NATURAL RESOURCES DAMAGE ALLOCATION OF INJURIES TO NATURAL RESOURCES IN THE HYLEBOS WATERWAY

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SUMMARY

This report presents a method to allocate damages to natural resources in the Hylebos Waterway resulting from chemical contamination of marine sediments. It also provides specific recommendations for allocation of these damages to sites along the Waterway.

The Natural Resource Trustees for Commencement Bay (NOAA of the U.S. Department of Commerce; the U.S. Department of the Interior; the Washington Department of Ecology (the lead state trustee); the Puyallup Tribe of Indians; and the Muckleshoot Indian Tribe) (Trustees), are conducting a Natural Resource Damage Assessment (NRDA) for the Commencement Bay Superfund site in and near Tacoma, Washington. At this time, focus of the NRDA effort is on the Hylebos Waterway, one of the more heavily industrialized waterways of the Bay. Contaminant levels in the Waterway's intertidal and subtidal sediments exceed State of Washington Sediment Management Standards.

Natural resource damage claims have three basic components:

1) The cost of restoring the injured resources to baseline;

2) The interim loss of resources from the time of injury until the resources recover to baseline, plus;

3) The reasonable costs of performing the damage assessment.

This report deals only with Item 2, the interim loss of resources. Habitat Equivalency Analysis (HEA) is a method used by the Trustees to determine the interim loss in habitat services, and is described in a separate document. The Hylebos HEA is sediment-based, and results in the quantification of natural resource damages in terms of the loss of Service Acre Years (SAYs).

This document develops an independent means of allocating natural resource damages for interim losses. The resulting methodology relied on existing information and the knowledge of the allocation team. No independent field or laboratory work was conducted. A summary of the allocation method is provided below. A detailed discussion of the methodology is provided in **Section 2**.

The proposed method allocates a percentage of the SAYs to each "site". A site is defined as a group of contiguous tax parcels which is a source of chemicals causing natural resource damages to the Hylebos Waterway. Many sites have had numerous owners and tenants. This phase of the work does not involve allocating damages among owners, tenants, operators, generators, or transporters although the project does involve the development of a database amenable to such use.

Natural resource damages are only allocated to specific sites if there is a link (nexus) between the site and contamination found in the Waterway. For each site and substance of concern (SOC) three threshold questions are posed:

1) Is there a pathway for the contamination to travel from the site to the Waterway;

2) Is it more likely than not that the SOC was used or generated at the site or were actions conducted at the site which could exacerbate the mass transfer of the substance of concern; and
3) Is the chemical found in the Waterway adjacent to the site, on-site groundwater, on-site surface water, an NPDES discharge, or potentially erodible soil or sediment.

Only if the answer to all three questions is yes, is the site considered to be a source of the chemical.

For those sites passing the "trigger" test described above, the allocation method depends on the best available data. For most chemicals the allocation is based on the chemical and visual link between the on-site activities and the footprint found in the Waterway. This method is applied when clearly defined areas of contamination (hot spots) are located immediately offshore or in very close proximity to one site likely to be the source of the chemical. In such cases, all the SAYs calculated for that hot spot are allocated to the specific site.

At the other end of the spectrum, the areas of contamination in the Waterway blend together or there are closely spaced sites likely to be the source of the same chemical. For these chemicals, the allocation is based on the probable mass loading of the chemical to the Waterway. Each site is assigned a percentage of the mass loading and the SAYs with that footprint are distributed to each site based on the calculated percentage and the distribution factors discussed in **Section 3.4**. One of these two methods or some combination of the two methods was used for all chemicals.

After allocating a portion of SAYs to each site for each chemical, the total of all SAYS for each site can be determined by combining the SAYs for all chemicals attributed to the site of interest. A further description of this summation and the resulting allocation of SAYs to each site is presented in an accompanying report.

No attempt was made to exclude sites without viable Potentially-Responsible Parties (PRP's) or to allocate to specific PRP's. It is understood that these issues will be addressed in the next phase.

1.0 INTRODUCTION

1.1 BACKGROUND

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601, et seq., provides that parties responsible for the release of hazardous substances into the environment are liable both for the cost of remediating the hazardous substance contamination and for natural resource damages resulting from the release. Under CERCLA, the USEPA is charged with developing a national list of priority sites for remedial investigation and activity (National Priority List, or NPL). On September 6, 1983, USEPA first published the NPL, containing 406 hazardous waste sites, including the Commencement Bay Nearshore/Tideflats Site. The Hylebos Waterway is part of the Site, identified in USEPA's Record of Decision as the Head of Hylebos and Mouth of Hylebos Problem Areas.

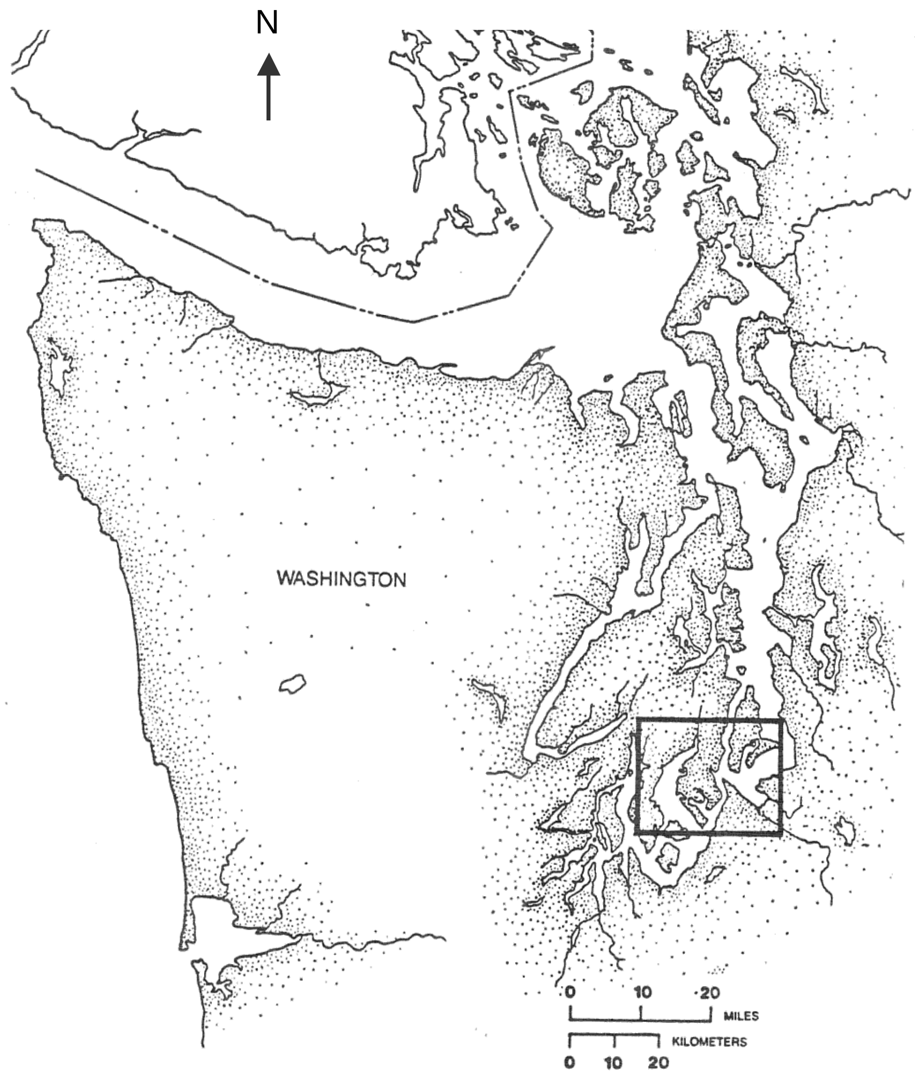
1.2 SITE DESCRIPTION

Commencement Bay is a heavily industrialized embayment at the mouth of the Puyallup River near Tacoma, Washington (**Figures 1-1, 1-2**). The Bay opens to Puget Sound to the northwest with Tacoma situated on the south and southeast shores. The Hylebos Waterway is the northernmost and largest of the industrialized waterways near the mouth of the Puyallup River.

Commencement Bay occupies an area of approximately 9 square miles. The mean tidal range in Commencement Bay is 8.1 feet, with a diurnal range of 11.8 feet and an extreme range of 19 feet. Hylebos Creek flows into the head of the Hylebos Waterway. Ownership of the shoreline is vested in the Port of Tacoma, the City of Tacoma, Pierce County, the State of Washington, the Puyallup Indian Tribe, and numerous private parties. Much of the publicly-owned land is leased to private industrial and commercial enterprises.

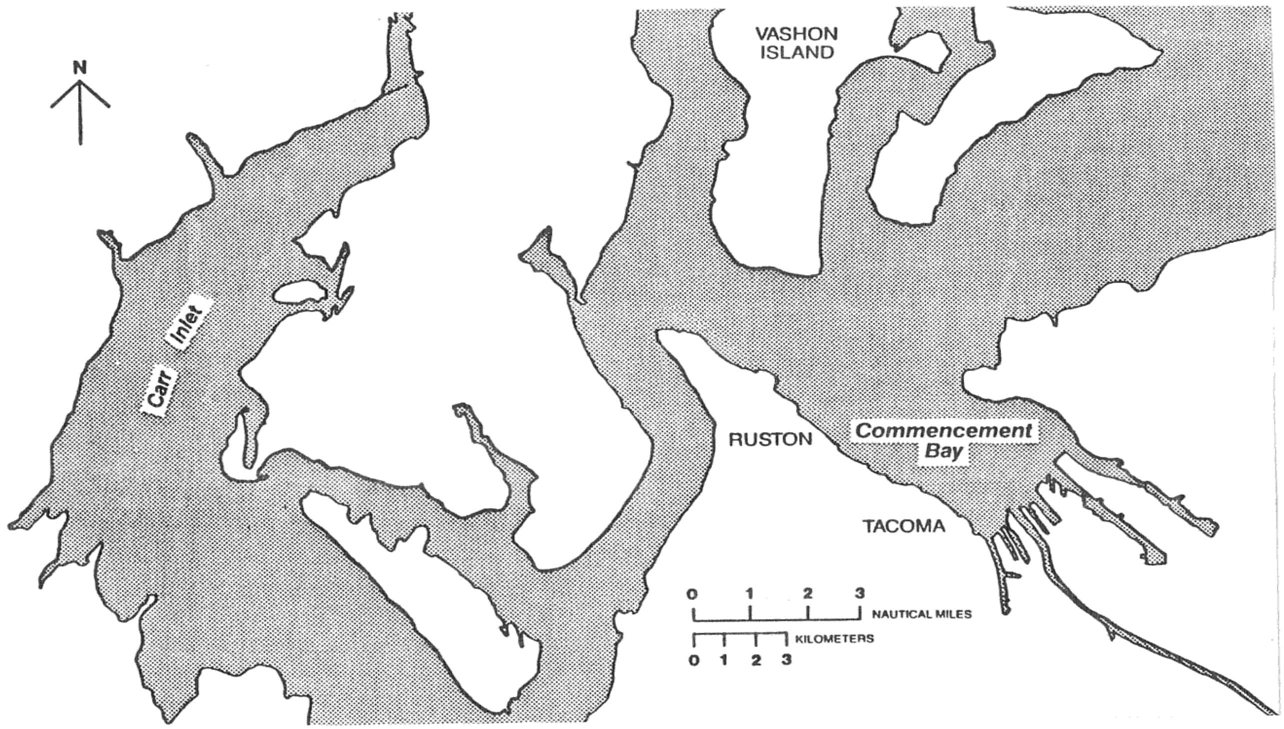
Urbanization and industrial development of the Commencement Bay area began in the late 1800s. At that time, the south end of the Bay was primarily tideflats formed by the Puyallup River delta. Since the 1920s, dredge and fill activities have significantly altered the estuarine nature of the Bay. Intertidal areas were covered and meandering streams, such as Hylebos Creek, and rivers were channeled. Numerous industrial and commercial operations located in the newly-filled areas of the Bay.

The Hylebos Waterway, in its current form, is approximately 200 feet wide, 30 feet deep (MLLW), and 3.2 miles long. Work on the Waterway began in the 1920s. By 1931, the Waterway was approximately 2.8 miles in length. A turning basin, now known as the lower turning basin was added in 1938. The turning basin widened the innermost 1400 feet of the Waterway by up to 510 feet. The main channel was extended 0.4 miles upstream between 1965 and 1967, and an upper turning basin was constructed. The upper turning basin widened the upstream 1800 feet of the Waterway by up to 770 feet. In 1972, the upper turning basin and three areas near the Eleventh Street Bridge were dredged (Tetra Tech 1985).



Reference: TetraTech. August 1985. Commencement Bay Nearshore/Tideflats Remedial Investigation. Final Report. EPA-910/9-85-134b, Volume I.

Figure 1-1
GENERAL LOCATION OF STUDY AREA IN PUGET SOUND



Reference: TetraTech. August 1985. Commencement Bay Nearshore/Tideflats Remedial Investigation. Final Report. EPA-910/9-85-134b, Volume I.

Figure 1.2
SOUTH AND SOUTHCENTRAL PUGET SOUND SHOWING LOCATION OF COMMENCEMENT BAY

1.3 NATURAL RESOURCE DAMAGE ASSESSMENT

Natural resource damage claims have three basic components:

1) The cost of restoring the injured resources to baseline;

2) The interim loss of resources from the time of injury until the resources recover to baseline, plus;

3) The reasonable costs of performing the damage assessment.

This report deals only with Item 2, the interim loss of resources. Actions by the U.S. Environmental Protection Agency (USEPA) and the Washington Department of Ecology are being designed to restore injured resources to baseline through remediation. Other efforts are underway to allocate the costs of the remedial activities and the costs of performing the damage assessment.

The Trustees are currently engaged in a series of studies designed to determine the nature and extent of injuries to public trust natural resources that are the result of releases of hazardous substances to Commencement Bay. In an attempt to reach settlement of potential natural resource damage claims prior to completing the NRDA process, the Trustees have employed Habitat Equivalency Analysis (HEA) to make a preliminary determination of the amount and type of natural resource restoration needed to compensate for the interim loss of natural resources. For the Hylebos Waterway, the Trustees quantified the interim loss in terms of natural resource habitat discounted Service Acre Years (SAYs) associated with releases of substances of concern (SOCs). A separate report prepared by the Trustees describes the HEA process and analysis and the data upon which it is based.

For purposes of allocation of the SAYs to the sources of past releases to the Hylebos Waterway, maps of footprints for 27 SOCs were developed. These maps are provided in **Appendix 1** and illustrate sediment concentrations for each of the SOCs at several threshold concentrations for the HEA. The SOCs considered and threshold concentrations for each SOC are listed in **Table 1-1**. The SOCs included in the NRDA process are not as comprehensive as the chemicals addressed for purposes of allocating the costs of remediation. Thus the NRDA allocation is "conservative" and does not attribute injury for all industrial wastes or releases known to have occurred.

This document presents a summary of the methods employed and allocation assessed to the sources of these SOCs in the Waterway. This allocation will then allow the subsequent allocation and summation of the associated SAYs to each site.

Table 1-1

HYLEBOS WATERWAY THRESHOLD CONCENTRATIONS FOR FOOTPRINT ANALYSIS

			Levels of Service Loss*				
Substance of Concern	**Symbol**	**Units**	**Level**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Polycyclic aromatic hydrocarbons	PAHs	ppm dw	1	8	17	70	--
Polychlorinated biphenyls	PCBs	ppm dw	0.13	0.173	1.5	4	15.2
Metals							
Antimony	Sb	ppm dw	5.9	21	150	200	--
Arsenic	As	ppm dw	57	130	450	700	--
Cadmium	Cd	ppm dw	2.7	5.1	9.6	14	--
Chromium	Cr	ppm dw	63.5	94	260	--	--
Copper	Cu	ppm dw	270	390	530	1,300	--
Lead	Pb	ppm dw	360	450	660	1,200	--
Mercury	Hg	ppm dw	0.41	1.3	2.1	2.3	--
Nickel	Ni	ppm dw	110	150	--	--	--
Silver	Ag	ppm dw	3	3.3	6.1	8.4	--
Zinc	Zn	ppm dw	410	530	1,600	3,800	--
Tributyltin	TBT	ppb dw	138	1000	--	--	--
Chlorobenzenes							
1,3-dichlorobenzene	mDCB	ppb dw	21	--	--	--	--
1,4-dichlorobenzene	pDCB	ppb dw	110	120	--	--	--
1,2,4-trichlorobenzene	TCB	ppb dw	31	51	62	--	--
Hexachlorobenzene	HCB	ppb dw	22	70	130	--	--
Phthalates							
bis (2-Ethylhexyl) phthalate	bEPH	ppm dw	1.3	1.9	2	--	--
Butylbenzyl phthalate	BBPH	ppb dw	63	200	900	970	--
di-n-octyl phthalate	DOPH	ppb dw	61	6,200	--	--	--
diethylphthalate	DEPH	ppb dw	6	200	--	--	--
Dimethylphthalate	DMPH	ppb dw	71	85	160	--	--
Phenols							
2-dimethyl phenol	MP2	ppb dw	55	63	72	77	--
4-dimethyl phenol	MP4	ppb dw	110	670	1,800	3,600	--
2,4-dimethyl phenol	DMP	ppb dw	29	55	77	210	--
Pentachlorophenol	PCP	ppb dw	12	400	690	--	--
Phenol		ppb dw	180	420	1,200	--	--
Hexachlorobutadiene	HCBD	ppb dw	11	120	180	270	--
DDTs							
Dichlorodiphenyldichloroethane	DDD	ppb dw	16	70	1,500	3,600	--
Dichlorodiphenyldichloroethylene	DDE	ppb dw	9	65	7,000	21,500	--
Dichlorodiphenyltrichloroethane	DDT	ppb dw	12	45	456	2,100	--

* Level 1: Very Low Injury
2: Low Injury
3: Medium Injury
4: High Injury
5. Very High Injury

Units ppm parts per million
ppb parts per billion
dw dry weight

2.0 METHODOLOGY FOR THE ALLOCATION OF SERVICE ACRE YEARS

The allocation methodology is based on the principle of injury causation. It relies on the best available information to allocate the SAYs determined by the Trustees to specific sites along or near the Hylebos Waterway. Because the quantity and quality of information is not the same for all sites and all SOCs, three different allocation methods are used. The goals of the allocation process are presented on **Table 2-1**. The sequential steps and decision junctions included in the allocation process are shown on **Figure 2-1**, and are explained on the following pages.

Table 2-1
ALLOCATION GOALS

Primary Goals

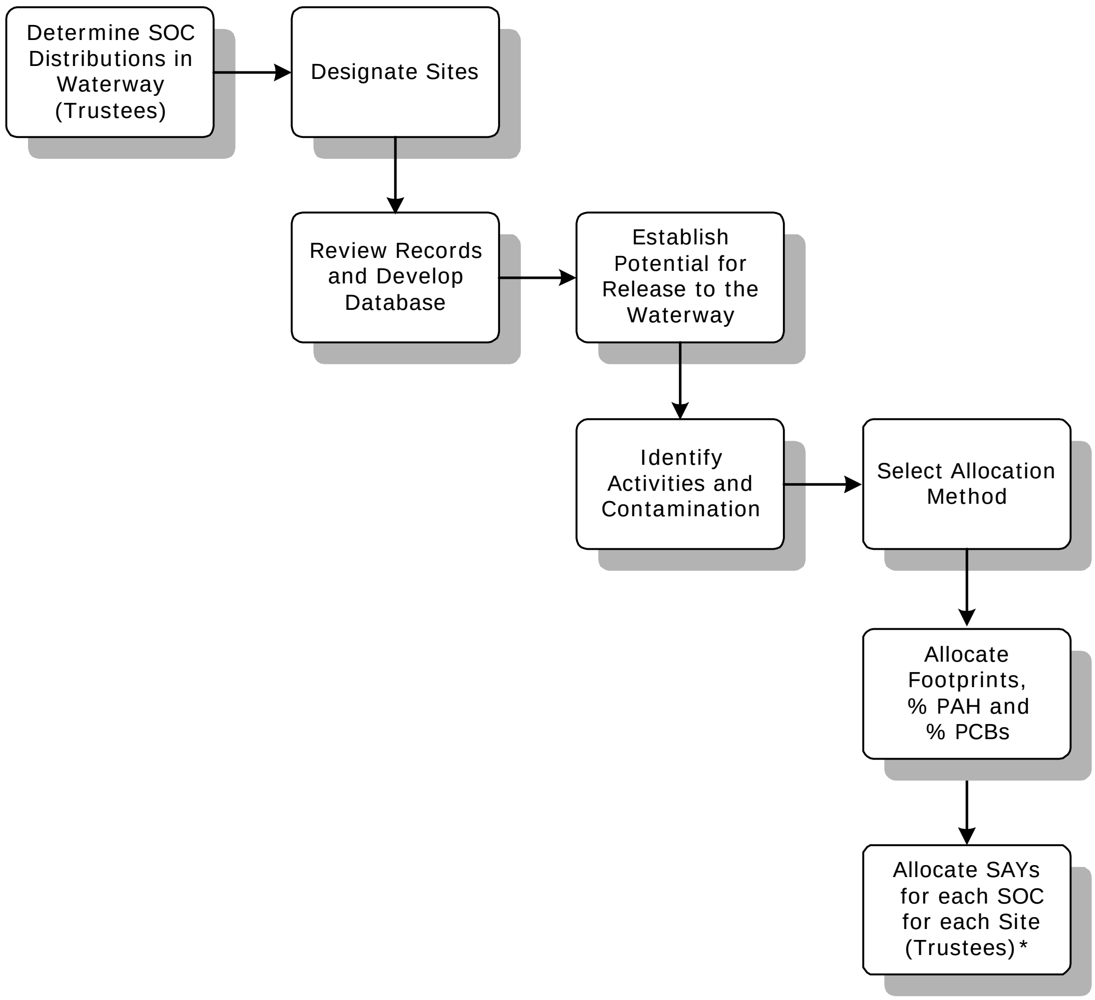
- Equitable
- Reasonable
- Clear
- Reproducible (within reasonable limits)

Secondary Goals

- Encourages voluntary participation by parties

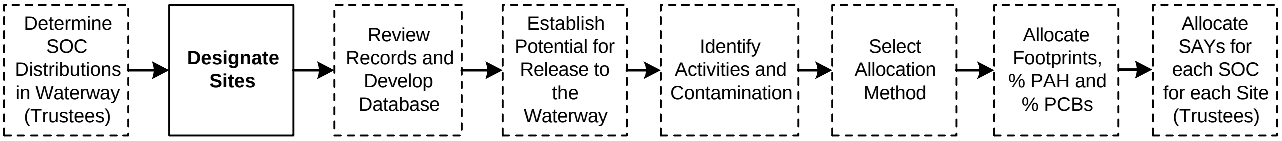
Figure 2-1

OVERVIEW OF ALLOCATION STEPS



* Note that this step does not include allocation to individual parties. Allocation to specific PRPs will be addressed in the final phase of the allocations process.

2.1 DESIGNATE POTENTIAL SITES



The site is the basic unit used for this allocation. A site is defined as a segment of land that is potentially a source of contamination to the Hylebos Waterway such that injury to natural resources occurs. A site may involve one or more activities and may cause the release of one or more SOCs. **Table 2-2** lists the attributes of sites considered for this study. Locations of potential sites are shown on **Figure 2-2**. Potential sites are limited to known commercial, industrial, and municipal properties in the vicinity of the Hylebos Waterway and to two properties (B&L Landfill and U.S. Gypsum Landfill) along Hylebos Creek. Municipal roadways and runoff associated with motor vehicle operation were not included as sites for purposes of this study. **Table 2-3** identifies potential sites and their areas based on Pierce County 1999 tax lots. In many cases the potential sites include the combined areas of contiguous or adjacent tax parcels known to have experienced common ownership or common usage.

Table 2-2
SITE ATTRIBUTES

A site is a segment of land that is a potential source of substances of concern which have caused natural resource injuries to the Hylebos Waterway. A site may involve one or more activities and cause the release of one or more substances of concern.

- The site, location, and area is based on the most recent complete maps of tax parcels (Pierce County, 1999)
- The site consists of more than one tax parcel when the parcels have experienced reasonably similar use with respect to the substance of concern.
- When parcels are grouped together to form a site, they are generally contiguous. Separation by a roadway is acceptable, but tax lots in different segments of the Waterway or on different sides of the Waterway were not grouped into the same site*.
- In general, the site was assigned a name consistent with general usage in reference literature or the street address. If no single name is predominant, the site was given the name of the most recent owner or operator of the site. The name of the operator generally took precedence over the owner unless there was no dominant operator.

* One exception: Small tax parcels were swapped between Elf Atochem (Atofina) and Oline properties. The recently exchanged parcels are on opposite sides of the Waterway.

Figure 2 - 2. Site Boundaries and Analytical Segments

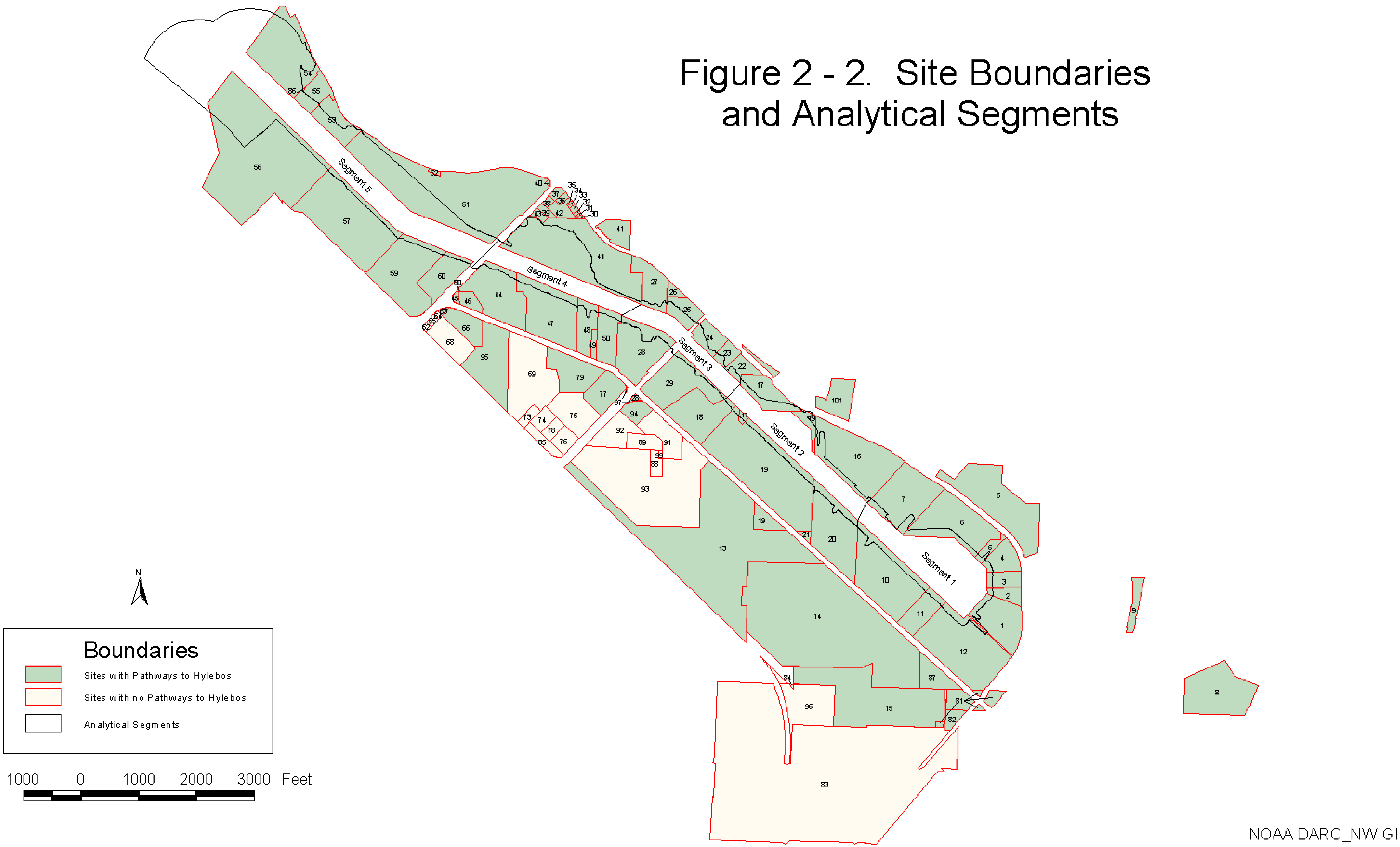


Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
1	1	WASSER WINTERS	5000350470	13.54
		WASSER WINTERS Total		13.54
	2	NORDLUND PROPERTIES	0321364045	2.9
		NORDLUND PROPERTIES Total		2.9
	3	STREICH BROTHERS	0321364019	2.07
			0321364044	1.73
		STREICH BROTHERS Total		3.8
	4	1670 MARINE VIEW DRIVE	5000350500	5.96
		1670 MARINE VIEW DRIVE Total		5.96
	5	JONES & GOODELL BOATBUILDING	0321364022	2.4
		JONES & GOODELL BOATBUILDING Total		2.4
	6	MANKE LUMBER	0321361006	0.64
			0321361015	1.5
			0321361016	10.91
			0321361026	7.01
			0321361037	26.69
		MANKE LUMBER Total		46.75
	7	TACOMA BOATBUILDING	0321361800	19.07
		TACOMA BOATBUILDING Total		19.07
	8	B&L WOODWASTE LANDFILL	0420053065	19.65
		B&L WOODWASTE LANDFILL Total		19.65
	9	US GYPSUM LANDFILL	0420057003	0.58
			0420057004	1.06
			0420057005	0.38
			0420057006	0.29
			0420057007	0.29
			0420057008	0.28
		US GYPSUM LANDFILL Total		2.88
	10	WEYERHAEUSER	0321362046	1.33
			0321363030	12.26
			0321364039	12.91
		WEYERHAEUSER Total		26.5
	11	LONE STAR NORTHWEST	0321364037	7.02
		LONE STAR NORTHWEST Total		7.02
	12	LOUISIANA PACIFIC	0321364024	33.35
		LOUISIANA PACIFIC Total		33.35

* Segment numbers and site numbers are shown on **Figure 2-2**.

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
1 (cont.)	13	PORT OF TACOMA (3002 TAYLOR WAY)	5000350090	85.15
		PORT OF TACOMA (3002 TAYLOR WAY) Total		85.15
	14	KAISER ALUMINUM & CHEMICAL	0321363013	31.56
			0321363033	46.44
			0321363034	15.09
			0321363037	3.67
		KAISER ALUMINUM & CHEMICAL Total		96.76
	15	BONNEVILLE POWER	0320011006	6
			0320012059	9.67
			0321363022	9.44
			3020200010	7.69
			6325000010	5.95
		BONNEVILLE POWER Total		38.75
	81	USA (#1)	0320011074	1.84
			0320011092	1.48
		USA (#1) Total		3.32
	82	OFF EAST-WEST ROAD #1	3020200020	0.14
			5000350081	1.85
		OFF EAST-WEST ROAD #1 Total		1.99
	83	PORT OF TACOMA (#3)	0320011007	11.19
			0320011076	7.19
			0320011087	2.34
			0320011088	19.06
			0320012000	131.51
			0321354027	0.03
		PORT OF TACOMA (#3) Total		171.32
	84	PORT OF TACOMA (#2)	0320012065	0.07
		PORT OF TACOMA (#2) Total		0.07
	87	3000 BLOCK TAYLOR WAY SITE	5000350110	5.76
		3000 BLOCK TAYLOR WAY SITE Total		5.76
	96	CITY OF TACOMA (#2)	0320012063	11.75
			0320012064	1.7
			0321363025	0.8
		CITY OF TACOMA (#2) Total		14.25
2	16	GENERAL METALS OF TACOMA	0321362032	12.16
			0321362033	0.5
			0321362037	3.4
			0321362038	4.08
			0321362053	6.59
		GENERAL METALS OF TACOMA Total		26.73

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
2 (cont.)	17	OLINE PROPERTIES (1800 MARINE VIEW DR)	0321362003	0.19
			0321362006	8.45
		OLINE PROPERTIES (1800 MARINE VIEW DR) Total		8.64
	18	US GYPSUM	0321351006	9.4
			0321351026	4.6
		US GYPSUM Total		14
	19	ELF ATOCHEM (less DUNLAP lower portion)	0321351041	50.4
		ELF ATOCHEM Total		50.4
	20	DUNLAP TOWING	0321363026	10.64
			(lower portion)	9.96
		DUNLAP TOWING Total		20.6
	21	PETROLEUM RECLAIMING SERVICES	0321363021	0.37
			0321363028	0.24
		PETROLEUM RECLAIMING SERVICES Total		0.61
	99	CITY OF TACOMA (2100 TAYLOR WAY)	0321351037	0.21
		CITY OF TACOMA (2100 TAYLOR WAY) Total		0.21
	101	JONES CHEMICAL	0321362049	6.59
		JONES CHEMICAL Total		6.59
3	22	HYLEBOS MARINA	0321253039	3.1
			0321264012	1.46
		HYLEBOS MARINA Total		4.56
	23	DON OLINE AUTOFLUFF SITE	0321264057	2.73
		DON OLINE AUTOFLUFF SITE Total		2.73
	24	MODUTECH MARINE	0321264017	0.73
		MODUTECH MARINE	0321264056	4.53
		MODUTECH MARINE Total		5.26
	25	STONE INVESTMENTS	0321264031	0.4
			0321264059	4.88
			0321264067	0.23
			0321264068	0.11
		STONE INVESTMENTS Total		5.62
	26	GENES BARK & TRANSPORT	0321264020	0.81
		GENES BARK & TRANSPORT Total		0.81
	27	CASCADE TIMBER (YARD #1)	0321268000	1.16
			0321268001	7.65
		CASCADE TIMBER (YARD #1) Total		8.81
	28	BUFFELEN	0321264006	13.87
			0321264035	0.88
			0321264042	0.91
			0321351019	1.46

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
	28	BUFFELEN (continued)	0321351044	0.33
3 (cont.)		**BUFFELEN Total**		17.45
	29	MURRAY PACIFIC	0321264018	0.07
			0321264051	3.1
			0321351039	13.42
			0321354049	0.18
		MURRAY PACIFIC Total		16.77
	74	SOL PRO	0321356003	2.3
		SOL PRO Total		2.3
	75	PACIFIC PAPER PRODUCTS	0321352014	2.71
		PACIFIC PAPER PRODUCTS Total		2.71
	76	ACCURATE PACKAGING	0321351051	9.13
		ACCURATE PACKAGING Total		9.13
	77	CARR GOTTSTEIN FOODS	0321351052	7.38
		CARR GOTTSTEIN FOODS Total		7.38
	78	DUCOLON	0321356002	1.89
		DUCOLON Total		1.89
	85	PORT OF TACOMA (#1)	0321356005	0.75
			0321356006	0.9
			0321356007	1.06
		PORT OF TACOMA (#1) Total		2.71
	88	PUGET CHEMCO	0321355006	2.01
		PUGET CHEMCO Total		2.01
	89	R/W INVESTMENTS	0321355001	1.03
			0321355002	2.37
		R/W INVESTMENTS Total		3.4
	91	FIELDS PRODUCTS	0321351031	1.48
			0321351032	2.06
			0321351043	3.04
		FIELDS PRODUCTS Total		6.58
	92	ERIVAN HAUB	0321355003	3.6
			0321355004	3.54
		ERIVAN HAUB Total		7.14
	93	REICHHOLD CHEMICALS	0321355005	50.48
			0321356001	0.58
		REICHHOLD CHEMICALS Total		51.06
	94	SUPERLON PLASTICS	0321351042	3.1
		SUPERLON PLASTICS Total		3.1
	97	CITY OF TACOMA (BUFFELEN DITCH)	0321351029	0.13
			0321351030	0.07

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
4		**CITY OF TACOMA (BUFFELEN DITCH) Total**		0.2
(cont.)	30	CHRISTEL, SOLOMEN (#1)	0321262065	0.19
		CHRISTEL, SOLOMEN (#1) Total		0.19
	31	ALLEN, JOHN	0321262061	0.11
		ALLEN, JOHN Total		0.11
	32	CHRISTEL, SOLOMEN (#2)	0321262030	0.14
		CHRISTEL, SOLOMEN (#2) Total		0.14
	33	PORT OF TACOMA AUTO BODY	0321262029	0.31
		PORT OF TACOMA AUTO BODY Total		0.31
	34	SFD DEMO'D	0321262087	0.15
		SFD DEMO'D Total		0.15
	35	WHIRLWIND PROPERTIES	0321262022	0.09
		WHIRLWIND PROPERTIES Total		0.09
	36	CITY OF TACOMA (2916 MARINE VIEW DR)	0321262080	0.6
		CITY OF TACOMA (2916 MARINE VIEW DR) Total		0.6
	37	NORTH SHORE RESTAURANT OFFICE	0321266005	0.88
		NORTH SHORE RESTAURANT OFFICE Total		0.88
	38	TOPE TRACTOR	0321266004	0.51
		TOPE TRACTOR Total		0.51
	39	COSKI SAMPSON MARINE	0321262137	0.03
		COSKI SAMPSON MARINE Total		0.03
	41	SOUND REFINING	0321263000	11.63
			0321263011	0.13
			0321263012	0.25
			0321264004	8.28
			0321264046	8.63
			0321264048	2.86
			2275200200	2.48
			2275200210	11.7
		SOUND REFINING Total		45.96
	42	AIRO SERVICES	0321262062	2.15
			0321262136	0.74
		AIRO SERVICES Total		2.89
	43	EXECUTIVE MARINE SERVICES	0321262110	0.08
			0321262138	0.68
			0321263025	0.23
		EXECUTIVE MARINE SERVICES Total		0.99
	44	CITY OF TACOMA (STEAM PLANT)	0321263036	16.84
			2275200220	1.58
		CITY OF TACOMA (STEAM PLANT) Total		18.42

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
4 (cont.)	45	CITY OF TACOMA (FIRE DEPT)	2275200430	0.33
			2275200470	0.11
		CITY OF TACOMA (FIRE DEPT) Total		0.44
	46	PORT OF TACOMA (1123 TAYLOR WAY)	0321363036	11.6
			5000350050	2.25
		PORT OF TACOMA (1123 TAYLOR WAY) Total		13.85
	47	TAYLOR WAY PROPERTIES	0321263040	9.21
			0321267001	1.63
			0321267002	2.03
			0321267003	4.81
			0321267004	2.7
		TAYLOR WAY PROPERTIES Total		20.38
	48	JOSEPH SIMON & SONS	0321263030	5.82
		JOSEPH SIMON & SONS Total		5.82
	49	NORDLUND BOATBUILDING	0321264054	1.13
		NORDLUND BOATBUILDING Total		1.13
	50	CENEX AG	0321264008	8.58
		CENEX AG Total		8.58
	62	VANCE LIFT TRUCK	2275200371	0.28
		VANCE LIFT TRUCK Total		0.28
	63	ARCHITECTURAL SERVICES AND KITE SALES	2275200420	0.32
		ARCHITECTURAL SERVICES AND KITE SALES Total		0.32
	64	HEBERT, DAVID	2275200410	0.25
		HEBERT, DAVID Total		0.25
	65	FLAGSHIP-BOBS PIER	2275200400	0.5
		FLAGSHIP-BOBS PIER Total		0.5
	66	PHILADELPHIA QUARTZ	0321263016	4.43
			2275200260	1.83
		PHILADELPHIA QUARTZ Total		6.26
	68	SEAMENS CENTER	5000350060	7.53
		SEAMENS CENTER Total		7.53
	69	CHEMICAL PROCESSORS	0321263003	4.43
			0321263024	3.56
			0321352043	0.19
			0321352044	4.93
			0321352050	0.68
			0321352052	1.53
			0321352053	1.04
			0321352054	2.04
			0321352062	3.32

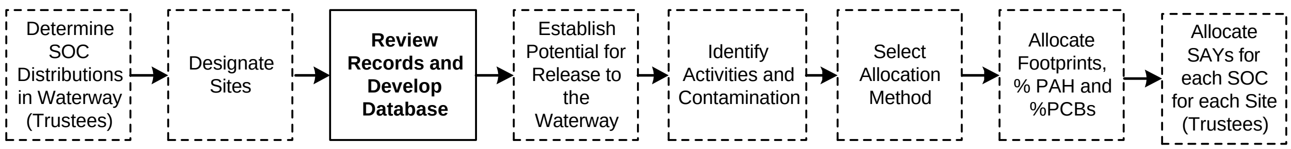
Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
4 (cont.)		**CHEMICAL PROCESSORS Total**		21.72
	73	ANGELES METAL SYSTEMS	0321352063	1.66
		ANGELES METAL SYSTEMS Total		1.66
	79	AOL EXPRESS	0321263042	10.58
			0321353042	4.08
		AOL EXPRESS Total		14.66
	80	LEVY, ROBERT E.	2275200440	0.03
		LEVY, ROBERT E. Total		0.03
	95	CITY OF TACOMA (#1)	0321263002	6.56
			0321263013	3.94
			0321263026	0.55
			0321352023	7.11
		CITY OF TACOMA (#1) Total		18.16
5	40	KELBAUGH PROPERTIES	0321262047	0.14
		KELBAUGH PROPERTIES Total		0.14
	51	3138 MARINE VIEW DR	5000350432	64.86
		3138 MARINE VIEW DR Total		64.86
	52	SPECIALTY MACHINE SHOP	2275200150	0.41
		SPECIALTY MACHINE SHOP Total		0.41
	53	CHINOOK LANDING MARINA	5000350431	7.75
		CHINOOK LANDING MARINA Total		7.75
	54	MARINE VIEW DRIVE #1	2275200081	24.51
		MARINE VIEW DRIVE #1 Total		24.51
	55	OLE & CHARLIE'S MARINA	0321275027	2.12
			0321275028	1.57
			0321275029	0.24
			0321275030	1.79
		OLE & CHARLIE'S MARINA Total		5.72
	56	AK-WA SHIPBUILDING	5000350013	74.24
		AK-WA SHIPBUILDING Total		74.24
	57	OCCIDENTAL	2275200040	6.27
			2275200050	4.18
			2275200510	4.59
			2275200520	0.03
			2275200560	20.89
		OCCIDENTAL Total		35.96
	59	U.S. NAVAL RESERVE	2275200502	9.9
			2275200532	0.71
			5000350021	14.86
		U.S. NAVAL RESERVE Total		25.47

Table 2–3
SITES SUBJECT TO ALLOCATION, TAX PARCELS, AND AREAS

Segment*	Site Number - Map Reference*	Site Name	Tax Parcel	Parcel Size (Acres)
	60	PORT OF TACOMA (9533 E. 11TH ST)	5000350040	8.11
		PORT OF TACOMA (9533 E. 11TH ST) Total		8.11
	86	COMMENCEMENT BAY MARINA (OLD)	0321271527	0.04
		COMMENCEMENT BAY MARINA (OLD) Total		0.04

2.2 REVIEW RECORDS AND DEVELOP DATABASE



An equitable allocation to companies and persons along the Hylebos Waterway is dependent on data of reasonable completeness and accuracy. Ninety-two potential sites were identified. Many of these sites have had multiple owners and multiple tenants. Some operations included several activities that had the potential to contaminate the Waterway and some of these operations dated back to the 1920's.

The data used for this study were compiled from the four principal sources described below. As noted there is considerable overlap for the sources.

- A preliminary review by Robert Kondrat for NOAA of the files for a subset of the sites. The review was of over 3600 documents obtained from NOAA files, Washington Department of Ecology (Ecology), USEPA, and the Tacoma Public Library.

- A review of Ecology files by EcoChem for those sites not included in NOAA's preliminary review. Because Ecology is the primary regulator for the majority of the industrial facilities in Hylebos Waterway, EcoChem reviewed the files at Ecology (Southwest Regional Office in Lacey, WA). A list of site addresses was compiled, and the files retrieved by Ecology personnel. EcoChem reviewed the files and had documents, which were relevant to the allocation process, copied.

- Potentially Responsible Party (PRP) Notebooks. This source included notebooks for 118 PRPs. The notebooks contained copies of documents that were obtained from the review of USEPA files.

- An independent assessment of USEPA files by EcoChem. As part of the review of the PRP notebooks, EcoChem reviewed USEPA files for 14 of the identified PRPs. Additional references in the USEPA files were noted by EcoChem beyond those found in the PRP notebooks. It was also noted that the files maintained by USEPA were not complete as to discharges, spill reports and clean up actions that would have been handled by Ecology. After this review, the files at Ecology were determined to be the primary source of information.

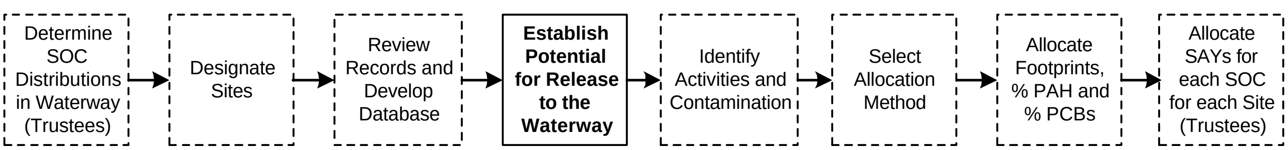
A relational database management system was constructed to facilitate the organization and management of records reviewed for the allocation process. The Hylebos Waterway Data Management System (HWDMS) was designed to manage data related to the sites, property owners, tenants, activities, pathways, contamination, and substances of concern associated with the Hylebos Waterway. The information contained in the HWDMS, in conjunction with the outlined allocation process, provides the foundation upon which the allocation results are built.

Within this database, 20 inter-related tables contain 150 fields of information. These records provide descriptions of industrial activities and associated SOC measurements or releases noted from the document review. The database allows for the tracking of the information back to the source document.

During the data compilation phase of the HWDMS, rules were developed to provide for consistent transcription and storage of the information gathered from the four principal sources. Once the data was uploaded to the database, automated procedures could be performed which reorganized and created associations among the various types of data within the database. From the HWDMS, a variety of tables, lists, and reports were generated to assist in the information review. Three reports from the database are provided in the Appendices. First, the "Site Activity Report" (**Appendix 2**) provides a listing of sites and activities that occurred on the site, which may have released one or more SOCs to the Waterway. Second, the "Site Contamination Report" (**Appendix 3**) provides a listing of sites and any on-site SOC contamination that was noted during the file review. The third report, "Trigger Report" (**Appendix 4**) combines the activity information from **Appendix 2** with the site contamination information in **Appendix 3**. A list of the references used in developing the SOC associations and allocations to each site is provided in the **Hylebos Waterway Natural Resource Damage Settlement Proposal Supporting Documents**.

The databases developed for this report are easily expanded. As additional information is obtained during the public comment period it can be added and used to assess whether any changes in the allocations are appropriate. The databases can also be used (in the next phase) to address the allocation to specific PRPs, where more than one PRP exists for a given site.

2.3 ESTABLISH POTENTIAL FOR RELEASE TO THE WATERWAY



A three step process was used to determine if a site was subject to allocation. This process is illustrated in **Figure 2-3**. First, there must be clear evidence of a pathway for process water, surface water, groundwater, or sediment to travel from the site to the Hylebos Waterway. All sites adjacent to the Waterway were assumed to have such a pathway. Evidence also showed that at least some portion of the sites not immediately adjacent to the Waterway had a pathway at least some time during their period of operation. Those sites in the area of consideration and not adjacent to the Hylebos Waterway, which were assumed to drain to other than the Hylebos, are listed in **Table 2-4**. Second, the evidence must show that some activity was conducted at the site which was reasonably likely to have involved an SOC or to have mobilized or otherwise exacerbated the release of an SOC to the Waterway. Third, there must be reasonable evidence that the SOC was present on site or was released to the Waterway as the result of activities undertaken at the site.

Figure 2-3
FACTORS CONSIDERED TO TRIGGER ALLOCATION TO A SITE

1. Pathway. Is there a pathway for process water, surface water, groundwater, or sediment to travel from the site to the Hylebos Waterway	Yes/No
2. Activity. Was an activity conducted at the site that is a likely source of an SOC or which resulted in the release of a chemical likely to exacerbate the impact of an SOC.	Yes/No
3. Evidence of Contamination	
a. NPDES violations	Yes/No
b. Surface water contamination	Yes/No
c. Groundwater contamination	Yes/No
d. Soil or sediment contamination	Yes/No
e. Sediment "footprint" in very close proximity to site.	Yes/No

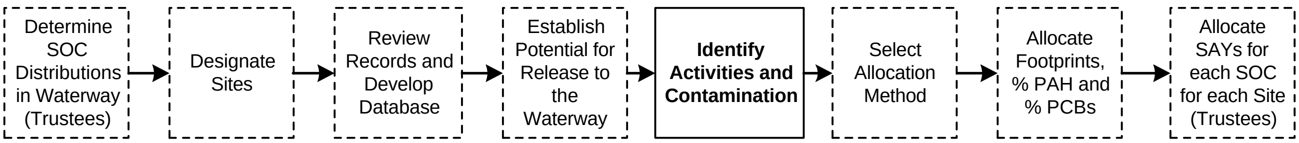
Do not proceed unless the answers to 1 and 2 are **Yes**,
And the answer to 3a, b, c, d, or e is **Yes**.

Table 2-4
SITES NOT ADJACENT TO THE WATERWAY WITH NO KNOWN PATHWAY

Segment	Site Name	Map Reference
1	CITY OF TACOMA (#2)	96
	PORT OF TACOMA (#2)	84
	PORT OF TACOMA (#3)	83
2	CITY OF TACOMA (2100 TAYLOR WAY)	99
3	ACCURATE PACKAGING	76
	DUCOLON	78
	ERIVAN HAUB	92
	FIELDS PRODUCTS	91
	PACIFIC PAPER PRODUCTS	75
	PORT OF TACOMA (#1)	85
	PUGET CHEMCO	88
	R/W INVESTMENTS	89
	REICHHOLD CHEMICALS	93
	SOL PRO	74
4	ANGELES METAL SYSTEMS	73
	CHEMICAL PROCESSORS	69
	FLAGSHIP-BOBS PIER	65
	HEBERT, DAVID	64
	SEAMENS CENTER	68
	VANCE LIFT TRUCK	62

It is recognized that this three step process may exclude some contributors to the Waterway because of lack of information. This is most likely for activities that took place in the earlier years of industrial activity. This could mean that more recent operations are captured by this allocation approach while earlier operations are excluded. It is not the intent of this allocation to exclude any contributors of contamination. As additional information is made available concerning activities, pathways, and contamination it is anticipated that the list of sites subject to allocation will change. Thus, changes to the NRDA could occur based on public review and comment.

2.4 IDENTIFY ACTIVITIES AND CONTAMINATION



Activities are site operations that ***could*** result in releases to the Hylebos Waterway of specific SOCs or combination of SOCs (e.g., slag related metals). The identification of activities and the quantification of releases associated with each activity is highly dependent on the available data.

Table 2-5 presents a list of those activities identified along the Hylebos Waterway, the SOCs associated with those activities, and references for the associations. **Appendix 2** lists the activities that were associated with each site and provides the references where the activities were noted. **Appendix 3** is a listing of SOC contamination noted during the record review for each site. **Appendix 4** lists those sites which passed all three parts of the trigger, combining the activity information from **Appendix 2** with the site contamination information in **Appendix 3**, for those sites that are believed to drain or to have drained to the Hylebos Waterway.

Table 2-5
ACTIVITIES AND ASSOCIATED SOCs

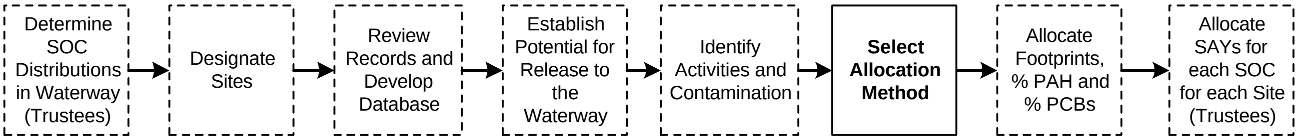
Activity	Associated SOCs	Reference *
AQUEOUS BASED WOOD PRESERVATIVE USE/STORAGE	PCP	52
ARSENIC TREATED DRYDOCK	As	120
ASARCO SLAG STORAGE OR LANDFILLING	As, Cd, Cu, Pb, Sb, Zn	296
ASARCO SLAG USED AS BALLAST ON LOG SORT YARD	As, Cd, Cu, DMP, Pb, Sb, Zn	296, 317
ASARCO SLAG USED AS BALLAST ON OTHER THAN LOG SORT YARD	As, Cd, Cu, Pb, Sb, Zn	296
ASPHALT BATCH PLANT	PAH	314
ASR GENERATION/STORAGE	As, BBPH, BEPH, Cd, Cu, DOPH, DMPH, Hg, Ni PAH, Pb, PCB, Zn	302, 303, 334
ASR USED AS FILL	As, BBPH, BEPH, Cd, Cu, DOPH, DMPH, Hg, Ni, PAH, Pb, PCB, Zn	302, 303, 334
AST BUNKER C	PAH	334
AST DIESEL	PAH	334
AST GASOLINE	PAH	334
AST WASTE OIL	PAH	334
BARK/WOODCHIP STORAGE (NO ASARCO SLAG)	DMP	317
CHLORINE MANUFACTURING BY ELF	Cr, CU, HCB, HCBD, Ni, TCB	7, 220, 222, 223
CHLORINE MANUFACTURING BY OCCIDENTAL	HCB, HCBD, mDCB, oDCB, Pb, pDCB, TCB	7, 174
DISCHARGE OF MACHINE SHOP METAL SHAVINGS	Cr, Cu, Ni	299, 300
DISPOSAL/STORAGE OF CHARCOAL	PAH	307
EXPOSED OILY FLOORS OR RAGS	PAH	334
EXPOSED ZINC ANODES	Zn	46
EXTENSIVE VEHICLE OPERATIONS OR WASHING FACILITIES	PAH	16
HYDRAULIC OIL LEAKAGE/SPILLS	PAH	334
HYDROCARBON BASED WOOD PRESERVATIVE USE/STORAGE	PAH, PCP	82
KAISER AIR POLLUTION CONTROL DUST/ROOF DUST	Cu, PAH, Pb, Zn	7, 301
KAISER WET SCRUBBER SLUDGE	Cu, PAH, Pb, Zn	7, 49
LANDFILLING OF SLAG MATERIAL AT OCCIDENTAL	Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Zn	276
LANDFILLING OFF-SPECIFICATION MINERAL FIBER FROM U.S. GYPSUM	As, Cd, Cr, Cu, Pb, Sb, Zn	64, 297
LANDFILLING OHIO FERRO ALLOY SMELTER SLAG	Cr	298
LANDFILLING U.S. GYPSUM BAGHOUSE DUST	As, Cd, Cr, Cu, Pb, Sb, Zn	64, 297
LANDFILLING USED SANDBLAST GRIT	Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, TBT, Zn	96, 309, 316
LEAD/GRAPHITE SPENT ANODE STORAGE/DISPOSAL	Pb	137
LOG SORT YARD WITHOUT ASARCO SLAG USED AS BALLAST	DMP	317
MALFUNCTIONING OIL/WATER SEPARATOR	PAH	334
MANUFACTURING PENITE	Ag, As, Cd, Cu, Hg, Pb, Sb, Zn	112
MANUFACTURING ROCK WOOL	As, Cd, Cr, Cu, Pb, Sb, Zn	64, 297
MERCURY ARC RECTIFIER OPERATION	Hg	310

Table 2-5
ACTIVITIES AND ASSOCIATED SOCs

Activity	Associated SOCs	Reference *
OCCIDENTAL RECLAMATION FILL	HCB, HCBD, mDCB, oDCB, Pb, pDCB, TCB	7, 174
PAINTING BOATS OR MARINE VESSELS	Cr, Cu, Hg, Pb, TBT, Zn	309, 319
PCB CONTAMINATED OIL SPILL	PCB	-
PCB TRANSFORMER USE	PCB	-
PCBs FROM SHIP MAINTENANCE	PCB	122
PETROLEUM BLENDING (TETRA-ETHYL LEAD)	PAH, Pb	149
PETROLEUM LEAKS FROM SHIP MAINTENANCE & REPAIRS	PAH	334
PETROLEUM LEAKS/SPILLS	PAH	334
PETROLEUM REFINING	PAH	313
PETROLEUM TRANSPORTING AND STORAGE IN LEAKING CONTAINERS/DRUMS	PAH	334
PRESSURE WASHING OF PAINTED BOATS OR VESSELS	Cr, Cu, Hg, PAH, Pb, TBT, Zn	102, 309, 319
PRODUCTION AND STORAGE OF POLYETHYLENE PIPING	BBPH, BEPH, DMPH	304
PRODUCTION OR REPACKAGING OF DDT	DDD, DDE, DDT	305
PULP MILL OPERATIONS	PAH	333
RECYCLING OF PCB TRANSFORMERS	PCB	288
REFURBISHING CHEMICAL CYLINDERS	Cd	184
SANDBLASTING USING COPPER SLAG FOR OTHER THAN BOATS OR VESSELS	Ag, As, Cd, Cr, Cu, Ni, Pb, Sb, Zn	316, 318
SANDING OR SANDBLASTING OF PAINTED BOATS OR VESSELS	Ag, As, Cd, Cr, Cu, Hg, Ni, PAH, Pb, Sb, TBT, Zn	96, 102, 309, 316
SHIP DISMANTLING	PAH, PCB	122, 320
STORAGE AND/OR RECYCLING OF WASTE OILS CONTAINING PCBs	PAH, PCB	312
STORAGE OF LEAD BATTERIES	Pb	311
STORAGE OF SPENT SANDBLASTING GRIT (COPPER SLAG)	Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, TBT, Zn	96, 309, 316
STORAGE OF SPENT SANDBLASTING GRIT (NICKEL SLAG)	Ni	-
UNCOVERED COAL STORAGE	PAH	-
UST BUNKER C	PAH	334
UST DIESEL	PAH	334
UST GASOLINE	PAH	334
UST WASTE OIL	PAH	334
VEHICLE RECYCLING	As, BBPH, BEPH, Cd, Cu, DMPH, Hg, Ni, PAH, Pb, PCB, Zn	302, 303, 334
WASTE WATER DISCHARGE FROM SOUND REFINING	Ag, As, Cd, Cr, Cu, Hg, Ni, PAH, Pb, PCP, Zn	158, 181, 183
ZINC SULFATE USE	Zn	204

3.0 ALLOCATION

3.1 SELECT ALLOCATION METHOD



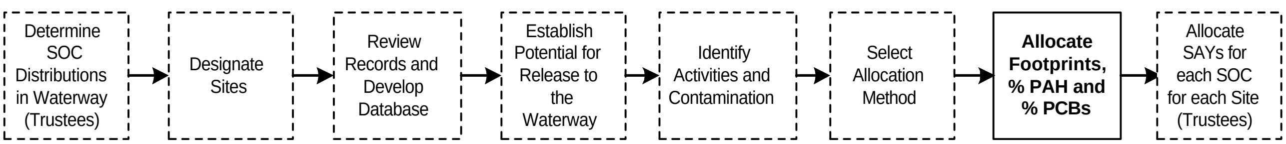
Section 3 discusses the specific methodology used to allocate SAYs for each SOC. It also presents the results of the allocation process for each SOC and each site. The final result is a distribution of SAYs to each site in proportion to the contribution of SOCs from that site to the Waterway.

The following three methods were used to allocate SAYs to sites:

- Allocation by Unique Footprint
- Allocation by Mass Loading
- Allocation by Mass Loading of Footprints.

The choice of the method is based on the quality and quantity of the information available. The intent was to choose the most equitable method. This sometimes results in different methods being applied to different SOCs originating at the same site. A description of each step and the results obtained is provided below. The final step in the allocation process is to total the SAYs for each SOC originating at each site. This final step will be performed by NOAA based on the information in this report.

3.2 ALLOCATE FOOTPRINTS, PERCENT PAH AND PERCENT PCBs



After selection of the allocation method, the information collected in the database was used to assign proportional responsibility of SAYs. Some footprints were assigned to specific sites or to two or more sites. For PAHs and PCBs, the mass loading approach was used. The methodology and results of this allocation are presented in **Sections 3.3** through **3.5**.

3.3 ALLOCATION BY UNIQUE FOOTPRINT

A large subset of the SOCs can be allocated based on the presence of contamination immediately offshore of the site (or discharge point from the site to the Waterway). This method is based on the premise that the highest concentration of SOCs will be found close to the site. It recognizes that lesser concentrations of SOCs could be found at distances from the site including areas immediately offshore from other sites. However the difficulty of tracing these contaminants back to their sources and the likelihood that sources closer to the footprints dominate are believed to justify neglecting the diminution of impact with distance when the link between a site and a footprint is clear.

The following criteria were used in assigning footprints to sites:

- The footprint must be within or immediately adjacent to the tax parcel boundary of the paired site.
- The paired site must have an activity that triggers the SOC in question. The footprint may not significantly overlap another site boundary unless that site does not trigger for that SOC.

This method was deemed appropriate for all SOCs with the exceptions of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

Maps of the Waterway which show the distribution of injury for each SOC are provided in **Appendix 1**. These maps also provide an identification number for each footprint. **Table 3-1** lists the footprint ID numbers and the sites to which they are allocated.

Table 3-1

ALLOCATION OF UNIQUE FOOTPRINT LISTED BY SITE NAME

Segment	Site Name	SOC	Footprint ID
1	JONES & GOODELL BOATBUILDING	MERCURY	HG2
	MANKE LUMBER	ARSENIC	AS2
	TACOMA BOATBUILDING	ARSENIC	AS4
		ARSENIC	AS5
		CHROMIUM	CR1
		COPPER	CU2
		LEAD	PB1
		ZINC	ZN2
		ZINC	ZN3
	WASSER WINTERS	ANTIMONY	SB1
		ARSENIC	AS1
2	DUNLAP TOWING	2,4-DIMETHYLPHENOL	DMP2
		ARSENIC	AS6
		ZINC	ZN4
	ELF ATOCHEM	ARSENIC	AS8
		HEXACHLOROBENZENE	HCB1
		MERCURY	HG8
		P,P'-DDD	DDD2
		P,P'-DDD	DDD3
		P,P'-DDE	DDE5
		P,P'-DDT	DDT1
		ZINC	ZN6
	GENERAL METALS OF TACOMA	1,3-DICHLOROBENZENE	MDCB6
		ARSENIC	AS7
		ARSENIC	AS9
		CADMIUM	CD1
		CADMIUM	CD2
		CHROMIUM	CR2
		CHROMIUM	CR3
		DI-N-OCTYL-PHTHALATE	DOPH3
		DI-N-OCTYL-PHTHALATE	DOPH5
		MERCURY	HG6
		MERCURY	HG7
		ZINC	ZN5
	US GYPSUM	COPPER	CU3
		LEAD	PB2
		ZINC	ZN7
3	BUFFELEN	COPPER	CU6

Table 3-1
ALLOCATION OF UNIQUE FOOTPRINT LISTED BY SITE NAME

Segment	Site Name	SOC	Footprint ID
	DON OLINE AUTOFLUFF SITE	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH6
3 (Cont.)	DON OLINE AUTOFLUFF SITE	CADMIUM	CD3
		DI-N-OCTYL-PHTHALATE	DOPH8
		LEAD	PB3
		MERCURY	HG10
		NICKEL	NI1
		ZINC	ZN8
	HYLEBOS MARINA	ANTIMONY	SB5
	MODUTECH MARINE	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH7
	MURRAY PACIFIC	COPPER	CU5
		ZINC	ZN9
4	SOUND REFINING	ARSENIC	AS11
		ARSENIC	AS13
		CADMIUM	CD4
		COPPER	CU7
		LEAD	PB4
		SILVER	AG2
		ZINC	ZN11
	TAYLOR WAY PROPERTIES	ARSENIC	AS12
		CHROMIUM	CR6
		COPPER	CU8
		LEAD	PB5
		ZINC	ZN12
5	3138 MARINE VIEW DR	MERCURY	HG14
		MERCURY	HG15
	AK-WA SHIPBUILDING	ARSENIC	AS16
		CHROMIUM	CR11
		COPPER	CU12
		ZINC	ZN16
	OCCIDENTAL	1,4-DICHLOROBENZENE	PDCB1
		ANTIMONY	SB11
		ARSENIC	AS14
		ARSENIC	AS15
		CHROMIUM	CR8
		CHROMIUM	CR9
		COPPER	CU9
		COPPER	CU10
		COPPER	CU11

Table 3-1

ALLOCATION OF UNIQUE FOOTPRINT LISTED BY SITE NAME

Segment	Site Name	SOC	Footprint ID
		LEAD	PB7
		LEAD	PB8
5		LEAD	PB9
5 (Cont.)	OCCIDENTAL (Continued)	MERCURY	HG16
		MERCURY	HG17
		NICKEL	NI2
		NICKEL	NI3
		NICKEL	NI4
		PENTACHLOROPHENOL	PCP1
		ZINC	ZN13
		ZINC	ZN14
		ZINC	ZN15

Table 3-1a

ALLOCATION OF UNIQUE FOOTPRINT, LISTED BY SOC AND SITE NAME

SOC	Site Name	Footprint ID	Segment
1,3-DICHLOROBENZENE	GENERAL METALS OF TACOMA	MDCB6	2
1,4-DICHLOROBENZENE	OCCIDENTAL	PDCB1	5
2,4-DIMETHYLPHENOL	DUNLAP TOWING	DMP2	2
ANTIMONY	WASSER WINTERS	SB1	1
	HYLEBOS MARINA	SB5	3
	OCCIDENTAL	SB11	5
ARSENIC	MANKE LUMBER	AS2	1
	TACOMA BOATBUILDING	AS4	1
	TACOMA BOATBUILDING	AS5	1
	WASSER WINTERS	AS1	1
	DUNLAP TOWING	AS6	2
	ELF ATOCHEM	AS8	2
	GENERAL METALS OF TACOMA	AS7	2
	GENERAL METALS OF TACOMA	AS9	2
	SOUND REFINING	AS11	4
	SOUND REFINING	AS13	4
	TAYLOR WAY PROPERTIES	AS12	4
	AK-WA SHIPBUILDING	AS16	5
	OCCIDENTAL	AS14	5
	OCCIDENTAL	AS15	5
BIS (2-ETHYLHEXYL) PHTHALATE	DON OLINE AUTOFLUFF SITE	BEPH6	3
	MODUTECH MARINE	BEPH7	3
CADMIUM	GENERAL METALS OF TACOMA	CD1	2
	GENERAL METALS OF TACOMA	CD2	2
	DON OLINE AUTOFLUFF SITE	CD3	3
	SOUND REFINING	CD4	4
CHROMIUM	TACOMA BOATBUILDING	CR1	1
	GENERAL METALS OF TACOMA	CR2	2
	GENERAL METALS OF TACOMA	CR3	2
	TAYLOR WAY PROPERTIES	CR6	4
	AK-WA SHIPBUILDING	CR611	5
	OCCIDENTAL	CR8	5
	OCCIDENTAL	CR9	5
COPPER	TACOMA BOATBUILDING	CU2	1
	US GYPSUM	CU3	2
	BUFFELEN	CU6	3
	MURRAY PACIFIC	CU5	3
	SOUND REFINING	CU7	4
	TAYLOR WAY PROPERTIES	CU8	4
	AK-WA SHIPBUILDING	CU12	5
	OCCIDENTAL	CU9	5
	OCCIDENTAL	CU10	5

COPPER (continued)	OCCIDENTAL	CU11	5
DI-N-OCTYL-PHTHALATE	GENERAL METALS OF TACOMA	DOPH3	2
	GENERAL METALS OF TACOMA	DOPH5	2
	DON OLINE AUTOFLUFF SITE	DOPH8	3
HEXACHLOROBENZENE	ELF ATOCHEM	HCB1	2
LEAD	TACOMA BOATBUILDING	PB1	1
	US GYPSUM	PB2	2
	DON OLINE AUTOFLUFF SITE	PB3	3
	SOUND REFINING	PB4	4
	TAYLOR WAY PROPERTIES	PB5	4
	OCCIDENTAL	PB7	5
	OCCIDENTAL	PB8	5
	OCCIDENTAL	PB9	5
MERCURY	JONES & GOODELL BOATBUILDING	HG2	1
	ELF ATOCHEM	HG8	2
	GENERAL METALS OF TACOMA	HG6	2
	GENERAL METALS OF TACOMA	HG7	2
	DON OLINE AUTOFLUFF SITE	HG10	3
	3138 MARINE VIEW DR	HG14	5
	3138 MARINE VIEW DR	HG15	5
	OCCIDENTAL	HG16	5
	OCCIDENTAL	HG17	5
NICKEL	DON OLINE AUTOFLUFF SITE	NI1	3
	OCCIDENTAL	NI2,NI3,NI4	5
P,P'-DDD	ELF ATOCHEM	DDD2	2
	ELF ATOCHEM	DDD3	2
P,P'-DDE	ELF ATOCHEM	DDE5	2
P,P'-DDT	ELF ATOCHEM	DDT1	2
PENTACHLOROPHENOL	OCCIDENTAL	PCP1	5
SILVER	SOUND REFINING	AG2	4
ZINC	TACOMA BOATBUILDING	ZN2	1
	TACOMA BOATBUILDING	ZN3	1
	DUNLAP TOWING	ZN4	2
	ELF ATOCHEM	ZN6	2
	GENERAL METALS OF TACOMA	ZN5	2
	US GYPSUM	ZN7	2
	DON OLINE AUTOFLUFF SITE	ZN8	3
	MURRAY PACIFIC	ZN9	3
	SOUND REFINING	ZN11	4
	TAYLOR WAY PROPERTIES	ZN12	4
	AK-WA SHIPBUILDING	ZN16	5
	OCCIDENTAL	ZN13 & ZN14	5
	OCCIDENTAL	ZN15	5

3.4 MASS LOADING ALLOCATION METHOD

The mass loading allocation method is used when the footprint method is not feasible. This occurs when the footprints blend together such that there is no clear link between a site and a specific hot spot (e.g., for PAHs and PCBs). The following is a description of the components of the allocation methodology which was developed to allow the proportional assignment of SAYs to sites when the footprints blend together.

3.4.1 Waterway Segments

To aid in the spatial correlation of the contaminants within the Waterway, five segments of the Waterway were established. Dividing the Hylebos Waterway into segments was first used in the Remedial Investigation (Tetra Tech 1985). Boundaries of segments within large areas such as the Hylebos Waterway were established by Tetra Tech to define "major zones of varying chemical contamination" with the recognition that contamination from one group of chemicals sometimes extended well past segment boundaries.

Ecology used the same segments in their *Source Control Action Plan for the Commencement Bay – Nearshore/Tideflats* (October 1987) with the exception that the outermost segment (Segment 6) was eliminated. This study has adopted the segments common to the Ecology and Tetra Tech studies with the exception that Segment 5 is extended to encompass the westernmost sites in the Waterway and the segment boundaries were adjusted to accommodate the property boundaries as determined from the Pierce County tax lot maps. This last adjustment involves a choice of whether to place some sites in one segment or the adjacent segment. Since for some SOCs this choice has the potential to influence the allocation, the choice was based on the segment most likely to be influenced by the site activities according to an evaluation of the following factors:

- Location of the nearest site boundary
- Location of NPDES discharges or other significant source
- Length of site shoreline in one (original) segment compared to the adjacent segment
- Business association with adjacent sites

The segments resulting from this evaluation are represented on the map in **Figure 2-2** by lines dividing the Waterway. It should be noted that two sites [Kaiser Aluminum and Chemical, and Port of Tacoma (3002 Taylor Way)] have their primary discharge points at the boundary between two segments (i.e., "Kaiser Ditch"). These sites are assumed to discharge equally to the two adjacent segments.

3.4.2 Distribution Factors

Numerous processes have been identified which cause the distribution of contaminants within (and beyond) the Waterway. This includes advective transport by tidal currents and to a lesser extent the flow of Hylebos Creek, dredging, and ship scour. The impact of these processes on the redistribution of SOCs depends on the initial location of the SOC (e.g., above or below the range the flow of Hylebos Creek, dredging, and ship scour. The impact of these processes on the redistribution of SOCs depends on the initial location of the SOC (e.g., above or below the range of tidal influence and within or beyond the influence of Hylebos Creek) and the form of the SOC (floating, dissolved, or solid).

An evaluation of the redistribution of each specific source of SOCs was not within the scope of this study. However a broad brush approach was deemed desirable and the Remedial Investigation (RI) by Tetra Tech was identified as an appropriate source of data[1]. The RI clearly demonstrated that chemicals released in one segment would migrate to adjacent segments and beyond. This is best illustrated by examining the distribution of contaminants in the Waterway that are largely traced to one site or a group of closely spaced sites. For example, much arsenic is believed to result from sites in Segments 1 and 2, much high molecular weight PAH from the Kaiser ditch at the boundary of Segments 1 and 2, and much total chlorobutadienes from Segment 5. The distribution of those constituents in the Waterway as developed during the RI is shown on **Figure 3-1**. This figure shows the distribution based on separate plots of dry weight concentration and concentrations normalized to particle size and total organic carbon.

A nonlinear regression analysis was performed on the dry weight normalized concentrations to determine the diminution of impact with distance from the source. The regression analysis is described in **Appendix 5**. Because the data become less reliable with distance, the analysis assumed that contamination originating in one segment would not spread further than the adjacent segment(s). Contamination originating in Segment 1 was assumed to remain in Segments 1 and 2; the portion potentially entering Hylebos Creek on an incoming tide was assumed to flow back to Segments 1 and 2 on an outgoing tide. The portion of contamination from Segment 5 that could be transported seaward into Commencement Bay is assumed to be lost from the system. The distribution factors calculated from the regression analysis are shown in **Table 3-2**.

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[1] While more recent data is probably appropriate for purposes of allocating remedial costs, the RI data is considered appropriate for allocating historic natural resource damages.

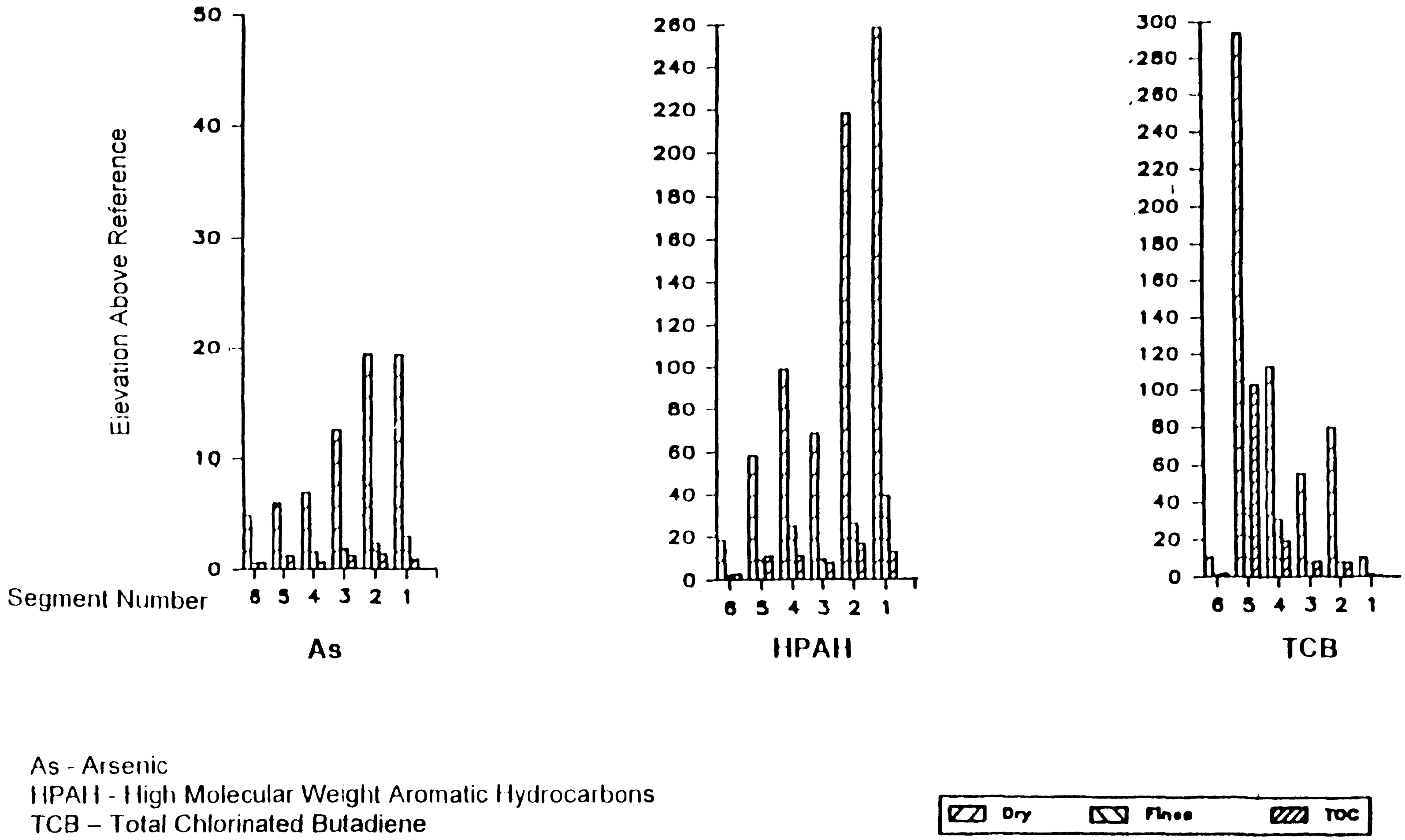
Table 3-2
DISTRIBUTION FACTORS

	Percent Distribution to Neighboring Segments*					
Source Segment	**Commencement Bay**	**5**	**4**	**3**	**2**	**1**
1					25	75
2				20	60	20
3			20	60	20	
4		20	60	20		
5	20**	60	20			

* Segments are numbered sequentially from right to left to correspond with their graphical representation on most figures of the Hylebos Waterway (i.e., Commencement Bay to the left).

** The contribution to Commencement Bay is not considered in this allocation (i.e., no SAYs are allocated based on the release of contaminants to Commencement Bay).

Figure 3-1
ELEVATIONS ABOVE REFERENCE (EAR) HYLEBOS WATERWAY



As - Arsenic
HPAH - High Molecular Weight Aromatic Hydrocarbons
TCB – Total Chlorinated Butadiene

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09/06/00

3.4.3 Contaminant Loading

The final step in the mass loading allocation is the determination of the total loading of an SOC to the Waterway from each site. When the data is available, the most direct method to determine the mass released to the Waterway is based on "flux". The term "flux" applies to the time-rate of release; for example, pounds per day. If the rate is multiplied by the duration (e.g., in days), the pounds (total loading) released to the Waterway can be calculated.

In almost all cases, the data available to determine flux is limited, thus, another method to determine contaminant loading is needed. The objective is to choose the fairest and most quantifiable method consistent with the data. In general, the mass released to the Waterway will be a function of the type of activity, scale, and duration of the activity, and the fate and transport mechanisms for the contaminant. The scale and duration of the activity can be translated potentially into quantifiable terms (e.g. acres and years). The type of activity is not as easily quantified. Fortunately, the absolute quantity of a release is less important than the relative quantity in comparison to other sources of the same SOC. This relative amount can be roughly determined by consulting the general literature and by analyzing site-specific information such as groundwater and surface water data. The fate and transport mechanisms depend on the physical and chemical characteristics of the SOC and the location of the site and pathways by which the SOC could reach the Hylebos Waterway. In some cases the footprints for certain SOCs can be used to estimate the releases of other SOCs with less clearly defined footprints.

Figure 3-2 presents two options available to determine actual or relative amounts of mass loading. **Figures 3-3** and **3-4** describe the Flux Method and Activity Ratings respectively. These methods require consideration of the fate and transport properties illustrated in **Figure 3-5**. Although, for clarity of presentation, these two methods are separately defined, they actually represent different levels of quantification of the same concept.

In practice neither method proved to be sufficiently quantifiable to develop absolute values for the allocation indices. For some sites a complete data set was available. However to completely quantify the allocation it is necessary to have complete data sets for all sites being compared. The existing data does not allow this. The deficiencies are greatest for older activities, activities that varied in scale with time and activities that affected multiple media (i.e., groundwater, surface water, sediments). Nevertheless, the models served as effective “roadmaps” for the development of qualitative or semi-quantitative determinations of unitless allocation indices (index values). These values are intended to represent the relative mass contribution (of specific SOCs) from the sites being compared. The index values have no meaning when comparing different SOCs. Thus, if two sites, each of which are the source of PAHs have index values of 40 and 20, the ratio of their mass contribution is assessed to be 2:1. On the other hand, if one site has an index value of 20 for PAH and another an index value of 20 for PCBs, it does not mean that their mass contributions are the same.

The mass loading allocation approach was provided to each individual involved in the allocation process. Initially, this involved personnel from EcoChem and GeoSphere. The team began by arbitrarily assigning an index value to one of the better known sites. Index values were then developed for other sites relative to the initial site using the mass loading allocation method where individuals assigned different indices. The differences were resolved by considering the factors included in the mass loading allocation method. In many cases, quantitative data were available to compare specific factors (e.g., duration, size). However, the comparison of different activity ratings (**Figure 3-4**) was purely qualitative and involved the professional judgment of the reviewers.

Following the assignment of index values by GeoSphere and EcoChem, the mass loading allocation methodology and the resulting indices were submitted to a review team composed of representative of NOAA, the Washington State Department of Ecology, the USEPA, and Robert Kondrat, a former NOAA employee who had performed file reviews for NOAA regarding major facilities adjacent to the Hylebos Waterway. The reviewers did not specifically disagree with any assigned indices, but did recommend some additional data sources and the re-examination of some assigned index values. This additional data review and rescoring was accomplished, and the resulting index values and allocation results are presented in this report.

Figure 3-2

MASS LOADING ALLOCATION METHOD

For each Substance of Concern choose the best method – depending on data:

Allocation Index	=	Duration Index	x	Flux		
				or		
	=	Size Index	x	Duration Index	x	Activity Index

$$\text{Allocation to Site A} = \frac{\text{Allocation Index for Site A}}{\sum \text{Allocation Indices in Segment}}$$

This assumes all sites for this SOC are in the same segment. For sites in multiple segments see Section 3.4.2 of the report.

Size and Duration Indices:

Size Index Use the size of the site, or area of activity, in acres. If the size has changed, use the weighted size (weighted by years of different size)	Acres
Duration Index Years from start of activity to present (2000) for on-going activities, termination of activity (for activities leaving no residual upland or groundwater contamination) or final cleanup. Use the same weighting for pre-1981 and post-1981 (it is assumed that waste generated prior to 1981 could lead to post-1981 releases).	Years

Fate and Transport:

Whenever any one of the following occurs, it is important to consider the fate and transport characteristics of the SOC:

- The flux or release is measured at a significant distance from the Waterway
- The activity takes place at some distance from the Waterway.
- Releases involving different pathways (surface water, groundwater, and soil/sediment erosion) are being added together or compared.

Figure 3-5 lists the factors to be considered with respect to fate and transport characteristics.

Figure 3-3

FLUX METHOD

In limited cases, data may be available for sites within a given segment which establishes the flux of the substance to the Waterway.

Assuming that the flux can be converted to units of Mass per Unit of Time:

$$\text{Allocation Index} = \text{Duration Index} \times \text{Flux}$$

Figure 3-4

ACTIVITY RATINGS FOR PCBs AND PAHs

This figure is intended to represent an initial screening of the relative ranking of activities with respect to their potential to release PCBs and PAHs. Thus, all other things being equal (e.g. size, duration, degree of case, fate and transport, chemical concentrations, etc.) an activity near the top of the list is expected to result in the release of a greater mass of SOCs than an activity near the bottom of the list. However, where things are not equal the actual mass contribution could be much different than that implied by the order noted in the table.

PCBs Activity	Activity Index
PCB transformer recycling	High
PCB contaminated oil spill	↓
Recycling waste oil	
PCB transformer use	
Ship dismantling	
Vehicle recycling	
ASR used as fill	
ASR generation/storage	
Ship maintenance	
Solvent mobilization of PCB's in the environment	Low

PAHs Activity	Activity Index
Waste piles/ponds	High
Raw material piles	↓
Petroleum refining	
Ship dismantling	
Vehicle recycling	
Recycling waste oil	
Hydrocarbon-based wood preservative use	
Pulp mill operations	
Underground storage tanks	
Above-ground storage tanks	
Equipment use, leaks, and spills	
Petroleum blending	
Ship machinery maintenance and repairs	
ASR used as fill	
ASR generation/storage	
Maintenance oil leaks and spills	
Sanding or sandblasting sea-going vessels	
Pressure-washing sea-going vessels	
Malfunctioning oil water separator	
Solvent mobilization of PAHs in the environment	Low

Figure 3-5
FATE AND TRANSPORT CONSIDERATIONS

Surface Water

Flow path to the Waterway (e.g., distance, velocity)

Presence of free product

Chemical concentration

Potential for volatilization and degradation

Adsorption to sediments

Groundwater

Flow path to the Waterway (e.g., distance, gradient)

Transmissivity of aquifer

Floating or sinking free product

Chemical concentration

Potential for adsorption by aquifer soil

Potential for volatilization and degradation

Mobilization by other chemicals

Mobilization of natural substances

Adsorption to sediments

Sediments

Proximity to ditch, swale, or waterway

Covered or uncovered

Velocity of eroding water

Particle size

Potential to settle before reaching Waterway

3.4.4 Allocation of SAYs to Each Site

If all sources for a particular SOC are in the same segment (or non-adjacent segments), the allocation for that SOC is based on the ratio of the mass released from the site of concern compared to the mass released from the other contributing sites. If contributing sites are present in adjacent segments, the mass loading was distributed within the Waterway as described in **Section 3.4.2** prior to allocating the percentage of SAYs. This mass loading method was used to allocate PCBs and PAHs. The results of the allocation are shown on **Tables 3-3** and **3-4**.

Allocation to multiple sites in different segments of the Waterway is best illustrated by example. Assume the Site A in Segment 1 is assigned an index value of 20 for PAH, while Site B in Segment 2, the only other PAH site, is assigned an index value of 50. To allocate to Site A and B the index value of 20 for Site A is first distributed at 15 (75% of 20) to Segment 1 and 5 (25% of 20) to Segment 2 according to the distribution factors. The index value of 50 for Site B is distributed at 10, 30, and 10 to Segments 1, 2, and 3 respectively (based on the 20%, 60%, and 20% distribution factors.)

The allocation of SAYs in Segment 1 is then determined by adding the distributed index values for each site within each segment and dividing this number by the total distributed index values in each segment (for all sites), as illustrated in **Figure 3-6**. The resulting fraction can then be multiplied by the SAYs in each segment to determine the actual allocation. (This last step is not undertaken in this report; but is performed by NOAA in an accompanying document.)

Figure 3-6

Example of Allocation Using Distribution Factors

a	**Segment**	**5**	**4**	**3**	**2**	**1**
b	Sources of PAHs	None	None	None	Site B	Site A
c	Assigned PAH Index Value	0	0	0	50	20
d	Distributed Index Value for Site A				5	15
e	Distributed Index Value for Site B			10	30	10
f	Sum of Rows d + e			10	35	25
g	Fraction of PAH SAYs Assigned to Site A			0 (0%)	5/35 (14.3%)	15/25 (60%)
h	Fraction of PAH SAYs Assigned to Site B			10/10 (100%)	30/35 (85.7%)	10/25 (40%)

3.5 MASS LOADING FOR FOOTPRINTS ADJACENT TO MORE THAN ONE SITE

For certain SOCs, most but not all hot spots are unambiguously paired with sites. For those clearly matched pairs the allocation is performed according to the methodology described in **Section 3.3**. However, some hot spots are adjacent to more than one source of the SOC. **Table 3-5** identifies those footprints where mass loading could be used to allocate SAYs for individual footprints adjacent to two or more sites.

Table 3-3

PCB Mass Loading Allocation Results

		Map Reference No.	Index Value	PCB Proportional Responsibility				
Segment	**Site Name**		**PCB**	**Segment 1**	**Segment 2**	**Segment 3**	**Segment 4**	**Segment 5**
1	WASSER WINTERS	1	0	0.00%	0.00%	0.00%	0.00%	0.00%
	NORDLUND PROPERTIES	2	0	0.00%	0.00%	0.00%	0.00%	0.00%
	STREICH BROTHERS	3	0	0.00%	0.00%	0.00%	0.00%	0.00%
	1670 MARINE VIEW DRIVE	4	0	0.00%	0.00%	0.00%	0.00%	0.00%
	JONES & GOODELL BOATBUILDING	5	0	0.00%	0.00%	0.00%	0.00%	0.00%
	MANKE LUMBER	6	0	0.00%	0.00%	0.00%	0.00%	0.00%
	TACOMA BOATBUILDING	7	0	0.00%	0.00%	0.00%	0.00%	0.00%
	B&L WOODWASTE LANDFILL	8	0	0.00%	0.00%	0.00%	0.00%	0.00%
	US GYPSUM LANDFILL	9	0	0.00%	0.00%	0.00%	0.00%	0.00%
	WEYERHAEUSER	10	0	0.00%	0.00%	0.00%	0.00%	0.00%
	LONE STAR NORTHWEST	11	0	0.00%	0.00%	0.00%	0.00%	0.00%
	LOUISIANA PACIFIC	12	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA (3002 TAYLOR WAY) SEG 1 (1/2)	13	0	0.00%	0.00%	0.00%	0.00%	0.00%
	KAISER ALUMINUM & CHEMICAL SEG 1 (1/2)	14	10	**30.00%**	**4.68%**	0.00%	0.00%	0.00%
	BONNEVILLE POWER	15	2	**6.00%**	**0.94%**	0.00%	0.00%	0.00%
	USA (#1)	81	0	0.00%	0.00%	0.00%	0.00%	0.00%
	OFF EAST-WEST ROAD #1	82	0	0.00%	0.00%	0.00%	0.00%	0.00%
	3000 BLOCK TAYLOR WAY SITE	87	0	0.00%	0.00%	0.00%	0.00%	0.00%
2	PORT OF TACOMA (3002 TAYLOR WAY) SEG 2 (1/2)	13	0	0.00%	0.00%	0.00%	0.00%	0.00%
	KAISER ALUMINUM & CHEMICAL SEG 2 (1/2)	14	10	**8.00%**	**11.24%**	**6.25%**	0.00%	0.00%
	GENERAL METALS OF TACOMA	16	50	**40.00%**	**56.18%**	**31.25%**	0.00%	0.00%
	OLINE PROPERTIES (1800 MARINE VIEW DR)	17	0	0.00%	0.00%	0.00%	0.00%	0.00%
	US GYPSUM	18	0	0.00%	0.00%	0.00%	0.00%	0.00%
	ELF ATOCHEM	19	15	**12.00%**	**16.85%**	**9.38%**	0.00%	0.00%
	DUNLAP TOWING	20	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PETROLEUM RECLAIMING SERVICES	21	5	**4.00%**	**5.62%**	**3.13%**	0.00%	0.00%
	JONES CHEMICAL	101	0	0.00%	0.00%	0.00%	0.00%	0.00%
3	HYLEBOS MARINA	22	0	0.00%	0.00%	0.00%	0.00%	0.00%
	DON OLINE AUTOFLUFF SITE	23	5	0.00%	**1.87%**	**9.38%**	**2.79%**	0.00%
	MODUTECH MARINE	24	5	0.00%	**1.87%**	**9.38%**	**2.79%**	0.00%
	STONE INVESTMENTS	25	0	0.00%	0.00%	0.00%	0.00%	0.00%
	GENES BARK & TRANSPORT	26	0	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-3
PCB Mass Loading Allocation Results

Segment	Site Name	Map Reference No.	Index Value PCB	PCB Proportional Responsibility Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
	CASCADE TIMBER (YARD #1)	27	0	0.00%	0.00%	0.00%	0.00%	0.00%
3 (cont.)	BUFFELEN	28	2	0.00%	**0.75%**	**3.75%**	**1.12%**	0.00%
	MURRAY PACIFIC	29	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CARR GOTTSTEIN FOODS	77	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SUPERLON PLASTICS	94	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (BUFFELEN DITCH)	97	0	0.00%	0.00%	0.00%	0.00%	0.00%
4	CHRISTEL, SOLOMEN (#1)	30	0	0.00%	0.00%	0.00%	0.00%	0.00%
	ALLEN, JOHN	31	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CHRISTEL, SOLOMEN (#2)	32	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA AUTO BODY	33	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SFD DEMO'D	34	0	0.00%	0.00%	0.00%	0.00%	0.00%
	WHIRLWIND PROPERTIES	35	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (2916 MARINE VIEW DR)	36	0	0.00%	0.00%	0.00%	0.00%	0.00%
	NORTH SHORE RESTAURANT OFFICE	37	0	0.00%	0.00%	0.00%	0.00%	0.00%
	TOPE TRACTOR	38	0	0.00%	0.00%	0.00%	0.00%	0.00%
	COSKI SAMPSON MARINE	39	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SOUND REFINING	41	0	0.00%	0.00%	0.00%	0.00%	0.00%
	AIRO SERVICES	42	2	0.00%	0.00%	**1.25%**	**3.35%**	**1.34%**
	EXECUTIVE MARINE SERVICES	43	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (STEAM PLANT)	44	20	0.00%	0.00%	**12.50%**	**33.52%**	**13.42%**
	CITY OF TACOMA (FIRE DEPT)	45	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA (1123 TAYLOR WAY)	49	0	0.00%	0.00%	0.00%	0.00%	0.00%
	TAYLOR WAY PROPERTIES	47	20	0.00%	0.00%	**12.50%**	**33.52%**	**13.42%**
	JOSEPH SIMON & SONS	48	2	0.00%	0.00%	**1.25%**	**3.35%**	**1.34%**
	NORDLUND BOATBUILDING	49	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CENEX AG	50	0	0.00%	0.00%	0.00%	0.00%	0.00%
	ARCHITECTURAL SERVICES AND KITE SALES	63	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PHILADELPHIA QUARTZ	66	0	0.00%	0.00%	0.00%	0.00%	0.00%
	AOL EXPRESS	79	0	0.00%	0.00%	0.00%	0.00%	0.00%
	LEVY, ROBERT E.	80	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (#1)	95	0	0.00%	0.00%	0.00%	0.00%	0.00%
5	3138 MARINE VIEW DRIVE	51	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SPECIALTY MACHINE SHOP	52	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CHINOOK LANDING MARINA	53	0	0.00%	0.00%	0.00%	0.00%	0.00%
	COMMENCEMENT BAY MARINA (OLD)	86	0	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-3
PCB Mass Loading Allocation Results

Segment	Site Name	Map Reference No.	Index Value PCB	PCB Proportional Responsibility Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
	MARINE VIEW DRIVE #1	54	0	0.00%	0.00%	0.00%	0.00%	0.00%
5	OLE & CHARLIE'S MARINA	55	0	0.00%	0.00%	0.00%	0.00%	0.00%
(cont.)	AK-WA SHIPBUILDING	56	5	0.00%	0.00%	0.00%	**2.79%**	**10.07%**
	OCCIDENTAL	57	30	0.00%	0.00%	0.00%	**16.76%**	**60.40%**
	U.S. NAVAL RESERVE	59	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA (9533 E. 11TH ST)	60	0	0.00%	0.00%	0.00%	0.00%	0.00%
	KELBAUGH PROPERTIES	48	0	0.00%	0.00%	0.00%	0.00%	0.00%
				100.00%	100.00%	100.00%	100.00%	100.00%

Table 3-4

PAH Mass Loading Allocation Results

Segment	Site Name	Map Reference No.	Index Value PAH	PAH Proportional Responsibility Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
1	WASSER WINTERS	1	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	NORDLUND PROPERTIES	2	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	STREICH BROTHERS	3	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	1670 MARINE VIEW DRIVE	4	0	0.00%	0.00%	0.00%	0.00%	0.00%
	JONES & GOODELL BOATBUILDING	5	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	MANKE LUMBER	6	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	TACOMA BOATBUILDING	7	5	**6.16%**	**1.82%**	0.00%	0.00%	0.00%
	B&L WOODWASTE LANDFILL	8	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	US GYPSUM LANDFILL	9	0	0.00%	0.00%	0.00%	0.00%	0.00%
	WEYERHAEUSER	10	5	**6.16%**	**1.82%**	0.00%	0.00%	0.00%
	LONE STAR NORTHWEST	11	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	LOUISIANA PACIFIC	12	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	PORT OF TACOMA (3002 TAYLOR WAY) SEG 1 (1/2)	13	5	**6.16%**	**1.82%**	0.00%	0.00%	0.00%
	KAISER ALUMINUM & CHEMICAL SEG 1 (1/2)	14	25	**30.79%**	**9.11%**	0.00%	0.00%	0.00%
	BONNEVILLE POWER	15	2	**2.46%**	**0.73%**	0.00%	0.00%	0.00%
	USA (#1)	81	0	0.00%	0.00%	0.00%	0.00%	0.00%
	OFF EAST-WEST ROAD #1	82	0	0.00%	0.00%	0.00%	0.00%	0.00%
	3000 BLOCK TAYLOR WAY SITE	87	0	0.00%	0.00%	0.00%	0.00%	0.00%
2	PORT OF TACOMA (3002 TAYLOR WAY) SEG 2 (1/2)	13	5	**1.64%**	**4.37%**	**2.82%**	0.00%	0.00%
	KAISER ALUMINUM & CHEMICAL SEG 2 (1/2)	14	25	**8.21%**	**21.87%**	**14.12%**	0.00%	0.00%
	GENERAL METALS OF TACOMA	16	25	**8.21%**	**21.87%**	**14.12%**	0.00%	0.00%
	OLINE PROPERTIES (1800 MARINE VIEW DR)	17	0	0.00%	0.00%	0.00%	0.00%	0.00%
	US GYPSUM	18	5	**1.64%**	**4.37%**	**2.82%**	0.00%	0.00%
	ELF ATOCHEM	19	10	**3.28%**	**8.75%**	**5.65%**	0.00%	0.00%
	DUNLAP TOWING	20	2	**0.66%**	**1.75%**	**1.13%**	0.00%	0.00%
	PETROLEUM RECLAIMING SERVICES	21	15	**4.93%**	**13.12%**	**8.47%**	0.00%	0.00%
	JONES CHEMICAL	101	0	0.00%	0.00%	0.00%	0.00%	0.00%
3	HYLEBOS MARINA	22	0	0.00%	0.00%	0.00%	0.00%	0.00%
	DON OLINE AUTOFLUFF SITE	23	0	0.00%	0.00%	0.00%	0.00%	0.00%
	MODUTECH MARINE	24	2	0.00%	**0.58%**	**3.39%**	**0.67%**	0.00%
	STONE INVESTMENTS	25	0.5	0.00%	**0.15%**	**0.85%**	**0.17%**	0.00%
	GENES BARK & TRANSPORT	26	0	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-4
PAH Mass Loading Allocation Results

Segment	Site Name	Map Reference No.	Index Value PAH	PAH Proportional Responsibility Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
	CASCADE TIMBER (YARD #1)	27	0	0.00%	0.00%	0.00%	0.00%	0.00%
3 (cont.)	BUFFELEN	28	5	0.00%	**1.46%**	**8.47%**	**1.66%**	0.00%
	MURRAY PACIFIC	29	2	0.00%	**0.58%**	**3.39%**	**0.67%**	0.00%
	CARR GOTTSTEIN FOODS	77	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SUPERLON PLASTICS	94	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (BUFFELEN DITCH)	97	0	0.00%	0.00%	0.00%	0.00%	0.00%
4	CHRISTEL, SOLOMEN (#1)	30	0	0.00%	0.00%	0.00%	0.00%	0.00%
	ALLEN, JOHN	31	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CHRISTEL, SOLOMEN (#2)	32	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA AUTO BODY	33	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SFD DEMO'D	34	0	0.00%	0.00%	0.00%	0.00%	0.00%
	WHIRLWIND PROPERTIES	35	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (2916 MARINE VIEW DR)	36	0	0.00%	0.00%	0.00%	0.00%	0.00%
	NORTH SHORE RESTAURANT OFFICE	37	0	0.00%	0.00%	0.00%	0.00%	0.00%
	TOPE TRACTOR	38	0.5	0.00%	0.00%	**0.28%**	**0.50%**	**0.13%**
	COSKI SAMPSON MARINE	39	0	0.00%	0.00%	0.00%	0.00%	0.00%
	SOUND REFINING	41	20	0.00%	0.00%	**11.30%**	**19.97%**	**5.25%**
	AIRO SERVICES	42	5	0.00%	0.00%	**2.82%**	**4.99%**	**1.31%**
	EXECUTIVE MARINE SERVICES	43	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (STEAM PLANT)	44	20	0.00%	0.00%	**11.30%**	**19.97%**	**5.25%**
	CITY OF TACOMA (FIRE DEPT)	45	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PORT OF TACOMA (1123 TAYLOR WAY)	46	0	0.00%	0.00%	0.00%	0.00%	0.00%
	TAYLOR WAY PROPERTIES	47	10	0.00%	0.00%	**5.65%**	**9.98%**	**2.62%**
	JOSEPH SIMON & SONS	48	2	0.00%	0.00%	**1.13%**	**2.00%**	**0.52%**
	NORDLUND BOATBUILDING	49	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CENEX AG	50	2	0.00%	0.00%	**1.13%**	**2.00%**	**0.52%**
	ARCHITECTURAL SERVICES AND KITE SALES	63	0	0.00%	0.00%	0.00%	0.00%	0.00%
	PHILADELPHIA QUARTZ	66	0	0.00%	0.00%	0.00%	0.00%	0.00%
	AOL EXPRESS	79	1	0.00%	0.00%	**0.56%**	**1.00%**	**0.26%**
	LEVY, ROBERT E.	80	0	0.00%	0.00%	0.00%	0.00%	0.00%
	CITY OF TACOMA (#1)	95	1	0.00%	0.00%	**0.56%**	**1.00%**	**0.26%**
5	3138 MARINE VIEW DRIVE	51	0.5	0.00%	0.00%	0.00%	**0.17%**	**0.39%**
	SPECIALTY MACHINE SHOP	52	0.5	0.00%	0.00%	0.00%	**0.17%**	**0.39%**
	CHINOOK LANDING MARINA	53	0	0.00%	0.00%	0.00%	0.00%	0.00%
	COMMENCEMENT BAY MARINA (OLD)	86	0	0.00%	0.00%	0.00%	0.00%	0.00%

Table 3-4
PAH Mass Loading Allocation Results

Segment	Site Name	Map Reference No.	Index Value PAH	PAH Proportional Responsibility Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
	MARINE VIEW DRIVE #1	54	0	0.00%	0.00%	0.00%	0.00%	0.00%
5 (cont.)	OLE & CHARLIE'S MARINA	55	0.5	0.00%	0.00%	0.00%	**0.17%**	**0.39%**
	AK-WA SHIPBUILDING	56	80	0.00%	0.00%	0.00%	**26.62%**	**62.99%**
	OCCIDENTAL	57	15	0.00%	0.00%	0.00%	**4.99%**	**11.81%**
	U.S. NAVAL RESERVE	59	10	0.00%	0.00%	0.00%	**3.33%**	**7.87%**
	PORT OF TACOMA (9533 E. 11TH ST)	60	0	0.00%	0.00%	0.00%	0.00%	0.00%
	KELBAUGH PROPERTIES	40	0	0.00%	0.00%	0.00%	0.00%	0.00%
				100.00%	100.00%	100.00%	100.00%	100.00%

Table 3-5

FOOTPRINTS SUBJECT TO MASS LOADING LISTED BY SITE NAME

Segment	Site Name	Substance of Concern	Footprint ID*	% Allocation
1	1670 MARINE VIEW DR	ANTIMONY	SB2	0
		COPPER	CU1	0
		MERCURY	HG1	0
		ZINC	ZN1	0
	JONES & GOODELL BOATBUILDING	**ANTIMONY**	**SB2**	**25**
		COPPER	**CU1**	**100**
		MERCURY	**HG1**	**100**
		ZINC	**ZN1**	**100**
	LONE STAR NORTHWEST	TRIBUTYLTIN	TBT3	0
	MANKE LUMBER	**ANTIMONY**	**SB2**	**75**
		ANTIMONY	**SB3**	**5**
		TRIBUTYLTIN	**TBT3**	**5**
	TACOMA BOATBUILDING	**ANTIMONY**	**SB3**	**65**
		TRIBUTYLTIN	**TBT3**	**95**
		BIS (2-ETHYLHEXYL) PHTHALATE	BEPH3	0
	WEYERHAEUSER	TRIBUTYLTIN	TBT3	0
2	DUNLAP TOWING	**ANTIMONY**	**SB3**	**10**
		BUTYLBENZYL PHTHALATE	BBPH7	0
		TRIBUTYLTIN	TBT3	0
	ELF ATOCHEM	1,3-DICHLOROBENZENE	MDCB7	0
		ANTIMONY	**SB3**	**10**
		ANTIMONY	**SB4**	**10**
		BIS (2-ETHYLHEXYL) PHTHALATE	BEPH5	0
		BUTYLBENZYL PHTHALATE	BBPH8	0
		CHROMIUM	**CR4**	**25**
		HEXACHLOROBUTADIENE	**HCBD6**	**95**
	GENERAL METALS OF TACOMA	**1,3-DICHLOROBENZENE**	**MDCB7**	**100**
		ANTIMONY	**SB3**	**10**
		BIS (2-ETHYLHEXYL) PHTHALATE	**BEPH3**	**100**
		BUTYLBENZYL PHTHALATE	**BBPH7**	**100**
		BUTYLBENZYL PHTHALATE	**BBPH8**	**19**
		HEXACHLOROBUTADIENE	**HCBD6**	**5**
	JONES CHEMICAL	**BUTYLBENZYL PHTHALATE**	**BBPH8**	**1**
		BIS (2-ETHYLHEXYL) PHTHALATE	**BEPH5**	**100**
	OLINE PROPERTIES (1800 MARINE VIEW DR)	ANTIMONY	SB3	0
		TRIBUTYLTIN	TBT8	0
	US GYPSUM	**ANTIMONY**	**SB4**	**75**
		ARSENIC	**AS10**	**75**

Table 3-5

FOOTPRINTS SUBJECT TO MASS LOADING LISTED BY SITE NAME

2 (cont.)	US GYPSUM (continued)	**CHROMIUM**	**CR4**	**75**
		HEXACHLOROBUTADIENE	HCBD6	0
3	BUFFELEN	ANTIMONY	SB4	0
	DON OLINE AUTOFLUFF SITE	ANTIMONY	SB6	0
		BUTYLBENZYL PHTHALATE	**BBPH8**	**40**
		COPPER	**CU4**	**50**
		DIMETHYL PHTHALATE	**DMPH9**	**50**
		DI-N-OCTYL PHTHALATE	**DOPH7**	**100**
		HEXACHLOROBUTADIENE	HCBD6	0
	GENE'S BARK AND TRANSPORT	BUTYLBENZYL PHTHALATE	BBPH8	0
	HYLEBOS MARINA	BUTYLBENZYL PHTHALATE	BBPH8	0
		DI-N-OCTYL PHTHALATE	DOPH7	0
		HEXACHLOROBUTADIENE	HCBD6	0
		MERCURY	**HG9**	**100**
		TRIBUTYLTIN	**TBT8**	**100**
	JONES CHEMICAL	**BUTYLBENZYL PHTHALATE**	**BBPH8**	**1**
	MODUTECH MARINE	**ANTIMONY**	**SB6**	**100**
		BUTYLBENZYL PHTHALATE	**BBPH8**	**40**
		COPPER	**CU4**	**50**
		DIMETHYL PHTHALATE	**DMPH9**	**50**
		HEXACHLOROBUTADIENE	HCBD6	0
	MURRAY PACIFIC	**ANTIMONY**	**SB4**	**15**
		ARSENIC	**AS10**	**25**
		CHROMIUM	CR4	0
		HEXACHLOROBUTADIENE	HCBD6	0
	OLINE PROPERTIES (1800 MARINE VIEW DR)	BUTYLBENZYL PHTHALATE	BBPH8	0
		HEXACHLOROBUTADIENE	HCBD6	0
		MERCURY	HG9	0
4	CASCADE TIMBER (YARD #1)	**ANTIMONY**	**SB7**	**20**
	JOSEPH SIMON & SONS	**ANTIMONY**	**SB7**	**20**
	SOUND REFINING	ANTIMONY	SB7	0
	TAYLOR WAY PROPERTIES	**ANTIMONY**	**SB7**	**60**
5	3138 MARINE VIEW DR	HEXACHLOROBUTADIENE	HCBD13	0
		TRICHLOROBENZENE	TCB5	0
	AK-WA SHIPBUILDING	1,3-DICHLOROBENZENE	MDCB15	0
		ANTIMONY	**SB12**	**50**
		HEXACHLOROBENZENE	HCB6	0
		TRIBUTYLTIN	**TBT13**	**95**
	MARINE VIEW DR #1	TRIBUTYLTIN	TBT13	0
		HEXACHLOROBENZENE	HCB6	0

Table 3-5

FOOTPRINTS SUBJECT TO MASS LOADING LISTED BY SITE NAME

5	MARINE VIEW DR #1 (continuted)	HEXACHLOROBUTADIENE	HCBD13	0
(cont)	OCCIDENTAL	**1,3-DICHLOROBENZENE**	**MDCB15**	**100**
		ANTIMONY	**SB12**	**50**
		HEXACHLOROBENZENE	**HCB6**	**100**
		HEXACHLOROBUTADIENE	**HCBD13**	**100**
		TRICHLOROBENZENE	**TCB5**	**100**
	OLE & CHARLIE'S MARINA	**TRIBUTYLTIN**	**TBT13**	**5**
	U.S. NAVAL RESERVE	HEXACHLOROBENZENE	HCB6	0

* See designations on maps in Appendix 1.

3.6 UNRESOLVED FOOTPRINTS

After allocating by footprint, mass loading, and by mass loading for footprints as described in **Sections 3.3**, **3.4**, and **3.5**, some footprints will remain unallocated. The SAYs associated with these footprints fit the following two categories:

> **Type I Unresolved:** The SOC footprints are not clearly adjacent to any site(s). Thus, there is no clear linkage between the footprint and a specific site, or sites. Type I Unresolved Footprints are listed in **Table 3-6**.

> **Type II Unresolved:** The SOC footprints could be assigned to a site according to the rules listed in **Section 3.3**, except that the site lacks the documentation of an activity that would cause the release of the SOC in question. Type II Unresolved Footprints are listed in **Table 3-7**.

Table 3-6

TYPE I UNRESOLVED FOOTPRINTS LISTED BY SOC*

SOC	Footprint ID**
ARSENIC	AS3
1,3-DICHLOROBENZENE	MDCB3
	MDCB13
2,4-DIMETHYLPHENOL	DMP1
	DMP6
ANTIMONY	SB9
ARSENIC	AS3
BUTYLBENZYL PHTHALATE	BBPH3
	BBPH4
	BBPH6
	BBPH10
	BBPH11
	BBPH13
	BBPH16
	BBPH17
	BBPH18
BIS (2-ETHYLHEXYL) PHTHALATE	BEPH1
DI-N-OCTYL-PHTHALATE	DOPH1
	DOPH6
DIMETHYL PHTHALATE	DMPH1
	DMPH4
	DMPH5
HEXACHLOROBENZENE	HCB2
	HCB3
	HCB4
	HCB5
HEXACHLOROBUTADIENE	HCBD1
	HCBD2
	HCBD3
	HCBD7
	HCBD8
	HCBD9
	HCBD12
MERCURY	HG3
	HG4
	HG5
	HG11
	HG12

Table 3-6

TYPE I UNRESOLVED FOOTPRINTS LISTED BY SOC*

	HG13
MERCURY (continued)	HG18
P,P'DDD	DDD1
P,P'DDE	DDE1
	DDE2
	DDE3
	DDE5
TRIBUTYLTIN	TBT1
	TBT4
	TBT6
	TBT9
	TBT11
1,2,4-TRICHLOROBENZENE	TCB1
	TCB2
	TCB6
ZINC	ZN10

* There is some justification for assigning all footprints for 1,2,4-trichlorobenzene (TCB) and hexachlorobenzene (HCB) to either the Elf Atochem site in Segment 2 or the Occidental site in Segment 5. These two sites are known to pass the trigger test. Elf Atochem would be assigned all SAYs in Segments 1, 2, and 3 for both SOCs based on the distribution factors described in Table 3-2. Occidental would be assigned all SAYs in Segments 4 and 5. Final resolution of the potential use of this option will depend on public comments that could identify other sources for these two chemicals.

** See designations on maps in Appendix 1.

Table 3-7
TYPE II UNRESOLVED FOOTPRINTS BY SITE AND SOC*

Site Name	Substance of Concern	Footprint ID**
1670 MARINE VIEW DR	BUTYLBENZYL PHTHALATE	BBPH5
	DIMETHYL PHTHALATE	DMPH2
3138 MARINE VIEW DR	1,2,4-TRICHLOROBENZENE	TCB3*
	1,2,4-TRICHLOROBENZENE	TCB4*
AK-WA SHIPBUILDING	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH11
	BUTYLBENZYL PHTHALATE	BBPH19
	BUTYLBENZYL PHTHALATE	BBPH20
BUFFELEN	TRIBUTYLTIN	TBT10
CASCADE TIMBER (YARD #1)	TRIBUTYLTIN	TBT10
CITY OF TACOMA (STEAM PLANT)	BUTYLBENZYL PHTHALATE	BBPH14
	BUTYLBENZYL PHTHALATE	BBPH15
	DI-N-OCTYL-PHTHALATE	DOPH11
	DIMETHYL PHTHALATE	DMPH10
	P,P'-DDD	DDD4
	P,P'-DDT	DDT6
CENEX AG	BUTYLBENZYL PHTHALATE	BBPH12
	TRIBUTYLTIN	TBT10
DON OLINE AUTOFLUFF SITE	2,4-DIMETHYLPHENOL	DMP4
	2,4-DIMETHYLPHENOL	DMP5
	CHROMIUM	CR5
DUNLAP TOWING	1,3-DICHLOROBENZENE	MDCB5
	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH4
	DI-N-OCTYL-PHTHALATE	DOPH2
	DI-N-OCTYL-PHTHALATE	DOPH4
	DIMETHYL PHTHALATE	DMPH6
	HEXACHLOROBUTADIENE	HCBD5
ELF ATOCHEM	1,3-DICHLOROBENZENE	MDCB8
	1,3-DICHLOROBENZENE	MDCB9
	1,3-DICHLOROBENZENE	MDCB10
	2,4-DIMETHYLPHENOL	DMP3
	DIMETHYL PHTHALATE	DMPH7
	TRIBUTYLTIN	TBT5
	TRIBUTYLTIN	TBT7
EXECUTIVE MARINE SERVICES	BUTYLBENZYL PHTHALATE	BBPH12
GENERAL METALS OF TACOMA	P,P'-DDT	DDT1
	P,P'-DDT	DDT2

HYLEBOS MARINA	2,4-DIMETHYLPHENOL	DMP4
	DI-N-OCTYL-PHTHALATE	DOPH7
	DIMETHYL PHTHALATE	DMPH8
	TRIBUTYLTIN	TBT8
JONES & GOODELL BOATBUILDING	BUTYLBENZYL PHTHALATE	BBPH5
	DIMETHYL PHTHALATE	DMPH2
JOSEPH SIMON & SONS	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH8
	BUTYLBENZYL PHTHALATE	BBPH12
	DI-N-OCTYL-PHTHALATE	DOPH10
LEVY, ROBERT E.	BUTYLBENZYL PHTHALATE	BBPH15
	DIMETHYL PHTHALATE	DMPH11
	DI-N-OCTYL-PHTHALATE	DOPH11
LOUISIANA PACIFIC	BUTYLBENZYL PHTHALATE	BBPH2
MANKE LUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH2
	DIMETHYL PHTHALATE	DMPH3
	1,3-DICHLOROBENZENE	MDCB2
	HEXACHLOROBUTADIENE	HCBD4
MODUTECH MARINE	P,P'-DDT	DDT4
	1,3-DICHLOROBENZENE	MDCB11
MURRAY PACIFIC	1,3-DICHLOROBENZENE	MDCB10
	BUTYLBENZYL PHTHALATE	BBPH9
NORDLUND PROPERTIES	DIMETHYL PHTHALATE	DMPH2
OCCIDENTAL	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH9
	BIS (2-ETHYLHEXYL) PHTHALATE	BEPH10
	DIMETHYL PHTHALATE	DMPH12
	P,P'-DDD	DDD5
	P,P'-DDE	DDE6
	P,P'-DDT	DDT7
	TRIBUTYLTIN	TBT12
OLINE PROPERTIES (1800 MARINE VIEW DR)	1,3-DICHLOROBENZENE	MDCB9
	DIMETHYL PHTHALATE	DMPH7
	P,P'-DDE	DDE7
	TRIBUTYLTIN	TBT8
PORT OF TACOMA (9533 E. 11TH ST)	ANTIMONY	SB10
	LEAD	PB6
	SILVER	AG3
SOUND REFINING	ANTIMONY	SB8
	BUTYLBENZYL PHTHALATE	BBPH12

SOUND REFINING (continued)	DI-N-OCTYL-PHTHALATE	DOPH9
	HEXACHLOROBUTADIENE	HCBD10
	TRIBUTYLTIN	TBT10
STONE INVESTMENTS	1,3-DICHLOROBENZENE	MDCB12
	TRIBUTYLTIN	TBT10
STREICH BROTHERS	DIMETHYL PHTHALATE	DMPH2
TACOMA BOATBUILDING	HEXACHLOROBUTADIENE	HCBD4
TAYLOR WAY PROPERTIES	BUTYLBENZYL PHTHALATE	BBPH12
	P,P'-DDT	DDT5
	HEXACHLOROBUTADIENE	HCBD11
U.S. NAVAL RESERVE	1,3-DICHLOROBENZENE	MDCB14
	ANTIMONY	SB10
	CHROMIUM	CR7
US GYPSUM	1,3-DICHLOROBENZENE	MDCB10
	SILVER	AG1
	TRIBUTYLTIN	TBT7
WASSER WINTERS	BUTYLBENZYL PHTHALATE	BBPH1
	1,3-DICHLOROBENZENE	MDCB1
WEYERHAEUSER	1,3-DICHLOROBENZENE	MDCB4
	CHROMIUM	CR10

* There is some justification for assigning all footprints for 1,2,4-trichlorobenzene (TCB) and hexachlorobenzene (HCB) to either the Elf Atochem site in Segment 2 or the Occidental site in Segment 5. These two sites are known to pass the trigger test. Elf Atochem would be assigned all SAYs in Segments 1, 2, and 3 for both SOCs based on the distribution factors described in Table 3-2. Occidental would be assigned all SAYs in Segments 4 and 5. Final resolution of the potential use of this option will depend on public comments which could identify other sources for these two chemicals.

** See designations on maps in Appendix 1.

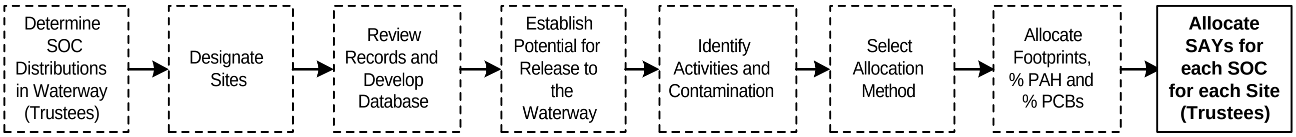
3.7 A SPECIAL CASE FOR UNRESOLVED FOOTPRINTS

In addition to the two unresolved categories described in the previous section is the unusual situation for pentachlorophenol (PCP). It represents a unique case where a very low injury threshold concentration (see **Table 1-1**) exceeds values associated with nearly all sediment chemistry samples used to map the injury footprint. The extraordinary aspect of these chemistry samples is that the vast majority has a PCP concentration that is listed as "non-detect" ("U" qualifier)—the analytical method used was unable to detect that SOC above a specific concentration associated with the sensitivity of analysis for that sample.

This reporting of chemistry results complicates mapping SOC footprints. Rules followed for setting up sediment chemistry data for spatial analysis (Appendix D, addenda) require that a concentration be associated with each sediment station where a SOC is listed in that station's analytical results. Usually, only a few stations are "U qualified" for a SOC, and the concentration assigned for mapping those "U qualified" stations is ½the "non-detect" value (i.e., the reported detection limit). In this instance, mapped PCP concentrations that represented ½the "non detect" value exceed the assigned injury threshold value determined in Appendix D and result in a ubiquitous injury footprint throughout nearly the entire waterway (see **Appendix 1**of this document). This footprint is deemed an artifact of an extraordinary combination of data. Therefore, except for a very small triggered allocation off Occidental (See **Table 3-5** and **Appendix 1**), the vast majority of SAYs associated with the PCP injury footprint is deemed not allocatable.

4.0 ALLOCATE SAYS FOR EACH SOC FOR EACH SITE (TRUSTEES)

The final step in this phase of the allocation process is accomplished by combining the results of this study with the SAYs determined by the Hylebos Waterway Habitat Equivalency Analysis. The end result is the allocation of a given number of SAYs to each site for all of the SOCs that trigger the allocation process for that site. The number of SAYs allocated to each SOC for each site is documented in an accompanying report by the Trustees.



The final phase in the allocation process will be to address the allocation to each PRP associated with each specific site. This will follow from the public review and comments received on this report.

5.0 REFERENCES

7 Tetra Tech Inc. 1985. *Commencement Bay Nearshore/Tideflats Remedial Investigation Final Report. EPA-910/9-85—134b.* Prepared for the Washington Department of Ecology and the USEPA. Bellevue, Washington.

387 Washington Department of Ecology. October, 1987. *Source Control Action Plan for the Commencement Bay – Nearshore/Tideflats*. Olympia, Washington.