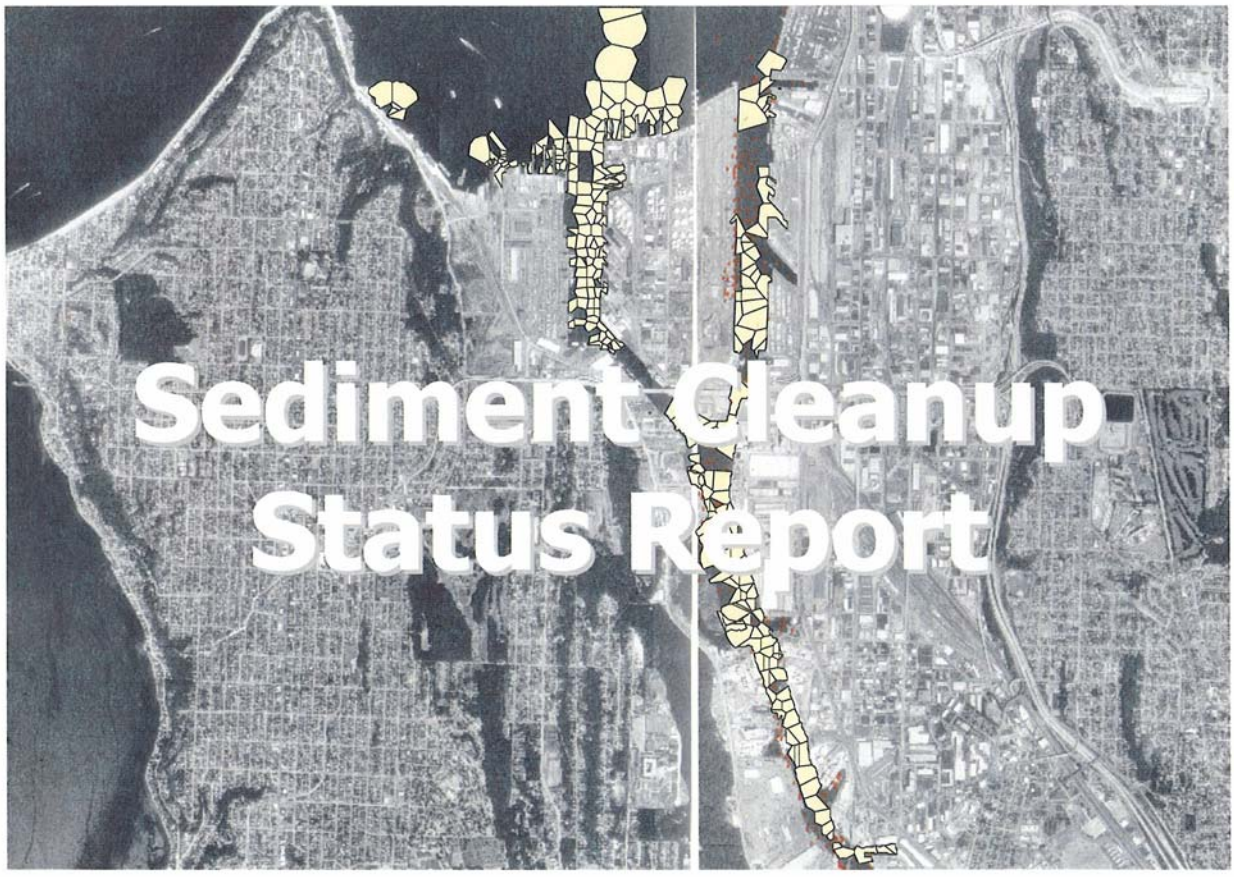
WASHINGTON STATE DEPARTMENT OF ECOLOGY



Washington State Department of Ecology Toxics Cleanup Program

June 2003
Publication No., 03-090-086

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How To Get More Information About Sediment Cleanup Issues

This report focuses on various measures about sediment cleanup sites in Washington State. If the reader desires more information about Washington State sediment quality issues, additional information is available from the Department of Ecology.

A broad range of information on sediment management is available on the Department of Ecology's website at http ://www.ecy.wa.gov/programs/tcp/smu/sedirnent.html

- A copy of the regulation for managing sediment contamination, Sediment Management Standards, Chapter 173-204 WAC, is available for viewing on our website or a copy can be ordered by contacting our publication department at Hecypub@ecy.wa.govH or (360) 407-7472.
- A bibliography of sediment related technical reports from the Sediment Management Unit is available on our website or by contacting Brett Betts at bbet461@Hecy.wa.govH or (360) 407-6914.
- A copy of this report is available on our webpage at Hhttp://www.ecy. wa.gov/programs/tcp/smu/sitestatus2003H .html
- If you have questions about this report or would like additional copies, please contact Kathryn Carlin at Hkbco46l@ecy.wa.govH or (360) 407-7242.

If you have special accommodation needs or need this document in an alternative format, please call Kathryn Carlin at (360) 407-7242 (Voice) or 1-800-833 6388 or 711 (TTY).

Cover image: The cover image was created using the Department of Ecology's Sediment Quality Information System, SEDQUAL. The image shows the northern end of the Duwamish River. The cleanup areas can be seen in yellow and some of the sample stations are shown in red. Additional information and maps concerning the Duwamish River and Harbor Island are included in the report.

Sediment Cleanup Status Report

Washington State Department of Ecology Toxics Cleanup Program

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Table of Contents

Introduction

This report focuses on what is known by the Department of Ecology (Ecology) about the status of cleanup at contaminated sediment sites. Discharges and accidental releases of harmful contaminants to the aquatic environment have caused sediment contamination in Washington State. As Washington State's environmental protection agency, Ecology's mission includes regulation of efforts to provide remedies for previous contamination. As the lead state agency for cleanup activities, Ecology has a crucial role to play in the restoration of the state's sediment quality.

Sediment Management Standards

In 1991, Ecology adopted the Sediment Management Standards (Chapter 173-204 WAC). To date, Washington remains the only state with adopted standards for sediment quality. The Sediment Management Standards address three major points:

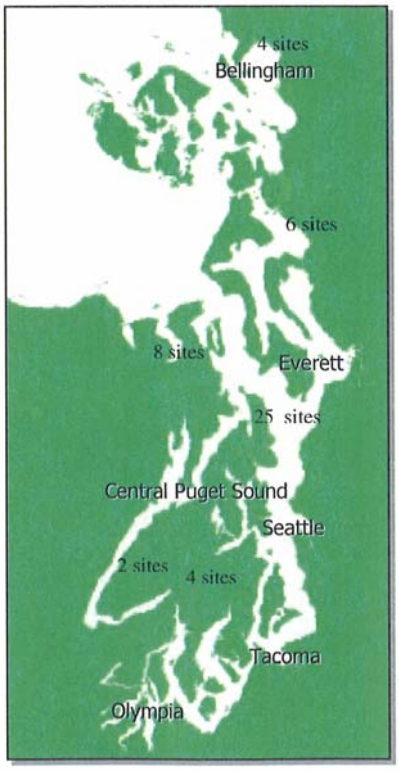
- Procedures for cleanup of historic sediment contamination,
- Procedures for preventing future sediment contamination from discharges, and
- Standards for defining sediment contamination.

The Sediment Management Standards include a long-term goal of no adverse effects to aquatic organisms and no significant health risks to humans, as well as higher regulatory levels used defining the maximum allowable levels for use in source control and cleanup programs.

Sediment Cleanup Sites and Relationship to this Report

Prior to the Sediment Management Standards, sediment contamination in Puget Sound urban bays had been investigated, but there was no coherent statewide approach for addressing sediment contamination. With the adoption of the Sediment Management Standards, the development of an extensive database of sediment quality sampling stations, and the screening of sediment stations for contaminant levels, Ecology developed a list of contaminated sediment sites. In 1996, the Contaminated Sediment Site List identified and ranked 49 contaminated sediment sites in Puget Sound. Figure 1 shows the number of sites in each of a number of Puget Sound urban bays as identified by the 1996 site list. Since 1996, new information has been collected to identify additional sediment cleanup sites or areas of concern.

Figure 1: Puget Sound Sites from 1996 Contaminated Sediment Site List

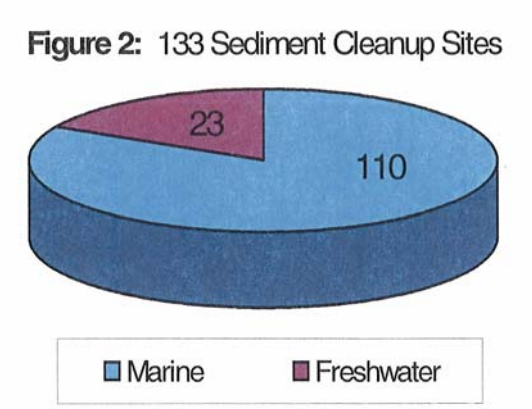


This report provides information about all the known or suspected Washington State sediment cleanup sites to date and various attributes of those sites that will provide a picture of sediment cleanup issues. The information gathered for this report was collected from Ecology sediment cleanup site managers in January of 2003 and reflects the most recent state of knowledge about sediment cleanup sites. As more is learned over time about sediment cleanup sites, some of the statistics and values reported here will undoubtedly change. The reporting of information about sediment sites is intended to inform policy and technical decision making. It is not intended to be a site list.

Defining the "Universe" of Sediment Cleanup Sites

To date, there are 133 sediment cleanup sites or areas of concern identified by Ecology site managers with sufficient information to perform some degree of environmental analysis. The measures, indicators, or statistics developed for this report are based on those 133 sites or some subset of those sites. The majority of the sites are in marine sediment in Puget Sound (110 sites), while a much smaller number are found in freshwater sediment (23 sites). The various statistics derived elsewhere in this report are based on the current count of marine and freshwater sites. The high number of marine sites is reflective of the history of sediment management in Washington State, which has focused initial efforts on Puget Sound and its contaminated urban embayments. While the number of sites reflects what is known today, it is likely that other sites will continue to be identified, particularly in areas previously less studied.

Figure 2: 133 Sediment Cleanup Sites



Cleanup Progress

About Sediment Site Listing

The term "sites", as used in this report, refers to areas of known or suspected sediment contamination. Some sites have been subject to a formal site listing process, including ranking. Other "sites" may be more appropriately termed "areas of concern" because of the lack of formal listing and confirmation as sites. In addition to the sites that were listed in the 1996 *Contaminated Sediment Site List*, some sites are listed on other site lists that include upland sites, such as the State's Hazardous Sites List, the State's Confirmed & Suspected Contaminated Sites Report (all sites reported to Ecology, excluding leaking underground storage tank sites), and the federal *National Priorities List* (Superfund sites). Additionally, some sites tracked here have been completed or have been investigated further and were determined not to require cleanup. The purpose of including these completed sites is to provide a picture of all sediment cleanup sites in Washington State.

The process for sediment site listing and ranking is described in the Sediment Management Standards (WAC 173-204-540).

Many Marine Sediment Sites in the Process of Cleanup

Of the 110 marine sediment sites, nearly two thirds (71 sites) are in the process of being cleaned up. This includes all ongoing sites with initial investigations, remedial investigations, feasibility studies, design phase, and cleanup and monitoring actions. In addition to the sites in the process of cleanup, other sites have been cleaned up or have been determined to be clean enough to not warrant cleanup ("no further actions" sites). At 23 sites, no cleanup process has started other than the identification that sediment contamination is suspected.

Figure 3: Status of 110 Marine Sediment Cleanup Sites

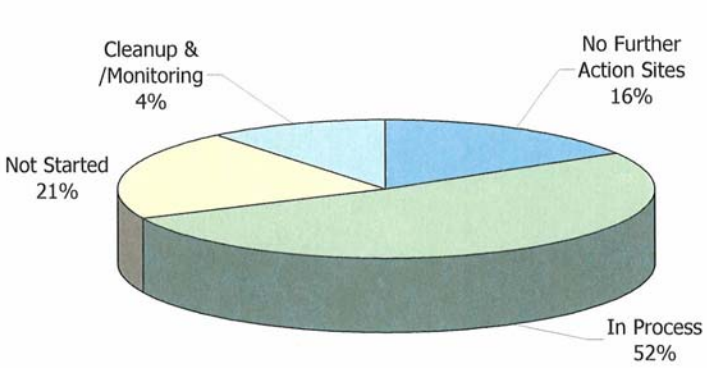
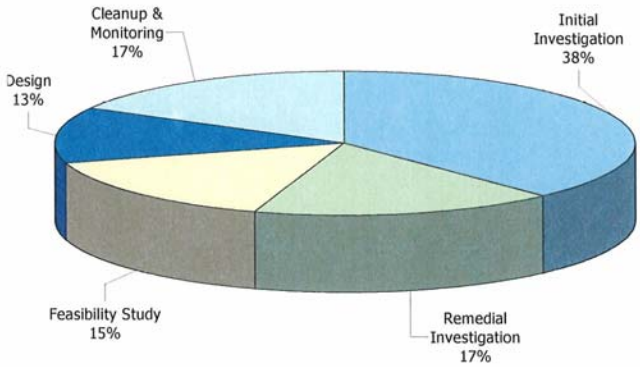


Figure 4: Phase of Cleanup for 71 Marine Sediment Sites with Cleanup in Progress



Fewer Freshwater Sites, but Cleanup is Occurring

While there are few freshwater sediment cleanup sites (23 sites), roughly the same proportion of sites, nearly two-thirds, are in the process of cleanup (16 sites). As with the marine sites, approximately one-third of the sites that remain are fairly evenly divided between those completed and those not started. Freshwater sites are complicated by the lack of numeric chemical criteria similar to those adopted nine years ago for marine sediments. However, in spite of the lack of chemical criteria, it is still possible to identify sediments that cause impacts on a case-by-case basis.

Figure 5: Status of 23 Freshwater Sediment Cleanup Sites

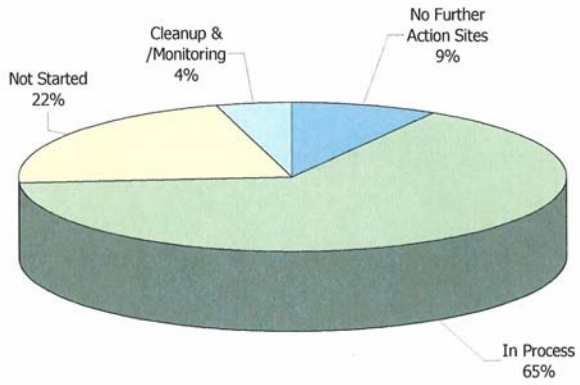
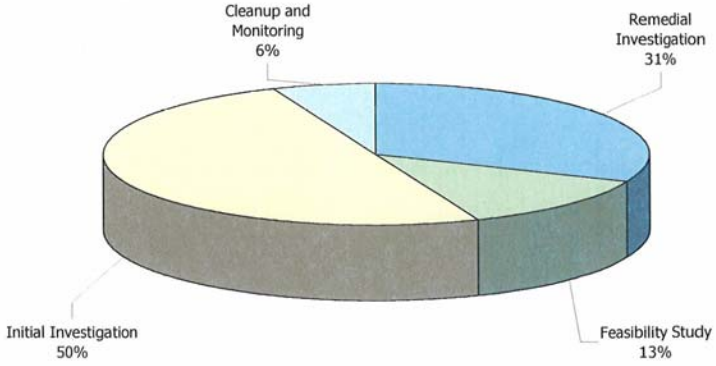


Figure 6: Phase of Cleanup for 16 Freshwater Sediment Sites with Cleanup in Progress



How Does Cleanup Get Done?

Depending on the sites, various cleanup authorities are used to accomplish cleanup at sediment sites. Primarily, cleanup is accomplished using either the state cleanup law - the Model Toxics Control Act - or the federal cleanup law - the Comprehensive Environmental Response Compensation Liability Act (Superfund).

A number of sediment cleanup actions are also accomplished voluntarily or in conjunction with development/dredging activities through the Dredge Material Management Program (DMMP). Table 1 shows the cleanup authorities applied at marine sediment sites and the corresponding phase of cleanup at those sites. Table 2 shows similar information for freshwater sediment sites.

Table 1: Cleanup Authorities and Status of Marie Sediment Sites

		Phase of Cleanup						
Cleanup Authority	**Number of Sites**	**Not Started**	II	RI	FS	**Design**	**Cleanup**	**N FA**
MTCA	25	3	10	4	4	0	1	3
Superfund / MTCA	4	0	0	0	1	1	2	0
Superfund	22	0	0	5	3	7	3	4
Partial Superfund	3	0	0	1	0	1	1	0
Clean Water Act	12	2	5	0	0	0	3	2
Voluntary Cleanup	4	0	1	1	2	0	0	0
Other	3	0	1	0	1	0	1	0
Not Assigned	37	18	9	0	0	0	1	9
TOTALS	110	23	26	11	11	9	12	18

MTCA =Model Toxics Control Act
II = Initial investigation
RI = Remedial Investigation
FS = Feasibility Study
N FA = No Further Action
Sites may be in more than one phase (i.e. RI & FS)

Table 2: Cleanup Authorities and Status of Freshwater Sediment Sites

		Phase of Cleanup						
Cleanup Authority	**Number of Sites**	**Not Started**	**II**	**RI**	**PS**	**Design**	**Cleanup**	**NFA**
MTCA	9	0	4	4	0	0	0	1
CERCLA / TCA	1	0	0	0	1	0	0	0
RCRA	2	0	0	1	1	0	0	0
Not Assigned	11	5	4	0	0	0	1	1
TOTALS	23	5	8	5	2	0	1	2

How Much Sediment Is Contaminated?

The area of contaminated sediment in Puget Sound has been previously reported in other documents, such *as 2001 Sediment Cleanup Status Report*, the Puget *Sound Confined Disposal Site Study Programmatic Environmental Impact Statement, or the Puget Sound's Health 1998,* published by the Puget Sound Water Quality Action Team. Information about the area of contamination outside of Puget Sound is not as detailed and is not presented in this section.

As shown in Table 3, acreage data exists for about two-thirds of Puget Sound marine sites which total 1,672 acres and average about 26 acres per site. If the same acreage per site is assumed for the remaining third of Puget Sound sites, the estimated area within the boundaries of Puget Sound sediment sites is 2,874 acres.

While having an understanding of the total area of sediment contamination can be an important measure of the health of the aquatic environment, it is important to define the basis for calculating areas of contamination. The area of the cleanup sites shown in Table 3 includes the most highly contaminated sediment in Puget Sound. Other areas of Puget Sound have some degree of impact, but not enough to warrant active cleanup.

Table 4 compares the estimated cleanup site acreage to other measures of Puget Sound. The total Puget Sound area exceeding the Sediment Quality Standards (SQS) is included in Table 4, and has been the most commonly reported measurement of sediment contamination reported by Ecology. The SQS is a level lower than the trigger for cleanup, and the area exceeding the SQS does not initially define the area that is subject to active cleanup, provided that reduction in contamination and associated toxicity is predicted to occur. This may occur through natural capping by cleaner materials, biodegradation, or other forms of natural recovery. The 5,748 Puget Sound acres exceeding the SQS is approximately twice that included in cleanup sites.

In Table 4, the 15,240 acres surveyed shows that about two-thirds of sediment stations reveal no contamination. This should not, however, be interpreted to mean that a third of Puget Sound is contaminated, because most sediment investigations focus on the urban bays and other areas of suspected contamination. The total area of Puget Sound, almost two million acres, dwarfs the other measures of area shown in Table 4.

Table 3: Estimated Sediment Site Acreage for Puget Sound Sites

	No. of Sites	Acres
Puget Sound Marine Sites with Acreage Data	64	1672
Puget Sound Marine Sites without Acreage Data	46	1201.98
Estimated Area of Puget Sound Within Cleanup Site Boundaries	110	2873.98

*Assume 26.13 acres per site

Table 4: Puget Sound Cleanup Acreage Compared with Other Puget Sound Measures

	Acres	Percent of Puget Sound
Area of All Puget Sound*	1,798,239	100.00
Area of Puget Sound Surveyed	15,240	0.85
Exceeding Sediment Quality Standards	5,748	0.32
Area of Puget Sound Cleanup Sites	2,874	0.15

*Includes Straight of Juan de Fuca, Straight of Georgia and Hood Canal

Cleanup Obstacles

While many sites have started the initial investigative phase of cleanup, there are often obstacles that prevent sites from moving further along in the cleanup process. Additionally, barriers exist which prevent some new sites from initiating the cleanup process. The major impediments to cleanup are listed below.

- **Policies on State Managed Aquatic Lands**
  Increased interagency coordination and identification of common goals have resulted in the acceleration of sediment cleanups involving state owned aquatic lands. When the state is involved, either as the principal owner, manager of the sediment site, or as the owner/manager of potential disposal areas, concerns about long term liability must be carefully addressed. These concerns include the need to expedite cleanup and reduce risks to aquatic organisms and humans by limiting exposure to contaminants. Previous uncertainty regarding appropriate policy for use of state managed aquatic lands had slowed some cleanup progress at selected sites in past years. The development of more collaborative management policies has significantly aided Ecology in state cleanup actions and eliminated this impediment. The next policy challenge which faces cleanup on state owned aquatic lands is the overall funding strategy to ensure that progress continues.

- **Need For Adequate Disposal Capacity**
  The recent Puget Sound Confined Disposal Site Study Programmatic Environmental Impact Statement identified 30 sites where cleanup may be expedited by the construction of a regional facility for disposal of contaminated sediment. Disposal capacity and cost of disposal often play a major role for sites that are in the later phases of cleanup, namely the feasibility phase, which identifies potential cleanup and disposal alternatives for contaminated material.

- **Reluctant Liable Party**
  At many cleanup sites, it is important to have a liable party that is willing to work towards cleanup. When the liable party is unwilling to work with Ecology and other liable parties, cleanup may become temporarily stalled at the initial investigation stage until appropriate actions can be taken. A greater amount of staff resources are often required if a liable party is non-responsive or otherwise uncooperative.

- **Sources Not Yet Controlled**
  Concerns about recontamination by ongoing, uncontrolled sources of contamination slows cleanup at some sites. In many cases it does not make sense to perform costly cleanup only to have the sediments become recontaminated by ongoing sources. Generally, one of the first steps to this type of cleanup action is identification and control of upland sources of contamination. This often requires involvement of water quality permit managers as well as cleanup of upland properties including contaminated groundwater prior to sediment cleanup.

- **Lack of Ecology Staff to Oversee Cleanup Activity**
  Funding for highly trained and specialized sediment cleanup staff is limited, and site managers are already committed to working on current sites. Besides cleanup and source control activities, sediment specialists must spend a significant portion of their time coordinating with outside agency staff on issues involving water quality, dredging, land management permits, endangered species laws and other natural resource issues, human health, and tribal fishing rights. Many of these issues are in support of pollution prevention but are not directly related to current active cleanup.

- **High Cost of Cleanup**
  While not independent of some of the other obstacles described previously, Ecology site managers identified that the high cost of cleanup was an obstacle at some sites. This is somewhat related to those issues discussed above related to disposal options.

- **Regulatory Uncertainties**
  Some liable parties have balked at expediting cleanup due to concerns that additional cleanup requirements may be placed on sites due to non-cleanup laws, such as the recent salmon listings under the Endangered Species Act and the Clean Water Act's TMDL provisions. Some sites are also slowed by the need to develop cleanup levels on a case-by-case basis, particularly at freshwater sites. New freshwater guidelines have been developed which should assist in this arena.

- **Potential Superfund Listing**
  Ecology site managers identified a small number of sites where action was being deferred until it could be determined if the site would be listed as a federal Superfund site. This was most recently true for the Lower Duwamish Waterway and the East Waterway of Harbor Island. Although decisions have now been made in each case, this possibility will undoubtedly always be on the horizon.

- **Area-wide contamination**
  Sites under investigation for contamination and/or cleanup may be but a small subset of a larger bay-wide or system-wide problem. Rather than approach cleanup on a site-by-site basis it often makes more economic and logistical sense to postpone major cleanup strategy until a coordinated system-wide approach can be developed. This is especially true for persistent bioaccumulative compounds. Examples of this are the lower level ubiquitous TBT and PCB contaminated areas in Lake Union.

How Much Does Cleanup Cost?

Cleanup Cost Ranges

This section focuses on the costs of cleanup as reported by Ecology site managers. Table 5 shows approximate cleanup costs at 34 sites as estimated by Ecology site managers and/or consultants. Costs of completed sites were not included. The accuracy of the cost estimates varies greatly depending on the stage of cleanup at the individual sites. For sites that are in the early stages of the cleanup process, the cost range estimates vary widely due to uncertainty, and are based on the acreage and volume estimates of contaminated sediments at the sites. Sites in the later stage use feasibility study data to determine costs and are more accurate. Costs also vary depending upon the potential remedy or combination of remedies as well as the disposal options selected for the site. Remedies may include but may not be limited to dredging, capping, in situ bioremediation, and active treatment, while disposal options can vary from nearshore placement and confined aquatic disposal to disposal at regulated landfills. Each option can significantly modify final cost estimates.

Estimating Cost of Remaining Cleanup

The estimated costs for completing all unfinished sediment cleanup range between $436 million and $1.862 billion, with an intermediate cost estimate of $1.15 billion, as shown in Table 6. This is a rather broad range that will be narrowed as more sites progress to the latter phases of cleanup.

The cost ranges shown in Table 5 include sites that have been completed, as well as sites where costs are not yet known. In order to determine the cost of all remaining uncompleted sediment cleanup, the completed sites must be removed from the calculation (26 sites) and costs must be estimated at unfinished sites where costs are unknown.

Table 5 shows that all but 10 sites with cost data fall between the range of $0.5 million and $10 million. (approximately 70%). This broad range is assumed for the unknown sites, thereby allowing for the estimates of total costs for cleanup of all the unfinished sites.

Table 5: Cleanup Cost Range Estimates for Sediment Sites

Cost Range (in Million$)	Number Sites	Total Cost Range (in Million $)
>0.5	2	0-1
0.5-5	8	4-40
1-5	2	2-10
1-25	2	2-50
5-10	12	60-120
5-25	3	15-75
10-50	4	40-200
25-170	1	25-170
Not Identified	76	-

Table 6: Estimated Cleanup Costs for All Sediment Sites Not Yet Completed

Status and Cost Info	Number of Sites	Cost Estimate Low (millions)	Cost Estimate Mid (millions)	Cost Estimate High (millions)
Completed Sites	26	*	*	*
Unfinished sites	47	$ 218	$ 575	$ 931
Unfinished sites w/o costs	47	$ 218	$ 575	$ 931
Total for unfinished sites	**120**	**$ 436**	**$ 1,150**	**$ 1,862**

* not included in the calculation

State Managed Aquatic Land

One important aspect of sediment cleanup is that most of the aquatic bedlands and tidelands in Washington State are owned by the public, either through ownership by the public ports or by the state. Much of the nearshore harbor areas are managed by the Washington Department of Natural Resources (DNR). For many sites that include state managed aquatic land, addressing liability concerns and determining appropriate policy choices for land held in the public trust has proved difficult. Figure 7 shows the percent of state managed aquatic land at all 110 sediment sites. Table 7 shows estimates of sediment cleanup costs on state owned lands. The estimates are for cleanup costs on those lands, not state share of cleanup costs. The assumptions used to calculate total values are shown in the table.

Figure 7: Percent State Managed Aquatic Lands at Sediment Cleanup Sites

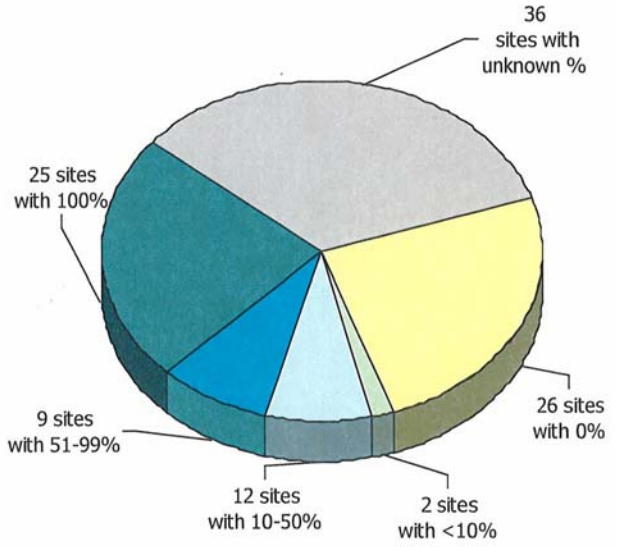


Table 7: Estimates of Sediment Cleanup Costs on State Managed Aquatic Lands

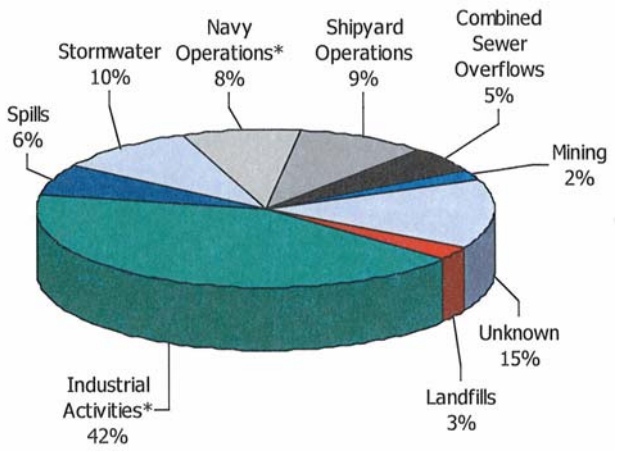
	No. of sites	State Cost Estimate Low (millions)	State Cost Estimate Mid (millions)	State Cost Estimate High (millions)
Completed Sites	33	-	-	-
No SOAL sites	25	-	-	-
Sites with cleanup cost data with percent SOAL data	34	$ 153.25	$ 403.38	$ 653.50
Sites without cleanup cost data with percent SOAL data	10	$ 46.44	$ 122.23	$ 198.03
Sites with cleanup cost data without percent SOAL data (assume 50% SOAL)	14	$ 65.02	$ 171.12	$ 277.24
Sites without cleanup cost data without percent SOAL data	37	$ 171.82	$ 452.26	$ 732.71
Totals	153	$436.53	$1148.99	$1861.48

Sources of Contamination

Much of the current sediment contamination has resulted from historic activities that have now ceased or been improved. However, many of the activities that caused the historic contamination continue in some form, indicating the need for continued scrutiny of such sources. Figure 8 illustrates the major factors that have contributed to sediment contamination at sediment cleanup sites. Industrial activity is overwhelmingly the most significant category; however, this designation is very general and describes a wide range of activities, including pulp and paper, wood treatment, metal refining, chemical production, manufacturing and petroleum refining, transport, and storage.

Current municipal and industrial discharges are regulated to prevent the release of significant quantities of the contaminants that have caused the cleanup sites discussed in this report. Methods and procedures for assessing potential sources of sediment contamination are included in the source control section of the Sediment Management Standards (WAC 173-204-400 through 420). Requirements necessary to prevent future sediment contamination are included in water quality discharge permits issued by Ecology.

Figure 8: Predominant Sources of Contamination at Sediment Cleanup Sites



Waterbody Focus

Most sediment cleanup sites are located in a relatively small number of bays, lakes, and rivers. Table 8 shows the number of sites within particular waterbodies. For the purposes of this report, the eastern Kitsap Peninsula inlets near Bremerton with sediment sites - Sinclair Inlet, Eagle Harbor, and Liberty Bay - are combined.

The subsequent sections of the report focus on the most significant of the individual waterbodies where all but 32 of the sediment cleanup sites are located.

As mentioned earlier, the listing of sites in the subsequent section focusing on waterbodies is not the same as the formal site listing and ranking process described in the Sediment Management Standards (WAC 173-204-540).

Table 8: Sediment Cleanup Site Locations

Waterbody	No. of Sites*
Bellingham Bay	12
Bremerton/Kitsap Inlets	18
Columbia River	6
Commencement Bay	12
Duwamish River	11
Elliott Bay	20
Everett/Port Gardner	13
Fidalgo Bay	8
Lake Union	7
Lake Washington	6
Waterbodies with 3 or less sites	32
Total	**145**

*May include completed sites.

Bellingham Bay

Bellingham Bay has 12 sites, as listed (Table 9) below. Much of the cleanup in Bellingham Bay is in the significant technical/investigative stages, as indicated by the large number of sites in the Remedial Investigation/Feasibility Study phases. Bellingham Bay is the subject of a pilot project involving local, state, and federal agencies, as well as tribes and business to address bay-wide cleanup of sediment sites. An Environmental Impact Statement (EIS) and supplemental ElS for the Bellingham Bay Comprehensive Strategy were issued in July 1999 and March 2000. The cost estimates (Figure 19) are significantly influenced by the large estimate for cleanup of the Whatcom and I&J waterways. It is possible that the costs will be reduced considerably as a result of the Remedial Investigation and Feasibility Study and the Bellingham Bay Comprehensive Strategy. Extensive effort has been put forth by the Department to encourage public participation and consider future use of the waterfront during the cleanup process.

Ongoing discussion of site-wide issues with the Port and City Bellingham, land owners, Potentially Liable Parties, tribes, natural resource agencies and the public has been highly successful in achieving effective cleanup.

Table 9: Bellingham Bay Vicinity Map

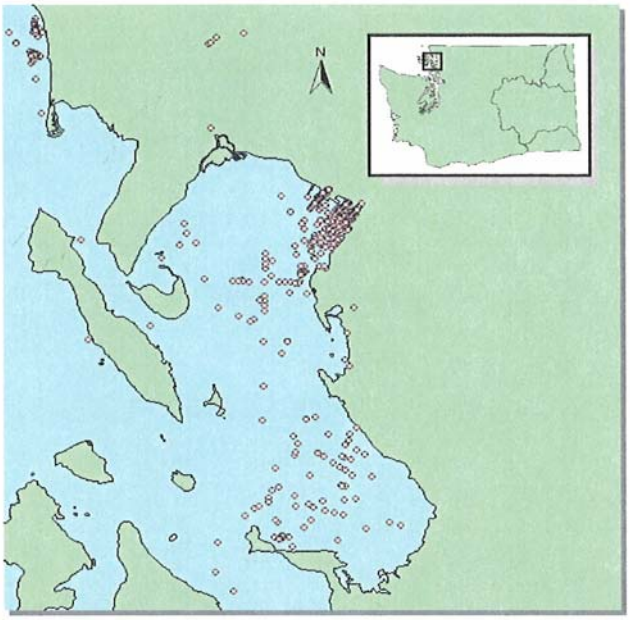


Table 9: Bellingham Bay Sediment Cleanup Site information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Cornwall Ave. Landfill	14	$1	$25	100%	RI/FS	Historic municipal landfill
Georgia-Pacific Outfall	4	$1	$5	L00%	Initial Investigation	Industrial
Harris Avenue Shipyard (MCI Bellingham)	1	$5	$10	100%	RI/FS	Industrial
Marine Services NW	---	---	$1	0%	RJIFS	Industrial
Olivine - Hilton Ave.	1	$1	$5	0%	RI/FS	Industrial
Squalicum Shipyard	---	---	$1	---	Initial Investigation	Industrial
Taylor Ave. Dock	---	$1	$5	100%	RI/FS	Industrial
Weldcraft Steel & Marine	---	---	$1	0%	RI/FS	Industrial
I&J Waterway	15	$1	$25	10%	RI/FS	Industrial
Whatcom Waterway	190	$25	$170	95%	RI/FS	Industrial
Taylor Ave Dock	4	---	---	0%	DNR Lease Authority	Industrial
Georgia Pacific Log Pond	8	---	---	100%	Monitoring	Industrial
Totals	**225 acres**	**$35 million**	**$248 million**	---	---	---

"---" = not applicable or data unavailable

Bremerton and Eastern Kitsap Peninsula Inlets

Sinclair Inlet, Eagle Harbor, Liberty Bay, and Dyes Inlet, on the eastern Kitsap Peninsula near Bremerton, are considered here together. The area and cost information in Table 10 is complete for the majority of the 18 sites in these bays. Much of the contamination in Sinclair Inlet and Liberty Bay is attributed to Naval operations. In Eagle Harbor much of the contamination is related to industrial activity (a former wood treatment facility). Table 10 shows that most of the Bremerton/ Kitsap sites are in the latter phases of cleanup. Six sites are completed and seven sites are in the final phases of cleanup (design, cleanup, or monitoring). This compares with two and five respectively as reported in the 2001 cleanup report.

Figure 10: Bremerton and Eastern Kitsap Peninsula Vicinity Map and Sediment Quality Stations

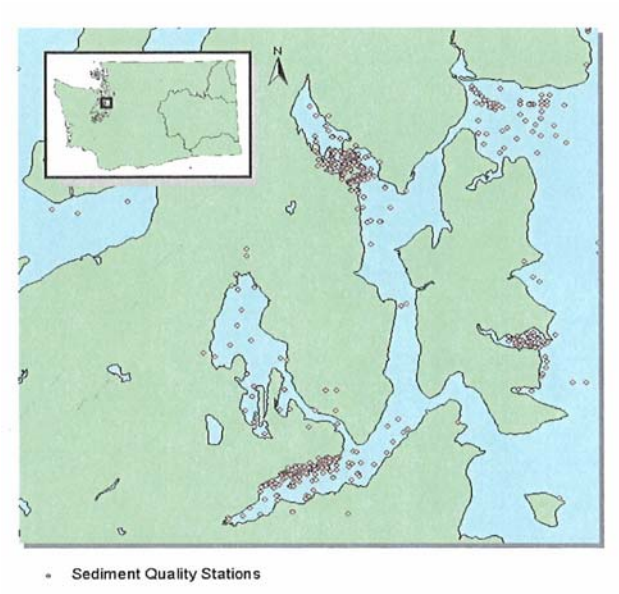


Table 10: Bremerton and Eastern Kitsap Peninsula Sediment Cleanup Site information

Site	Location	Area (acres)	Cost Estimate high (millions)	Cost Estimate Low (millions)	% State Owned Land (DNR owns all subtidal and some intertidal)	Site Cleanup Status	Causes of Contamination
Bremerton Evergreen Park	Sinclair Inlet	2.30	---	---		Initial Investigation	Industrial
Chevron Poulsbo	Liberty Bay	---	---	---	---	No Further Action	Industrial
Eagle Harbor –East OU 1	Eagle Harbor	33.75	$5.00	$10.00	100%	Design	Industrial
Eagle Harbor –East OU 2	Eagle Harbor	33.75	$5.00	$10.00	100%	Design	Industrial
Eagle Harbor-West OU	Eagle Harbor	9.18	$2.50	$5.00	100%	Monitoring	Industrial
Mukilteo DFSP	Port Gardner	24.65	$5.00	$10.00	---	Not Started	Industrial/ Navy
Pope and Talbot	Hood Canal, Port Gamble	---	---	---	---	Initial Investigation	Industrial
Port Ludlow	Port Ludlow	---	--	--	100?	Initial Investigation	Industrial
USACE Manchester Annex	Clam Bay	4.94	$0.25	$0.50	100%	Monitoring	Navy
USN Jackson Park	Ostrich Bay, Dyes Inlet	169.03	$0.75	$1.50	100%	FS	Navy
USN Keyport - Libertyl	Liberty Bay	23.76	$0.05	$0.10	---	No Further Action	Navy
USN Keyport - Liberty2	Liberty Bay	11.97	$0.05	$0.10	---	No Further Action	Navy
USN Keyport -Tide Flats	Liberty Bay	0.20	$0.13	$0.25	0%	Monitoring	Navy
USN Lake Hancock	Whidbey Island	6.89	---	--	25%,	No Further Action	Navy
USN Port Hadlock	Indian Island	9.18	$0.25	$0.50	---	No Further Action	Navy
USN PSNS - Sinclair East	Sinclair Inlet	22.50	$3.50	$7.00	0%	Monitoring	Navy
USN PSNS - Sinclair West	Sinclair Inlet	22.50	$3.50	$7.00	0%	Monitoring	Navy
USN Subase Bangor	Hood Canal	9.18	$0.05	$0.10	---	No Further Action	Navy
Totals		**383.76 Acres**	**$26.03 Million**	**$52.05 Million**			
Based on data available for		**15 of 18 sites**	**13 of 18 sites**	**13 of 18 sites**			

"---" = not applicable or data unavailable

Columbia River

The six Columbia River sites listed in Table 11 are likely not the only sites in the Washington portion of the waterbody. Investigation of sediment contamination issues in the Columbia River is a relatively recent activity in comparison to the work done in Puget Sound. However, regional work in the river progresses, including Oregon's cleanup of Portland Harbor. With the exception of the Port of Vancouver copper ore spill, the Columbia River sites listed below are in the initial stages of cleanup. Lake Roosevelt was recently listed by EPA as a Superfund site under their CERCLA authority. Significant investigation and activity is expected by Ecology and EPA within the next several years to address contamination issues. Much of the contamination consists of metals, presumably from major mining activities taking place adjacent to the sources waters and tributaries of the Columbia both in the United States and Canada.

Figure 11: Columbia River Vicinity Map and Sediment Quality Stations

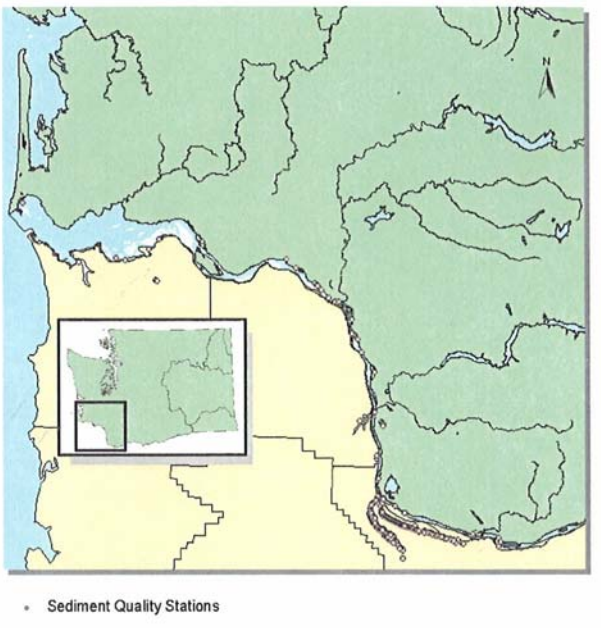


Table 11: Columbia River Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Port of Vancouver, Copper Ore			---		Done	Industrial
ALCOA Aluminum PCB, Vancouver	---	---		100%	Initial Investigation	Industrial
Gibbons Creek	---			0%	Initial Investigation	Industrial, Wood Treating
Columbia River			---	---	Initial Investigation	---
Port of Ridgefield					Done	---
Lake Roosevelt	---	---	---	0%	Initial Investigation	Mining
Totals	**0 acres**	**$0 million**	**$0 million**	---	---	---

"=" not applicable or data unavailable

Commencement Bay

Commencement Bay, near Tacoma, was one of the first locations in the state where sediment cleanups were initiated. Commencement Bay work has significantly contributed to the historic foundation of sediment management in Washington State. There are 12 Commencement Bay sites listed in Table 12. The sites are associated with the industrial history of Tacoma, including the former Asarco smelter. All 12 sites are in the latter stages of cleanup. Most of the Commencement Bay sites are addressed through Superfund cleanups. Recently, Ecology announced significant reductions in the amount of toxic metals discharged to the bay. Challenges include ensuring that industrial and municipal discharges will not cause recontamination.

Figure 12: commencement Bay Vicinity Map and Sediment Quality Stations

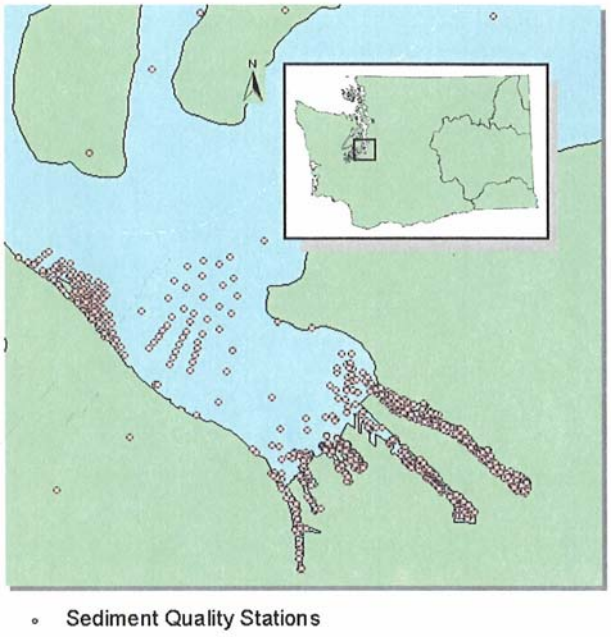


Table 12: Commencement Bay Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
CB1 - Asarco	205	$5	$10	100%	RI/FS	Industrial, Spill Stormwater
CB2 —Thea Foss	103	$5	$10	90%	Cleanup Monitoring	Industrial, Stormwater
CB3 - Hylebos	192	$5	$10	0%	Cleanup Monitoring	Industrial, Stormwater
CB3 Hylebos wood debris	---	---	---	0%	Cleanup Monitoring	Industrial
CB4 - Middle Waterway	13	$5	$10	90%	RI/FS	Industrial, Stormwater
Dickman Mill	---	---	---	---	RI/FS	
Oline Autofluff	---	---	$0.5	0%	Done	Industrial
Olympic View Resource Area	---	---	---	100%	RI/FS	Industrial
Pier 23, US Army Reserve	---	---	---	25	RI/FS	Industrial, Shipyard
Silver Cloud Inn, Ruston	---	---	---	---	Done	Leaking UST
Sitcum Waterway	---	---	---	---	Done	---
St. Paul Waterway	---	---	---	---	Done	---
Totals	**513 acres**	**$20 million**	**$41 million**	**---**	---	---

"---" = not applicable or data unavailable

Duwamish River

The largest concentration of sites in Washington waters is near Seattle in Elliott Bay and the Duwamish River. While the waterbodies are connected, they are treated separately here, with the south end of Harbor Island as the boundary between the river and the bay. There are eleven sites in the Duwamish River as listed in Table 13 below. The heavy concentration of industrial activity along the river is the primary cause of contamination. The sediment sites in the Duwamish are classified as marine, due to the saltwater wedge that extends upriver on the bottom with the more buoyant freshwater at the surface. Most of the sites in the Duwamish River are in the early stages of cleanup. An Administrative Order on Consent (AOC) between public and private parties was signed in 2001 for lower Duwamish River cleanup investigations and evaluation, and may expedite cleanup. The site was listed as an EPA Superfund site under CERCLA with the EPA responsible for sediment cleanup and the Washington State Department of Ecology responsible for source control activities. The East and West Waterways of Harbor Island are also under Superfund cleanup, but under a separate administrative listing.

Figure 13: Duwamish River Vicinity Map and Sediment Quality Stations

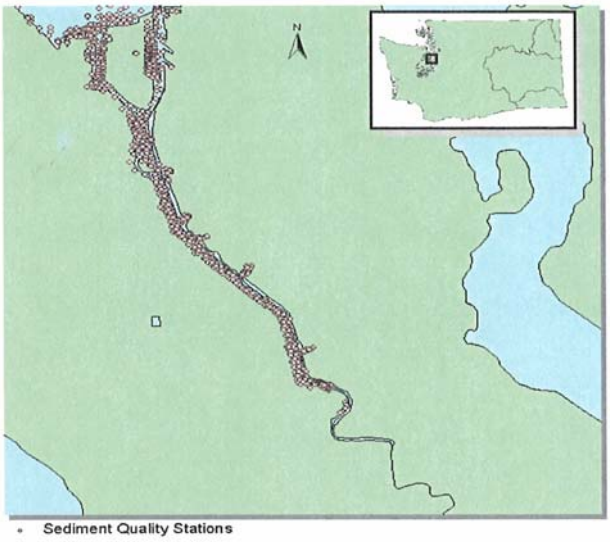


Table 13: Duwamish River Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Boeing Plant 2	23.0	$10.00	$50.00	0%	Interim/partial cleanup	Industrial/Spills
DR29 - South Harbor Island	28.0	$5.00	$10.00	0%	Initial Investigation	Industrial/CSO
DR3O - Duwamish River main channel	115.5	$10.00	$50.00	0-10%	Initial Investigation	Unknown
DR31 - Duwamish/Diagonal CSO	2.5	$0.50	$5.00	0%	Initial Investigation	CSO/Stormwater
DR32 - Brandon St. CSO	1.5	$0.50	$5.00	0%	Initial Investigation	CSO
DR34 - Slip 3, MP&E	7.3	$0.50	$5.00	50%	Initial Investigation	Shipyard Discharges
DR36 - Duwamish Shipyard	2.1	$0.50	$5.00	Unknown	Initial Investigation	Shipyard Discharges
Norfolk CSO	---	---	---	0%	Cleanup & - Monitoring	---
Pier 65 Seattle	---	---	---	0%	Not Started	Industrial/ Shipyard
Rhone-Poulonc	---	---	---	0%	Not Started	Industrial
Seattle City Light	---	---	---	0%	Not Started	Industrial
Totals	**180 acres**	**$27 million**	**$130 million**	**---**	**---**	**---**

"---" = not applicable or data unavailable

Elliott Bay

There are 20 sediment sites in Elliott Bay, as shown in Table 14. As mentioned previously, Elliott Bay and the Duwamish River are discussed separately here, with the south end of Harbor Island as the boundary between the river and the bay. When considered with the Duwamish River sites, Seattle has 27 marine sites. The contamination in Elliott Bay results from maritime and industrial activity that has, in part, made Seattle the state's largest city. There are clusters of sites surrounding Harbor Island, with a few isolated sites along the western shore of Elliott Bay on the Seattle downtown waterfront. Much of the cleanup in Elliott Bay is underway and/or completed With the addition of embarkation of large cruise ships from pier 66, additional monitoring or previous cleanups may be necessary in the near future.

Figure 14: Elliott Bay Vicinity Map and Sediment Quality Stations

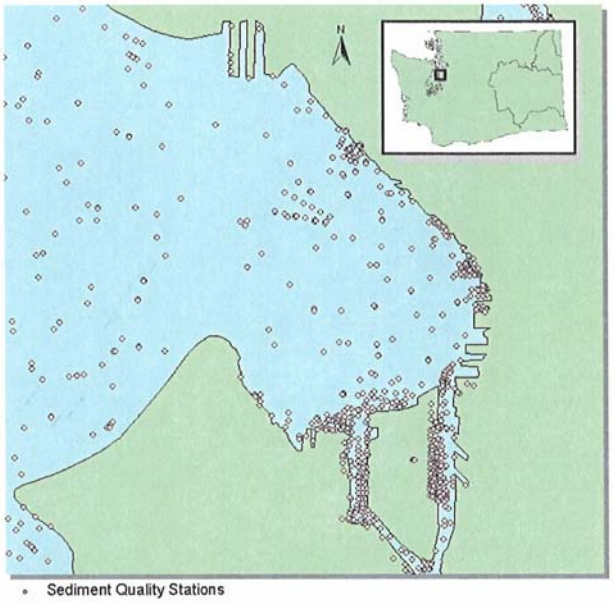


Table 14: Elliott Bay Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
EB1 - Harbor Island West Waterway	11.9	$0.00	$0.00	0%	Done	Stormwater, Ship traffic
EB1O -Todd/Lockheed	18.1	$5.00	$10.00	100%	R1/FS	Refueling Spills, shipyard
EB11 -Harbor Island West Waterway	6.6	$0.00	$0.00	0%	Done	Shipyard wastes
EB12 -Harbor Island West Waterway	27.5	$0.00	$0.00	0%	Done	Stormwater, Ship traffic
EB13 - Harbor Island West Waterway	6.1	$0.00	$0.00	0%	Done	Stormwater, CSO
EB17 - East Waterway	18.9	$5.00	$10.00	30-50%	RI/FS	Unknown
EB18 - Piers 48-52	15.5	$5.00	$10.00	80-90%	Initial Investigation	Industrial, CSO, Stormwater
E132 -Harbor Island West Waterway	9.1	$0.00	$0.00	0%	Done	Shipyard wastes
EB23 -Seacrest Park	14.3	$5.00	$10.00	100%	Done	Unknown
EB25 -Central Seattle Waterfront	35.7	$10.00	$50.00	---	Not started	Industrial, CSO, Spills
EB26 -Denny Way CSO	2.4	$0.50	$5.00	---	Cleanup & Monitoring	CSO
EB27 -Piers 46-48	1.6	$0.50	$5.00	0-5%	Not started	CSO
EB28 -Colman Dock, Pier 58	12.8	$5.00	$10.00	30-50%	RI/FS	Industrial, CSO, Spills
E133 -Todd/Lockheed	77.0	$5.00	$25.00	100%	R1/FS	Shipyard discharges
EB5 -Todd/Lockheed	19.7	$5.00	$25.00	80%	RI/FS	Shipyard Discharges
E136 - Pacific Sound Resources (Old Wckoff)	11.4	$0.50	$5.00	100%	RI/FS	Industrial
E137 - East Waterway	12.0	$5.00	$10.00	0%	RI/FS	CSO, Tank Farm Seeps
EBB - Harbor Island (partial T18)	37.9	$5.00	$25.00	0%	Initial Investigation	Industrial, CSO, Port Operations
EB9 - East Waterway	2.6	$0.50	$5.00	0%	RI/FS	Unknown
Pier 53-55 Seattle	8	---	---	---	Done	Industrial
Total	**349 acres**	**$57 million**	**$205 million**	---	---	---

"---" = not applicable or data unavailable

Everett and Port Gardner

The thirteen sediment cleanup sites near Everett are listed in Table 15 below. Although the number of sediment sites increased from 9 to 13 since the 2001 report, this is a bit misleading. The addition of some sites are a result of extending upland sites to include sediments, and may also result partly from the fact that Edmonds was included in the Everett vicinity. It should be noted, however, that to sites are now in the active cleanup stage within the Everett Port Gardner area. For the sites not yet started, lack of available staff has been identified as the primary impediment to progress. Most of the completed sites were associated with the former Weyerhaeuser Everett facility. Sale of the facility by Weyerhaeuser may have contributed to the expedited cleanup of the associated sites.

Figure 15: Everett and Port Gardner Vicinity Map and Sediment Quality Stations

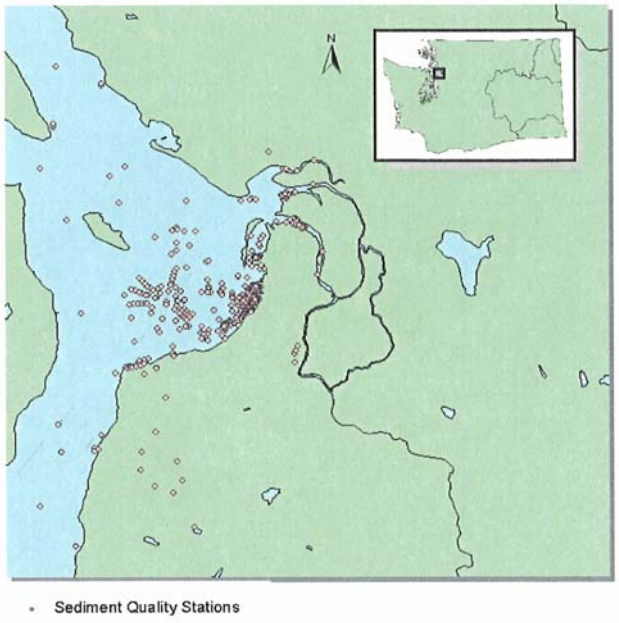


Table 15: Everett Sediment Cleanup Site Information

Site	**Area** (acres)	**Cost Estimate Low** (millions)	**Cost Estimate High** (millions)	**State Owned Land** (%)	**Site Cleanup Status**	**Causes of Contamination**
Mill E/Koppers	45.91	$0	$0	0	Done	Industrial
Piers 1 & 3	11.25	$1	$5	10-20%	Done	Industrial CSO
South East Waterway	7.25	$1	$5		Not Started	Industrial Spills
North East Waterway	13.34	$5	$10		Not Started	Industrial
South Terminal	27.23	$5	$10	20%	Not Started	Industrial
Mukilteo DFSP	24.66	$5	$10	---	Not Started	Industrial, Groundwater, Military
Everett Simpson	---	---	---	---	Done	
Weyerhauser - Everett	---	---	---	---	Done	
Point Wells Chevron	13.77	0.50	5.00	---	---	Industrial
Silver Lake	---	---	---	---	---	
Boeing Everett	0.57	---	---	10%	RI/FS	Industrial
Unocal Edmonds	4.93	0.25	0.50	100%	RI/FS	Industrial
Smith Island Slough	---	---	---	---	Done	
Totals	**149 acres**	**$17 million**	**$46 million**	---	---	---

"=" not applicable or data unavailable

Fidalgo Bay

There are eight sediment sites identified in Fidalgo Bay near Anacortes, listed in Table 16 below. Most of the sites are in the early stages of cleanup. Much of the information about area and cost of cleanup has not yet been determined. It should be noted that while two refineries are located in Fidalgo Bay, the sites listed here do not appear to be associated with the refinery operations. Instead, the sites are associated with maritime and historical industrial activities near Anacortes.

Figure 16: Fidalgo Bay Vicinity Map and Sediment Quality Stations

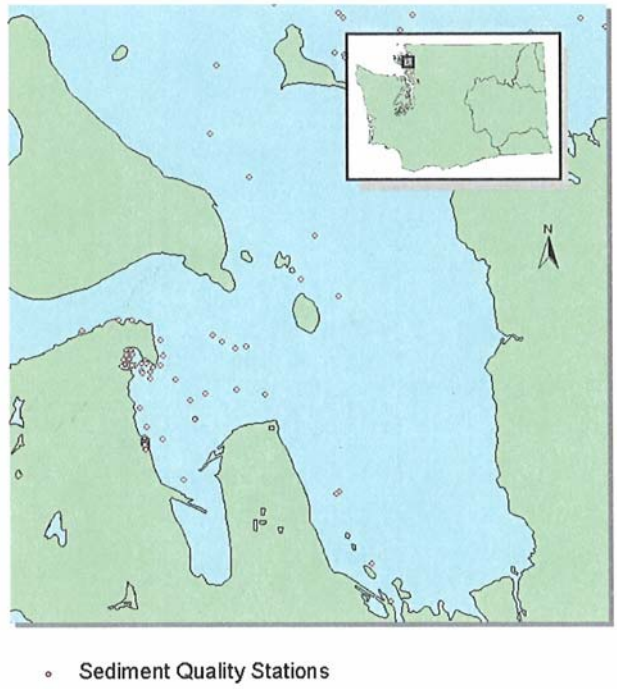


Table 16: Fidalgo Bay Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Anacortes Plywood	---	---	---	---	Initial Investigation	Industrial
City of Anacortes Fidalgo Marina	---	---	---	---	Not Started	Industrial
Custom Plywood	3.67	$0.50	$5.00	0	Initial Investigation	Industrial
Dakota Creek Shipyard	---	---	---	---	Initial Investigation	Shipyard
MJB Properties	---	$0.50	$5.00	Unknown	RI/FS	Industrial
Scott Paper Co. Anacortes	---	---	---	Unknown	RI/FS	Industrial
Shannon Point Seafoods	---	---	---	---	Done	Industrial
V Street	---	---	---	---	Not Started	Industrial
Totals	**4 acres**	**$1 million**	**$10 million**	---	---	---

"=" not applicable or data unavailable

Lake Union

Lake Union and the Ship Canal are located in Seattle and now have seven sediment identified sites as shown in Table 17 below. Maritime industry is the predominant activity in the vicinity and with the main exception of the Gas Works Park site, the Lake Union sites are related to maritime activity. Some nearshore sites also may consist of historical contaminated fill material, predominantly pre-WW TI era. The Lake Union sites are in the early stage of cleanup. One of the significant issues that somewhat hinders site by site cleanup is the ubiquitous nature of lower but still toxic levels of bioaccumulative contaminants of concerns, namely tributyl-tin (TBT) and PCBs. While there can be some marine water influence entering through the locks at the Ship canal, the sediments in Lake Union are freshwater in nature. Ecology site managers identified lack of staff to oversee cleanup and control of sources as the primary impediments to progress in Lake Union.

Figure 17: Lake Union Vicinity Map and Sediment Quality Stations

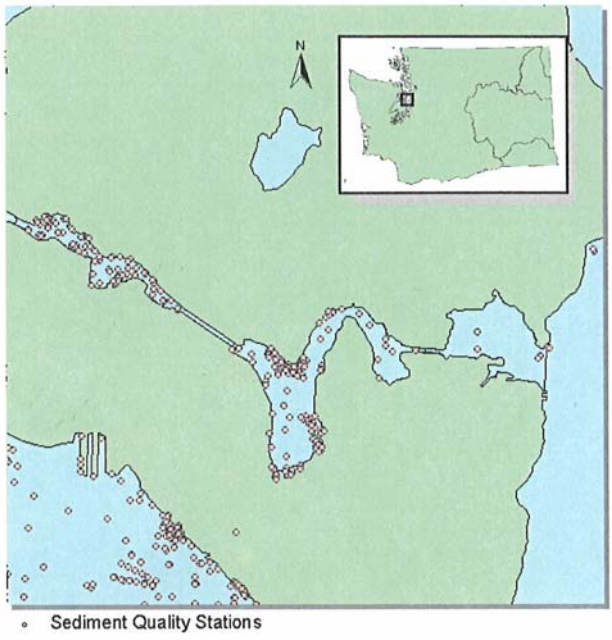


Table 17: Lake Union Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Lake Union Drydock	11.48	$0.50	$5.00	10-0%	Initial Investigation	Stormwater, Refueling
NOAA Dockside Facility	11.48	$0.50	$5.00	---	Initial Investigation	Shipyard
Northlake Shipyard	32.14	$0.50	$5.00	80%	Initial Investigation	Shipyard
Gas Works Park	51.65	$5.00	$10.00	---	RI/FS	Industrial
South Lake Union Wharf	0.46	---	---	100%	RI	Industrial
Unimar Northlake	0.57	---	---	100%	Initial Investigation	Industrial
Lake Union/Ship Canal	---	$10.00	$50.00	90%	Initial Investigation	Industrial, CSO, Stormwater, Vessels
Totals	**108 acres**	**$17 million**	**$75 million**	---	---	---

"=" not applicable or data unavailable

Lake Washington

The six known sites in Lake Washington are shown in Table 18. Contaminants from historic wood treatment and other industry in the southern part of the lake are the predominant concern. As shown in Figure 18, the available sediment quality data from sampling stations are clustered around a few distinct sites and not much is known about sediment quality in the majority of the lake. However, much of the lake lacks the influences that cause sediment contamination and is not likely to have sediments causing adverse impacts or risks to human health.

Figure 18: Lake Washington Vicinity Map and Sediment Quality Stations

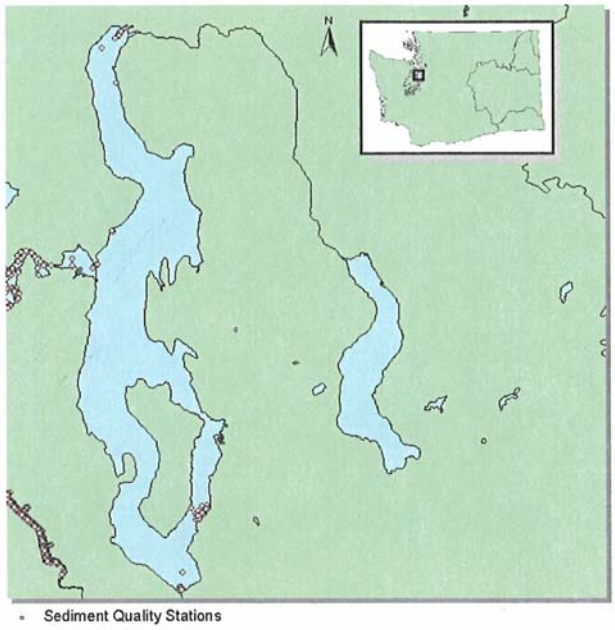


Table 18: Lake Washington Sediment Cleanup Site Information

Site	Area (acres)	Cost Estimate Low (millions)	Cost Estimate High (millions)	State Owned Land (%)	Site Cleanup Status	Causes of Contamination
Lakepoint	1.1	$0.50	$5.00	0%	RI/FS	Industrial
Port Quendall	13.5	$5.00	$10.00	30-40%	RI/FS	Industrial
Barbee Mill	2.6	$0.50	$2.50	50-75%	Cleanup & Monitoring	Industrial
Baxter	1.0	---	---	50-75%	Cleanup & Monitoring	Industrial
NOAA Sandpoint	---	---	---	---	Cleanup & Monitoring	
South Lake WA/Renton	5.0	---	---	90%	RI/FS	Industrial/Outfalls
Totals	**23.2 acres**	**$6 million**	**$18 million**	---		

"=" not applicable or data unavailable

Other waterbodies with Sites

Of the 31 sites located in waterbodies other than those shown in the previous pages, 22 are listed in Table 19 below. Data on the additional 9 sites is currently being evaluated for accuracy and completeness and is therefore not presented here. The 22 sites in Table 19 include both freshwater and marine sites. The list contains a few high priority sites such as Intalco in the Strait of Georgia north of Bellingham and Cascade Pole in Budd Inlet in Olympia. If sediment cleanup is approached on a bay-by-bay basis, some accommodation will need to be made for sites in waterbodies with fewer identified sites.

Table 19: Other Waterbodies with Sediment Cleanup Sites

Site	Location	Fresh or Marine Waters (F,M)	Area (Acres)	Cost Estimate (Lower) (Millions)	Cost Estimate (Upper) (Millions)	State Owned Land (%)	Site Cleanup Status	Cause of Contamination
Cascade Pole	Budd Islet	M	8.72	$0.50	$5.00	0	FS	Industrial
Gibbons Creek	Washongal	F		complete	complete	0	Done	Industrial, Wood Treating
Goose Lake	Mason Co.	F		$0.25	$0.50	90	RI	Industrial
Gray's Harbor Paper Co.	Gray's Harbor	M		complete	complete	---	II	---
Gray's Harbor Shipyard – Berg Marine	Gray's Harbor	M		complete	complete	50	II	Industrial
Heritage Park, Capitol Lake	Capitol Lake	F		---	---	100	Done	Industrial
Houghton Beach	---	M		...	---	---	Not Started	---
Intalco	Strait of Georgia	M	48.14	$10.00	$50.00	100	II	Industrial
McNeil Island Penetentiary	South Puget Sound	M		complete	complete	100	Done	Industrial, Shipyard
METRO Lake Hills	---	F			---	---	Not Started	
Midwest	Budd Inlet	M	16.14	$5.00	$10.00	100	Cleanup Monitoring	Industrial/Municipal Sewer
Mill Creek, Western Processing	Mill Creek, King Co.	F		complete	complete	0	Done	Industrial
Norwegian Seafoods	Colvos Passage, South Puget Sound	M		---	---	---	RI	---
NW Enviroservices	--	M		---	---	---	Not Started	---
Oakland Bay,Shelton	Oakland Bay	M		---	---	100	II	Industrial
Pacific Wholesale, Raymond	Willapa River	M		---	---	0	Not Started	Leaking UST
Pakonen Boatyard	Gray's Harbor	M		complete	complete	---	Cleanup Monitoring	Industrial
Pope and Talbot	Hood Canal, Port Gamble	M		---	---	---	II	Industrial
Port Angeles Harbor	Port Angeles	M		---	---	---	II	---
Port Ludlow	Port Ludlow	M		---	---	100	II	Industrial
Russell's Orcas Landing	Orcas Island	M		complete	complete	---	Done	---
Seattle Commons/Lake Union Air		F		---	---	---	Not Started	---
Smith Island Slough	Smith Island	M		complete	complete	---	Done	---
Spokane River	Spokane River	F		---	---	---	FS	Mining and Industry
Strandley - Manning	---	M		---	---	---	Not Started	---
Trail Property	---	M		---	---	---	NFA	---
Unocal Seattle Marketing Terminal	Seattle	M		---	---	---	Done	USACE
Manchester Annex	Clam Bay	M	4.93	$0.25	$0.50	100	Cleanup Monitoring	Navy operations-Landfill
USN Lake Hancock	Whldbey Island	M	6.89	complete	complete	25	Done	Navy – Bombing practice
USN Port Hadlock	Indian Island	M	9.18	complete	complete	---	Done	Navy operations
Weyerhauser Log Barkers Longview	Longview	M		complete	complete	---	II	---
Whitmarsh Landfill - Padilla Bay	Padilla Bay	M		---	---	---	II	Landfill
Totals			**94 Acres**	**$16.00 Million**	**$66.00 Million**			

Impaired Waterbodies

Sediment/Water relationships and 303d listing

A significant effort has been undertaken within the Toxics Cleanup Program to provide information on state-wide sediment contamination and the relationship it has with water quality and potential impairment of freshwater and marine bodies of water. This ongoing effort and the resulting information is being provided to Ecology's Water Quality Program (WQP) for use in the listing of impaired water bodies (303d list) throughout the state. This is being provided partially because the SQS (Sediment Quality Standards) were approved by the Environmental Protection Agency's Water Quality Program as Water Quality Standards. As such, the sediment data that is in violation of the SQS is considered for 303d listing purposes in much the same manner as the water-column water quality violations. The following figures illustrate those "water bodies" throughout the state that violate water quality standards based upon sediment data (either Sediment Quality Standards or Cleanup Screening Levels (CSL)). This information has been forwarded to Ecology's WQP for 303d listing and Total Maximum Daily Load calculation (TMDL) consideration.

Figure 19: Bellingham Bay

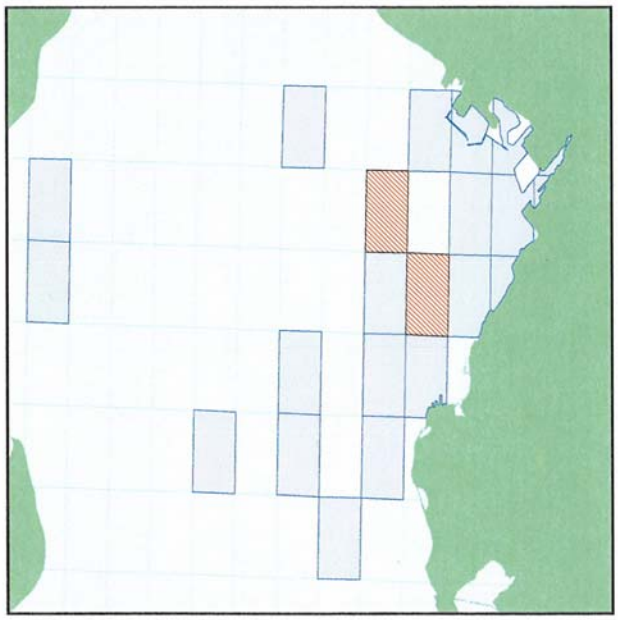
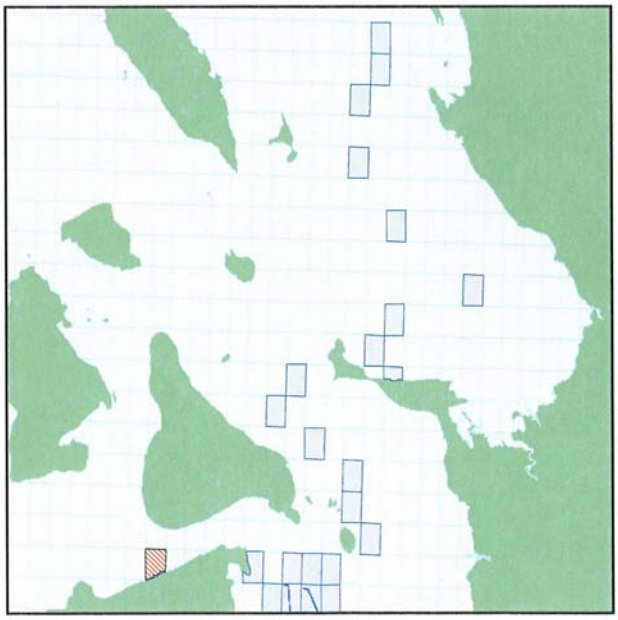


Figure 20: Between Fidalgo Bay to Bellingham Bay



Marine Sediment Chemical Hit Grids (SQS & CSL inclusive)
Open Water Grids
Washington Land

Figure 21: Eastern Kitsap County

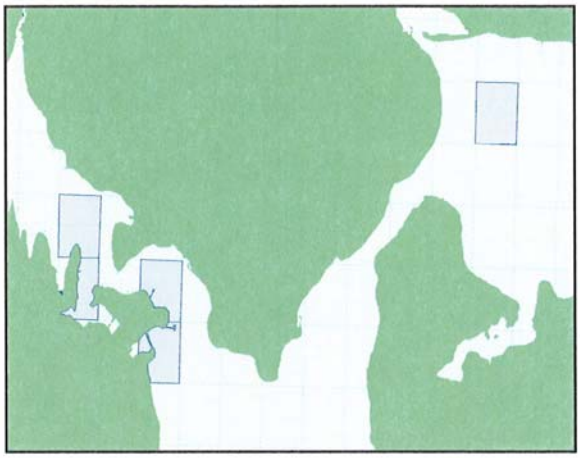


Figure 22: Dyes and Sinclair Inlets (Eastern Kitsap County)

Figure 23: Commencement Bay (Tacoma)

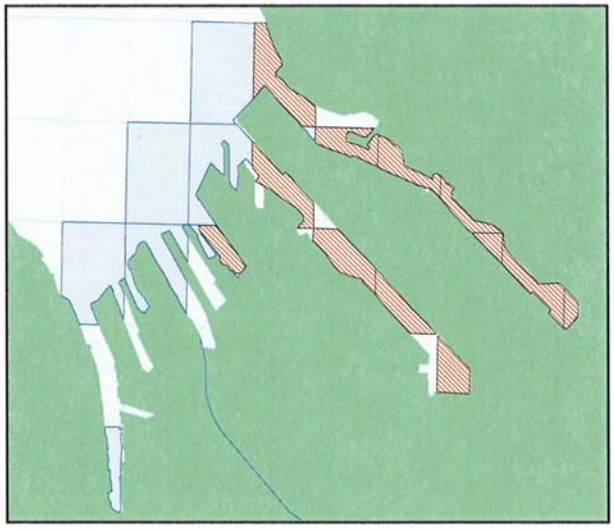
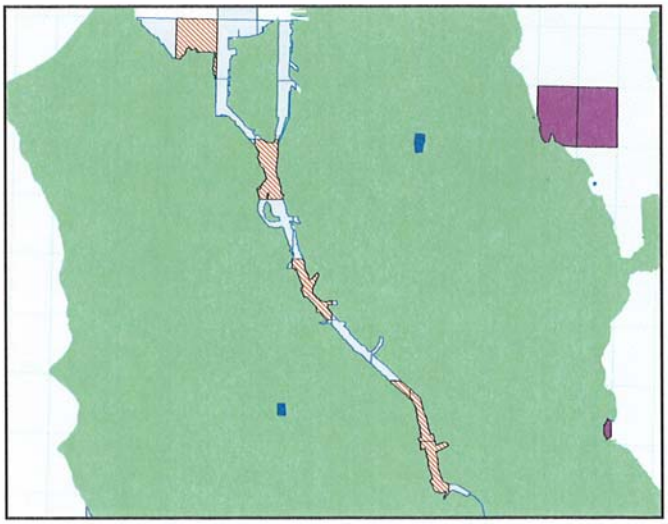


Figure 24: Duwamish River (Seattle)



Marine Sediment Bioassay Hit Grids (SQS & CSL inclusive)
Marine Sediment Chemical Hit Grids (SQS & CSL inclusive)
Open Water Grids
Washington Land

Figure 25: Elliot Bay (Seattle)

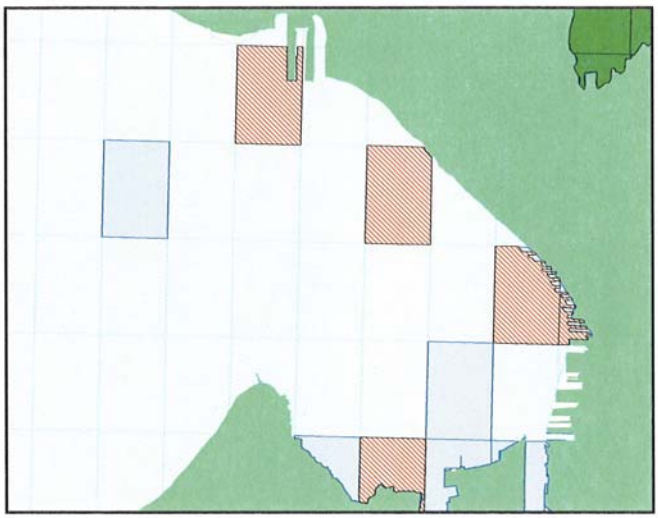


Figure 26: Everett Harbor

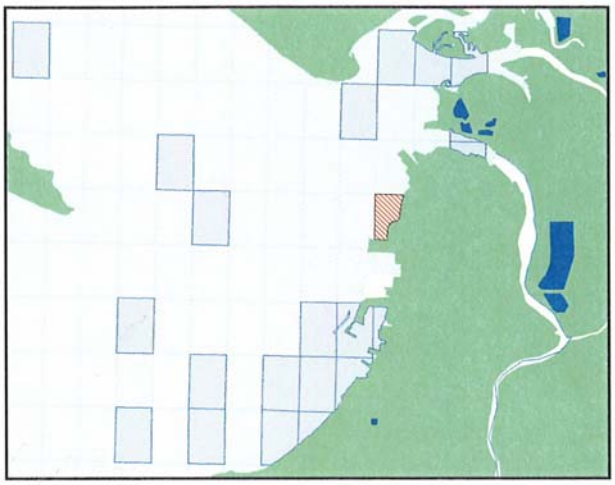


Figure 24: Duwamish River (Seattle)

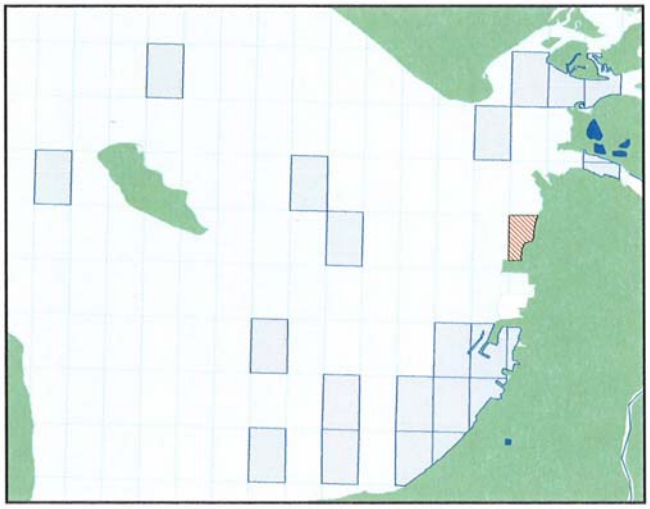
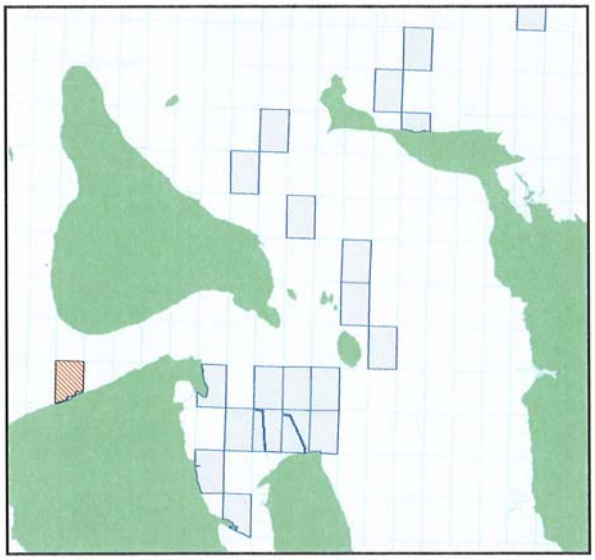


Figure 28: Fidalgo Bay (Anacortes)



Marine Sediment Bioassay Hit Grids (SQS & CSL inclusive)
Marine Sediment Chemical Hit Grids (SQS & CSL inclusive)
Open Water Grids
Washington Land

Figure 29: Lake Union (Seattle)

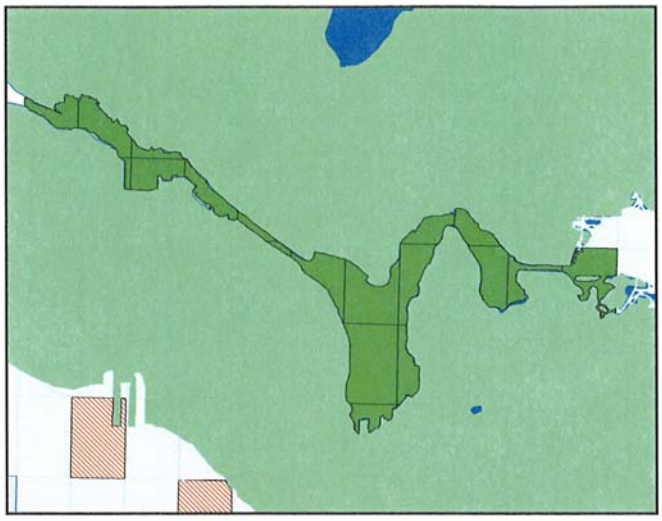


Figure 30: Gray's Harbor

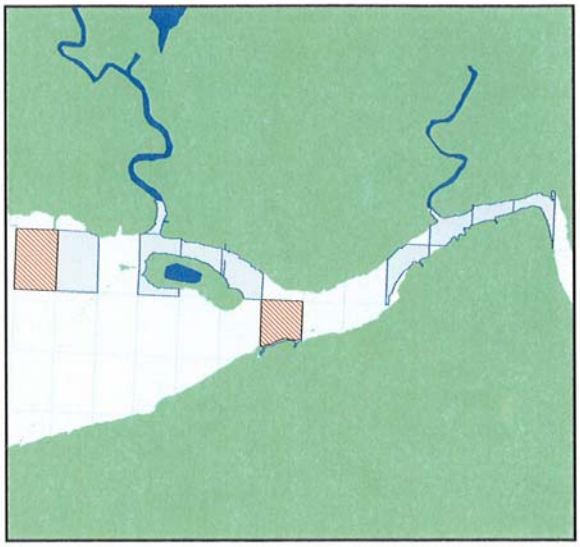


Figure 31: Lake Washington and Lake Issaquah (Seattle/Bellevue)

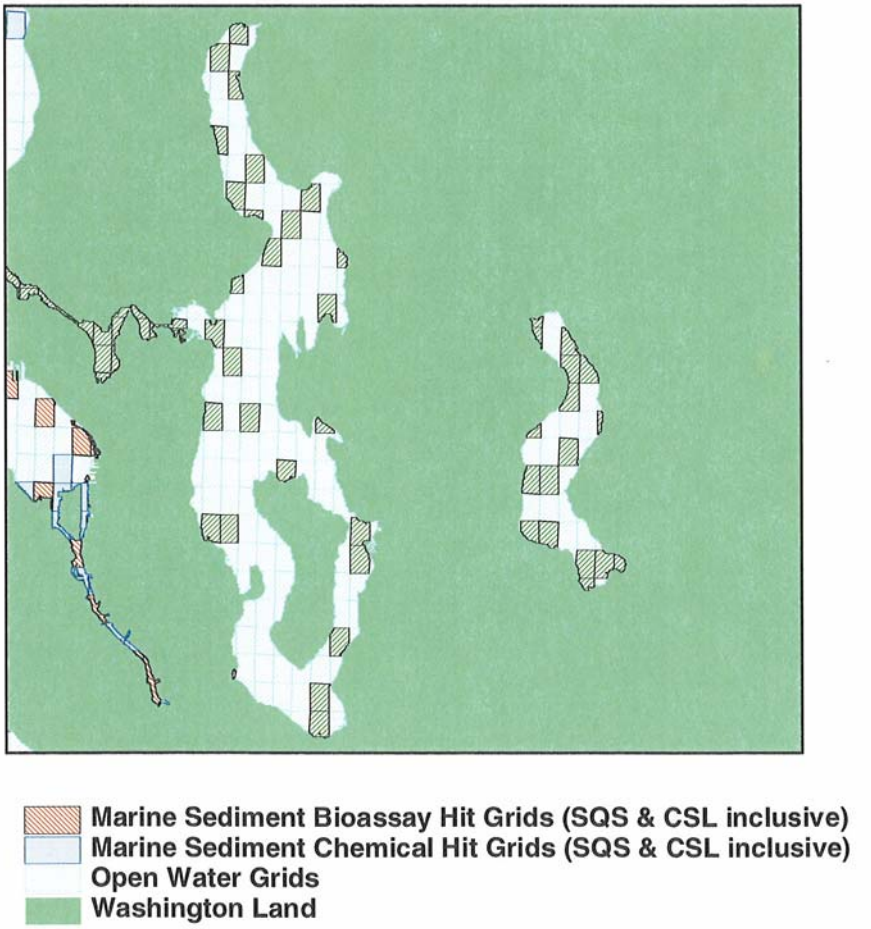


Figure 32: Strait of Juan DeFuca

Figure 33: Budd Inlet (Olympia)

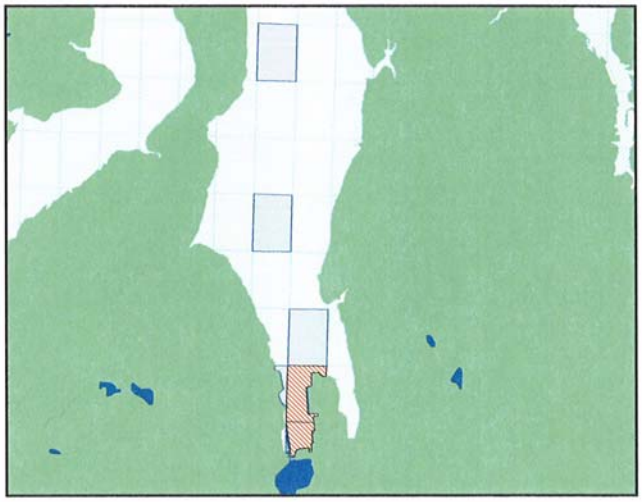
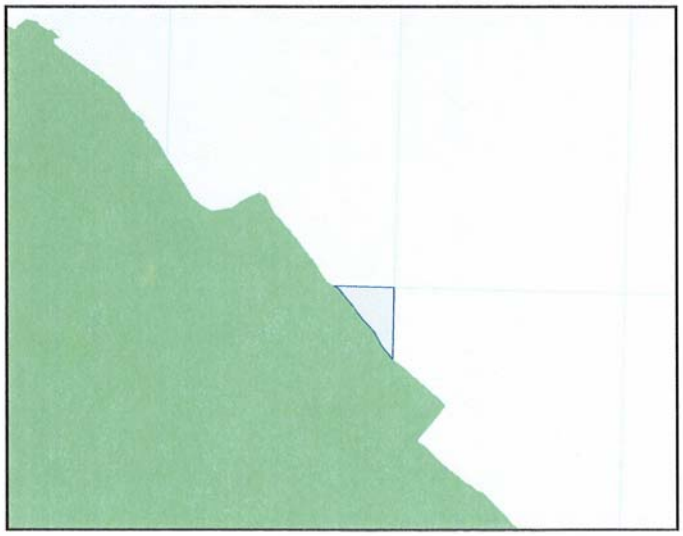


Figure 34: Asarco (Ruston)



Marine Sediment Bioassay Hit Grids (SQS & CSL inclusive)
Marine Sediment Chemical Hit Grids (SQS & CSL inclusive)
Open Water Grids
Washington Land

Figure 35: South Puget Sound