



Tahoma Salt Marsh Restoration

Project Concept Plan

March 1997

*Appendix C to the City of Tacoma
Natural Resource Damages Consent Decree*



City of Tacoma

This document is a reprint of the October 1996 document of the same title. This document and the October 1996 document differ in the following manner:

- 1. The date on the initial title pages has been corrected (updated);***
- 2. Selected graphics have been reproduced (but not changed) to enhance readability;***
- 3. The project schedule has been modified to reflect the passage of time.***

This document was prepared by the staff of the City of Tacoma Public Works Department, Utility Services Engineering Division. Questions concerning the information presented can be directed to Greg Zentner of Utility Services Engineering at the following address and phone number.

City of Tacoma Public Works Department
Utility Services Engineering
2201 Portland Avenue
Tacoma, WA 98421-2711
(206) 502-2108
(206) 502-2107 fax
gzentner@ci.tacoma.wa.us (e-mail)

TAHOMA SALT MARSH RESTORATION
PROJECT CONCEPT PLAN

CITY OF TACOMA
MARCH 1997

**CITY OF TACOMA
TAHOMA SALT MARSH RESTORATION
PROJECT CONCEPT PLAN**

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Acknowledgment

City staff acknowledge the members of the City of Tacoma Chinese Reconciliation Project Committee and its successor, the Chinese Reconciliation Project Foundation. The Foundation has undertaken the task of developing for their fellow citizens a facility to acknowledge the events leading to and culminating in the expulsion of the Chinese community from the City in November, 1885. Project facilities will be located on the Ruston Shoreline adjacent to the Tahoma Salt Marsh on the property referenced in this report as the National Guard property.

A Note on Datums

Topographical data contained in figures in this report are based upon the National Geodetic Vertical Datum, 1929, or more simply, NGVD29. This topographic information is based upon aerial photogrammetric data collected by the City in 1990. NGVD29 is the datum appropriate for engineering and land surveying uses, where precision and accuracy with respect to elevations requires the use of an exact standard. For this reason, the City's Geographical Information Systems City-Wide Base Map Data Base, which was used to produce these figures, utilizes NGVD29.

Elevation data described in relation to mean lower low water (MLLW) in contrast is useful for the comparison of intertidal habitat attributes between sites. Both datums, (MLLW and NGVD29) are used in this report. In Commencement Bay using the NGVD29 datum, MHHW is located (approximately) at elevation 5.5 feet, and MLLW is located (approximately) at elevation -6.3 feet. As an aide to the reader, we have periodically presented in the text the NGVD29 elevation in parenthesis following elevations presented relative to MLLW.

**CITY OF TACOMA
TAHOMA SALT MARSH RESTORATION
PROJECT CONCEPT PLAN**

I INTRODUCTION

The City of Tacoma is proposing to develop a salt marsh wetland restoration project on the Ruston Way shoreline within the City of Tacoma and Commencement Bay (Figure TSM- 1). The project would be developed on property that is presently owned by the United States for the use of the Washington State Military Department (National Guard) and the property is referred to in this report as the National Guard property. The property will be transferred to the City in 1996 after a cleanup action is completed and a property transfer agreement executed.

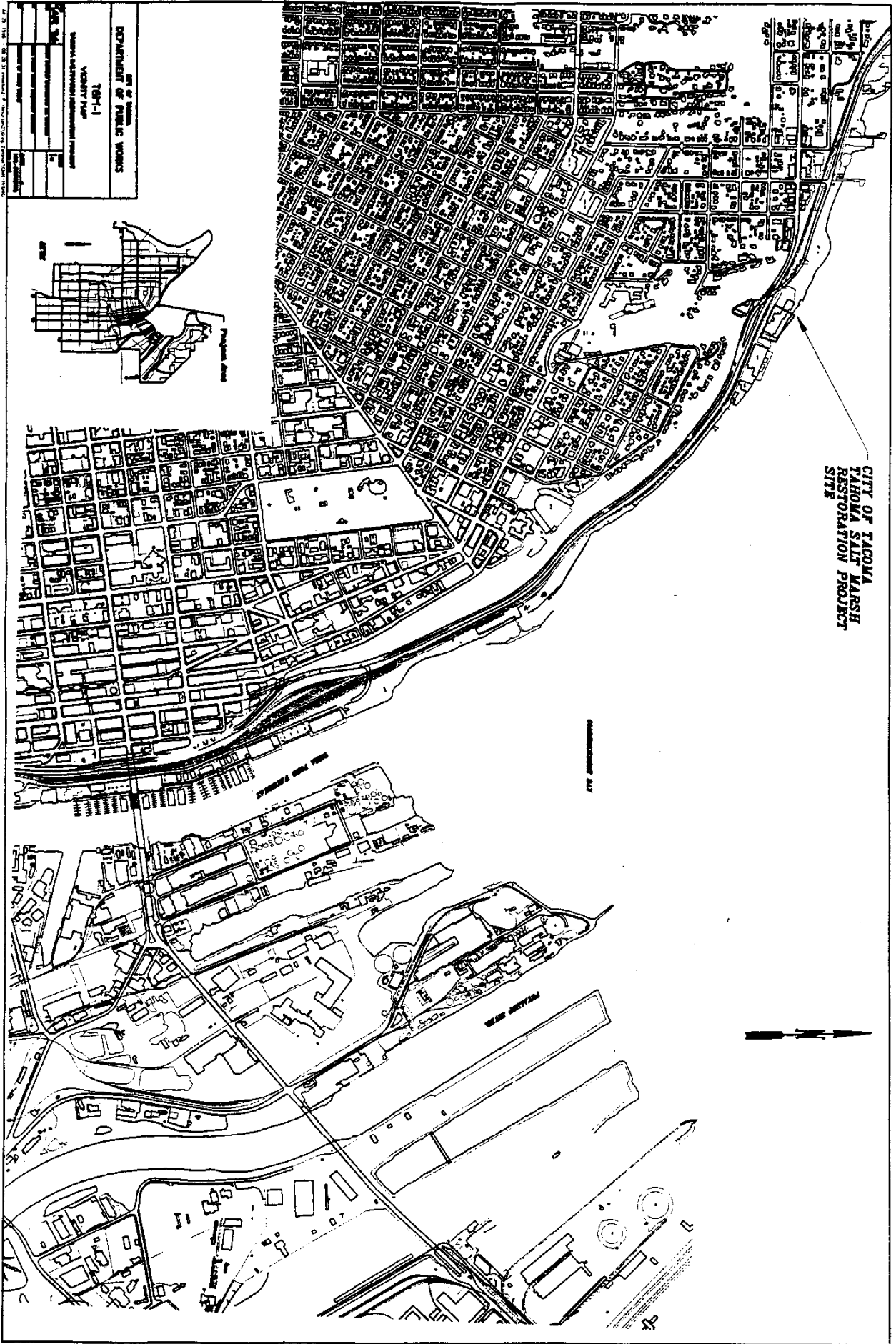
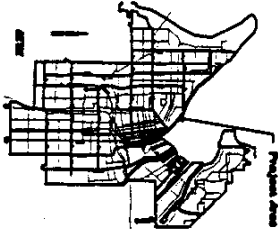
Activities associated with site habitat restoration include excavation or re-grading of 1.95 acres on the Guard property and the planting of native marsh and riparian vegetation. Completion of the project would result in the establishment of intertidal marsh and riparian buffer on a property now largely devoid of habitat value. The project would create new habitat and provide habitat-appropriate public access for education and passive recreation. The location of this project on Ruston Way presents unique opportunities for both public education and outreach.

The City's goals for the restoration project are based upon the habitat needs in Commencement Bay and generally include:

1. Creating intertidal tideflat and emergent habitat to provide nesting, refuge and feeding opportunities for a variety of fish and waterfowl species (e.g., salmon, juvenile flatfish, Western Grebe, Great Blue Heron, plovers, sandpipers).
2. Providing a habitat linkage between nearshore habitat in the vicinity of Ruston Way/Pt. Defiance and intertidal and riverine habitat near the mouth of the Puyallup River.
3. Providing a public education opportunity in close proximity to the Ruston Way shoreline to increase public awareness of the importance of this type of habitat in the ecosystem

Estuarine marshes (including fresh, brackish and salt marshes) are one of the primary sources of carbon that drive the estuarine food web. Carbon, and the chemical energy associated with carbon molecules, comes into the estuarine system via primary

CITY OF TACOMA
 DEPARTMENT OF PUBLIC WORKS
 T-107-1
 VACUITY MAP
 NATIONAL SANITATION FOUNDATION PROJECT



CITY OF TACOMA
 TAHOMA SALT MARSH
 RESTORATION PROJECT
 SITE

production (i.e. is produced within the estuary by plants) and via import from the adjacent river and shoreline environments. The largest source of carbon to the estuary is the river. However, each source of carbon is important as each enters the estuary at different rates at different times of the year and each supports a different type of vertebrate or invertebrate organism. The organic matter that is exported as detritus from estuarine marshes to mudflats supports for example an assemblage of macro-invertebrates which are a primary prey organism of juvenile salmon (Simenstad, 1983). Estuarine marshes as a result provide indirect and perhaps indispensable support for a commercial, sport, subsistence and ceremonial fishery that remains central to life in the Pacific Northwest. Estuarine marshes also provide feeding opportunities for terrestrial mammals and wintering waterfowl. Mallard, pintail, and American widgeon, among others, feed directly on the seed of estuarine marsh grasses, and the northern harrier hunts deer mice and shrews in the marsh (Schultz, 1990). The restoration of estuarine marsh habitat was one of six recommendations put forth by researchers investigating historic changes in populations of fish and shellfish in Commencement Bay (Wampler, 1991).

A number of approaches have been attempted to define the value of such habitats. Mitsch and Gosselink (1986) review the difficulties inherent in such a valuation, i.e., wetlands are multiple value systems; their most valuable products are public amenities with limited value to a private landowner; and that as wetland area decreases, the marginal value increases. The increasing value of a diminishing resource is particularly relevant in Commencement Bay, where 240 of the original 6000 acres exist today, the remainder having been converted to upland uses or otherwise "lost" (USACOE, 1993). Although Commencement Bay wetland habitats have not been reduced to their last acre, clearly there have been reductions in extent and function.¹ Consultants to federal agencies have concluded that "restoration of nearshore wetland habitat would benefit natural resources in this area and enhance fish and wildlife populations."

Restoration along the Ruston Way shoreline not only benefits area wildlife, it is also consistent with City policies for open space and economic development. The City's Recreation and Open Space Facilities Plan (1994) recognizes that:

Investing in the environment through parks and the provision of open space...leads to an increase in neighborhood property values through accessibility to environmentally friendly green spaces ... The trend toward natural environment based leisure activities is insurance for a new and improved environmental future.

¹ The United States Fish and Wildlife offers a somewhat more forceful assessment: "(N)early total loss of habitat resulted in nearly total loss of many species endemic to the bay during the 138 years prior to 1988." (Wampler, 1991)

II RESTORATION STUDY AREA: HISTORY AND SITE CONDITIONS

The National Guard site is located on the Ruston Way shoreline near Old Town in the City of Tacoma, State of Washington. The property is 6.7 acres in size, of which approximately 2.2 acres are intertidal or subtidal and 4.5 acres are upland. A large, dilapidated warehouse, approximately 3/4 of an acre in size, dominated the upland portion of the property until its recent removal during a site remedial action.

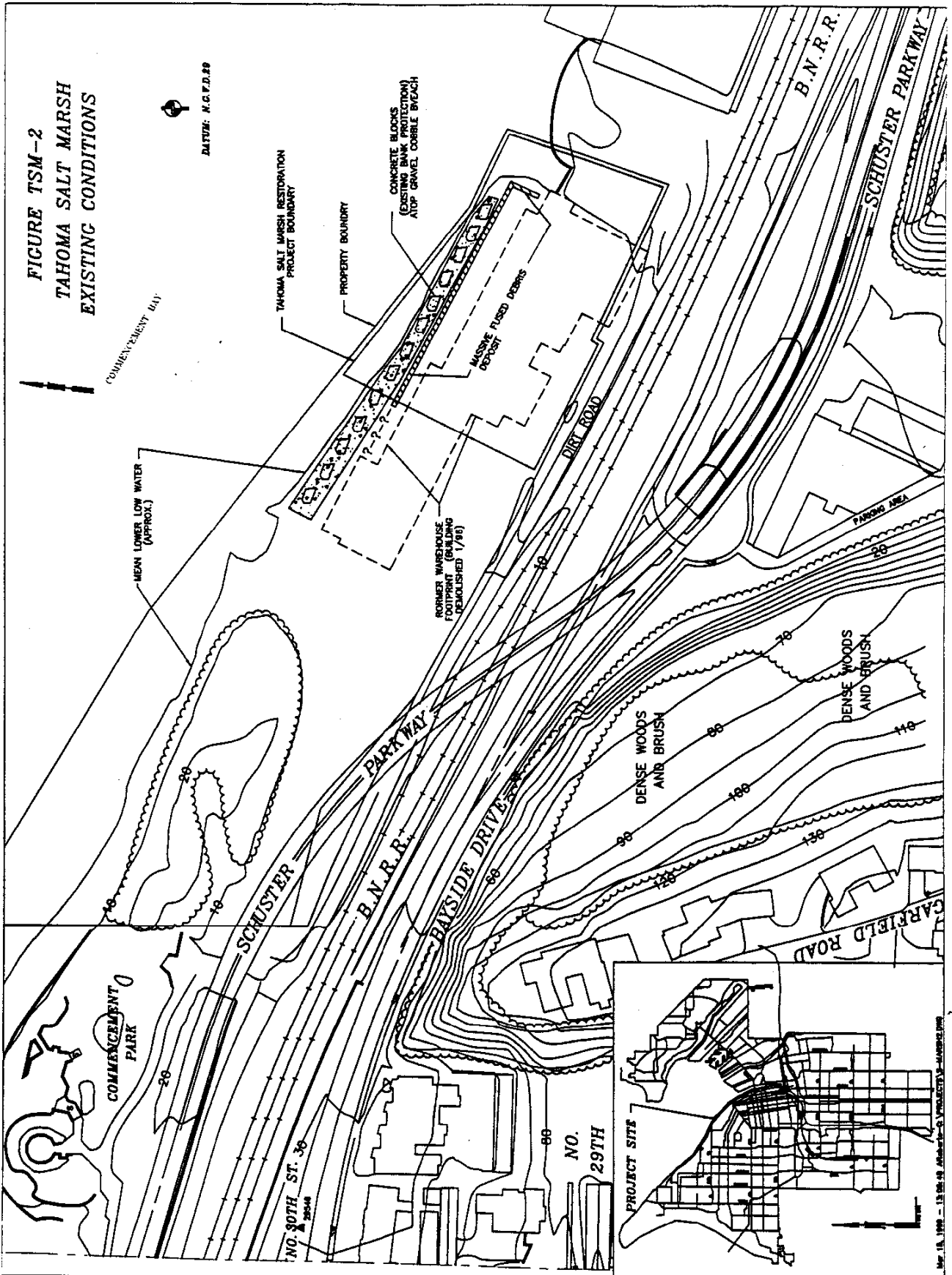
The property has not been utilized for commercial uses since 1980. Historically, the site had been utilized for lumber production and boat building. The site was part of a larger property originally developed in 1869 as the Hansen-Ackerson Mill at a time when the City of Tacoma was newly established. Charles Ackerson operated lumber facilities in northern California and in 1868 he and his associate, John Ackerson, visited Puget Sound with the intent of establishing a mill site. After investigating other sites in Commencement Bay and Quartermaster Harbor, the company purchased 85 acres of waterfront property and adjacent land in the area of the National Guard Site, including a lagoon which occupied the base of present-day Garfield Gulch.² The mill was evidently built over water as construction of the mill and wharf required six hundred pilings from sixty to eighty feet in length. The mill shipped its first lumber in December, 1869, a year which also witnessed the establishment of Tacoma's first post office, first school and the city's first wedding. The Hanson-Ackerson mill was for many years one of the largest milling operations in the Puget Sound Region.

The Hanson-Ackerson Mill (later the Tacoma Mill) operated at the mouth of Garfield Gulch until the 1920s. At that time, the Northern Pacific Railroad obtained right-of-way through the mill property and the mill was relocated to the northwest, occupying the area now encompassed by Commencement Park, the Schuster Parkway Overpass, and the National Guard property. Mill activity remained a dominant land use in the area through the mid - 1940's and the early 1960's but anecdotal information exists which suggests that the site was used for boat building or activities associated with boat building as early as the 1920's.

In 1963, the site was purchased by Tacoma Boat. The Northern Line Machine and Engineering Company, a division of Tacoma Boat, operated at the site between the mid-1960's and 1970. In 1970, Northern Line was relocated to property owned by Tacoma Boat on Marine View Drive (across Commencement Bay). That same year or shortly thereafter, Tacoma Boat subcontracted with Aerojet General to construct a naval test-craft for the United States Navy. The craft, the Surface Effect Ship (SES) 100A, was built by Tacoma Boat at its facility on Marine View Drive and the project was managed by Aerojet General from offices located at the Ruston Way site. After the ship was built, it was moored during testing at the Ruston Way site; support and maintenance crews were also located at the site during testing. The SES project was completed in 1973 and Tacoma Boat subsequently used the site to construct aluminum deck houses for water craft. Tacoma Boat sold the property in 1980 but the subsequent property owner or owners did not utilize the property.

² Garfield Gulch appears in Figure TSM-1 as an undeveloped area immediately south of the project site.

**FIGURE TSM-2
TAHOMA SALT MARSH
EXISTING CONDITIONS**



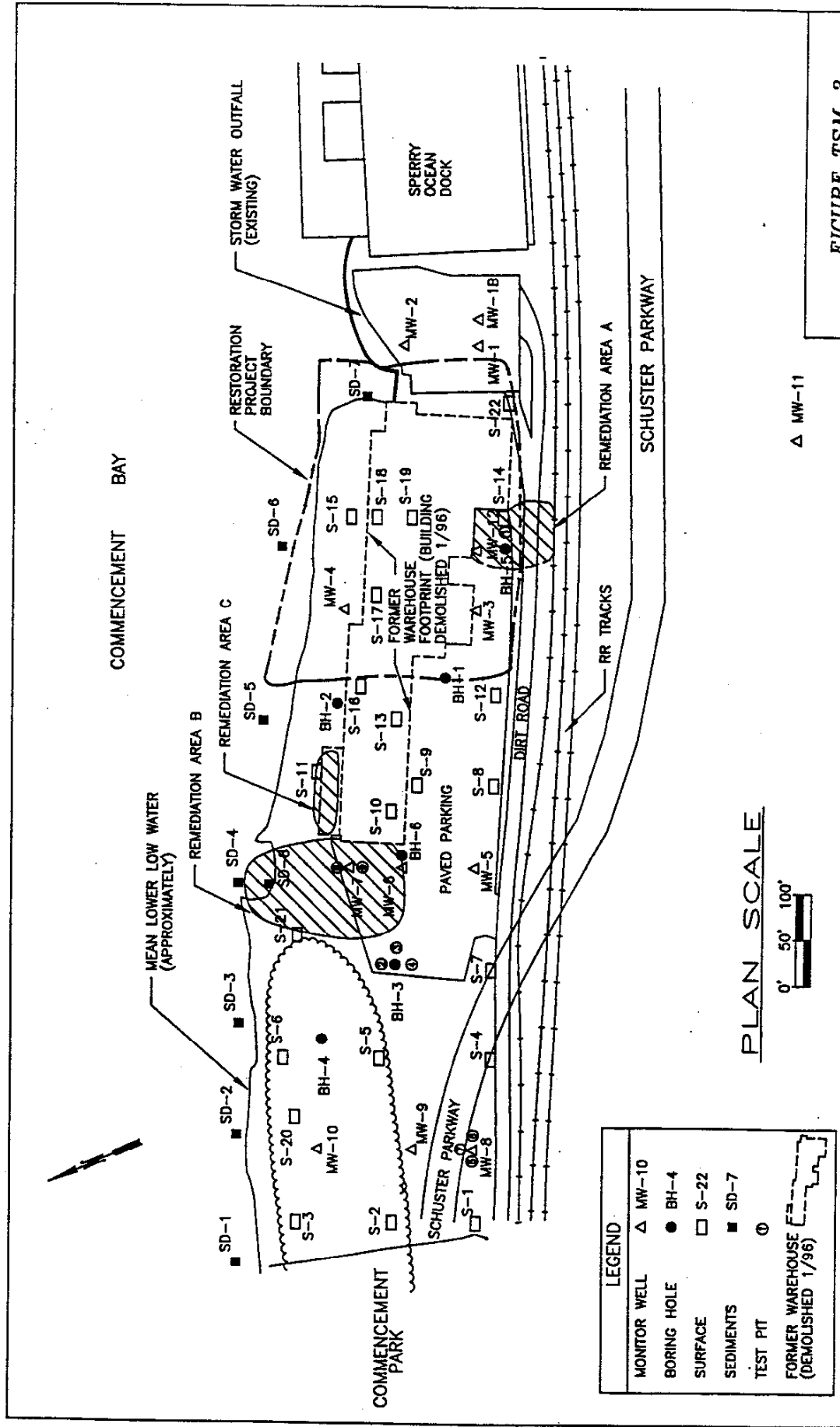
The property was purchased in 1987 by the United States (Department of Defense) for the use of the Washington State Military Department (National Guard). The National Guard however did not occupy or otherwise utilize the site but have instead, at the request of local citizens, retained operations at Pier 23 in the Port Industrial Area. Subsequently, the United States agreed to transfer property ownership to the City.

In 1989, the United States Army Corps of Engineers commissioned a preliminary environmental site assessment to assess the nature and extent of hazardous materials which might have been improperly disposed of or otherwise abandoned on the property. The site assessment was completed in 1990 (USACOE, 1990) after modification of the original scope of work to allow for additional environmental sampling. Subsequent to this preliminary investigation, the Washington State National Guard assumed management of additional site assessment and cleanup activities necessary for compliance with federal law, policy and regulations requiring that property be remediated, if remediation is necessary, prior to property transfer and the State Model Toxics Control Act (MTCA).

The Guard initiated a combined Remedial Investigation / Feasibility Study (RI/FS) in 1993 (State of Washington Military Dept, 1994). Subsequent to this study, the Guard developed a Cleanup Action Plan and completed remediation of Areas A and B (Figure TSM-3) as recommended by consultants and the Washington State Department of Ecology. The Guard also removed several tons of material referred to as the "Ruston Formation", a fused waste metal product that was shown to be chemically inert but nonetheless may have posed environmental or safety concerns. Area C was subsequently shown to require remediation, also undertaken by the Guard. Remediation in Areas A, B and C consisted of removing materials present above cleanup standards for disposal in permitted facilities and backfilling excavated areas with filter fabric and/or clean gravel fill. Areas from which Ruston formation material was removed are not noted on Figure TSM-3, but removal was undertaken generally in the beach area within the footprint of the restoration project. Not all of this material was removed, however, and the remnant formation is visible along the shoreline on the east end of the site.

Environmental data collected by the Guard as part of the RI/FS was collected in two phases. Phase I data collection efforts included surface soil and sediment sampling, subsurface soil sampling, and groundwater and soil gas sampling. During phase II, three additional wells and one additional soil boring were installed and sampled and a number of test pits were excavated and sampled. Data collected by the Guard is reproduced in this report as Tables TSM-1 through TSM-4. The data is discussed on the following pages.

**FIGURE TSM-3
TAHOMA SALT MARSH
SAMPLING STATIONS
&
REMEDATION AREAS**



LEGEND	
MONITOR WELL	△ MW-10
BORING HOLE	● BH-4
SURFACE	□ S-22
SEDIMENTS	■ SD-7
TEST PIT	⊙
FORMER WAREHOUSE (DEMOLISHED 1/96)	[Hatched Area]

△ MW-11

Table TSM-1 Analytical Results for Groundwater Sampling

Twelve monitoring wells were installed at the Guard site during the RI/FS; monitoring wells were sampled within the footprint of the proposed restoration project and also in adjacent areas. Groundwater samples east and adjacent to the restoration project footprint (MW-1, MW-1B, & MW-2) in the vicinity of a stormwater outfall contain constituents typical of urban stormwater systems (i.e. copper, lead, zinc) and may reflect activities, including fill, associated with past site uses and/or discharges from the upstream residential area above Garfield Gulch. Historical discharges from on-site and from the adjacent stormwater outfall does not appear to be affecting sediment quality in the area based upon sediment results from an adjacent sediment sampling station, SD-7, discussed below. MW-3, west of Remediation Area A, also contains constituents (metals) at levels that could be of concern; however, MW-12, installed in the immediate vicinity of MW-3, contained no detectable levels of metals in groundwater. Additionally, subsurface soil samples obtained during the drilling of MW-1, MW-1B, MW-2 and MW-3 do not indicate levels of metals that would be of concern. MW-4, drilled within the footprint of the restoration site, does not contain constituents at levels of concern. Constituent levels noted in MW-1, MW-1B, MW-2 and MW-3 may be a result of the digestion of whole water (non-filtered) samples and may not reflect actual ground water quality or water quality that will result following site excavation, removal of material, and the introduction of intertidal flushing.

Table TSM-2 Analytical Results for Surface Soil Sampling

Thirty-nine surface soil samples were obtained at the site during the RI/FS. Samples generally did not exceed MTCA site cleanup levels. One sample did exceed site cleanup levels within the footprint of the restoration area (S-15) but this material was removed from the site during excavation and removal of the Ruston Formation from the beach area. Sample values in Table TSM-2 are compared to site cleanup standards but not aquatic sediment quality standards as upland surface sediments will not be subject to future intertidal action.

Table TSM-3 Analytical Results for Subsurface Soil Sampling

Subsurface soil samples were obtained from twelve monitoring wells, five soil borings and nine test pits on site. Except in isolated instances, subsurface soil samples do not exceed site cleanup standards or sediment quality objectives. Both standards are important as excavation will result in new intertidal surfaces and exposure to both aquatic organisms and human populations.

Sample results that could be of concern in the restoration area include a sample at 5 feet depth in MW-4 (copper) and 5 feet of depth at MW-2. Material in the vicinity of the latter sample (MW-2-5) will be removed during restoration-related excavation. Material at 5 feet depth at MW-4 (sample MW4-5) may or may not be of concern depending upon the extent of the removal of overburden during site restoration. Presently, surface sediments at that location do not exhibit levels of concern (Table TSM-2). In addition to chemical constituents, consultants to the

National Guard noted substantial quantities of saw dust in the subsurface during the installation of monitoring wells.

Table TSM-4 Analytical Results for Aquatic Sediment Sampling

Eight sampling stations were established in intertidal areas for the sampling of aquatic sediments. Three stations, SD-5, SD-6 and SD-7 are within or in the vicinity of the restoration project site. The samples generally meet EPA Sediment Quality Objectives (SQOs) with the exception of station SD-5 (arsenic) and SD-7 (copper). The arsenic value at station SD-5, 60.4 ppm, may not represent a statistically significant departure from the actual objective (57 ppm); and copper concentrations in a duplicate sample from SD-7 was reported at one-half the value of the standard.

In total, the data suggest that the site is suitable for utilization for intertidal habitat restoration. The vast majority of samples analyzed do not exceed environmental quality standards. Where samples do exceed standards, adjacent values or duplicate analysis offer an alternate assessment of sediment or water quality in the vicinity.

Table TSM-1
Analytical Results from Groundwater Sampling

Station Name (Depth - cm/ft)	Marine CMC	Marine CCC	Marine Consumpt.	MW1	MW-1A	MW1-B	MW2	MW-2A	MW3	MW-3A	MW4	MW4-D	MW-4A
Metals (ug/L)													
Antimony													
Arsenic	69	36	0.14	16.0	NT	11.0	ND	NT	ND	NT	ND	ND	NT
Barium				220.0	NT	100.0	ND	NT	ND	NT	400.0	400.0	NT
Cadmium	43	9.3	narrative	16.0	NT	ND	ND	NT	ND	NT	ND	ND	NT
Chromium	1100	50	narrative	60.0	NT	100.0	ND	NT	ND	NT	ND	ND	NT
Copper	2.9	2.9		370.0	NT	ND	1300.0	NT	1300.0	NT	ND	ND	NT
Lead	220	8.5	narrative	858.0	500.0	234.0	7.0	ND	12.0	ND	8.0	4.0	ND
Mercury	2.1	0.025		ND	NT	ND	ND	NT	ND	NT	ND	ND	NT
Nickel	75	8.3	4600										
Silver	2.3												
Zinc	95	86		1510.0	400.0	400.0	600.0	NT	500.0	NT	ND	ND	NT
Organics (ug/kg unless otherwise noted)													
LPAH													
Naphthalene				ND		5.5	ND		ND		ND	ND	NT
Acenaphthylene				ND		11	ND		ND		ND	ND	NT
Acenaphthene				ND		17	ND		ND		ND	ND	NT
Fluorene				ND		*	ND		ND		ND	ND	NT
Phenanthrene				ND		8.3	ND		ND		ND	ND	NT
Anthracene				ND		1.4	ND		ND		ND	ND	NT
2-Methylnaphthalene				NT		NT	NT		NT		NT	NT	NT
Total LPAH													
HPAH													
Flouranthene				0.48		7.5	ND		ND		ND	0.79	NT
Pyrene				ND		6.7	ND		ND		ND	ND	NT
Benzo(a)anthracene				ND		2	ND		ND		ND	ND	NT
Chrysene				ND		2.8	ND		ND		ND	ND	NT
Benzo(b+h)fluoranthene				0.07		2.01	ND		ND		ND	ND	NT
Benzo(a)pyrene				0.08		2.1	ND		ND		0.05	ND	NT
Indeno(1,2,3-cd)pyrene				ND		3.1	ND		ND		ND	ND	NT
Dibenzo(a,h)anthracene				ND		0.19	ND		ND		ND	ND	NT
Total HPAH													
OTHER													
Di-n-Butyl phthalate				NT		NT	NT		NT		ND	NT	NT
Benzo(g,h,i)perylene				ND		1.6	ND		ND		ND	ND	NT
Benzo(j)fluoranthene				NT		NT	NT		NT		NT	NT	NT
Dibenzo(a,h)acridine				NT		NT	NT		NT		NT	NT	NT
Dibenzo(a,j)acridine				NT		NT	NT		NT		NT	NT	NT
7H-Dibenzo(c,g)carbazole				NT		NT	NT		NT		NT	NT	NT
Dibenzo(a,e)pyrene				NT		NT	NT		NT		NT	NT	NT
Dibenzo(a,h)pyrene				NT		NT	NT		NT		NT	NT	NT
3-Methylcholanthrene				NT		NT	NT		NT		NT	NT	NT
7,12 Dimethylbenz(a)anthracene				NT		NT	NT		NT		NT	NT	NT
Total Carcinogenic PAHs				0.15		12.2	ND		ND		0.05	ND	-
Total PAHs				0.63		71.2	ND		ND		0.05	0.79	-
EPA 624				NT		NT	NT		NT		ND	ND	NT
EPA 601				NT		NT	NT		NT		NT	NT	NT
EPA 625				NT		NT	NT		NT		ND	NT	NT
EPA 8240				NT		NT	NT		NT		NT	NT	NT
EPA 8010				NT		NT	NT		NT		NT	NT	NT
EPA 8270				NT		NT	NT		NT		NT	NT	NT
Methylene Chloride				NT		NT	NT		NT		NT	NT	NT
TOC (mg/L)				NT		NT	NT		NT		NT	NT	NT
TPH 418.1 (mg/L)				ND		NT	ND		ND		ND	ND	3.07
Oil & Grease 413.2				NT		NT	NT		NT		NT	NT	ND
PCB-1262													
PCB-1254													
PCBs	10.0	0.03		NT		NT	NT		NT		NT	NT	NT

Notes:

Samples with the designation of "A" (i.e., MW-2A) were collected during Phase II sampling
 Samples with the designation "D" (i.e., MW4-D) indicate a duplicate sample collected from that location
 ND = Not Detected
 NT = Not Tested

Exceeds Water Quality CMC or CCC standard (established for the protection of aquatic life)

Exceeds Water Quality Standard for Organism Consumption (human health-based standard)

CMC = Criterion Maximum Concentration as per 40CFR 131.36

CMC = Criterion Continuous Concentration as per 40CFR 131.36

Table TSM-1
Analytical Results from Groundwater Sampling

Station Name (Depth - cm/ft)	Marine CMC	Marine CCC	Marine Consumpt.	MW5	MW5-A	MW6	MW6-A	MW6-AD	MW7	MW7-A	MW7-AD	MW8	MW8-A
Metals (ug/L)													
Antimony													
Arsenic	69	36	0.14	ND	NT	ND	NT		ND	NT	NT	ND	NT
Barium				ND	NT	ND	NT		ND	NT	NT	ND	NT
Cadmium	43	9.3	narrative	ND	NT	ND	NT		ND	NT	NT	ND	NT
Chromium	1100	50	narrative	ND	NT	ND	NT		ND	NT	NT	ND	NT
Copper	2.9	2.9		1800.0	NT	1600.0	NT		ND	NT	NT	800.0	NT
Lead	220	8.5	narrative	9.0	ND	8.0	ND		4.0	ND	ND	7.0	ND
Mercury	2.1	0.025		ND	NT	ND	NT		ND	NT	NT	ND	NT
Nickel	75	8.3	4600										
Silver	2.3												
Zinc	95	86		600.0	NT	600.0	NT		ND	NT	NT	300.0	NT
Organics (ug/kg unless otherwise noted)													
LPAH													
Naphthalene				ND		ND		NT	ND	NT		ND	
Acenaphthylene				ND		ND		NT	ND	NT		ND	
Acenaphthene				ND		ND		NT	ND	NT		ND	
Fluorene				ND		ND		NT	ND	NT		ND	
Phenanthrene				ND		0.25		NT	ND	NT		ND	
Anthracene				ND		ND		NT	ND	NT		ND	
2-Methylnaphthalene				NT		NT		NT	NT	NT		NT	
Total LPAH													
HPAH													
Flouranthene				ND		ND		NT	0.78	NT		0.34	
Pyrene				ND		ND		NT	ND	NT		ND	
Benzo(a)anthracene				ND		ND		NT	ND	NT		ND	
Chrysene				ND		ND		NT	ND	NT		ND	
Benzo(b+k)fluoranthene				ND		ND		NT	ND	NT		0.06	
Benzo(a)pyrene				ND		ND		NT	ND	NT		0.07	
indeno(1,2,3-cd)pyrene				ND		ND		NT	ND	NT		ND	
Dibenzo(a,h)anthracene				ND		ND		NT	ND	NT		ND	
Total HPAH													
OTHER													
Di-n-Butyl phthalate				NT		NT		NT	ND	NT		NT	
Benzo(g,h,i)perylene				ND		ND		NT	ND	NT		ND	
Benzo(j)fluoranthene				NT		NT		NT	NT	NT		NT	
Dibenzo(a,h)acridine				NT		NT		NT	NT	NT		NT	
Dibenzo(a,j)acridine				NT		NT		NT	NT	NT		NT	
7H-Dibenzo(c,g)carbazole				NT		NT		NT	NT	NT		NT	
Dibenzo(a,e)pyrene				NT		NT		NT	NT	NT		NT	
Dibenzo(a,h)pyrene				NT		NT		NT	NT	NT		NT	
3-Methylcholanthrene				NT		NT		NT	NT	NT		NT	
7,12 Dimethylbenz(a)anthracene				NT		NT		NT	NT	NT		NT	
Total Carcinogenic PAHs				ND		ND		-	ND	-		0.13	
Total PAHs				ND		0.25		-	0.78	-		0.47	
EPA 624				NT		NT		NT	ND	NT		NT	
EPA 601				NT		ND		ND	NT	NT		NT	
EPA 625				NT		NT		NT	-	NT		NT	
EPA 8240				NT		NT		NT	NT	NT		NT	
EPA 8010				NT		NT		NT	NT	NT		NT	
EPA 8270				NT		NT		NT	NT	NT		NT	
Methylene Chloride				NT		NT		NT	NT	NT		NT	
TOC (mg/L)				NT		NT		NT	NT	4.70		NT	
TPH 418.1 (mg/L)				ND		ND		NT	ND	NT		ND	
Oil & Grease 413.2				NT		NT		NT	NT	NT		NT	
PCB-1262													
PCB-1254													
PCBs	10.0	0.03		NT		NT		NT	NT	NT		NT	

Notes:

Samples with the designation of "A" (i.e., MW-2A) were collected during Phase II sampling
 Samples with the designation "D" (i.e., MW4-D) indicate a duplicate sample collected from that location
 ND = Not Detected
 NT = Not Tested
 [Boxed Value] Exceeds Water Quality CMC or CMC standard (established for the protection of aquatic life)
 [Dashed Boxed Value] Exceeds Water Quality Standard for Organism Consumption (human health-based standard)
 CMC = Criterion Maximum Concentration as per 40CFR 131.36
 CMC = Criterion Continuous Concentration as per 40CFR 131.36

Table TSM-1
Analytical Results from Groundwater Sampling

Station Name (Depth - cm/ft)	Marine CMC	Marine CCC	Marine Consumpt.	MW9	MW9-A	MW10	MW10-A	MW10A-D	MW11	MW11-A	MW12	MW12D
Metals (ug/L)												
Antimony												
Arsenic	69	36	0.14	ND	NT	ND	NT	NT	ND		ND	ND
Barium				ND	NT	ND	NT	NT	100.0		ND	ND
Cadmium	43	9.3	narrative	ND	NT	ND	NT	NT	ND		ND	ND
Chromium	1100	50	narrative	ND	NT	ND	NT	NT	ND		ND	ND
Copper	2.9	2.9		ND	NT	ND	NT	NT	ND		ND	ND
Lead	220	8.5	narrative	4.0	ND	ND	NT	NT	ND		ND	ND
Mercury	2.1	0.025		ND	NT	ND	NT	NT	ND		ND	ND
Nickel	75	8.3	4600									
Silver	2.3											
Zinc	95	86		200.0	NT	ND	NT	NT	500.0		ND	ND
Organics (ug/kg unless otherwise noted)												
LPAH												
Naphthalene				ND		ND	NT		3.3	NT	ND	ND
Acenaphthylene				ND		ND	NT		ND	NT	ND	ND
Acenaphthene				ND		ND	NT		ND	NT	ND	ND
Fluorene				ND		ND	NT		NT	NT	NT	NT
Phenanthrene				ND		ND	NT		0.18	NT	0.12	ND
Anthracene				ND		ND	NT		ND	NT	ND	ND
2-Methylnaphthalene				NT		NT	NT		NT	NT	NT	NT
Total LPAH												
HPAH												
Flouranthene				ND		0.36	NT		0.49	NT	ND	ND
Pyrene				ND		ND	NT		ND	NT	ND	ND
Benzo(a)anthracene				ND		ND	NT		ND	NT	ND	ND
Chrysene				ND		ND	NT		ND	NT	ND	ND
Benzo(b+k)fluoranthene				ND		0.16	NT		ND	NT	ND	ND
Benzo(a)pyrene				ND		0.13	NT		ND	NT	ND	ND
Indeno(1,2,3-cd)pyrene				ND		ND	NT		ND	NT	ND	ND
Dibenzo(a,h)anthracene				ND		ND	NT		ND	NT	ND	ND
Total HPAH												
OTHER												
Di-n-Butyl phthalate				NT		23	NT		NT	NT	NT	NT
Benzo(g,h,i)perylene				ND		ND	NT		ND	NT	ND	ND
Benzo(j)fluoranthene				NT		NT	NT		NT	NT	NT	NT
Dibenzo(a,h)acridine				NT		NT	NT		NT	NT	NT	NT
Dibenzo(a,j)acridine				NT		NT	NT		NT	NT	NT	NT
7H-Dibenzo(c,g)carbazole				NT		NT	NT		NT	NT	NT	NT
Dibenzo(a,e)pyrene				NT		NT	NT		NT	NT	NT	NT
Dibenzo(a,h)pyrene				NT		NT	NT		NT	NT	NT	NT
3-Methylcholanthrene				NT		NT	NT		NT	NT	NT	NT
7,12 Dimethylbenz(a)anthracene				NT		NT	NT		NT	NT	NT	NT
Total Carcinogenic PAHs				ND		0.29	-		ND	-	ND	ND
Total PAHs				ND		0.65	-		3.97	-	0.12	ND
EPA 624				NT		ND	NT		NT	NT	NT	NT
EPA 601				NT		NT	NT		NT	NT	NT	NT
EPA 625				NT		-	NT		NT	NT	NT	NT
EPA 8240				NT		NT	NT		NT	NT	NT	NT
EPA 8010				NT		NT	NT		NT	NT	NT	NT
EPA 8270				NT		NT	NT		NT	NT	NT	NT
Methylene Chloride				NT		NT	NT		NT	NT	NT	NT
TOC (mg/L)				NT		NT	27.20		NT	21.20	NT	NT
TPH 418.1 (mg/L)				ND		ND	NT		NT	NT	ND	NT
Oil & Grease 413.2				NT		NT	NT		NT	NT	NT	NT
PCB-1262												
PCB-1254												
PCBs	10.0	0.03		NT		NT	NT		NT	NT	NT	NT

Notes:

Samples with the designation of "A" (i.e., MW-2A) were collected during Phase II sampling
 Samples with the designation "D" (i.e., MW4-D) indicate a duplicate sample collected from that location
 ND = Not Detected
 NT = Not Tested
 Exceeds Water Quality CMC or CMC standard (established for the protection of aquatic life)
 Exceeds Water Quality Standard for Organism Consumption (human health-based standard)
 CMC = Criterion Maximum Concentration as per 40CFR 131.36
 CCC = Criterion Continuous Concentration as per 40CFR 131.36

Table TSM-2
Analytical Results from Surface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9
Metals (mg/L)													
Antimony	150												
Arsenic	57	57	93	60	13.0	10.6	7.0	15.8	4.3	4.8	3.6	2.2	3.9
Barium					41.0	27.0	48.0	41.0	100.0	70.0	36.0	37.0	53.0
Cadmium	5.1	5.1	6.7	320	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium				1600	14.0	17.0	16.0	23.0	29.0	16.0	21.0	12.0	19.0
Copper	390	390	390		61.0	41.0	36.0	139.0	16.0	35.0	30.0	15.0	35.0
Lead	450	450	530		52.0	18.0	52.0	49.0	13.0	67.0	12.0	ND	23.0
Mercury	0.59	0.41	0.59		ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	140												
Silver	6.1	6.1	6.1										
Zinc	410	410	960		181.0	72.0	57.0	85.0	53.0	64.0	66.0	27.0	81.0
Organics (mg/kg)													
LPAH													
Naphthalene	2.1	99	170		ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	1.3	66	66		ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	0.5	16	57		ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.54	23	79	12800	ND	ND	ND	ND	ND	ND	ND	ND	1.72
Phenanthrene	1.5	100	480		ND	ND	ND	0.35	ND	ND	ND	ND	3.33
Anthracene	0.96	220	1200	96000	ND	ND	ND	ND	ND	ND	ND	ND	2.56
2-Methylnaphthalene	0.67	38	64		ND	ND	ND	ND	ND	ND	ND	0.91	4.96
Total LPAH	5.2	370	780										
HPAH													
Flouranthene	2.5	160	1200	12800	ND	ND	ND	0.40	ND	ND	ND	1.54	ND
Pyrene	3.3	1000	1400	9600	ND	ND	ND	0.40	ND	ND	ND	2.03	3.10
Benzo(a)anthracene	1.6	110	270		ND	ND	ND	ND	ND	ND	ND	ND	2.96
Chrysene	2.8	110	460		ND	ND	ND	ND	ND	ND	ND	1.44	2.98
Benzo(b+k)fluoranthene					ND	ND	ND	0.46	ND	ND	ND	ND	ND
Benzo(a)fluoranthene	3.6	230	450										
Benzo(a)pyrene	1.6	99	210		ND	ND	ND	ND	ND	ND	ND	ND	1.98
Indeno(1,2,3-cd)pyrene	0.69	34	88		ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	0.23	12	33		ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.72	31	78		ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HPAH	17	960	5300										
OTHER													
Benzo(j)fluoranthene					NT	NT	NT	NT	NT	NT	NT	NT	NT
Dibenzo(a,h)acridine					NT	NT	NT	NT	NT	NT	NT	NT	NT
Dibenzo(a,j)acridine					NT	NT	NT	NT	NT	NT	NT	NT	NT
7H-Dibenzo(c,g)carbazole					NT	NT	NT	NT	NT	NT	NT	NT	NT
Dibenzo(a,e)pyrene					NT	NT	NT	NT	NT	NT	NT	NT	NT
Dibenzo(a,h)pyrene					NT	NT	NT	NT	NT	NT	NT	NT	NT
3-Methylcholanthrene					NT	NT	NT	NT	NT	NT	NT	NT	NT
7,12 Dimethylbenz(a)anthracene					ND	ND	ND	ND	ND	ND	ND	ND	3.23
Total Carcinogenic PAHs				5.5	ND	ND	ND	0.46	ND	ND	ND	1.44	7.92
Total PAHs					ND	ND	ND	1.61	ND	ND	ND	5.92	26.80
EPA 8240													
Methylene Chloride													
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					NT	NT	NT	NT	NT	NT	NT	NT	NT
Oil & Grease 413.2					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1262					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1254					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCBs	150			5.2	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:

ND = Not Detected
NT = Not Tested

Samples with the designation "DUP" (i.e., SD-16DUP) indicate a duplicate sample collected from that location

Exceeds applicable Model Toxics Control Act (MTCA) cleanup standard for upland soils

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-2
Analytical Results from Surface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	S-10	S-11	S-12	S-13	S-14	S-15	S-16	S-16DUP	S-17
Metals (mg/L)													
Antimony	150												
Arsenic	57	57	93	60	2.4	12.7	2.0	1.3	624.0	2.9	ND	ND	ND
Barium					30.0	27.0	37.0	40.0	261.0	38.0	35.0	26.0	34.0
Cadmium	5.1	5.1	6.7	320	ND	ND	ND	ND	3.0	1.0	ND	ND	ND
Chromium				1600	20.0	62.0	19.0	19.0	97.0	41.0	24.0	14.0	13.0
Copper	390	390	390		17.0	29.0	18.0	19.0	744.0	31.0	16.0	15.0	12.0
Lead	450	450	530		ND	15.0	ND	13.0	5210.0	23.0	ND	ND	ND
Mercury	0.59	0.41	0.59		ND	ND	ND	ND	2.2	ND	ND	ND	ND
Nickel	140												
Silver	6.1	6.1	6.1										
Zinc	410	410	960		33.0	73.0	28.0	57.0	719.0	83.0	31.0	20.0	21.0
Organics (mg/kg)													
LPAH													
Naphthalene	2.1	99	170		ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	1.3	66	66		ND	ND	ND	ND	ND	0.97	ND	ND	ND
Acenaphthene	0.5	16	57		ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.54	23	79	12800	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	1.5	100	480		ND	ND	ND	ND	ND	5.55	ND	ND	ND
Anthracene	0.96	220	1200	96000	ND	ND	ND	ND	ND	4.27	ND	ND	ND
2-Methylnaphthalene	0.67	38	64		ND	ND	ND	ND	ND	ND	NT	NT	NT
Total LPAH	5.2	370	780										
HPAH													
Flouranthene	2.5	160	1200	12800	ND	ND	ND	ND	ND	3.74	ND	ND	ND
Pyrene	3.3	1000	1400	9600	ND	ND	ND	ND	ND	5.52	ND	ND	ND
Benzo(a)anthracene	1.6	110	270		ND	ND	ND	ND	ND	3.60	ND	ND	ND
Chrysene	2.8	110	460		ND	ND	ND	ND	ND	3.62	ND	ND	ND
Benzo(b+k)fluoranthene					ND	ND	ND	ND	ND	2.69	ND	ND	ND
Benzo(a)pyrene	1.6	99	210		ND	ND	ND	ND	ND	4.20	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.69	34	88		ND	ND	ND	ND	ND	1.20	ND	ND	ND
Dibenzo(a,h)anthracene	0.23	12	33		ND	ND	ND	ND	ND	0.50	ND	ND	ND
Benzo(g,h,i)perylene	0.72	31	78		ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HPAH	17	960	5300										
OTHER													
Benzo(j)fluoranthene					NT	NT	NT	NT	NT	NT	ND	ND	ND
Dibenzo(a,h)acridine					NT	NT	NT	NT	NT	NT	ND	ND	ND
Dibenzo(a,j)acridine					NT	NT	NT	NT	NT	NT	ND	ND	ND
7H-Dibenzo(c,g)carbazole					NT	NT	NT	NT	NT	NT	ND	ND	ND
Dibenzo(a,e)pyrene					NT	NT	NT	NT	NT	NT	ND	ND	ND
Dibenzo(a,h)pyrene					NT	NT	NT	NT	NT	NT	ND	ND	ND
3-Methylcholanthrene					NT	NT	NT	NT	NT	NT	ND	ND	ND
7,12 Dimethylbenz(a)anthracene					ND	ND	ND	ND	ND	ND	NT	NT	NT
Total Carcinogenic PAHs				5.5	ND	ND	ND	ND	ND	15.81	ND	ND	ND
Total PAHs					ND	ND	ND	ND	ND	35.86	ND	ND	ND
EPA 8240													
Methylene Chloride													
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					NT	NT	NT	NT	NT	NT	NT	NT	NT
Oil & Grease 413.2					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1262					NT	NT	NT	NT	18.60	NT	NT	NT	NT
PCB-1254					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCBs	150			5.2	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation "DUP" (i.e., SD-16DUP) indicate a duplicate sample collected from that location

Exceeds applicable Model Toxics Control Act (MTCA) cleanup standard for upland soils

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-2
Analytical Results from Surface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	S-19	S-19DUP	S-20	S-21	S-21DUP	S-22	MW2-6"	MW3-6"	MW4-6"
Metals (mg/L)													
Antimony	150												
Arsenic	57	57	93	60	ND	ND	16.9	4.7	4.7	5.0	4.3	1.2	ND
Barium					39.0	48.0	68.0	75.0	87.0	85.0	72.0	38.0	13.0
Cadmium	5.1	5.1	6.7	320	ND	ND	ND	ND	ND	104.0	ND	ND	ND
Chromium				1600	14.0	20.0	19.0	32.0	39.0	48.0	25.0	18.0	16.0
Copper	390	390	390		21.0	25.0	58.0	47.0	59.0	60.0	27.0	19.0	16.0
Lead	450	450	530		ND	ND	65.0	19.0	32.0	70.0	47.0	8.0	ND
Mercury	0.59	0.41	0.59		ND	ND	ND	0.5	ND	ND	ND	ND	ND
Nickel	140												
Silver	6.1	6.1	6.1										
Zinc	410	410	960		29.0	33.0	62.0	384.0	484.0	196.0	61.0	37.0	60.0
Organics (mg/kg)													
LPAH													
Naphthalene	2.1	99	170		ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	1.3	66	66		ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	0.5	16	57		ND	ND	ND	ND	ND	ND	ND	ND	0.85
Fluorene	0.54	23	79	12800	ND	ND	ND	ND	ND	ND	ND	ND	0.66
Phenanthrene	1.5	100	480		ND	ND	ND	ND	ND	0.36	4.85	ND	4.73
Anthracene	0.96	220	1200	96000	ND	ND	ND	ND	ND	ND	3.73	ND	1.15
2-Methylnaphthalene	0.67	38	64		NT	NT	NT	NT	NT	NT	ND	ND	NT
Total LPAH	5.2	370	780										
HPAH													
Flouranthene	2.5	160	1200	12800	ND	ND	ND	ND	ND	0.40	1.61	ND	2.01
Pyrene	3.3	1000	1400	9600	ND	ND	ND	ND	ND	0.63	2.88	ND	2.88
Benzo(a)anthracene	1.6	110	270		ND	ND	ND	ND	ND	ND	ND	ND	0.81
Chrysene	2.8	110	460		ND	ND	ND	ND	ND	ND	ND	ND	0.81
Benzo(b+k)fluoranthene					ND	ND	ND	ND	ND	0.96	1.01	ND	1.04
Benzo(a)fluoranthene	3.6	230	450										
Benzo(a)pyrene	1.6	99	210		ND	ND	ND	ND	ND	0.40	1.62	ND	0.96
Indeno(1,2,3-cd)pyrene	0.69	34	88		ND	ND	ND	ND	ND	0.43	0.45	ND	ND
Dibenzo(a,h)anthracene	0.23	12	33		ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.72	31	78		ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HPAH	17	960	5300										
OTHER													
Benzo(j)fluoranthene					ND	ND	ND	ND	ND	ND	NT	NT	ND
Dibenzo(a,h)acridine					ND	ND	ND	ND	ND	ND	NT	NT	ND
Dibenzo(a,j)acridine					ND	ND	ND	ND	ND	ND	NT	NT	ND
7H-Dibenzo(c,g)carbazole					ND	ND	ND	ND	ND	ND	NT	NT	ND
Dibenzo(a,e)pyrene					ND	ND	ND	ND	ND	ND	NT	NT	ND
Dibenzo(a,h)pyrene					ND	ND	ND	ND	ND	ND	NT	NT	ND
3-Methylcholanthrene					ND	ND	ND	ND	ND	ND	NT	NT	ND
7,12 Dimethylbenz(a)anthracene					ND	NT	NT	NT	NT	NT	ND	ND	NT
Total Carcinogenic PAHs				5.5	ND	ND	ND	ND	ND	1.79	3.08	ND	3.62
Total PAHs					ND	ND	ND	ND	ND	3.18	16.15	ND	15.90
EPA 8240													
Methylene Chloride													
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					NT	NT	NT	NT	NT	NT	NT	NT	NT
Oil & Grease 413.2					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1262					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1254					NT	NT	NT	NT	NT	NT	NT	NT	NT
PCBs	150			5.2	NT	NT	NT	ND	NT	ND	NT	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation "DUP" (i.e., SD-16DUP) indicate a duplicate sample collected from that location:

Exceeds applicable Model Toxics Control Act (MTCA) cleanup standard for upland soils

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-2
Analytical Results from Surface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQU (1)	State SQU (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	MW5-6"	MW6-6"	MW7-6"	MW8-6"	MW9-6"	MW11-6"	BH1-6"	BH2-6"	BH3-6"
Metals (mg/L)													
Antimony	150												
Arsenic	57	57	93	60	2.4	23.4	867.0	4.7	4.5	12.3	14.1	3.6	4.3
Barium					44.0	82.0	343.0	39.0	39.0	60.0	51.0	43.0	19.0
Cadmium	5.1	5.1	6.7	320	ND	ND	25.0	ND	ND	1.0	ND	ND	ND
Chromium				1600	17.0	36.0	83.0	23.0	28.0	20.0	33.0	24.0	12.0
Copper	390	390	390		185.0	161.0	1350.0	42.0	30.0	554.0	122.0	19.0	14.0
Lead	450	450	530		44.0	86.0	647.0	38.0	22.0	54.0	84.0	14.0	ND
Mercury	0.59	0.41	0.59		ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	140												
Silver	6.1	6.1	6.1										
Zinc	410	410	960		37.0	360.0	5250.0	67.0	66.0	69.0	161.0	63.0	24.0
Organics (mg/kg)													
LPAH													
Naphthalene	2.1	99	170		ND	ND	ND	ND	ND		ND	ND	ND
Acenaphthylene	1.3	66	66		ND	ND	ND	ND	ND		ND	ND	ND
Acenaphthene	0.5	16	57		ND	ND	ND	ND	ND		ND	0.44	ND
Fluorene	0.54	23	79	12800	ND	ND	ND	ND	ND		ND	0.37	ND
Phenanthrene	1.5	100	480		ND	ND	ND	ND	ND		ND	3.40	ND
Anthracene	0.96	220	1200	96000	ND	ND	ND	ND	ND		ND	0.73	ND
2-Methylnaphthalene	0.67	38	64		NT	ND	NT	NT	NT		NT	NT	NT
Total LPAH	5.2	370	780										
HPAH													
Flouranthene	2.5	160	1200	12800	ND	ND	ND	ND	ND		ND	2.09	ND
Pyrene	3.3	1000	1400	9600	ND	ND	ND	ND	ND		ND	2.85	ND
Benzo(a)anthracene	1.6	110	270		ND	ND	ND	ND	ND		ND	ND	ND
Chrysene	2.8	110	460		ND	ND	ND	ND	ND		ND	0.90	ND
Benzo(b+k)fluoranthene					ND	ND	ND	0.44	ND		ND	1.30	ND
Benzo(a)fluoranthene	3.6	230	450										
Benzo(a)pyrene	1.6	99	210		ND	ND	ND	ND	ND		ND	1.12	ND
Indeno(1,2,3-cd)pyrene	0.69	34	88		ND	ND	ND	ND	ND		ND	0.52	ND
Dibenzo(a,h)anthracene	0.23	12	33		ND	ND	ND	ND	ND		ND	ND	ND
Benzo(g,h,i)perylene	0.72	31	78		ND	ND	ND	ND	ND		ND	ND	ND
Total HPAH	17	960	5300										
OTHER													
Benzo(j)fluoranthene					ND	NT	ND	ND	ND		ND	ND	ND
Dibenzo(a,h)acridine					ND	NT	ND	ND	ND		ND	ND	ND
Dibenzo(a,j)acridine					ND	NT	ND	ND	ND		ND	ND	ND
7H-Dibenzo(c,g)carbazole					ND	NT	ND	ND	ND		ND	ND	ND
Dibenzo(a,e)pyrene					ND	NT	ND	ND	ND		ND	ND	ND
Dibenzo(a,h)pyrene					ND	NT	ND	ND	ND		ND	ND	ND
3-Methylcholanthrene					ND	NT	ND	ND	ND		ND	ND	ND
7,12 Dimethylbenz(a)anthracene					NT	ND	NT	NT	NT		NT	NT	NT
Total Carcinogenic PAHs				5.5	ND	ND	ND	0.44	ND		ND	3.84	ND
Total PAHs					ND	ND	ND	0.44	ND		ND	13.72	ND
EPA 8240													
Methylene Chloride													
TOC					NT	NT	NT	NT	NT		NT	NT	NT
TPH 418.1					NT	NT	NT	NT	NT		NT	NT	NT
Oil & Grease 413.2					NT	NT	NT	NT	NT		NT	NT	NT
PCB-1262					NT	NT	NT	NT	NT		NT	NT	NT
PCB-1254					NT	NT	NT	NT	NT		NT	NT	NT
PCBs	150			5.2	NT	NT	NT	NT	NT		NT	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation "DUP" (i.e., SD-16DUP) indicate a duplicate sample collected from that location

Exceeds applicable Model Toxics Control Act (MTCA) cleanup standard for upland soils

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-2
Analytical Results from Surface Soil Sampling

Station Name (Depth - cm/f)	EPA SQO (1)	State SQS (2)	State MCL/CSL (2)	MTCA Site Standard (1)	BH5-6*	PIT 1A-6*	PIT 1B-6*	PIT 1C-6*	PIT 8-6*	PIT 9-6*
Metals (mg/L)										
Antimony	150									
Arsenic	57	57	93	60	ND	2.8	4.0	2.1	188.0	13.5
Barium					73.0	39.0	58.5	61.7	77.6	36.7
Cadmium	5.1	5.1	6.7	320	ND	2.1	7.8	7.5	5.9	ND
Chromium				1600	25.0	20.7	33.0	42.8	25.1	20.5
Copper	390	390	390		57.0	33.4	203.0	130.0	169.0	32.1
Lead	450	450	530		16.0	8.8	54.3	88.0	176.0	11.5
Mercury	0.59	0.41	0.59		ND	ND	0.7	ND	ND	ND
Nickel	140									
Silver	6.1	6.1	6.1							
Zinc	410	410	960		62.0	60.9	96.2	85.0	589.0	95.3
Organics (mg/kg)										
LPAH										
Naphthalene	2.1	99	170		ND	NT	NT	NT	NT	NT
Acenaphthylene	1.3	66	66		ND	NT	NT	NT	NT	NT
Acenaphthene	0.5	16	57		ND	NT	NT	NT	NT	NT
Fluorene	0.54	23	79	12800	ND	NT	NT	NT	NT	NT
Phenanthrene	1.5	100	480		ND	NT	NT	NT	NT	NT
Anthracene	0.96	220	1200	96000	ND	NT	NT	NT	NT	NT
2-Methylnaphthalene	0.67	38	64		ND	NT	NT	NT	NT	NT
Total LPAH	5.2	370	780							
HPAH										
Flouranthene	2.5	160	1200	12800	ND	NT	NT	NT	NT	NT
Pyrene	3.3	1000	1400	9600	ND	NT	NT	NT	NT	NT
Benzo(a)anthracene	1.6	110	270		ND	NT	NT	NT	NT	NT
Chrysene	2.8	110	460		ND	NT	NT	NT	NT	NT
Benzo(b+k)fluoranthene					ND	NT	NT	NT	NT	NT
Benzo(a)pyrene	3.6	230	450		ND	NT	NT	NT	NT	NT
Benzo(a)pyrene	1.6	99	210		ND	NT	NT	NT	NT	NT
Indeno(1,2,3-cd)pyrene	0.69	34	88		ND	NT	NT	NT	NT	NT
Dibenzo(a,h)anthracene	0.23	12	33		ND	NT	NT	NT	NT	NT
Benzo(g,h,i)perylene	0.72	31	78		ND	NT	NT	NT	NT	NT
Total HPAH	17	960	5300							
OTHER										
Benzo(j)fluoranthene					ND	NT	NT	NT	NT	NT
Dibenzo(a,h)acridine					ND	NT	NT	NT	NT	NT
Dibenzo(a,j)acridine					ND	NT	NT	NT	NT	NT
7H-Dibenzo(c,g)carbazole					ND	NT	NT	NT	NT	NT
Dibenzo(a,e)pyrene					ND	NT	NT	NT	NT	NT
Dibenzo(a,h)pyrene					ND	NT	NT	NT	NT	NT
3-Methylcholanthrene					ND	NT	NT	NT	NT	NT
7,12 Dimethylbenz(a)anthracene					NT	NT	NT	NT	NT	NT
Total Carcinogenic PAHs				5.5	ND	-	-	-	-	-
Total PAHs					ND	-	-	-	-	-
EPA 8240										
Methylene Chloride										
TOC					NT	NT	NT	NT	NT	NT
TPH 418.1					NT	4110	43100	16600	NT	NT
Oil & Grease 413.2					NT	NT	NT	NT	NT	NT
PCB-1262					NT	NT	NT	NT	NT	NT
PCB-1254					NT	NT	3.30	NT	NT	NT
PCBs	150			5.2	NT	ND	NT	ND	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation "DUP" (i.e., SD-16DUP) indicate a duplicate sample collected from that location

Exceeds applicable Model Toxics Control Act (MTCA) cleanup standard for upland soils

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-3
Analytical Results from Subsurface Soil Sampling

Station Name (Depth - cm/ft)	EPA	State	State	MTCA	MW1-5	MW1-10A	MW1B-5	MW2-5	MW2-10	MW3-5	MW3-10	MW4-5	MW4-10	MW4-20	MW4-30
	SQO (1)	SQS (2)	MCUL/CSL (2)	Site Standard (1)											
Metals (mg/kg)															
Antimony	150														
Arsenic	57	57	93	60	3.3	2.8	6.0	13.8	2.3	ND	ND	6.8	ND	ND	ND
Barium					47.0	16.0	75.0	157.0	30.0	54.0	539.0	12.0	30.0	113.0	165.0
Cadmium	5.1	5.1	6.7	320	5.0	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Chromium				1600	17.0	18.0	13.0	51.0	14.0	8.0	14.0	392.0	22.0	10.0	14.0
Copper	390	390	390		16.0	23.0	22.0	169.0	24.0	14.0	134.0	933.0	20.0	21.0	24.0
Lead	450	450	530		6.0	8.0	19.0	44.0	ND	20.0	63.0	70.0	ND	9.0	14.0
Mercury	0.59	0.41	0.59		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	140														
Silver	6.1	6.1	6.1												
Zinc	410	410	960		28.0	40.0	44.0	96.0	59.0	48.0	ND	116.0	22.0	35.0	25.0
Organics (mg/kg total organic carbon)															
LPAH															
Naphthalene	99	170			ND			ND						ND	ND
Acenaphthylene	66	66			ND			ND						ND	ND
Acenaphthene	16	57			ND			ND						ND	ND
Fluorene	23	79	12800		ND			ND						ND	ND
Phenanthrene	100	480			ND			0.38						ND	ND
Anthracene	220	1200	96000		ND			ND						ND	ND
2-Methylnaphthalene	38	64			NT			NT						NT	NT
Total LPAH	370	780													
HPAH															
Flouranthene	160	1200	12800		ND			0.56						ND	ND
Pyrene	1000	1400	9600		ND			0.74						ND	ND
Benzo(a)anthracene	110	270			ND			0.47						ND	ND
Chrysene	110	460			ND			0.45						ND	ND
Benzo(b+k)fluoranthene					ND			0.72						ND	ND
Benzo(a)pyrene	230	450													
Benzo(a)pyrene	99	210			ND			6.63						ND	ND
Indeno(1,2,3-cd)pyrene	34	88			ND			ND						ND	ND
Dibenzo(a,h)anthracene	12	33			ND			ND						ND	ND
Benzo(g,h,i)perylene	31	78			ND			ND						ND	ND
Total HPAH	960	5300													
OTHER															
Benzo(j)fluoranthene					NT			NT						NT	NT
Dibenzo(a,h)acridine					NT			NT						NT	NT
Dibenzo(a,i)acridine					NT			NT						NT	NT
7H-Dibenzo(c,g)carbazole					NT			NT						NT	NT
Dibenzo(a,e)pyrene					NT			NT						NT	NT
Dibenzo(a,h)pyrene					NT			NT						NT	NT
3-Methylcholanthrene					NT			NT						NT	NT
7,12 Dimethylbenz(a)anthracene					NT			NT						NT	NT
Total Carcinogenic PAHs			5.5		ND			8.27						ND	ND
Total PAHs					ND			9.95						ND	ND
Oil & Grease 413.2															
EPA 8010															
EPA 8270									NT	NT	NT	NT	NT		
EPA 8240					NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND
Methylene Chloride					NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					87.30	107.00	220.00	ND	ND	31.40	ND	47.50	ND	31.60	NT
PCB-1262															
PCB-1254															
PCBs 150			5.2		NT			NT	NT	NT	NT	NT	NT	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation of "A" (i.e., MW1-10A) were collected during Phase II sampling

Exceeds applicable EPA Sediment Quality Objective or Site Cleanup Standard

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

ND = Not Detected

NT = Not Tested

Samples with the designation of "A" were collected during Phase II sampling

Exceeds applicable EPA Sediment Quality Objective or Site Cleanup Standard

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-3
Analytical Results from Subsurface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCULCSL (2)	MTCA Site Standard (1)	MW5-5	MW5-15	MW6-5	MW6-10	MW6-20	MW6-29	MW7-5	MW7-10	MW7-30	MW8-5	MW8-10
Metals (mg/kg)															
Antimony	150														
Arsenic	57	57	93	60	3.6	2.2	9.3	NT	ND	NT	17.9	NT	4.0	0.8	3.7
Barium					31.0	8.0	39.0	NT	10.0	NT	30.0	NT	7.0	14.0	32.0
Cadmium	5.1	5.1	6.7	320	ND	ND	ND	NT	ND	NT	ND	NT	ND	ND	ND
Chromium				1600	15.0	16.0	10.0	NT	13.0	NT	16.0	NT	14.0	36.0	8.0
Copper	390	390	390		14.0	9.0	28.0	NT	6.0	NT	550.0	NT	6.0	26.0	8.0
Lead	450	450	530		ND	ND	77.0	NT	ND	NT	144.0	NT	ND	33.0	ND
Mercury	0.59	0.41	0.59		ND	ND	ND	NT	ND	NT	ND	NT	ND	ND	ND
Nickel	140														
Silver	6.1	6.1	6.1												
Zinc	410	410	960		57.0	23.0	97.0	NT	19.0	NT	56.0	NT	16.0	18.0	21.0
Organics (mg/kg total organic carbon)															
LPAH															
Naphthalene		99	170				ND	ND			ND		ND		
Acenaphthylene		66	66				ND	ND			ND		ND		
Acenaphthene		16	57				ND	ND			ND		ND		
Fluorene		23	79	12800			ND	ND			ND		ND		
Phenanthrene		100	480				ND	ND			ND		ND		
Anthracene		220	1200	96000			ND	ND			ND		ND		
2-Methylnaphthalene		38	64				NT	NT			NT		NT		
Total LPAH		370	780												
HPAH															
Flouranthene		160	1200	12800			ND	ND			ND		ND		
Pyrene		1000	1400	9600			ND	ND			ND		ND		
Benzo(a)anthracene		110	270				ND	ND			ND		ND		
Chrysene		110	460				ND	ND			ND		ND		
Benzo(b+k)fluoranthene							ND	ND			ND		ND		
Benzofluoranthenes		230	450												
Benzo(a)pyrene		99	210				ND	ND			ND		ND		
Indeno(1,2,3-cd)pyrene		34	88				ND	ND			ND		ND		
Dibenzo(a,h)anthracene		12	33				ND	ND			ND		ND		
Benzo(g,h,i)perylene		31	78				ND	ND			ND		ND		
Total HPAH		960	5300												
OTHER															
Benzo(j)fluoranthene							NT	NT			ND		ND		
Dibenzo(a,h)acridine							NT	NT			ND		ND		
Dibenzo(a,j)acridine							NT	NT			ND		ND		
7H-Dibenzo(c,g)carbazole							NT	NT			ND		ND		
Dibenzo(a,e)pyrene							NT	NT			ND		ND		
Dibenzo(a,h)pyrene							NT	NT			ND		ND		
3-Methylcholanthrene							NT	NT			ND		ND		
7,12 Dimethylbenz(a)anthracene							NT	NT			ND		ND		
Total Carcinogenic PAHs				5.5			ND	ND			ND		ND		
Total PAHs							ND	ND			ND		ND		
Oil & Grease 413.2															
EPA 8010					NT	NT			NT	NT		NT		NT	NT
EPA 8270					NT	NT			NT	NT		NT		NT	NT
EPA 8240					NT	NT	-	-	NT	NT		NT		NT	NT
Methylene Chloride					NT	NT	193.00	193.00	NT	NT	NT	NT	NT	NT	NT
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					ND	ND	58.20	NT	ND	ND	ND	32.00	ND	821.00	ND
PCB-1262															
PCB-1254															
PCBs	150			5.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:

n of "A" (i.e., MW1-10A) were collected during Phase II sampling
licable EPA Sediment Quality Objective or Site Cleanup Standard
mg/kg
mg/kg except LPAH & HPAH standards are mg/kg TOC

ND = Not Detected
NT = Not Tested
Samples with the designation of "A" (i.e., MW1-10A) w
Exceeds applicable EPA Sediment Qual
(1) Standards are mg/kg
(2) Standards are mg/kg except LPAH & H

Table TSM-3
Analytical Results from Subsurface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	MW9-12.5	MW9-25	MW10-10	MW10-15	MW10-20	MW10-40	MW10-45	MW11-5	MW11-10	MW12-5
Metals (mg/kg)														
Antimony	150													
Arsenic	57	57	93	60	0.8	NT	3.6	NT	2.5	0.7	NT	3.2	4.0	NT
Barium					7.0	NT	53.0	NT	52.0	20.0	NT	48.0	17.0	NT
Cadmium	5.1	5.1	6.7	320	ND	NT	ND	NT	ND	ND	NT	ND	ND	NT
Chromium				1600	5.0	NT	16.0	NT	23.0	11.0	NT	17.0	11.0	NT
Copper	390	390	390		ND	NT	25.0	NT	13.0	11.0	NT	47.0	18.0	NT
Lead	450	450	530		ND	NT	18.0	NT	15.0	11.0	NT	36.0	6.0	NT
Mercury	0.59	0.41	0.59		ND	NT	ND	NT	ND	ND	NT	ND	ND	NT
Nickel	140													
Silver	6.1	6.1	6.1											
Zinc	410	410	960		5.0	NT	46.0	NT	29.0	18.0	NT	70.0	26.0	NT
Organics (mg/kg total organic carbon)														
<u>LPAH</u>														
Naphthalene	99	170			ND		NT	NT		ND	ND			
Acenaphthylene	66	66			ND		NT	NT		ND	ND			
Acenaphthene	16	57			ND		NT	NT		ND	ND			
Fluorene	23	79	12800		ND		ND	ND		ND	ND			
Phenanthrene	100	480			ND		ND	ND		ND	ND			
Anthracene	220	1200	96000		ND		NT	NT		ND	ND			
2-Methylnaphthalene	38	64			NT		ND	ND		NT	NT			
Total LPAH	370	780												
<u>HPAH</u>														
Flouranthene	160	1200	12800		ND		1.51	1.51		ND	ND			
Pyrene	1000	1400	9600		ND		1.62	1.62		ND	ND			
Benzo(a)anthracene	110	270			ND		ND	ND		ND	ND			
Chrysene	110	460			ND		NT	NT		ND	ND			
Benzo(b+k)fluoranthene					ND		1.81	1.81		ND	ND			
Benzo(a)pyrene	230	450			ND									
Benzo(a)pyrene	99	210			ND		1.49	1.49		ND	ND			
Indeno(1,2,3-cd)pyrene	34	88			ND		ND	ND		ND	ND			
Dibenzo(a,h)anthracene	12	33			ND		NT	NT		ND	ND			
Benzo(g,h,i)perylene	31	78			ND		NT	NT		ND	ND			
Total HPAH	960	5300												
<u>OTHER</u>														
Benzo(j)fluoranthene					ND		NT	NT		NT	NT			
Dibenzo(a,h)acridine					ND		NT	NT		NT	NT			
Dibenzo(a,j)acridine					ND		NT	NT		NT	NT			
7H-Dibenzo(c,g)carbazole					ND		NT	NT		NT	NT			
Dibenzo(a,e)pyrene					ND		NT	NT		NT	NT			
Dibenzo(a,h)pyrene					ND		NT	NT		NT	NT			
3-Methylcholanthrene					ND		ND	ND		NT	NT			
7,12 Dimethylbenz(a)anthracene					NT		NT	NT		NT	NT			
Total Carcinogenic PAHs			5.5		ND		3.30	3.30		ND	ND			
Total PAHs					ND		6.43	6.43		ND	ND			
Oil & Grease 413.2														
EPA 8010							NT			NT				NT
EPA 8270							NT			NT				NT
EPA 8240					ND	NT	ND	NT	NT	ND	ND			NT
Methylene Chloride					ND	NT	ND	NT	NT	ND	ND			NT
TOC					NT	NT	NT	NT	NT	NT	NT			NT
TPH 418.1					32.00	ND	202.00	NT	18.00	NT	NT			85.00
PCB-1262														
PCB-1254														
PCBs 150			5.2		NT	NT	NT	NT	NT	NT	NT			NT

Notes:

re collected during Phase II sampling
 by Objective or Site Cleanup Standard

AH standards are mg/kg TOC

ND = Not Detected

NT = Not Tested

Samples with the designation of "A" (i.e., MW1-10A) were collected during

Exceeds applicable EPA Sediment Quality Objective or

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are

Table TSM-3
Analytical Results from Subsurface Soil Sampling

Station Name (Depth - cm/ft)	EPA SQO (1)	State SQS (2)	State MCULCSL (2)	MTCA Site Standard (1)	MW12-10	BH1-5	BH3-2.5	BH4-5	BH4-15	BH6-5	BH6-10	BH6-17.5	BH5-5	PIT 1A-2'	PIT 2-2'
Metals (mg/kg)															
Antimony	150														
Arsenic	57	57	93	60	NT	1.9	2.6	1.1	2.0	NT	NT	NT	NT	ND	NT
Barium					NT	388.0	45.0	53.0	30.0	NT	NT	NT	NT	39.5	NT
Cadmium	5.1	5.1	6.7	320	NT	ND	ND	ND	ND	NT	NT	NT	NT	ND	NT
Chromium				1600	NT	11.0	24.0	24.0	20.0	NT	NT	NT	NT	ND	NT
Copper	390	390	390		NT	93.0	13.0	17.0	14.0	NT	NT	NT	NT	25.5	NT
Lead	450	450	530		NT	146.0	385.0	8.0	6.0	NT	NT	NT	NT	12.0	NT
Mercury	0.59	0.41	0.59		NT	ND	ND	ND	ND	NT	NT	NT	NT	2.9	ND
Nickel	140													ND	NT
Silver	6.1	6.1	6.1											ND	NT
Zinc	410	410	960		NT	95.0	27.0	34.0	25.0	NT	NT	NT	NT	23.8	NT
Organics (mg/kg total organic carbon)															
LPAH															
Naphthalene		99	170												
Acenaphthylene		66	66					ND	ND						
Acenaphthene		16	57					ND	ND						
Fluorene		23	79	12800				ND	ND						
Phenanthrene		100	480					ND	ND						
Anthracene		220	1200	96000				ND	ND						
2-Methylnaphthalene		38	64					ND	ND						
Total LPAH		370	780					NT	NT						
HPAH															
Flouranthene		160	1200	12800				ND	ND						
Pyrene		1000	1400	9600				ND	ND						
Benzo(a)anthracene		110	270					ND	ND						
Chrysene		110	460					ND	ND						
Benzo(b+k)fluoranthene								ND	ND						
Benzo(a)fluoranthene		230	450					ND	ND						
Benzo(a)pyrene		99	210					ND	ND						
Indeno(1,2,3-cd)pyrene		34	88					ND	ND						
Dibenzo(a,h)anthracene		12	33					ND	ND						
Benzo(g,h,i)perylene		31	78					ND	ND						
Total HPAH		960	5300					ND	ND						
OTHER															
Benzo(j)fluoranthene								ND	ND						
Dibenzo(a,h)acridine								ND	ND						
Dibenzo(a,j)acridine								ND	ND						
7H-Dibenzo(c,g)carbazole								ND	ND						
Dibenzo(a,e)pyrene								ND	ND						
Dibenzo(a,h)pyrene								ND	ND						
3-Methylcholanthrene								ND	ND						
7,12 Dimethylbenz(a)anthracene								ND	ND						
Total Carcinogenic PAHs				5.5				NT	NT						
Total PAHs								ND	ND						
Oil & Grease 413.2								ND	ND						
EPA 8010					NT	NT	NT			ND	ND	ND	NT	NT	NT
EPA 8270					NT	NT	NT			NT	NT	NT	NT	NT	NT
EPA 8240					NT	NT	NT			NT	NT	NT	NT	NT	NT
Methylene Chloride					NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TOC					NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TPH 418.1					301.00	ND	180.00	47.50	30.00	NT	NT	NT	56.30	28.00	24.00
PCB-1262															
PCB-1254															
PCBs 150				5.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT

Notes:

g Phase II sampling
ite Cleanup Standard

mg/kg TOC

ND = Not Detected

NT = Not Tested

Samples with the designation of "A" (i.e., MW1-10A) were collected during Phase II sampling

Exceeds applicable EPA Sediment Quality Objective or Site Cleanup Standard

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-3
Analytical Results from Subsurface Soil Sampling

Station Name (Depth - cm/R)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	MTCA Site Standard (1)	PIT 2-4'	PIT 3-2'	PIT 3-4'	PIT 4-2'	PIT 4-4'	PIT 5-5'	PIT 6-5'	PIT 7-5'	PIT 8-2'	PIT 9-2'
Metals (mg/kg)														
Antimony	150													
Arsenic	57	57	93	60	NT	NT	NT	NT	NT	NT	NT	NT	275.0	8.9
Barium					NT	NT	NT	NT	NT	NT	NT	NT	1220.0	200.0
Cadmium	5.1	5.1	6.7	320	NT	NT	NT	NT	NT	NT	NT	NT	13.5	ND
Chromium				1600	NT	NT	NT	NT	NT	NT	NT	NT	101.0	20.7
Copper	390	390	390		NT	NT	NT	NT	NT	NT	NT	NT	369.0	109.0
Lead	450	450	530		ND	ND	ND	6.7	ND	NT	NT	NT	507.0	173.0
Mercury	0.59	0.41	0.59		NT	NT	NT	NT	NT	NT	NT	NT	ND	ND
Nickel	140													
Silver	6.1	6.1	6.1											
Zinc	410	410	960		NT	NT	NT	NT	NT	NT	NT	NT	1110.0	147.0
Organics (mg/kg total organic carbon)														
<u>LPAH</u>														
Naphthalene		99	170											
Acenaphthylene		66	66											
Acenaphthene		16	57											
Fluorene		23	79	12800										
Phenanthrene		100	480											
Anthracene		220	1200	96000										
2-Methylnaphthalene		38	64											
Total LPAH		370	780											
<u>HPAH</u>														
Flouranthene		160	1200	12800										
Pyrene		1000	1400	9600										
Benzo(a)anthracene		110	270											
Chrysene		110	460											
Benzo(b+k)fluoranthene														
Benzo(a)pyrene		230	450											
Indeno(1,2,3-cd)pyrene		99	210											
Dibenzo(a,h)anthracene		34	88											
Benzo(g,h,i)perylene		12	33											
Total HPAH		960	5300											
<u>OTHER</u>														
Benzo(j)fluoranthene														
Dibenzo(a,h)acridine														
Dibenzo(a,i)acridine														
7H-Dibenzo(c,g)carbazole														
Dibenzo(a,e)pyrene														
Dibenzo(a,h)pyrene														
3-Methylcholanthrene														
7,12 Dimethylbenz(a)anthracene														
Total Carcinogenic PAHs				5.5										
Total PAHs														
Oil & Grease 413.2														
EPA 8010					NT			NT	NT	NT	NT	NT		
EPA 8270					NT			NT	NT	NT	NT	NT		
EPA 8240					NT			NT	NT	NT	NT	NT		
Methylene Chloride					NT			NT	NT	NT	NT	NT		
TOC					NT			NT	NT	NT	NT	NT		
TPH 418.1					16.00			1620.00	36.00	33.00	32.00	53.00		
PCB-1262														
PCB-1254														
PCBs 150				5.2	NT			NT	NT	NT	NT	NT		

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation of "A" (i.e., MW1-10A) were collected during Phase II sampling

Exceeds applicable EPA Sediment Quality Objective or Site Cleanup Standard

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

Table TSM-4
Analytical Results from Aquatic Sediment Sampling

Station Name (Depth - cm/vft)	EPA SQO (1)	State SQS (2)	State MCUL/CSL (2)	SD1	SD2	SD2-B	SD3	SD4	SD5	SD6	SD7	SD7DUP	SD7-B
Metals (mg/kg)													
Antimony	150												
Arsenic	57	57	93	12.5	13.7		6.4	49.5	60.4	6.8	9.6	7.9	3.7
Barium				11.0	11.0		38.0	48.0	56.0	46.0	24.0	12.0	21.7
Cadmium	5.1	5.1	6.7	ND	ND		ND	ND	ND	ND	ND	ND	ND
Chromium				14.0	13.0		14.0	60.0	59.0	21.0	183.0	80.0	36.4
Copper	390	390	390	57.0	31.0		27.0	108.0	139.0	17.0	917.0	159.0	86.7
Lead	450	450	530	13.0	13.0		62.0	64.0	85.0	16.0	86.0	28.0	32.8
Mercury	0.59	0.41	0.59	ND	ND		ND	ND	ND	ND	ND	ND	ND
Nickel	140												
Silver	6.1	6.1	6.1										
Zinc	410	410	960	34.0	56.0		69.0	236.0	320.0	60.0	290.0	117.0	103.0
Organics (mg/kg dry wt / toc normalized)													
LPAH													
Naphthalene	2.1	99	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	1.3	66	66	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	0.5	16	57	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.54	23	79	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	1.5	100	480	ND	2.11/703	ND	ND	ND	ND	96/320	ND	ND	ND
Anthracene	0.96	220	1200	ND	.44/147	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.67	38	64	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Total LPAH	5.2	370	780										
HPAH													
Flouranthene	2.5	160	1200	ND	1.07/357	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	3.3	1000	1400	ND	1.63/543	ND	ND	ND	ND	.9/300	ND	ND	ND
Benzo(a)anthracene	1.6	110	270	ND	.46/153	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	2.8	110	460	ND	.46/153	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b+k)fluoranthene				ND	.72/240	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	1.6	99	210	ND	6.63/2210	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.69	34	88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	0.23	12	33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.72	31	78	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HPAH	17	960	5300										
OTHER													
Dibenzo(a,h)acridine				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,j)acridine				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7H-Dibenzo(c,g)carbazole				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,e)pyrene				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)pyrene				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(j)fluoranthene				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylcholanthrene				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7,12 Dimethylbenz(a)anthracene				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Total Carcinogenic PAHs				ND	6.27/2757	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs				ND	13.52/4507	ND	ND	ND	ND	1.86/620	ND	ND	ND
Oil & Grease 413.2				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
EPA 8010				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
EPA 8270				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
EPA 8240				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methylene Chloride				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TOC				0.20	0.30	0.13	0.30	0.20	0.10	0.30	0.40	0.30	
TPH 418.1				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1262				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB-1254				NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PCBs	150			ND	NT	NT	NT	ND	NT	NT	ND	NT	NT

Notes:

ND = Not Detected

NT = Not Tested

Samples with the designation "DUP" (i.e., SD7DUP) indicate a duplicate sample collected from that location.

B Phase II sample

SD-4 and SD-8 were also analyzed for TBT. Both samples reported ND for TBT

Exceeds applicable EPA Sediment Quality Objective or State Sediment Quality Standard

(1) Standards are mg/kg

(2) Standards are mg/kg except LPAH & HPAH standards are mg/kg TOC

III PROJECT CONCEPT PLAN

As part of a public development effort at the National Guard property, the City is proposing to restore intertidal aquatic habitat in the eastern-most 1.95 acres of the property (Figure TSM-4). Additional land uses planned for the site include the development of the Chinese Reconciliation Project facilities in the center of the property adjacent to the restoration project site and, on the west side of the property, an extension of Commencement Park.

The restoration project would be situated on 1.5 acres of existing upland property formerly dominated by a dilapidated warehouse and 0.45 acres of existing intertidal and subtidal land presently encumbered by large amounts of debris and remnants of the Ruston formation. Project goals include:

- i. Creating intertidal tideflat and emergent habitat to provide nesting, refuge and feeding opportunities for a variety of fish and waterfowl species (e.g., salmon, juvenile flatfish, Western Grebe, Great Blue Heron, plovers, sandpipers).
- ii. Providing a habitat linkage between nearshore habitat in the vicinity of Ruston Way/Pt. Defiance and intertidal and riverine habitat near the mouth of the Puyallup River.
- iii. Providing a public education opportunity in close proximity to the Ruston Way shoreline to increase public awareness of the importance of this type of habitat in the ecosystem.

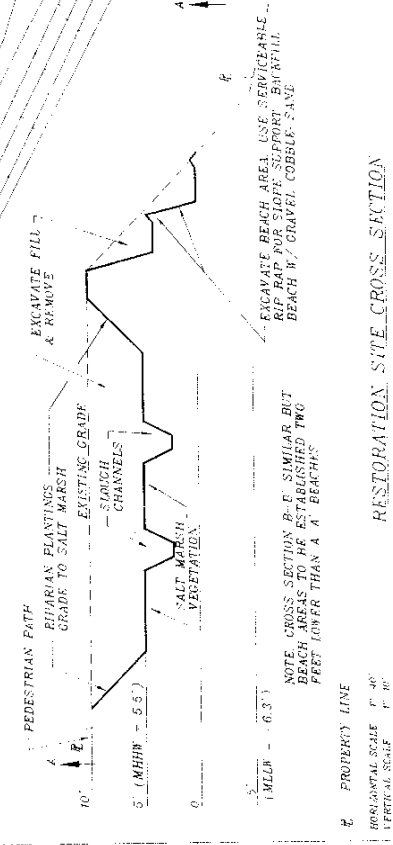
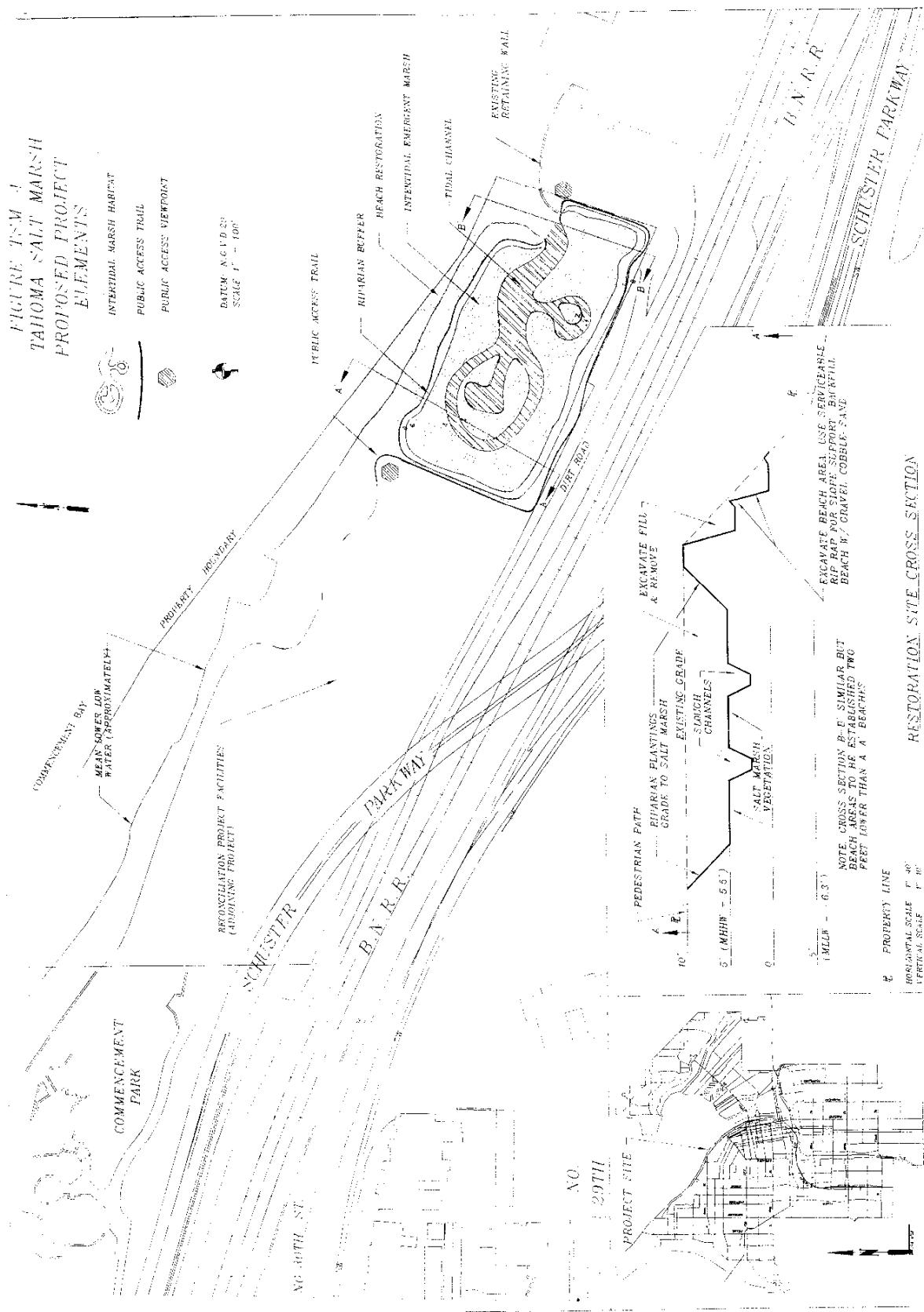
Project elements include:

- i. Pre-design subsurface exploration to provide additional information specific to this habitat restoration project.
- ii. Establishment of intertidal salt marsh (0.97 acres) and mudflat habitat (0.30 acres) in the central portion of the restoration project area;
- iii. Restoration of beach area (0.45 acres) via the removal of debris, remnants of the Ruston Formation, and other anthropogenic materials.
- iv. Creation of a tidal channel through the restored beach area connecting the intertidal salt marsh to Commencement Bay.

FIGURE TSM-1
TALOMA SALT MARSH
PROPOSED PROJECT
ELEMENTS

- INTERTIDAL MARSH HABITAT
- PUBLIC ACCESS TRAIL
- PUBLIC ACCESS VIEWPOINT

DATUM: N.G.V.D. 83
SCALE: 1" = 100'



NO. 29TH

PROJECT SITE

DATE: 10/15/10

- v. Planting riparian areas (0.23 acres) with native vegetation.
- vi. Provisions for public access around the landward perimeter of the project site, consistent with habitat restoration and City of Tacoma shoreline program objectives.
- vii. Provisions for monitoring and maintenance of the restoration project site.

Property elevations in the area of the restoration project will range from existing conditions around the perimeter of the proposed salt marsh to intertidal and subtidal elevations in the center of the property and in the beach area. The interior wetland area would after restoration be dominated by intertidal emergent vegetation, a tidal channel, and riparian vegetation - in combination, a salt marsh. The ultimate project configuration will be based upon comments received from resource agencies and the public during project development, as well as site conditions and project goals. Each of the project elements outlined above is discussed in more detail below.

Pre-design subsurface exploration

As part of the project pre-design activities, the City will develop a site characterization plan in order to develop design information specific to this project. The characterization plan will include provisions for additional physical and chemical sampling targeted primarily at the future intertidal areas. Sampling will be conducted using a backhoe capable of reaching a minimum of three feet beneath the proposed intertidal elevations and other sampling protocols as defined by standard sampling procedures. Physical and chemical sampling and analysis protocols will be identical to those developed for the City of Tacoma's Middle Waterway Natural Resources Restoration Project with modifications that may be identified by regulatory, resource or trustee staff.

Establishment of intertidal salt marsh and mudflat habitat

Intertidal salt marsh and mudflat habitat would be created by excavating up to ten feet of fill from the interior of the project site. Post construction elevations would range from less than 7 ft MLLW (0.7 ft. NGVD29) in the mudflat area to 9-11 feet MLLW (2.7 - 4.7 ft. NGVD29) in areas of salt marsh to existing elevations - approximately 16.3 feet MLLW (10 ft NGVD29) - around the salt marsh perimeter.

Material at the intertidal interface and immediately below will be demonstrably suitable for use in the intertidal environment. Where subsurface exploration or project excavation reveals fill at the proposed wetland surface, such fill shall be excavated to a depth of 3 feet or to a depth where wood or other fill material is not evident, whichever is less. This additional excavated area will be backfilled with a suitable substrate to an elevation not greater than target elevations. Where subsurface exploration reveals native material at the proposed intertidal surface and to a depth of

two feet below that surface, the proposed surface would be considered suitable. Excavated fill would be removed to the appropriate disposal facility. If suitable, some excavated material may be utilized on site to create topographic features, such as a small berm between pedestrian walkways and the restored project area.

Salt marsh areas will be planted with vegetation native to such environments in Western Washington. Salt marsh plants native to the area include, in higher elevation intertidal areas, tufted hairgrass (*Deschampsia caespitosa*); Pacific silverweed (*Potentilla pacifica*); and meadow barley (*Hordeum brachyantherum*), among others. Below mean higher high water and above mudflat areas, species such as fleshy jaumea (*Jaumea carnosa*) and pickleweed (*Salicornia virginica*) are expected to dominate.

A planting plan will be developed for the restoration site during project permitting and would be subject to the review, comment and approval of resource and permitting agencies prior to the issuance of project permits. Planting will be designed for 80% of the marsh and shall be based upon a review of similar projects in the Commencement Bay Area. The city may propose during project permitting, if federal, state and tribal resource staff agree, that an additional area or areas of salt marsh be re-established through natural re-colonization in order to investigate the efficacy of natural re-colonization in this shoreline environment or if a higher value of habitat can be achieved through an alternative expenditure.

The inclusion of both mudflat and salt marsh at this restoration site has two purposes. First, the intertidal area as a whole is conceived as refuge habitat in what is otherwise a high energy shoreline environment during winter storm events. Second, the mudflat provides a mechanism to trap nutrients and detrital matter washed from upland areas following leaf drop or general plant senescence. The trapping of nutrients in the intertidal mudflat allows for additional use of carbon and other energy sources by resident, transient, sessile or motile intertidal species before the ultimate export of organic and inorganic detrital matter to Commencement Bay and Puget Sound.

Restoration of the intertidal beach area

The City would restore intertidal beach area as part of the National Guard Site restoration effort. The existing beach area within the project site is approximately 350 feet in length and 0.45 acres in extent. Approximately two-thirds of the beach area is intertidal and the entire beach varies in width from 15 to 70 feet. The lower shore presently contains some elements of fine substrate and native materials which provide suitable intertidal habitat. Most of the shore area however is characterized by concrete rip-rap and remnants of the Ruston Formation not removed by the Guard during the cleanup action.

The City's goal for the beach area is two-fold. First, the City seeks to protect the interior of the property including restored intertidal habitats from wave-induced erosion. Second, the City

seeks to re-establish beach habitat consistent with the property protection goal. The City expects to meet these two goals simultaneously by retaining in higher elevations of the beach area structural elements necessary to protect the property from wave-induced erosion; and by restoring a gravel-cobble-sand substrate for habitat utilization in the lower intertidal areas of the shore.

The gravel-cobble-sand substrate would be placed in the intertidal area in a constructed bench or benches. If more than one bench is constructed, each bench would be separated by two to four feet of vertical off-set; that is, some benches would be higher (or lower) than other benches in order to investigate the effect of beach position (height in the intertidal) on utilization. Bench areas could be established at approximately ten, eight, six or four feet (MLLW). Benches would be constructed by removing existing rip-rap from the beach area to create a level bench and then backfilling with beach mix. Fine grain material now evident at lower intertidal areas would not be disturbed. A decision on the number of beaches to be utilized will be based upon survey information collected as part of preliminary design work prior to shoreline permitting, and upon discussions with the resource agencies

Rip-rap removed from the bench/beach area and judged serviceable would be repositioned for back-slope shore stabilization and, with natural materials of a suitable size, utilized as a raised beach lip to help slow backwash and thereby retain beach materials. If necessary for the establishment of the benches, the shoreline edge of the property would be cut back slightly. Structural protection would be maintained by use of the repositioned rip-rap positioned against the massive debris deposit (Ruston formation) that forms a linear scarp parallel to shore. The Ruston formation would be isolated from other substrate materials using filter fabric. The City would remove elements of the deposit (and other anthropogenic material) which now appear in smaller, discrete pieces waterward of the consolidated formation. Alternatively, the massive deposit can be removed and this upper area backfilled with a material suitable for property protection along this shoreline. The extent to which the Ruston formation will remain in the shoreline area will be discussed with the resource and permitting agencies prior to permit submittal.

Creation of a tidal channel through the restored beach area connecting the intertidal area with Commencement Bay

City restoration project plans include a provision for an intertidal channel connecting interior salt marsh and mudflat areas to beach areas and Commencement Bay. An alternative design concept would be simply to remove all of the fill material on the project site to intertidal elevations and allow the restored marsh area to be directly connected to Commencement Bay. The City expects though that wave action at the site would result in frequent disturbance within much of any such restored area. As a result, the City has adopted a design incorporating the channel connecting salt marsh to bay.

The design of self-maintained channels connecting interior bays to open waters has been studied by coastal engineers and geomorphologists for many years. Traditionally, such channels are heavily armored to protect them from wave action and as a result offer only nominal if any habitat value. In recent years, increased interest in maintaining shoreline resource values has resulted in designs based upon the utilization of site-available substrates. Primary design parameters include channel width, depth, and gradient; parameters affecting design elements include tidal prism (the volume of water exported from the interior bay between high and low tides), and channel substrate. Channel design will be based upon the maximum utilization of habitat enhancing substrates.

Planting riparian areas with native vegetation.

City plans for restoration call for the planting of upland riparian flora around the perimeter of the newly created intertidal area. Riparian upland plantings will be comprised of a mixture of native vegetation suitable for this area. Tree and shrub species planted may be similar to those proposed by the City for planting or those recently planted by Simpson at Middle Waterway. Those species include Douglas Fir (*Pseudotsuga menziesii*); Shore Pine (*Pinus contorta*); Pacific madrona (*Arbutus menziesii*); Vine Maple (*Acer circinatum*); Serviceberry (*Amelanchier alnifolia*); Nootka rose (*Rosa nutkana*); Oregon grape (*Mahonia nervosa*) and Hazelnut (*Corylus cornuta*). Shrubs only will be used on the crest of the shoreline berm as access over this berm by heavy equipment may be necessary for future site maintenance activities.

A planting plan will be developed for the restoration site during project permitting and would be subject to the review, comment and approval of resource and permitting agencies prior to the issuance of project permits. Planting will be designed for 100% of the riparian area less land utilized for public access and shall be based upon a review of similar projects in the Commencement Bay Area. Drip irrigation will be established to provide water to these plantings and soil amendments will be applied in a manner consistent with requirements for fertilizer use in shoreline areas. In areas where it is apparent that existing surface materials are not suitable for riparian plantings, the City will remove such material to a depth of three feet and backfill with a suitable soil prior to planting.

Provisions for public access around the perimeter of the project site.

To promote community stewardship at the project site and pedestrian connections along the Ruston shoreline, public access improvements will be constructed as part of the restoration project. Improvements would consist primarily of a trail around the landward perimeter of the site, as depicted in Figure TSM-4, and one or two shoreline view areas. The trail would provide an extension to the pedestrian pathway presently extending from Ruston Way through Commencement Park. In Figure TSM-4, the pathway is depicted as a shoreline or near-shoreline path along most of the property; at the project site, the path will proceed around the landward perimeter rather than across the restored beach area. The portion of the path west of the restoration site is not part of the restoration project and its actual location and development

would be coordinated by the Chinese Reconciliation Foundation and/or the Metropolitan Park District.

The pedestrian pathway planned for the restoration site would connect to the pathway on the west at the shoreline, at the southern property boundary, or at an intermediate location. If the trails do not connect at the shoreline, the portion of the path along the west side of the restoration project would extend beyond the juncture to the shoreline to provide a pedestrian overlook. Such an overlook provides for better viewing and presumably stewardship of the restoration project and also better meets the public access provisions of the City Shoreline Master Program.

Provisions for monitoring and maintenance

The City has included in the project budget funds sufficient for monitoring and maintenance of the project over a five year period. Funds have been budgeted for maintenance and the implementation of recommendations developed through project monitoring at an amount equal to 25% of the expected construction cost, or 5% per annum for five years. Additional funds are available for the monitoring of site conditions annually for five years. Monitoring will be primarily physical (intertidal surfaces elevation changes) and biological (planting success; colonization; fish and wildlife utilization), although money has also been budgeted for chemical (sediments) data collection. Existing monitoring wells will be destroyed during construction and the City does not plan to replace them. Monitoring Well Number 4, evident by a three foot stand-pipe on the shoreline, will be retained both as a fixed point of reference and to provide on-going water-quality data.

The City expects that some part of parts of the monitoring program can be conducted in conjunction with local conservation and education groups. The local Audobon Society chapter sponsors an annual bird count and the City expects to solicit their aid in establishing an outreach effort to document site use by migrating and resident avian species.

If funds are not utilized as part of the monitoring and maintenance program, they will be available for the implementation of project elements arising outside of the formal monitoring program or for restoration actions elsewhere in Commencement Bay at the discretion of the trustee agencies.

References

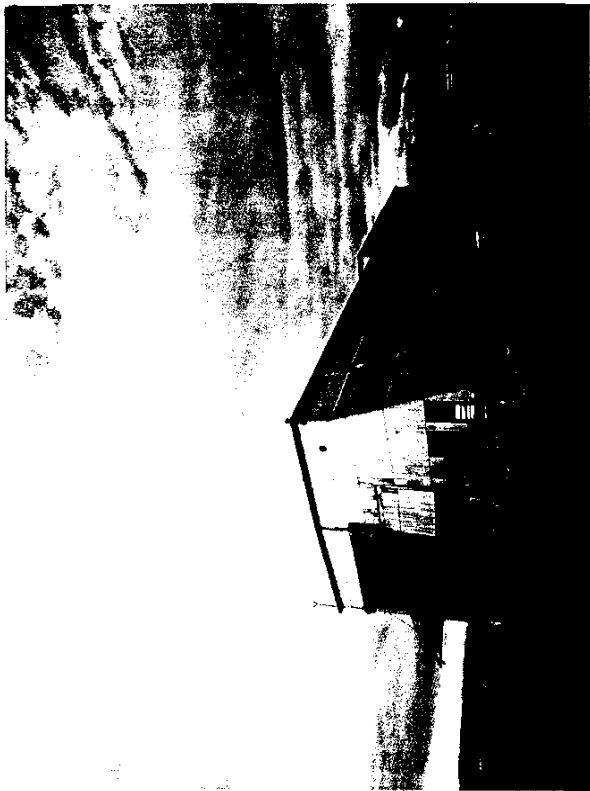
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Additional Source Material

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Appendix A

Photo Log



Tahoma Salt Marsh Property

Photo 1 (Above, Left)

View east along the shoreline. The building has been demolished since this photograph was taken.

Photo 2 (Above, Right)

View east. The restoration marsh will be located at the far (eastern) end of the property and will extend to a point just beyond (east of) the gray building.

Photo 3 (Right)

View west along the shoreline.

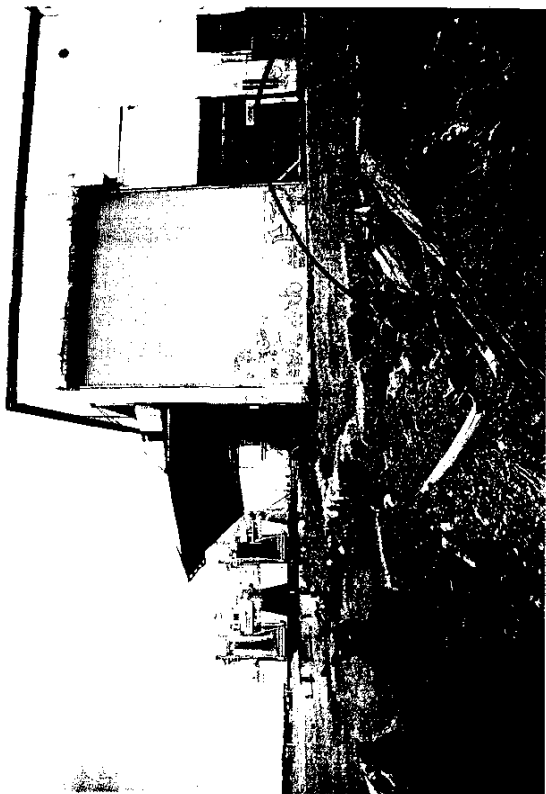


FIGURE TSM-5 TAHOMA SALT MARSH PHOTO LOG

COMMENCEMENT BAY



DATUM: N.G.V.D.29
SCALE 1" = 100'

MEAN LOWER LOW WATER
(APPROX.)

TAHOMA SALT MARSH RESTORATION
PROJECT BOUNDARY

PROPERTY BOUNDARY

CONCRETE BLOCKS
(EXISTING BANK PROTECTION)
ATOP GRAVEL COBBLE BEVEACH

①

②

③

FORMER WAREHOUSE
FOOTPRINT (BUILDING
DEMOLISHED 1/96)

MASSIVE FUSED DEBRIS

DIRT ROAD

B.N.R.R.

SCHUSTER PARKWAY

PARKING AREA

Appendix B

Project Schedule

**CITY OF TACOMA
TAHOMA SALT MARSH RESTORATION
PROJECT SCHEDULE**

ID	Task Name	Start Day	Finish Day	Year 3				Year 4				Year 5						
				Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3			
1	Tahoma Salt Marsh	1	0															
2	Deed Restrictions Filed (1)	180	180															
3	Baseline Habitat Data Collection	0	360															
4	Draft Site Characterization Plan Published	0	0															
5	Final Site Characterization Plan Published	30	30															
6	Site Characterization	45	60															
7	Site Characterization Report	150	150															
8	Preliminary Design	165	225															
9	Shoreline/Wetland Permit Applications	225	225															
10	Shoreline/Wetland Permit Review	225	345															
11	City Shoreline/Wetland Permit Approval	345	345															
12	Corps Of Engineers Permit Application (2)	360	360															
13	State Shoreline Permit Approval	375	375															
14	Corps Of Engineers Permit Review (3)	360	540															
15	Final Design	435	495															
16	CMMP Submittal (4)	450	450															
17	Corps Of Engineers Permit Approval	540	540															
18	CMMP Approval	540	540															
19	Bid and Contract	570	630															
20	Construction (5)	630	810															
21	Notice of Completion (6)	840	840															

Notes:

1. Start Date: Consent Decree entry date plus 2 years; except that deed restrictions will be filed within 180 days of the entry of the Consent Decree or acquisition. The date shown is a surrogate date.
2. Anticipated Date. The US Army Corps of Engineers permit application is to be filed within 30 days of the City of Tacoma notice of exemption or approval of the shoreline/wetland permits.
3. Application for State Water Quality Certification and Hydraulic Permit application will be filed during the Corps permit review.
4. Anticipated Date. CMMP (Construction, Maintenance, Monitoring/Adaptive Management Plans) will be filed with the Natural Resource Trustee Agencies within 90 days of the Corps permit application.
5. Anticipated Date. Notice of completion will be filed with the Natural Resource Trustee Agencies within 300 days of the Corps permit and Trustee CMMP approvals.