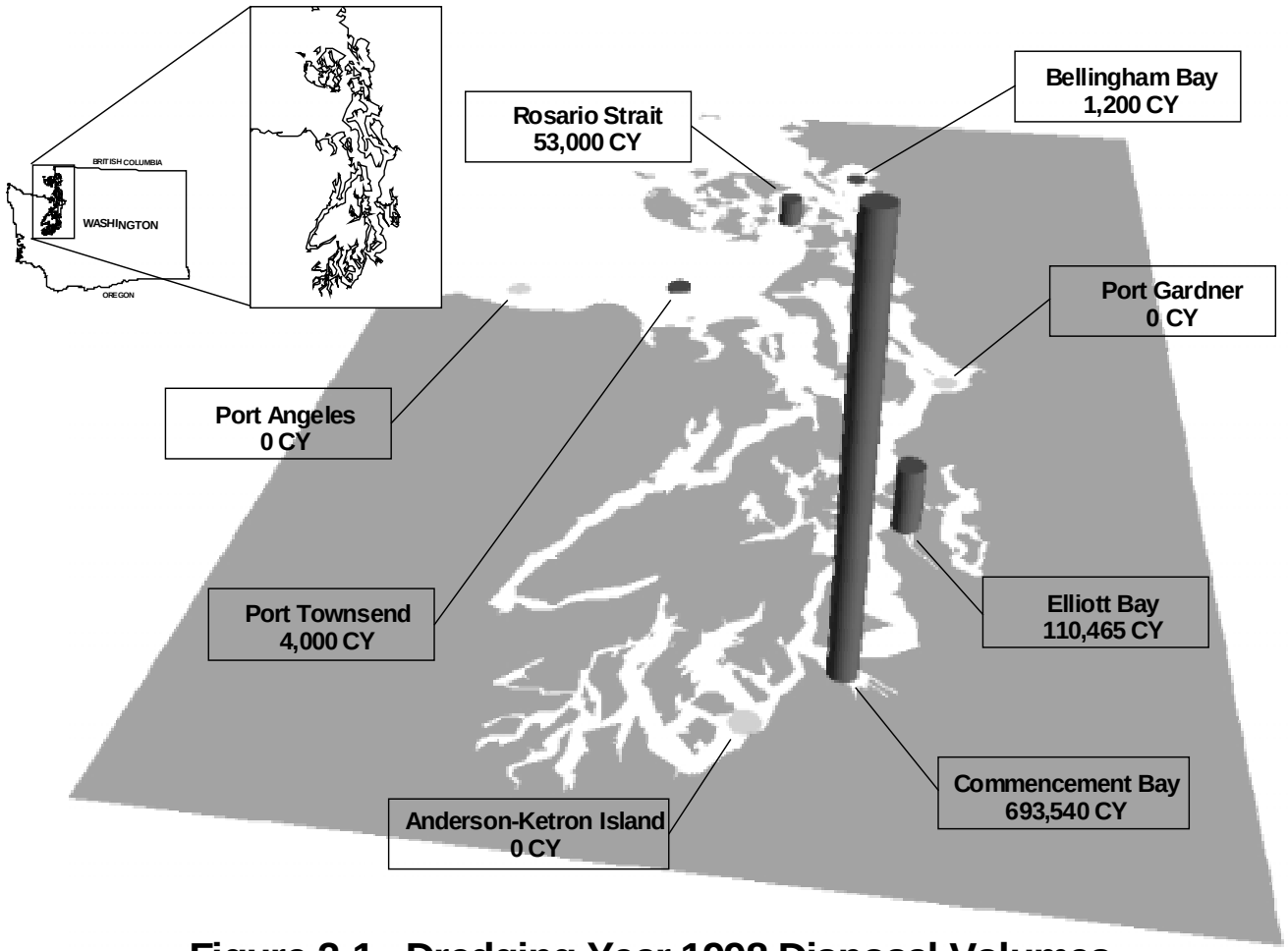


Figure 2-1. Dredging Year 1998 Disposal Volumes

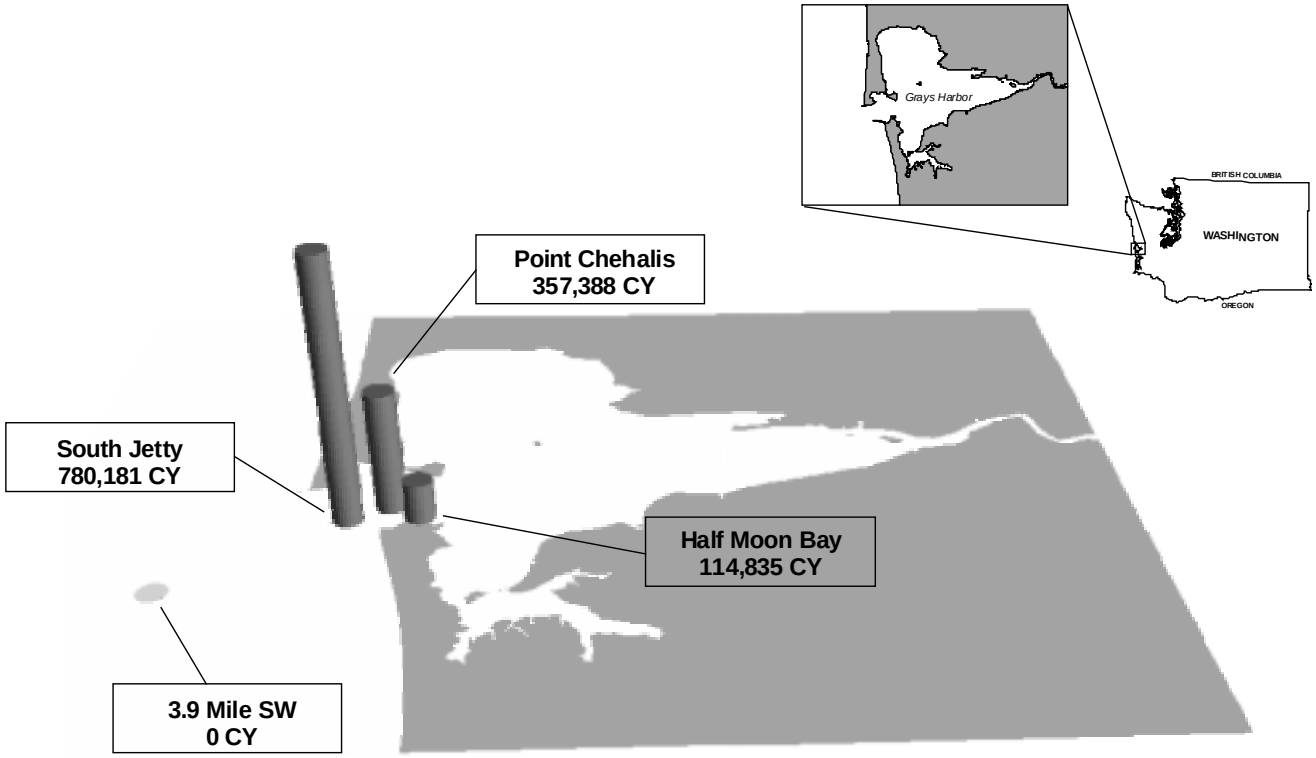


Figure 2-2. Dredging Year 1998 Disposal Volumes for Grays Harbor

Table 2-1. Disposal Site Activity Summary, DY98

Disposal Site	Jurisdiction	Number of Projects	Total Volume (cy)
Port Gardner	PSDDA	0	0
Port Townsend	PSDDA	1	4,000
Port Angeles	PSDDA	0	0
Rosario Straits	PSDDA	3	53,000
Bellingham Bay	PSDDA	1	1,200
Elliott Bay	PSDDA	4	110,465
Commencement Bay	PSDDA	2	693,540
Anderson/Ketron Island	PSDDA	0	0
Willapa Bay	GH/WBDDA	0	0
Point Chehalis	GH/WBDDA	2	357,388
South Jetty	GH/WBDDA	4	780,181
Half Moon Bay (Beneficial Use)	GH/WBDDA	1	114,835
All Sites Within	PSDDA	7	862,205
Jurisdiction Combined:	GH/WBDDA	7	1,252,404

Table 2-2. Summary of Disposal Activity by Jurisdiction and Site, DY98

Site	Proponent	Disposal Volumes	Barge Loads
RS	Corps of Engineers	7,543	4
RS	Corps of Engineers	6,211	3
RS	Corps of Engineers	39,246	19
PT	Port of Port Townsend	4,000	2
BB	Bellingham Cold Storage	1,200	1
CB	Port of Tacoma	678,694	568
CB	U.S. Oil	14,846	23
EB	Port of Seattle	38,296	74
EB	Port of Seattle	23,043	21
EB	Corps of Engineers	49,126	29
SJ	Corps of Engineers	366,259	68
SJ	Corps of Engineers	171,628	45
PC	Corps of Engineers	114,836	64
HMB	Corps of Engineers	114,835	64
PC	Corps of Engineers	242,552	179
SJ	Corps of Engineers	63,992	41
SJ	Corps of Engineers	178,302	122

Legend: RS = Rosario Strait, PT = Port Townsend, BB = Bellingham Bay, CB = Commencement Bay, EB = Elliott Bay, SJ = South Jetty, PC = Point Chehalis, HMB = Half Moon Bay.

Dredging Year 1999 (June 16, 1998 - June 15, 1999)

In DY99, a total of 697,860 cubic yards of dredged material was disposed at four PSDDA sites, whereas a total of 2,989,483 cubic yards was disposed at DNR managed sites on the coast (GH/WBDDA). Elliott Bay received the majority of the Puget Sound material, a total of 414,794 cubic yards. A total of 140,319 cubic yards were disposed at Commencement Bay, 140,761 cubic yards at the Rosario Strait site, and 1,986 cubic yards at the Port Townsend site. In Grays Harbor, all sites together received a total of 2,961,836 cubic yards. Disposals in Willapa Bay were comprised of 27,647 cubic yards. These volumes are represented graphically in Figures 2-3 and 2-4, and are shown in Tables 2-3 and 2-4.

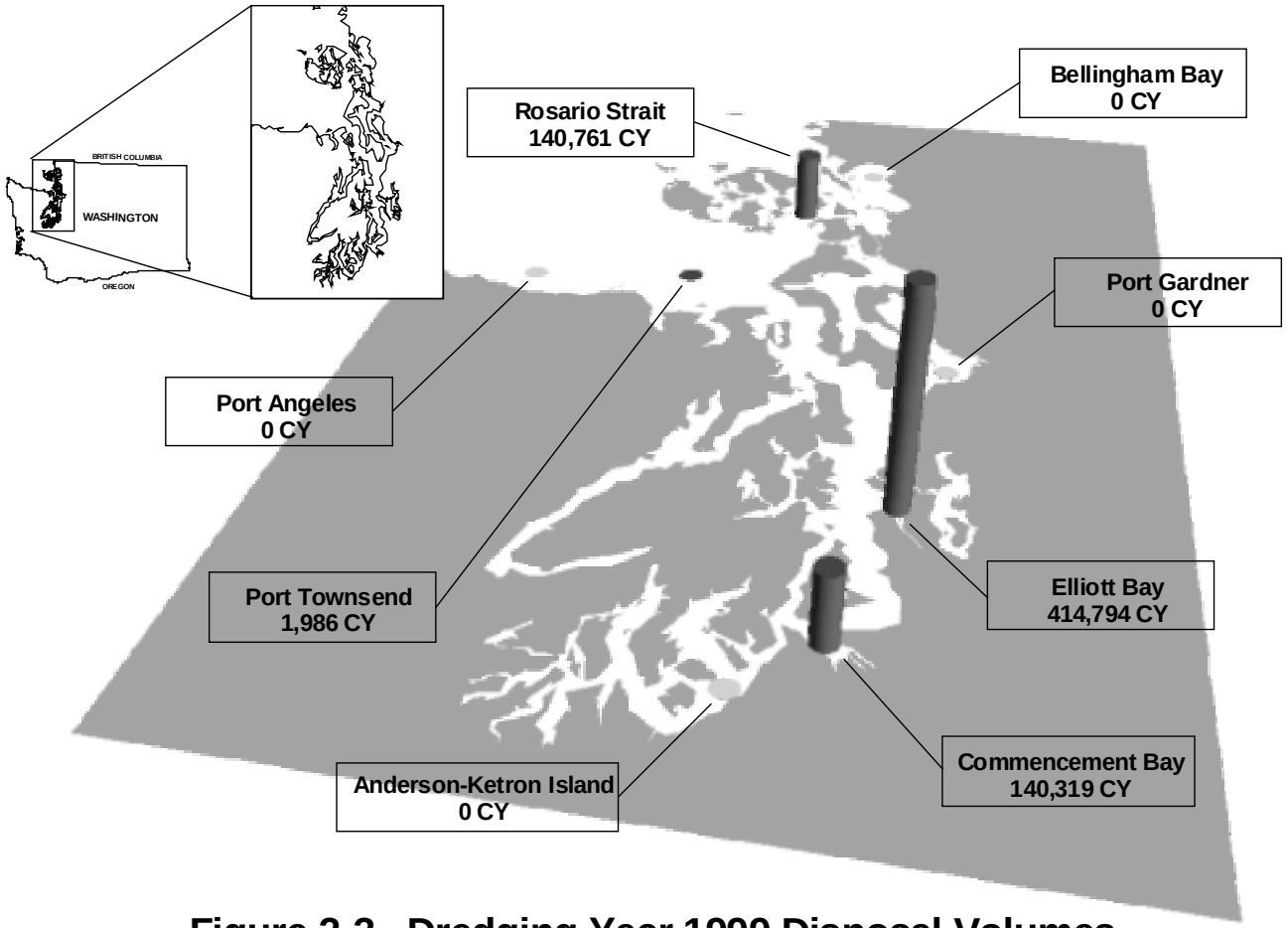


Figure 2-3. Dredging Year 1999 Disposal Volumes

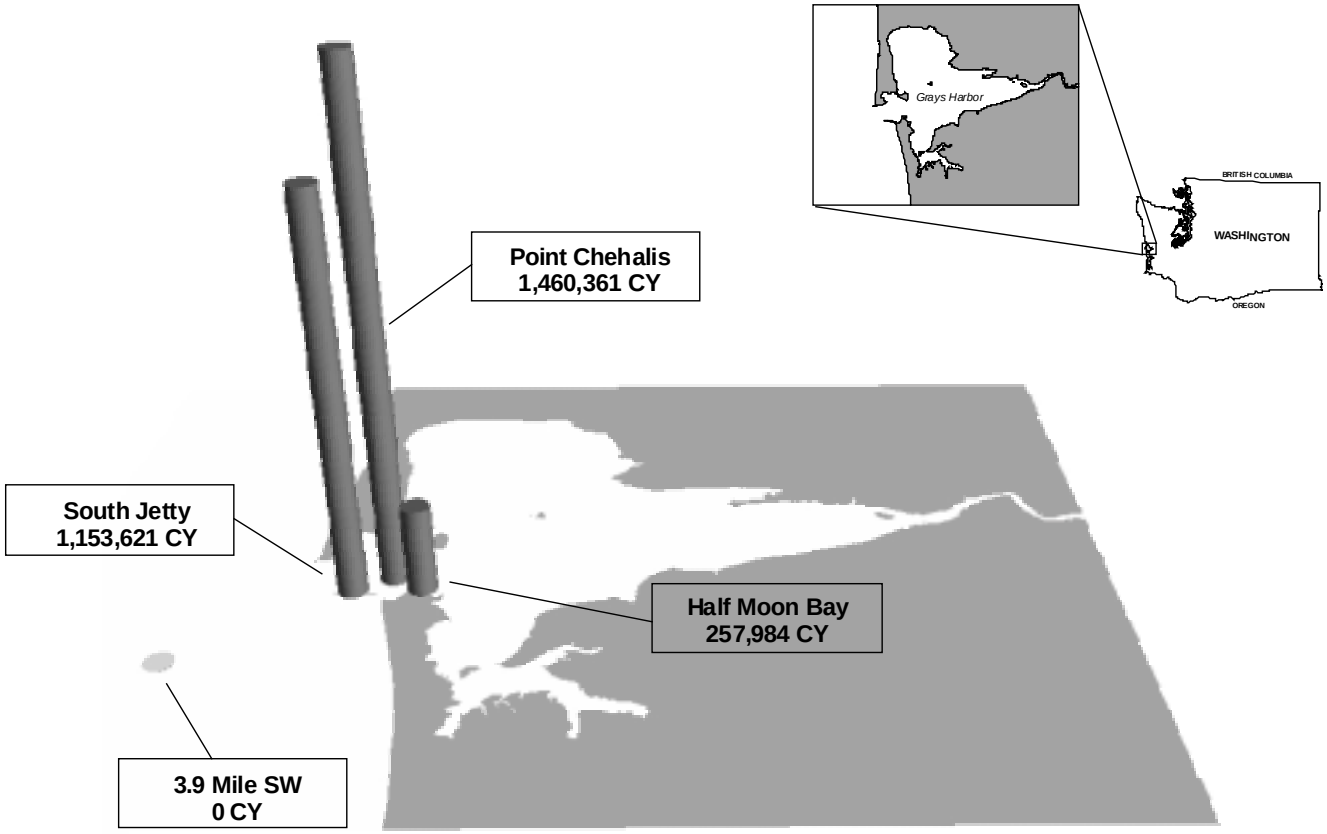


Figure 2-4. Dredging Year 1999 Disposal Volumes for Grays Harbor

Table 2-3. Disposal Site Activity Summary, DY99

Disposal Site	Jurisdiction	Number of Projects	Total Volume (cy)
Port Gardner	PSDDA	0	0
Port Townsend	PSDDA	1	1,986
Port Angeles	PSDDA	0	0
Rosario Straits	PSDDA	1	140,761
Bellingham Bay	PSDDA	0	0
Elliott Bay	PSDDA	4	414,794
Commencement Bay	PSDDA	2	140,319
Anderson/Ketron Island	PSDDA	0	0
Willapa Bay	GH/WBDDA	1	27,647
Point Chehalis	GH/WBDDA	6	1,460,361
South Jetty	GH/WBDDA	8	1,153,621
Half Moon Bay (Beneficial Use)	GH/WBDDA	2	257,984
All Sites Within	PSDDA	8	697,860
Jurisdiction Combined:	GH/WBDDA	17	2,899,613

Table 2-4. Summary of Disposal Activity by Jurisdiction and Site, DY99

Site	Proponent	Disposal Volumes	Barge Loads
PC	Corps of Engineers	181,735	147
HMB	Corps of Engineers	133,408	109
PC	Corps of Engineers	208,951	60
PC	Corps of Engineers	295,679	54
SJ	Corps of Engineers	157,930	43
PC	Corps of Engineers	417,058	96
PC	Corps of Engineers	316474	151
SJ	Corps of Engineers	111519	48
SJ	Corps of Engineers	13,683	11
SJ	Corps of Engineers	560,417	215
SJ	Corps of Engineers	6,317	6
SJ	Corps of Engineers	157,375	72
SJ	Corps of Engineers	35,486	37
PC	Corps of Engineers	40,464	40
HMB	Corps of Engineers	124,576	128
SJ	Corps of Engineers	124,577	129
SB	Corps of Engineers	76,187	82
WB	Corps of Engineers	27,647	18
CB	Murphy's Landing	900	1
CB	Port of Tacoma	139,419	87
EB	Corps of Engineers	84,562	48
EB	Corps of Engineers	165,116	100
EB	Corps of Engineers	47,884	29
EB	Corps of Engineers	117,232	71
RS	Port of Bellingham	140,761	98
PT	Corps of Engineers	1,986	2

Legend: RS = Rosario Straits, PT = Port Townsend, CB = Commencement Bay, EB = Elliott Bay,
SJ = South Jetty, PC = Point Chehalis, HMB = Half Moon Bay, WB = Willapa Bay.

B. PSDDA Disposal Site Monitoring

Overview: Environmental monitoring is the primary tool in the management of the PSDDA non-dispersive disposal sites. The objective of disposal site monitoring is to determine whether the disposed dredged material produces unanticipated adverse effects at the sites. Environmental monitoring includes physical, chemical, and biological assessment of the sediments and biological resources in and adjacent to the disposal sites. The PSDDA monitoring program, as originally designed, compared the post-disposal monitoring results to "baseline" values. Baseline values of key environmental parameters, such as sediment chemistry, toxicity, and biological community structure, were determined for each PSDDA site and at various benchmark stations prior to the first use of the sites (PTI, 1988, 1989). The DMMP agencies now use a time trend analysis approach to evaluate changes in site chemistry over time. The new analysis was first used in Commencement Bay in 1996 to analyze the post-disposal monitoring data.

Post disposal site monitoring surveys address these three major questions:

1. Is the dredged material deposited on site?

2. Is the deposited dredged material producing chemical and/or biological conditions on site beyond the "minor adverse effects" levels allowed for by the PSDDA site management plans?

3. Is the dredged material causing any adverse impacts to biological resources beyond the disposal site boundaries?

Full PSDDA monitoring is designed to address all three questions; partial PSDDA monitoring addresses only questions 1 and 2. PSDDA monitoring is now designed to work in a tiered manner, with a partial monitoring event addressing questions 1 and 2. Question 3 is addressed if either of the first two questions is answered in the affirmative.

The Corps of Engineers is responsible for physical monitoring and DNR is responsible for chemical/biological monitoring of the PSDDA non-dispersive disposal sites. This environmental monitoring is conducted, at irregular intervals, based on the "pattern" of disposal site use since the previous monitoring event. This pattern encompasses several important elements, such as volume and characteristics of the material disposed at a given site, the nature and recency of previous site monitoring data, and site-specific environmental concerns. Each spring, DMMP technical staff review the previous year's disposal activity and reach consensus in which site(s), if any, will be monitored and at what intensity.

No site monitoring was conducted in either of the two dredge material management years covered by this report. Although monitoring would have been triggered by the

volume of material disposed at the Commencement Bay site, due to the Blair Waterway development and other projects, the PSDDA agencies instead decided to forego monitoring for one year. The site user fees generated by the Blair Development Project were used to fund a study assessing the sensitivity of *Leptocheirus plumulosa* to tributyltin.

The Blair Waterway development has been accomplished in three phases, starting with a widening and deepening, followed by an expansion of the turning basin, and concluding with a final widening and deepening. Monitoring of the Commencement Bay PSDDA disposal site was done after the conclusion of the first phase, and all site management conditions were met There will be another site monitoring after the conclusion of the current widening and deepening project.

Sediment Image Survey of the Commencement Bay Site

An imaging survey of the Commencement Bay PSDDA disposal site was conducted using a Sediment Vertical Profiling System (SVPS) camera in December of 1998. The primary purpose of this survey was to identify dredged material at the site and to map its distribution.

A total of 69 stations were sampled during the survey. PSDDA disposal site perimeter, zone, site, central cross, transect, and benchmark stations were occupied, and images were acquired. A total of eighty-three images from sixty-nine stations were analyzed using a computerized analysis system, with one representative image from each station selected for full image analysis.

The analysis of the images shows a distribution of dredged material that is roughly pear-shaped and lies with the “stem” portion outside the disposal site boundary to the northwest (Figure2-5a). This material, seen outside the site perimeter, is present as a thin (<5 cm) band of fine sands (4-3 phi) which overlie slightly sandy silts and clays. This area around one station (Station CB06) was the only area where recent dredged material was seen beyond site boundaries.

The Commencement Bay PSDDA disposal site will undergo a full environmental site monitoring; at the conclusion of the Blair Waterway expansion projects. These projects will result in the disposal of approximately 2,000,000 cubic yards of material at the site since the last monitoring event. Integral to this monitoring will be an investigation into the possible impacts of the offsite material, as well as evaluating possible sources of this material. The results of these studies will be presented at a future Sediment Management Annual Review Meeting.

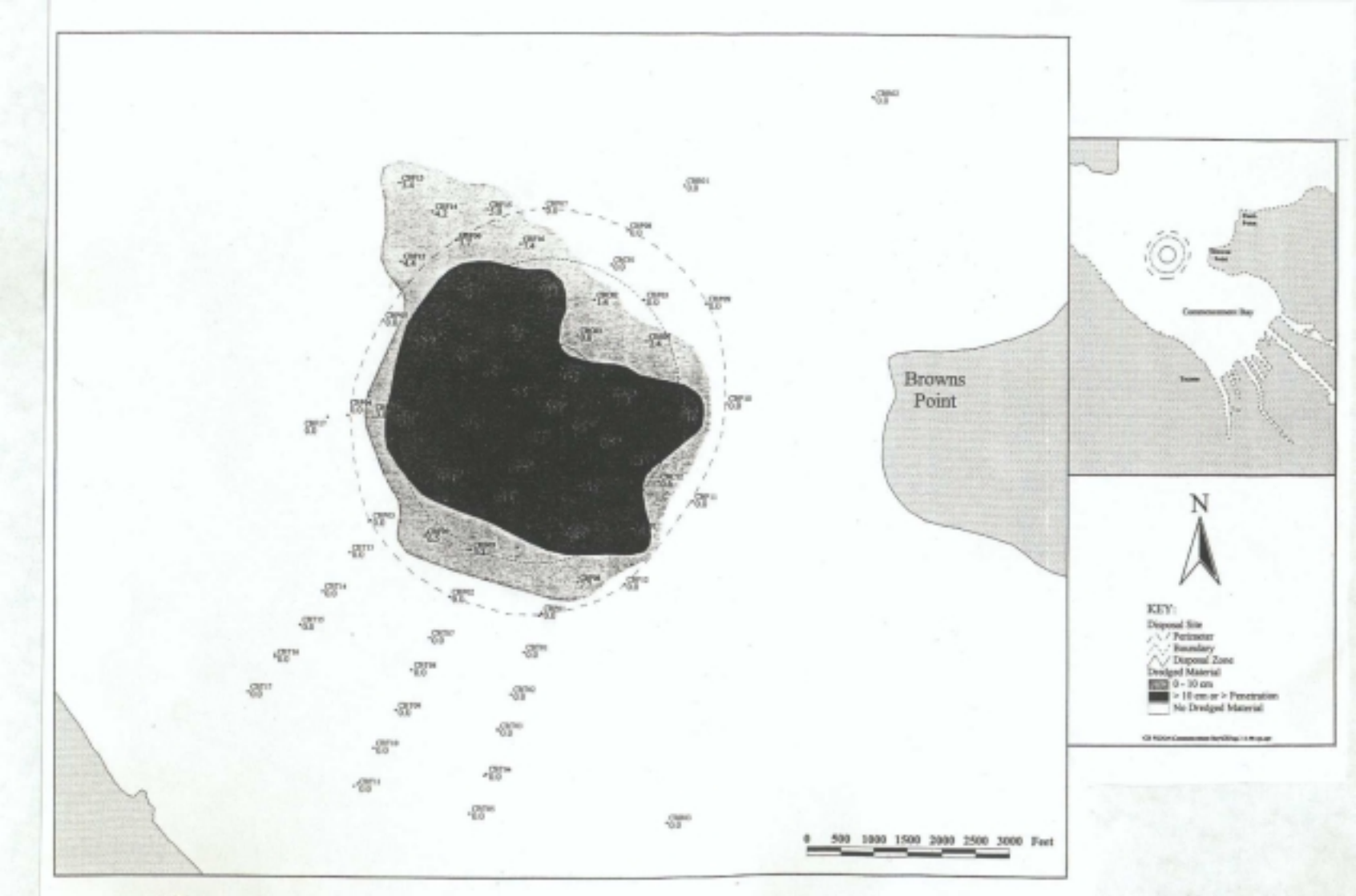


Figure 2-5a. Distribution and thickness of dredged material at the Commencement Bay disposal site during December 1998 SVPS Survey. Note the shallow lobe of dredged material extending outside the northwest boundary and perimeter line.

Bathymetric Survey at the Rosario Strait Site

The Corps of Engineers' survey boat "Shoalhunter" conducted a bathymetry survey on August 4 and 5, 1999, at the Rosario Strait site. The survey lanes from the initial predisposal baseline and 1991 and 1994 post-disposal surveys were re-occupied. All the dredged material disposed at this site has been dispersed, and there has been no accumulation of dredged material observed along the transect lines. The results indicated that there has been no net change in bathymetry at the site since the 1989 baseline survey.

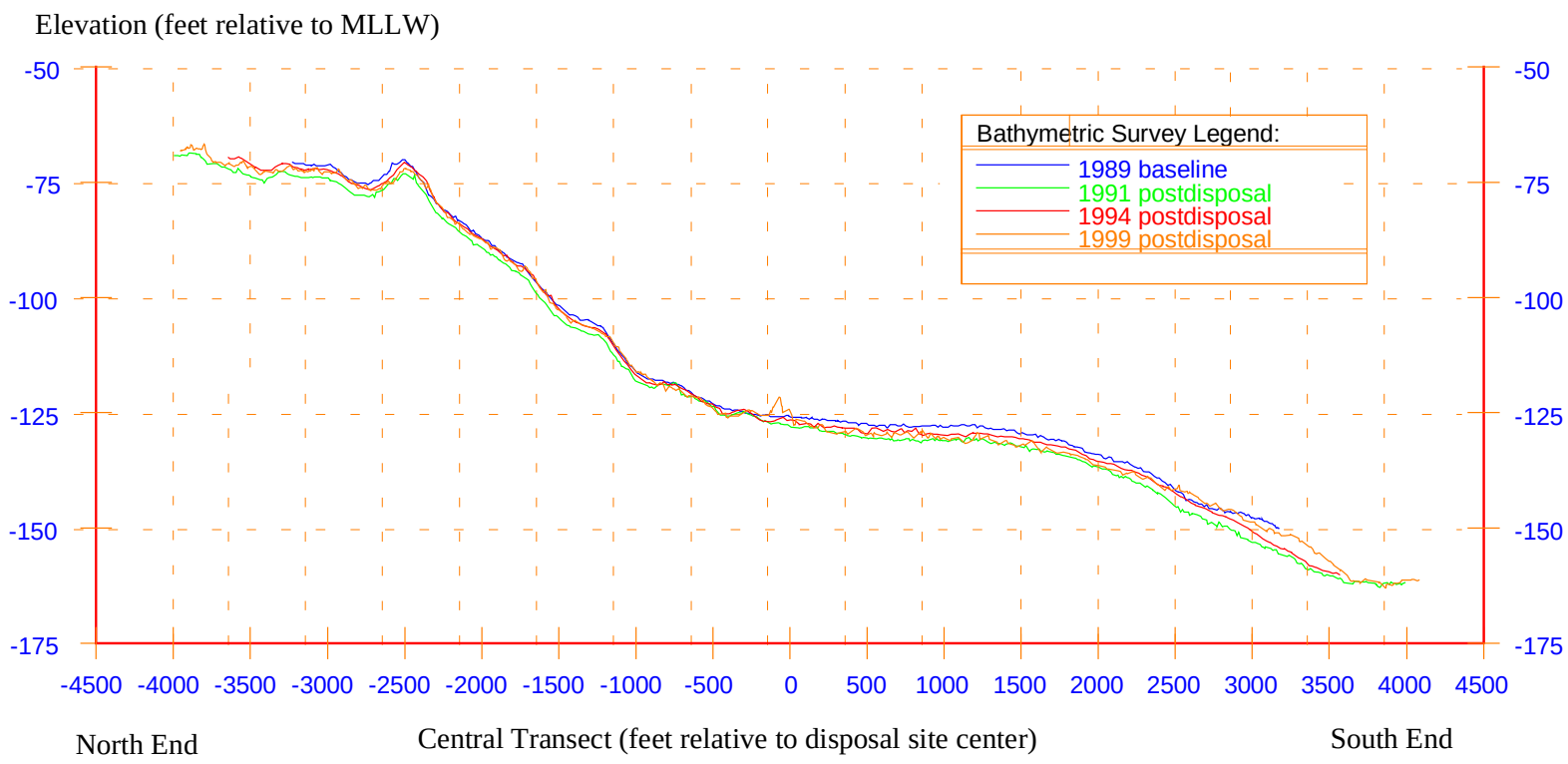


Figure 2-5b. Summary of bathymetric survey monitoring conducted at the Rosario Straits dispersive site(Central Transect).

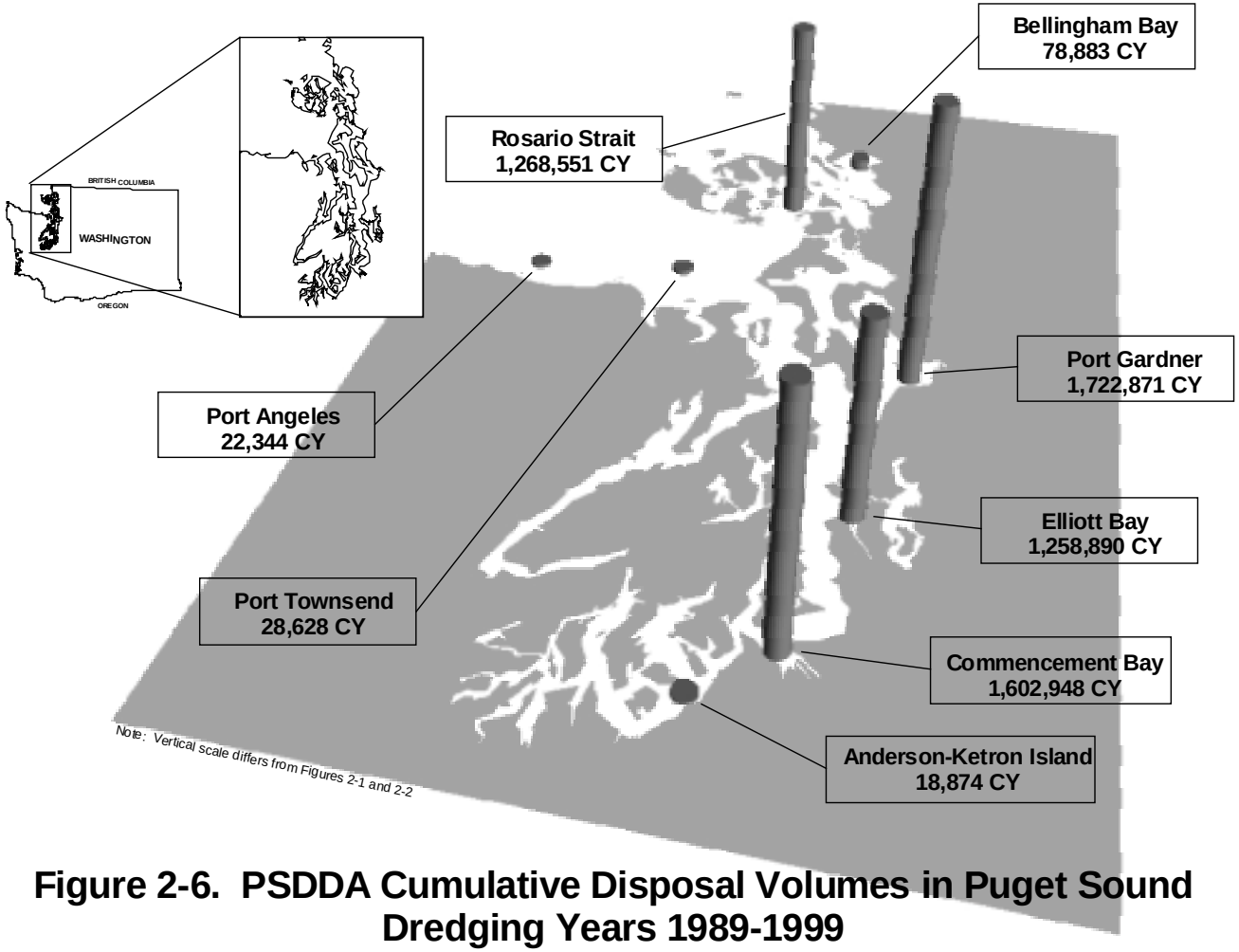
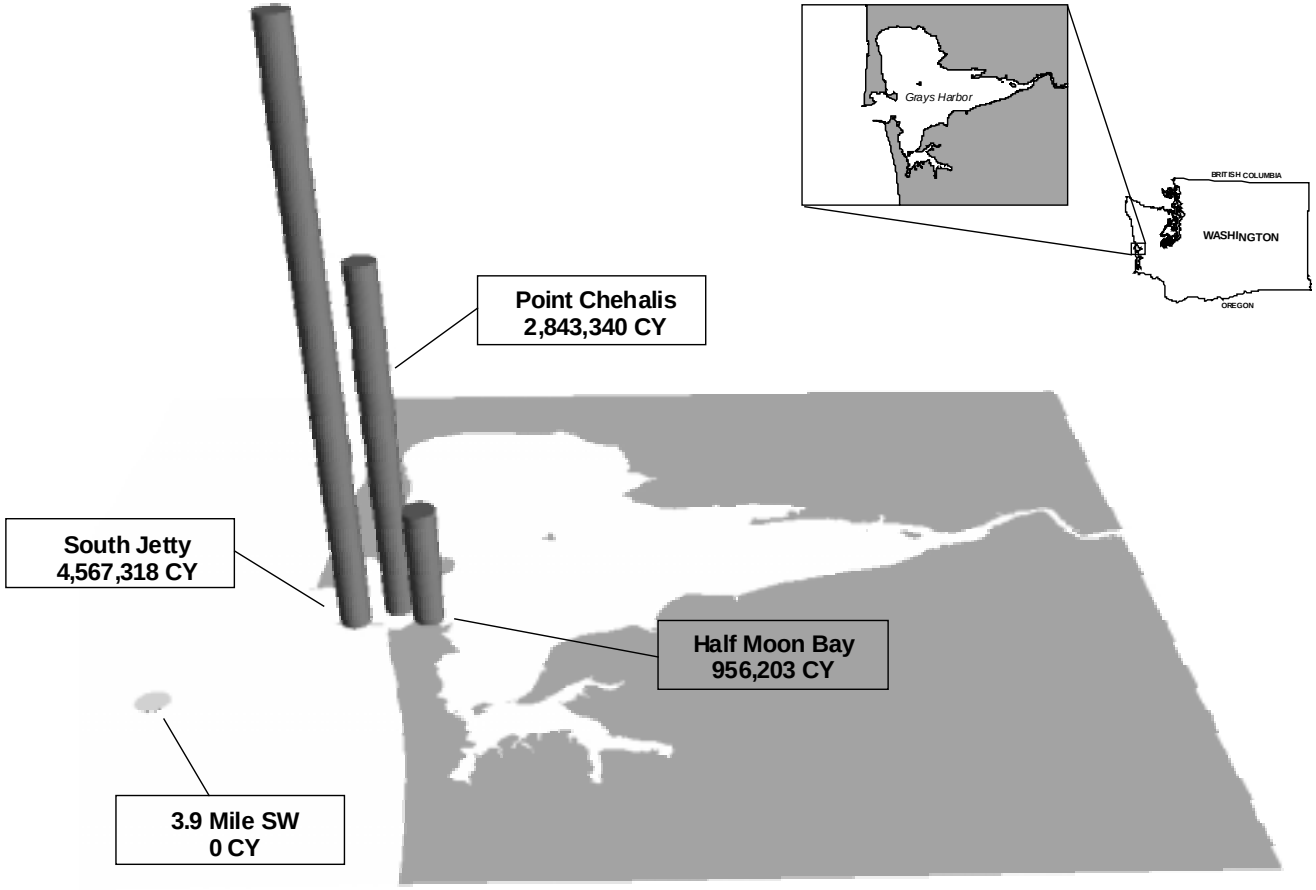


Figure 2-6. PSDDA Cumulative Disposal Volumes in Puget Sound Dredging Years 1989-1999



Note: Vertical scale differs from Figures 2-2 and 2-4

Figure 2-7. Cumulative Disposal Volumes for Grays Harbor (1996-1999)

APPENDIX A

The following discussion includes those projects requiring explanation beyond the summaries provided in Chapter 1 or those for which the DMMP agencies used best professional judgment as part of the decision-making process.

Dredging Year 1999

Weyerhaeuser Company, Longview Fibre. Sediments for this maintenance dredging project were evaluated using the draft Lower Columbia River Dredged Material Evaluation Framework. Based on historical information, it appeared some sediment was eligible for exclusion from further testing based on grain-size. Three samples were tested for grain-size and sediment conventional parameters only. This analysis confirmed that the sediment exceeded 80 percent sand and did not need further analysis. An additional eight sample (composited into three analyses) were analyzed for all chemical of concern.

St. Paul Waterway. The City of Tacoma and Simpson Tacoma Kraft Company propose to use the St. Paul Waterway as a nearshore confined disposal facility for contaminated sediment from the Thea Foss and Wheeler-Osgood Waterways. As part of the site evaluation process, sediments in the St. Paul Waterway underwent PSDDA evaluation and testing. Sediments removed from the waterway to create the nearshore disposal facility will be used for beneficial use and/or for creation of the berm to enclose the disposal facility. All sediments tested in the St. Paul Waterway were below PSDDA SL.

Appendix B. DY98/99 DMMP BIOASSAY PERFORMANCE STANDARDS AND EVALUATION GUIDELINES

Bioassay	Negative Control Performance Standard	Reference Sediment Performance Standard	Dispersive Disposal Site Interpretation Guidelines		Nondispersive Disposal Site Interpretation Guidelines	
			1-hit rule	2-hit rule	1-hit rule	2-hit rule
Amphipod	$M_C < 10\%$	$M_R - M_C < 20\%$	$M_T - M_C > 20\%$ and M_T vs M_R SD (p=.05) and		$M_T - M_C > 20\%$ and M_T vs M_R SD (p=.05) and	
			$M_T - M_R > 10\%$	NOCN	$M_T - M_R > 30\%$	NOCN
Larval	$N_C \div I > 0.70$	$N_R > N_C > 0.65$	$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD (p=.10) and		$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD (p=.10) and	
			$N_R/N_C - N_T/N_C > 0.15$	NOCN	$N_R/N_C - N_T/N_C > 0.30$	NOCN
Neanthes growth	$M_C < 10\%$ and $MIG_C > 0.38$	$M_R < 20\%$ and $MIG_R \div MIG_C > 0.80$	$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD (p=.05) and		$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD (p=.05) and	
			$MIG_T/MIG_R < 0.70$	NOCN	$MIG_T/MIG_R < 0.50$	$MIG_T/MIG_R < 0.70$

M = mortality, N = normal survivors, I = initial count, MIG = mean individual growth rate (mg/individual/day)
SD = statistically different, NOCN = no other conditions necessary, N/A = not applicable
Subscripts: R = reference sediment, C = negative control, T = test sediment

APPENDIX C - LEGEND

S = reported concentration exceeds screening level (SL)
B = reported concentration exceeds bioaccumulation trigger (BT)
M = reported concentration exceeds maximum level (ML)
L = the highest reported concentration was below SL
LM = the highest reported concentration was between SL and (SL + ML)/2
H = the highest reported concentration exceeded the ML
X = a hit under the two-hit rule (nondispersive sites), requires another corroborating hit to fail unconfined open-water disposal guidelines
P = test sediment passed DMMP guidelines for open-water unconfined disposal
F(C) = test sediment failed DMMP guidelines for open-water unconfined disposal in the absence of biological/bioaccumulation testing

APPENDIX C. DY 98/99 EVALUATION GUIDELINE EXCEEDANCES

Project	Hurlen Construction				Boyer Alaska Barge Lines	USACOE Duwamish River O&M										USACOE Westport Marina		USACOE Grays Harbor O&M	
DMMU ID:	C1	C2	C3	C4	C2	S1	S2	S3	S4	S5	S6	S7	C1	C2	C3	C1	C2	C5	C6
LPAH																			
Acenaphthene			M																
Fluorene			S																
Phenanthrene		S	S											S					
Total LPAH			S																
HPAH																			
Benzo(a)anthracene		S	S																
Benzo(a)pyrene		S	S																
Benzo(b+k)fluoranthenes			S																
Chrysene		S	S																
Fluoranthene	S	S	B	S										S					
Indeno(1,2,3-c,d)pyrene		S	S																
Pyrene	S	S	S																
Total HPAH		S	S																
MISCELLANEOUS EXTRACTABLE																			
Dibenzofuran			S																
PESTICIDES, PCBs, DIOXINs																			
Total PCBs					S														
BIOASSAYS																			
Amphipod					X														
Neanthes Biomass																			
Sediment Larval															X				
Bioassay Pass/Fail:	P			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
BTs exceeded:			X																
Bioaccumulation Test Conducted:																			
Bioaccumulation Pass/Fail:																			
ML rule exceeded:																			
OVERALL PASS/FAIL	P	F(C)*	F(C)*	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
HIGHEST RANKING	LM	LM	H	LM	LM	L	L	L	L	L	L	L	L	LM	L	L	L	L	L

* Applicant elected not to perform biological testing. Therefore, DMMU considered unsuitable for unconfined open-water disposal.