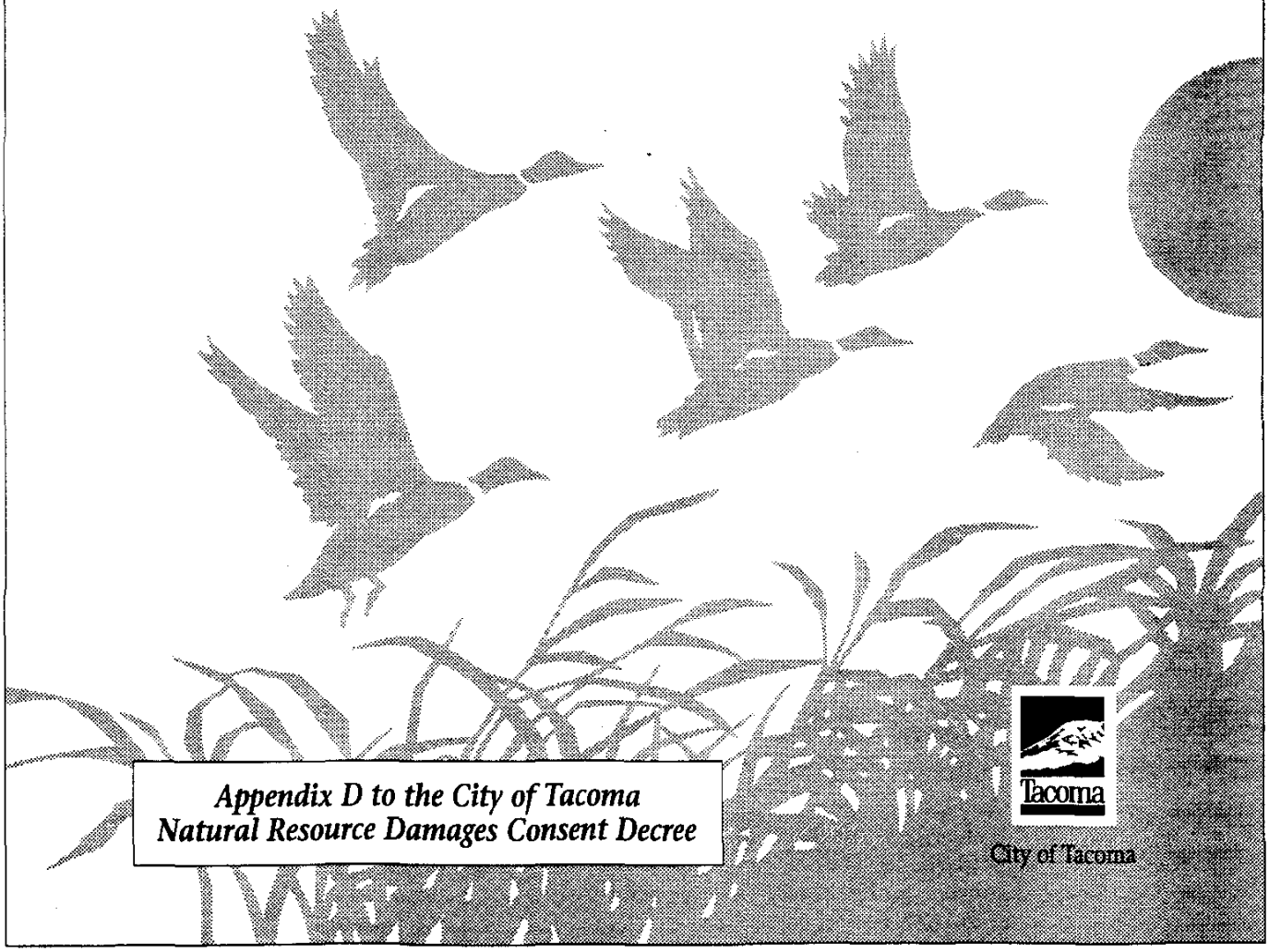
Hylebos Marsh and Wildlife Habitat Restoration

Project Concept Plan

March 1997



Appendix D to the City of Tacoma Natural Resource Damages Consent Decree

Tacoma

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;***
4. ***A water supply contingency provision has been added (page 18).***

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HYLEBOS MARSH AND WILDLIFE HABITAT RESTORATION PROJECT PROJECT CONCEPT PLAN

CITY OF TACOMA
MARCH 1997

CITY OF TACOMA
HYLEBOS MARSH AND WILDLIFE
HABITAT RESTORATION PROJECT
PROJECT CONCEPT PLAN

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CITY OF TACOMA
HYLEBOS MARSH AND WILDLIFE
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I INTRODUCTION

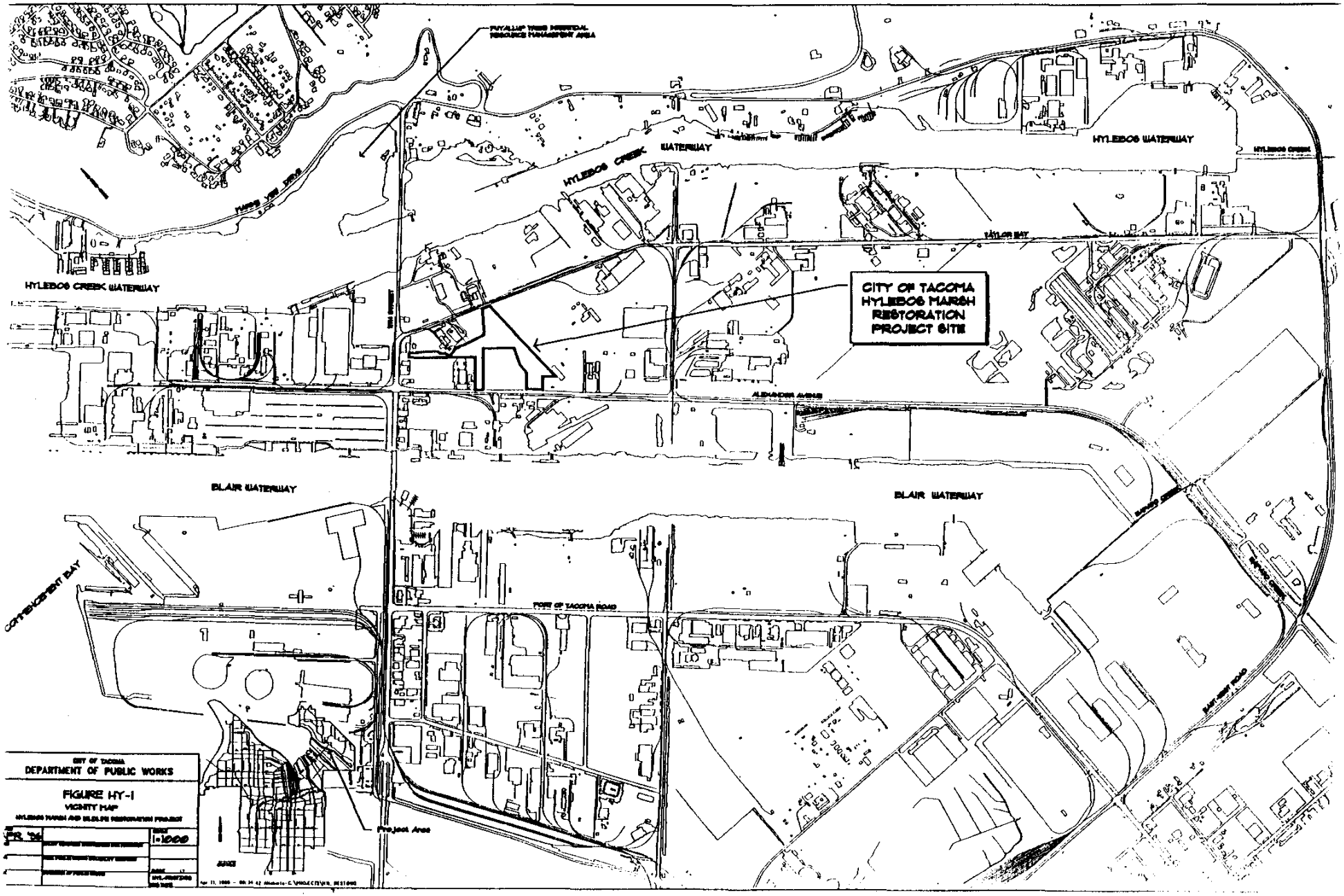
The City of Tacoma is proposing to develop a marsh and wildlife habitat restoration project on 9.9 acres of property in the Tacoma tideflats between Taylor Way and Alexander Avenue, near the Hylebos and Blair Waterways (Figures HY-1). The project would be developed on an 8.2 acre property that is presently owned by the City of Tacoma Department of Public Utilities and a second, adjacent 1.7 acre property which is being purchased by the City of Tacoma Department of Public Works for this restoration project.

The project goal is to develop and enhance open water, emergent, and riparian freshwater habitat in order to promote the habitat values associated with these freshwater wetland systems, including nesting, refuge and feeding opportunities for a variety of avian species in the Commencement Bay Area. Activities associated with site habitat restoration include creating open water habitat for wetland dependent species; removing invasive species; planting riparian vegetation; providing a permanent source of water for the wetland areas; and preserving on site forested wetlands. Habitat restoration activities are designed to create additional wetland habitat and better link existing but somewhat isolated forested wetland environments in order to provide a continuous complex of freshwater wetland and wildlife habitat.

The 8.2 acre TPU property is part of a larger, 16.4 acre property owned by the City. The property is vacant with the exception of an operating electrical substation (0.7 acres) which occupies the southern corner of this larger property. The use of portions of the property not dedicated to this habitat restoration project will be determined at a future date by TPU and may include energy facilities development (e.g. gas turbine/cogeneration facilities). The 1.7 acre wetland is part of a 6.2 acre property owned by the PQ corporation. PQ has operated silica manufacturing facilities on the property for over 50 years.

Species of waterfowl, shorebirds, songbirds, raptors and other bird species that have historically occupied southern Puget Sound delta areas would be the primary wildlife beneficiary of this project. According to the Commencement Bay Cumulative Impact Study (USACOE, 1993),

Commencement Bay was probably an important area of migrating and resident waterfowl and shorebirds...(but) ...(t)oday, other less industrialized areas such as Nisqually, Carr Inlet, and Quartermaster Harbor support substantially greater populations of waterfowl. ... Loss of historical foraging, nesting, and resting habitat has undoubtedly resulted in a reduction in use of


CITY OF TACOMA
HYLEBOS MARSH
RESTORATION
PROJECT SITE
HYLEBOS CREEK WATERWAY
HYLEBOS WATERWAY
HYLEBOS CREEK
TAYLOR WAY
ALEXANDER AVENUE
BLAIR WATERWAY
BLAIR WATERWAY
PORT OF TACOMA ROAD
COMMENCEMENT BAY
Project Area
CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS
FIGURE HY-1
VICINITY MAP
1"=1000'

the area by birds. Information on abundance and diversity of bird species in the study area prior to its development is not available, making it impossible to quantitatively assess impacts on waterfowl from changes in the Commencement Bay ecosystem. When habitat utilization by birds in Commencement Bay is compared to the Nisqually Delta, however, data suggest that adverse impacts on the study area as a result of habitat alteration and loss have been significant.

Despite significant land use alterations in the Commencement Bay area, a number of highly valued bird species still utilize the area. The species include Bald eagle, Peregrine falcon, Osprey, Hooded merganser, Great-blue Heron, and numerous migratory shorebirds and resident and migratory songbirds.

If one-tenth of the land in the tideflat area is restored to a habitat condition - a goal suggested by Citizens for a Healthy Bay - the resulting 600 acres of wetland and riparian area would approach in size the 900 acre Nisqually National Wildlife Sanctuary. These comparisons suggest that the cumulative habitat benefits of restoration projects such as this one in the Commencement Bay Tideflats Industrial Area can be substantial.

Hylebos Marsh Restoration

Photo 1 (Above, Left)	View of forested wetlands in the property interior. The wetlands in the property interior are flooded during winter and early spring months and dry during summer and fall.
Photo 2 (Above, Right)	Pacific Madrone (*Arbutus Menziesii*) saplings in the project interior. Madrone is becoming established in areas elevated above seasonal forest wetlands.
Photo 3 (Right)	Wetland area on PQ property. This open water wetland is flooded during the winter but dries out during summer months, when this photo was taken. Well water will be used to maintain a permanent source of water to this area.

II RESTORATION STUDY AREA: HISTORY AND SITE CONDITIONS

The Hylebos Marsh restoration project site is located on property located between Taylor Way and Alexander Avenue near the Blair and Hylebos Waterways. The restoration property is approximately 9.9 acres in size; 8.2 acres are presently owned by the City of Tacoma Department of Public Utilities (TPU) and the remaining 1.7 acres is being purchased from a private corporation (PQ Corp.) by the City of Tacoma Department of Public Works (Public Works) for this project.

The two dominant existing features of the 9.9 acre restoration site are a complex of shrub and forested wetlands on the city property and a seasonal open water wetland on PQ property (Figure HY-2). These wetlands apparently formed in their present state as the result of historic property fill, soil conditions (dredged sand), surface water runoff to the site, which continues to follow traditional drainage patterns, and seasonally high groundwater.

The restoration property is located near the historic mouth of Hylebos Creek. At the time of European settlement, Hylebos Creek discharged into Commencement Bay through a tidal channel which existed along the length of the present day Hylebos waterway extending to a terminus in an open water embayment at approximately present day 11th St. Southwest of this embayment, two smaller sloughs separated Hylebos Creek from the mouth of Wapato Creek, the larger slough being composed of two channels separated by a low island of marsh. The restoration project site is located on property historically occupied by this latter, larger slough.

The history of land use on the TPU property was investigated in 1990 by Dames and Moore for Sithe Energies of San Diego, CA. This Phase I environmental site assessment consisted of a review of existing information, primarily environmental agency facility lists, aerial photographs, Sanborn and Metzker Maps, and Polk City Directories. Information developed by Dames and Moore suggested that the site has remained in an undeveloped state since its original reclamation while development, including the filling of a fifteen acre wetland immediately to the east of the property between 1965 and 1980, proceeded in the vicinity.

The exact date of reclamation was not reported in the Phase I report but the consultants did note that the site was within a "tidal marsh zone" depicted on a 1949 USGS map. Additional insight is provided by the report *Historic Review of Special Aquatic Sites* in the Commencement Bay Cumulative Impact Study (David Evans & Assoc., 1993). Figures 7 and 8 in *Historic Review* suggest that the character of the site changed from a mix of tidal slough, mudflat and tidal marsh to tidal marsh alone between 1927 and 1941, suggesting partial fill. Such fill may have occurred in 1937 when, according to the Cumulative Impact Study, the Hylebos Waterway was extended beyond Lincoln Avenue and approximately 0.8 million yards of material was dredged and "sidecast on the west side."

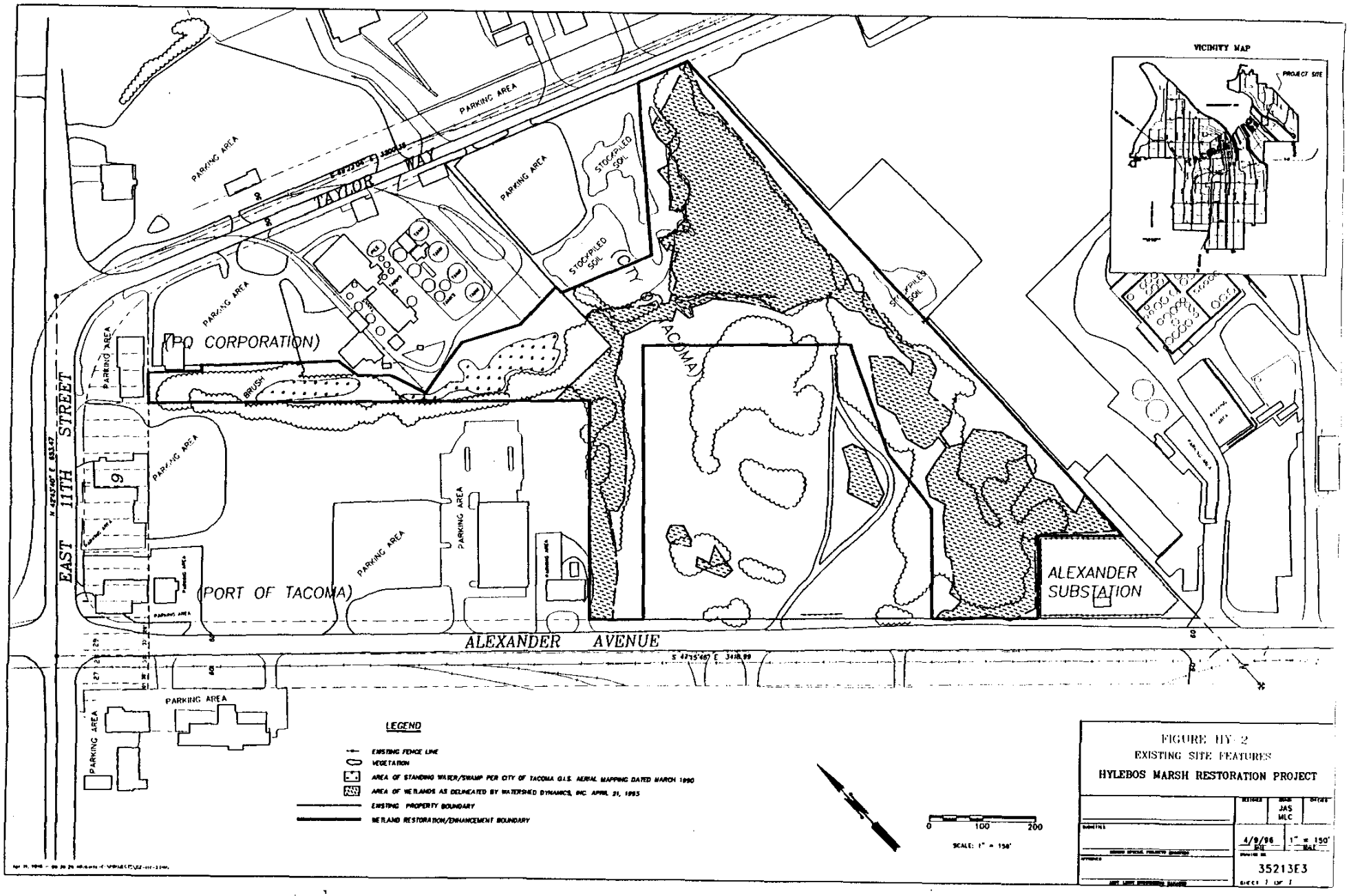


FIGURE HY-2
EXISTING SITE FEATURES
HYLEBOS MARSH RESTORATION PROJECT

		JAS MLC	
		4/9/96	1" = 150'
		35213E3	

While Dames and Moore did not discover evidence of previous industrial use at the site, the consultants did recommend additional site characterization based upon the existence on site of abandoned drums and other discarded solid waste and the general industrial character of surrounding land uses. Subsequent to the Dames and Moore investigation, Sithe Energies commissioned a Phase II site assessment to determine if soil and groundwater contamination were present at the site. Woodward-Clyde Consultants (1991) supervised the investigation, which included:

1. A review of the Phase I report;

2. A terrain conductivity study to identify anomalous conductivity values that could indicate the presence of improperly abandoned underground storage tanks or buried drums;

3. Excavation and examination of 16 test pits;

4. Installation of three monitoring wells in the shallow, unconfined aquifer;

5. Installation of four monitoring wells in a "confined" aquifer underlying the shallow aquifer;

6. Priority pollutant analysis for:
   a. Four soil samples (composites from 14 of the 16 test pits);
   b. Three groundwater samples collected from the shallow aquifer wells;
   c. One groundwater sample collected from the underlying confined aquifer;

7. Comparison of detected chemical contaminants against MTCA Method A Industrial cleanup standards for soil and Method A standards for groundwater, and

8. Preparation of the Phase II Site Assessment Report.

Phase II sample locations are depicted in Figure HY-3 and a summary of the data is presented in Tables HY-1 and HY-2. Table HY-1 presents summary information on soil chemistry and MTCA Method B standards and representative freshwater sediment guidance. Table HY-2 presents summary information on groundwater chemistry and freshwater standards for the protection of aquatic life. Although comparison of soil and groundwater data with these standards or guidance values provides useful insights into the suitability of the site for restoration, changes in soil and water chemistry (e.g. oxidation within the water column) can be expected after construction. Additionally, standards and constituent values may not be directly comparable, as discussed below.

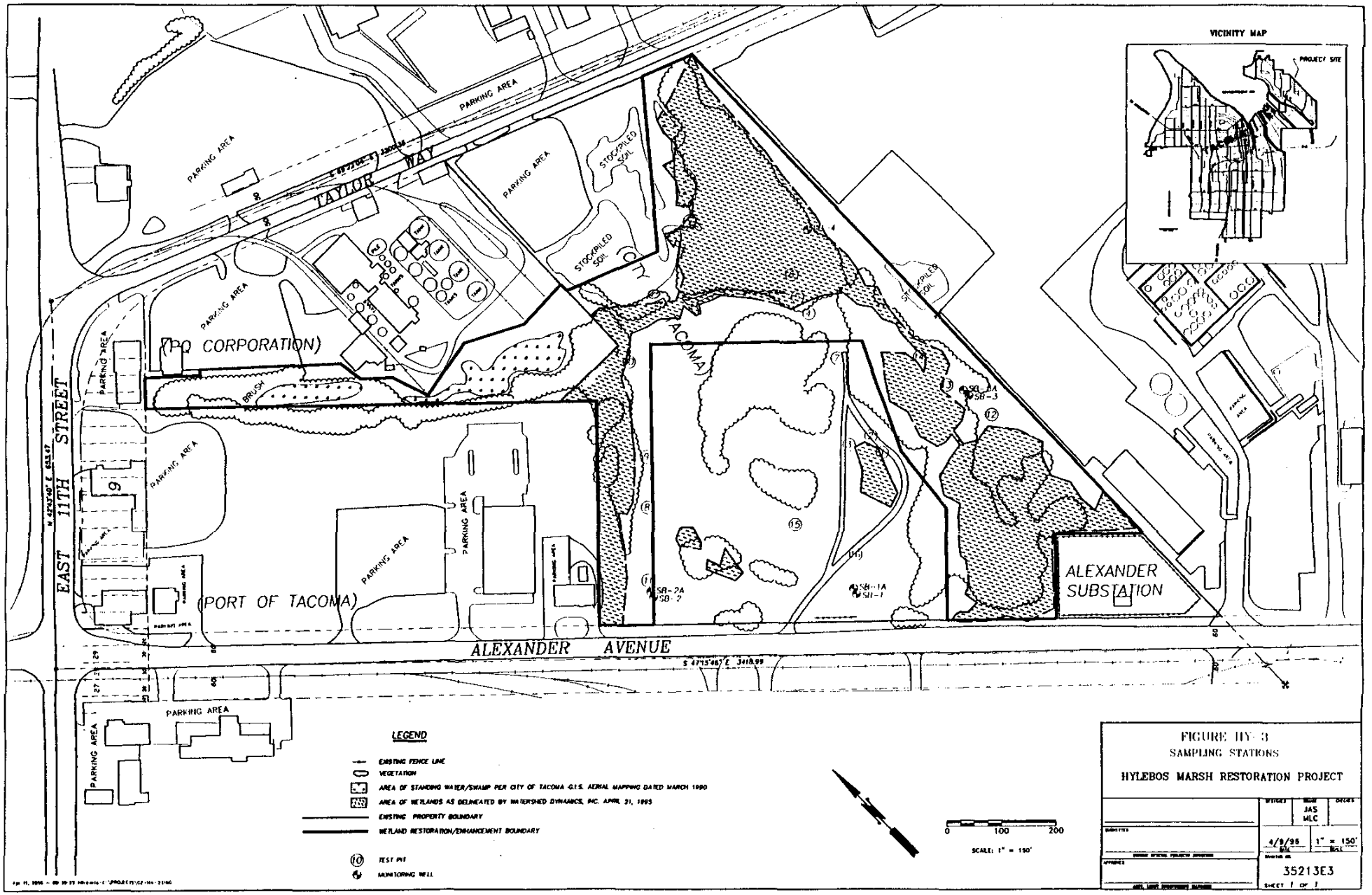


FIGURE HY-3
SAMPLING STATIONS
HYLEBOS MARSH RESTORATION PROJECT

	JAS	
	MLC	
4/9/96	1" = 150'	
	35213E3	
	SHEET 1 OF 1	

Terrain Conductivity

The terrain conductivity study did not reveal anomalies that would suggest that abandoned tanks or drums are present underground on the property. Woodward-Clyde estimated that the "effective exploration depth" was 20 feet. Wetland areas of the property were generally not examined due to the presence of standing water.

Test Pits

Test pits were excavated in groups of two, three and four to characterize site subsurface conditions (Figure HY-3).

Test Pits 1, 2 & 3	Excavated in the vicinity of empty drums, paint cans and other debris evident in the immediate vicinity; sample TP010203 was obtained from these pits.
Test Pits 4, 5, 6, & 7	Excavated in an area of demolition debris; sample TP040507 was obtained from pits 4, 5 & 7.
Test Pits 8, 9, 10, & 11	Excavated in an area lacking trees suggesting perhaps more recent fill or disturbance; sample TP08091011 was obtained from the pits.
Test Pits 12, 13, & 14	Excavated near an access road leading toward the eastern property boundary; sample TP121314 was obtained from the pits.
Test Pits 15 & 16	Excavated in the central southwestern portion of the site but a sample was not obtained for chemical analysis. The report authors noted that soils in these latter two pits were similar in appearance to soils from the other test pits.

Soils in all test pits were collected from the pit wall directly above the water table. Soil sampling results for detected compounds are provided in Table HY-1 and Appendix B. In general, the concentrations of constituents of concern were well below standards and guidance with the exception of arsenic. Values reported for arsenic were also well below freshwater sediment guidance values but were reported at approximately the MTCA B standard.

Monitoring Wells

Seven monitoring wells were installed at the site, six in pairs (i.e. three pairs) plus a seventh. Wells 1, 2, 3 and 4 were drilled to approximately 25 feet and screened in strata beneath native clays and logged by a supervising geologist. Wells 1A, 2A and 3A were screened in the upper sand fill without logging since deeper wells immediately adjacent (i.e. Well 1 adjacent to 1A) presumably provided a representative log. Well logs indicate that a medium sand fill exists on the site to a depth of approximately 5- 8 feet. Sand fill is generally underlain by saturated clays and, at depths of 20-25 ft., clays inter-bedded with sands.

An exception to this general site lithology described above was noted in Well 4 and at the surface of Well 3. In Well 3, a surface layer exists which is composed of coarse sandy gravel with cobbles mixed with white lime. The location of this well at the terminus of the unpaved access road and the orientation of the access road on the property suggests this area and perhaps the area to the east may have been utilized for an activity such as cement truck washout. Well 4, drilled to approximately 30 ft., contains approximately 10 feet of wood pulp, fibrous wood and "chunks" and "bits" of black rubber overlying native clays, sandy silts and silty clay sands.

Groundwater samples retrieved from wells 1A, 2A, 3 and 3A are presented in Table HY-2. Values detected are below surface water quality standards except for copper; two of four lead samples; two of four zinc samples, and one sample of chromium. Copper, while low compared to other urban waters, is above assumed acute and chronic standards.[1] Samples exceeding lead standards were at approximately the limits of detection, below assumed acute standards but above assumed chronic standards. Zinc exceedences were noted close to acute and chronic values, which are similar in magnitude. The single chromium exceedence was near the chronic standard for hexavalent chromium and did not exceed acute or chronic trivalent chromium standards.

Surface water standards are used for comparison as excavation required for project construction would expose site groundwater to surface conditions. However, surface water standards for metals are based upon the dissolved fraction rather than total metals; for chromium, standards are based also upon constituent speciation. For an investigation such as this one, it is likely that samples analyzed for metals were not filtered prior to digestion and analysis and that metals reported in the Phase II report are total metals. Laboratory reports of "matrix interference" support the assumption that samples were not filtered. Regardless, the comparison with standards still provides for a useful, albeit conservative, assessment of site environmental quality and suggests that the site is suitable for habitat restoration.

[1] Standards for copper, lead and zinc are assumed in that standards are calculated using an assumed hardness value; the hardness value utilized, 50 mg/l, is generally consistent with hardness values for freshwater environments (Mitsch and Gosselink, pg. 108). Hardness is defined as the sum of calcium and magnesium salts (WAC 173-201A-020).

TABLE HY-1
SOIL SAMPLING SUMMARY

Chemical Parameter	EPA SQO (Marine Sediments - (3))	State SQS (Marine Sediments - (3))	State MCUL/CSL (Marine Sediments - (3))	State MTCA B (Soil)	Freshwater Sediment Guidance (Freshwater Sediments)	Sample ID Number TP010203	TP040507	TP08091011	TP121314
Metals (mg/kg)									
Antimony (Sb)	150			32.0		<0.5	<0.5	<0.5	<0.5
Arsenic (As)	57	57	93	1.4	6.0 (4)	1.6	1.3	1.8	1.7
Beryllium (Be)				0.23		<0.07	<0.06	<0.06	<0.06
Cadmium (Cd)	5.1	5.1	6.7	2.0 (1)	0.6 (4)	1.1	1.2	1.5	1.3
Chromium (Cr)				100.0 (1)	26.0 (4)	4.7	1.5	7.2	3.4
Copper (Cu)	390	390	390	2600.0	16.0 (4)	6.3	4.5	3.4	3.6
Lead (Pb)	450	450	530	250.0 (1)	31.0 (4)	<1.3	1.3	6.5	3.6
Mercury (Hg)	0.59	0.41	0.59	1.0 (1)	0.2 (4)	<0.15	<0.15	<0.15	<0.15
Nickel (Ni)	140			1600.0	16 (4)	4.3	4.8	5.2	6.1
Selenium (Se)				400.0		<0.5	<0.5	<0.5	<0.5
Silver (Ag)	6.1	6.1	6.1	240.0	0.5 (4)	<0.20	<0.20	<0.20	<0.20
Thallium (Tl)				5.6	(4)	<0.5	<0.5	<0.5	<0.5
Zinc (Zn)	410	410	960	24000.0	120.0 (4)	12	13	21	15
Organics (ug/l)									
Volatile Organic Compounds									
Acetone				8000		4.3	<1.0	1.0	0.96
Methylene Chloride				0.05 (1)		0.85 B	0.82 B	0.97 B	0.88 B
1,1,1-Trichloroethane				20.0 (1)		<0.050	<0.050	<0.050	0.13
Semi-Volatile Organic Compounds									
Di-n-Butyl phthalate	1400			8000		0.19 JB	0.084 JB	0.16 JB	0.079 JB
Bis(2-Ethylhexyl) phthalate	1300			71		0.047 JB	0.12 JB	<0.17	<0.17
Phenanthrene	1500			(2)	139 (5)	<0.17	0.042 J	<0.17	<0.17
Flouranthene	2500			3200 (1)	1311 (5)	<0.17	<0.17	0.056 J	<0.17
Pyrene	3300			2400 (1)		<0.17	<0.17	0.091 J	<0.17
Miscellaneous Constituents (mg/l)									
Total Cyanide				1600	0.1 (4)	<0.1	<0.1	<0.1	<0.1
Total Phenols				48000		<0.2	<0.2	<0.2	<0.2

Notes:

(1) Cleanup standard listed is for Method A - residential as i) a Method B Standard has not been established or ii) the Method A - Residential standard is more protective than the established Method B standard.

(2) MTCA cleanup level not established for this parameter.

(3) EPA SQO and State MCUL/CSL standards are for marine sediments and are not necessarily comparable to sediments in non-marine environments.

(4) Guidelines for the Protection and Management of Aquatic Sediment Quality In Ontario, Ontario Ministry Of The Environment (Lowest Effect Level).

(5) EPA Interim Sediment Criteria For Non-Polar Organics.
See Batts, D. and Cubbage, J. 1995. Summary Of Guidlines For Contaminated Freshwater Sediments. Washington State. Department Of Ecology, Env. Investigations and Laboratory Services, Olympia, WA.

"<" Value reported with "less than" (<) symbol indicates analytical result less than the listed detection limit.

J Value estimated by laboratory.

B Compound also detected in laboratory QA/QC blank.

Value exceeds standard or guidance value.

Detection limit exceeds standard or guidance value.

TABLE HY-2
GROUNDWATER SAMPLING SUMMARY

Chemical Parameter	State Water Quality Standards (ug/l) (1)		Assumed Hardness	Sample ID Number (1)			
	Acute	*Chronic*	*(mg/l CaCO3)*	SB1A	SB2A	SB3	SB3A
Metals (ug/l)							
Antimony (Sb)				<5	<5	<5	<5
Arsenic (As)	360.0	190.0		5	48	<5	6
Beryllium (Be)				<1	<1	<1	<1
Cadmium (Cd)	2.8	0.6	50	<.3	<.3	<.3	<.3
Chromium (Cr)	160.0 (2)	11.0 (2)		<5	<5	15	6
Copper (Cu)	8.0	5.6	50	25	23	26	16
Lead (Pb)	23.2	0.9	50	6	5	<5	<5
Mercury (Hg)	2.4	0.012		<.5	<.5	<.5	<.5
Nickel (Ni)	749.6	83.3	50	<10	<10	<10	<10
Selenium (Se)				<5	<5	<5	<5
Silver (Ag)	0.7		50	<3	<3	<3	<3
Thallium (Tl)				<5	<5	<5	<5
Zinc (Zn)	58.2	52.5	50	39	62	63	38
Organics (ug/l)							
Volatile Organic Compounds							
Carbon Disulfide				<1	5	<1	<1
Chloroform				<1	<1	2	<1
Semi-Volatile Organic Compounds							
Bis(2-Ethylhexyl) phthalate				<10	<10	6.3 J	<10
Miscellaneous Constituents (mg/l)							
Total Cyanide				<0.01			
Total Phenols				<0.02			
					<0.01	<0.05 (3)	<0.01
					<0.02	<0.10 (3)	<0.02

Notes:

(1) Standards are based upon dissolved constituent analysis.
Sample data apparently provide total constitunent values. See Note (2).

(2) Chromium standards are for hexavalent chromium. Acute and chronic standards for trivalent Cr. are 984 and 117 ug/kg, respectively.

(3) Elevated detection limit due to matrix interference.

"<" Value recorded with "less than" (<) symbol indicates analytical result was less than the listed detection limit.

J Value estimated by laboratory.

Value exceeds standard or guidance value.

Detection limit exceeds standard or guidance value.

III PROJECT CONCEPT PLAN

The City is proposing a number of project elements to restore wetland habitat at the project site in order to further the project goals outlined in Section I. Project elements are depicted in Figure HY-4 and include:

i. Creating 0.45 acres of palustrine, open water wetland.

ii Preserving 4.5 acres of forested and shrub-scrub wetland.

ii. Removing established invasive species in all buffer areas.

iii. Planting native riparian vegetation in 3.0 acres of wetland buffer and 4000 sq. ft. of existing wetland.

iv. Providing summer water level maintenance in non-forested wetland areas.

v. Install a public education viewing area on Taylor Way.

vi. Monitoring and maintenance of the restoration project site.

These project elements are discussed below and are outlined in Figure HY-4. Alternatives to the concept depicted in Figure HY-4 may be considered prior to project permitting in order to better consolidate habitat provided that consolidation does not result in a reduction in acreage dedicated to habitat at this site and provided that such consolidation is consistent with resource agency objectives.

Creation of Palustrine, Open Water Habitat

Palustrine, open water habitat would be created by excavating up to eight feet of fill from approximately one-third of an acre in the interior of the property and allowing the excavated area to fill with groundwater to create the desired open water condition. This newly established open water area will provide new aquatic habitat and link existing wetland habitats, connecting open water areas to the northwest (PQ wetland) with forested wetland environments on the east. This habitat linkage will provide a corridor through which wildlife can access the various wetland habitats on the property.

The material excavated from the property would be removed to the appropriate solid waste disposal facility. If suitable, some excavated material may be utilized on site to create topographic features, such as a small berm between the wetland areas and adjacent properties. Clay found at depth within non-wetland areas of the property may be excavated and used as a sealant in the excavated area as a means to minimize expected future summer pond leakage.

The City expects to plant the fringe of open water area with emergent vegetation native to such environments in Western Washington. 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 10% of the palustrine area 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 emergent area be re-established through natural re-colonization in order to investigate the efficacy of natural re-colonization in this environment or if a higher value of habitat can be achieved through an alternative expenditure. Water depths in emergent areas will in general be designed to promote *Scirpus* (bulrush) although it is expected that *Typha latifolia* (cattails) will also become established. *Typha* is now present within the PQ wetland area where it survives the summer lowering of water surface elevation.

The configuration of the palustrine wetland will be finalized as part of project design. The concept depicted in Figure HY-4 assumes a single continuous wetland at an assumed single water surface elevation. Alternatively, the wetland could be constructed in cells with flash-board weirs between cells to control water surface elevations. The latter system provides the ability to manage site hydrology in a manner that promotes or discourages targeted riparian or emergent species. The City will also, during project design, evaluate creation of additional smaller palustrine areas elsewhere on site in order to maximize wetland acreage; and if sufficient room exists in open water areas, incorporate into the design island habitat to promote nesting.

The establishment of open water marsh at this restoration site serves three purposes. First, the open water area - and the open water area on the PQ site - is conceived as winter refuge habitat for avian species utilizing Commencement Bay. Second, the wetland will provide year-round and seasonal habitat for amphibian, mammalian, and avian wildlife species dependent upon such habitats. Third, the re-established wetland and its riparian zone provide a mechanism by which nutrients originating in terrestrial riparian habitats can be efficiently transferred to the aquatic environment. The palustrine wetland will trap nutrients and detrital matter dropped directly into it as a result of leaf drop in riparian areas and emergent plant senescence. The trapping of nutrients in the wetland provides for additional use of carbon and other energy sources by aquatic species before the ultimate export of organic and inorganic detrital matter to the Hylebos Waterway and Commencement Bay.

Preserve existing forested and shrub-scrub wetland.

The City would protect and preserve 4.5 acres of forested and shrub-scrub wetland as part of this restoration project. A small amount of the existing 4.68 acres would be modified under the concept plan depicted in Figure HY-4 to link proposed palustrine habitat in the center of the property with a) existing palustrine habitat (PQ wetland) and b) existing water sources. The City will also excavate and remove waste rubber and wood noted in the vicinity of Well 4 within the wetland area; and either backfill and replant this area or utilize the excavation to create additional open water habitat.

Removing Established Invasive Species

Himalayan blackberry (*Rubus discolor*) is established in the center of the property in the area where new open water will be created, in riparian areas adjacent to the PQ wetland, and in isolated areas within the restoration area. The City would physically remove blackberries from the site in preparation for replanting with native riparian species. Exotic tree species on the south-eastern border of the PQ wetland - a large willow (*Salix* sp.) and several young fruit trees - will likely not be removed. Although these species would not be included in a site planting plan they may provide functional attributes which benefit the wetland ecosystem.

Riparian Areas

City plans for the riparian/wetland buffer areas include the retention of all trees and snags present in existing buffer areas; the removal of material from the buffer that would impede plant development (e.g. calcified lime near Well 3) and subsequent replacement with clean fill; the planting of riparian flora in buffer areas now lacking significant vegetation; and the City installation of nest boxes and perches in areas recommended by project biologists. The City will also install fencing on the perimeter of the riparian/buffer area or maintain existing fencing on the larger property sufficient to prevent vehicular access.

Riparian plantings will be comprised of a mixture of native vegetation suitable for this area considering site soil, shade and proximity to seasonal water, and depth to (seasonal) groundwater. Tree and shrub species will include a mixture of the species listed in Table HY-3 and other species as appropriate. Table HY-3 is identical to a similar planting table prepared for riparian areas adjacent to Swan Creek; however, the well-drained nature of soils on this site in combination with seasonal fluctuations in groundwater present conditions somewhat different than those present in the Swan Creek corridor. A planting plan will be developed for the Hylebos project based upon site specific conditions.

Table HY-3
Proposed Plantings - Wetland and Riparian Areas
Hylebos Marsh and Wildlife Restoration Project

Trees	Shrubs	
Western Red Cedar *(Thuja plicata)*	Vine Maple (*Acer circinatum*)	Ninebark *(Physocarpus capitatus)*
Western Hemlock *(Tsuga heterophylla)*	Red Osier Dogwood *(Cornus stolonifera)*	Ocean Spray *(Holodiscus discolor)*
Douglas Fir *(Pseudotsuga menziesii)*	Salmonberry *(Rubus spectabilis)*	Willow *(Salix sp.)*
Red Alder *(Alnus rubra)*	Serviceberry *(Amelanchier alnifolia)*	
Black Cottonwood *(Populus trichocarpa)*	Nootka rose (*Rosa nutkana*)	
Big Leaf Maple *(Acer macrophyllum)*	Red Elderberry *(Sambucus racemosa)*	

Emergent Vegetation

Rushes *(Juncus sp.)*	Bur-reed *(Sparganum emersum)*
Sedges *(Carex sp.)*	Wapato (i.e. Arrowhead) *(Sagittaria latifolia)*
Small-fruited and Hard Stem Bulrush *(Scirpus microcarpus & S. acutus)*	Skunk cabbage *(Lysichitum americanum)*

The planting plan will be developed 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 and shall be based upon a review of similar projects in the Commencement Bay Area. Drip irrigation will be established to provide water to plantings and soil amendments will be applied in a manner consistent with requirements for fertilizer use in shoreline areas.

Utilizing existing wells for summer water level maintenance in non-forested wetland areas

Open water wetland functions and values in the PQ wetland area are presently compromised during summer months by a loss of water from the wetland area. Seasonal drying results in the loss of aquatic habitat and the emergence of large areas of bare soil. Soils in the emergent area are colonized by *Typha latifolia* which survives these periods of water loss.

The City plans to use on site wells to provide supplemental water to the PQ wetland and to the created open water wetland to ensure that summer functional values are maintained. Water depths will be designed to promote *Scirpus* (bulrush) although *Typha latifoli* (cattails) may become established or remain on site given its present distribution in the PQ wetland.

As surface water present in ponded areas may be in part an expression of the underlying water table, water would not be withdrawn from wells screened in the sand fill but would be obtained from wells screened below the underlying native materials. Well #3, shown in Figure HY-4, was drilled to a depth and screened below both underlying dredged sand fill and intervening native clays and would be the City's initial choice for supplementing on-site water supplies. Wells will be tested for yield and re-tested for quality prior to being placed into service. In the event that water of adequate quantity and quality cannot be obtained for any reason from existing on-site wells, the City will provide water of adequate quantity and quality from an alternative source, subject to the funding limits of this consent degree.

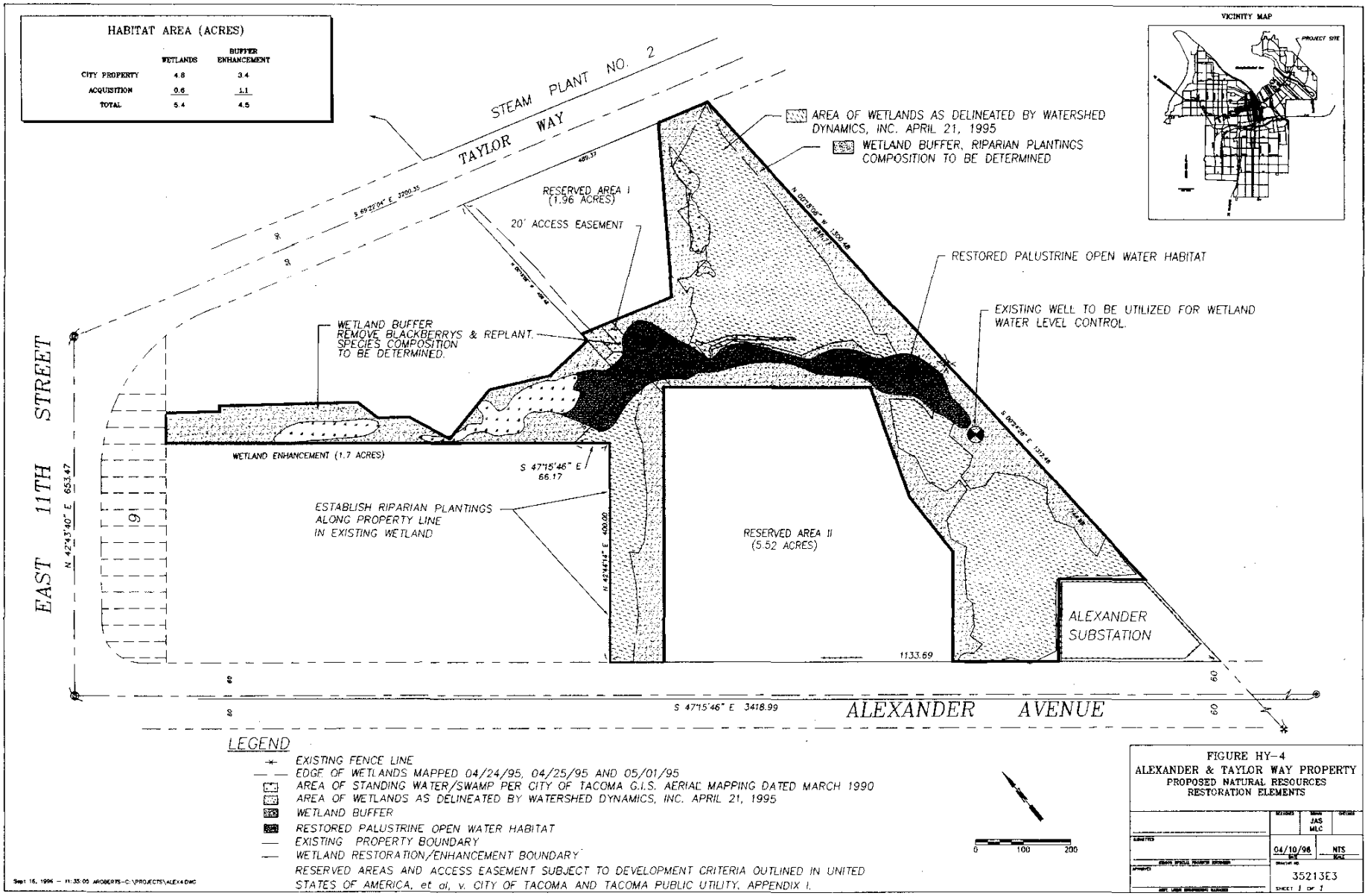
Public education

The City will design and install a public education display on Taylor Way describing habitat and wildlife attributes associated with the project. The purpose of this display is to increase public awarenes of the importance of this type of habitat in the Commencement Bay area.

Provisions for monitoring and maintenance of the restoration project site.

The City has included in the project budget funds sufficient for monitoring and maintenance of the project over a five year period. Maintenance funds have been budgeted at an amount equal to 25% of the expected construction cost, or 5% per annum for five years, and additional funds are budgeted for project monitoring. Maintenance funds are available for the implementation of recommendations developed during project

monitoring or for actions recommended by Trustee agencies. If funds are not utilized as part of the monitoring and maintenance program, they will be available for restoration actions elsewhere in Commencement Bay at the discretion of the trustee agencies.


HABITAT AREA (ACRES)
WETLANDS
BUFFER ENHANCEMENT
CITY PROPERTY 4.8 3.4
ACQUISITION 0.6 1.1
TOTAL 5.4 4.5
VICINITY MAP
PROJECT SITE
STEAM PLANT NO. 2
TAYLOR WAY
AREA OF WETLANDS AS DELINEATED BY WATERSHED DYNAMICS, INC. APRIL 21, 1995
WETLAND BUFFER, RIPARIAN PLANTINGS COMPOSITION TO BE DETERMINED
RESERVED AREA I (1.96 ACRES)
20' ACCESS EASEMENT
RESTORED PALUSTRINE OPEN WATER HABITAT
EXISTING WELL TO BE UTILIZED FOR WETLAND WATER LEVEL CONTROL.
WETLAND BUFFER REMOVE BLACKBERRYS & REPLANT. SPECIES COMPOSITION TO BE DETERMINED.
WETLAND ENHANCEMENT (1.7 ACRES)
S 47°15'46" E 66.17
ESTABLISH RIPARIAN PLANTINGS ALONG PROPERTY LINE IN EXISTING WETLAND
RESERVED AREA II (5.52 ACRES)
ALEXANDER SUBSTATION
EAST 11TH STREET
N 42°43'40" E 653.47
S 47°15'46" E 3418.99
ALEXANDER AVENUE
LEGEND
EXISTING FENCE LINE
EDGE OF WETLANDS MAPPED 04/24/95, 04/25/95 AND 05/01/95
AREA OF STANDING WATER/SWAMP PER CITY OF TACOMA G.I.S. AERIAL MAPPING DATED MARCH 1990
AREA OF WETLANDS AS DELINEATED BY WATERSHED DYNAMICS, INC. APRIL 21, 1995
WETLAND BUFFER
RESTORED PALUSTRINE OPEN WATER HABITAT
EXISTING PROPERTY BOUNDARY
WETLAND RESTORATION/ENHANCEMENT BOUNDARY
RESERVED AREAS AND ACCESS EASEMENT SUBJECT TO DEVELOPMENT CRITERIA OUTLINED IN UNITED STATES OF AMERICA, et al, v. CITY OF TACOMA AND TACOMA PUBLIC UTILITY, APPENDIX I.
0 100 200
FIGURE HY-4
ALEXANDER & TAYLOR WAY PROPERTY
PROPOSED NATURAL RESOURCES RESTORATION ELEMENTS
JAS MLC
04/10/96
NTS
35213E3
SHEET 1 OF 1

References

David Evans and Associates. 1993. Historic Review of Special Aquatic Sites, in, *Commencement Bay Cumulative Impact Study Vol. 1 Assessment of Impacts*. United States Army Corps of Engineers, United States Environmental Protection Agency, United States Fish and Wildlife Service, United States Department of Commerce, National Oceanographic and Atmospheric Administration. Seattle, WA.

Dames and Moore. 1990. *Preliminary Site Assessment Report, Proposed Cogeneration Plant, City of Tacoma Property*. Prepared for Sithe Energies of San Diego, CA by Dames and Moore., Seattle, WA.

David Evans and Associates. 1993. Historic Review of Special Aquatic Sites, in, *Commencement Bay Cumulative Impact Study Vol. 1 Assessment of Impacts*. United States Army Corps of Engineers, United States Environmental Protection Agency, United States Fish and Wildlife Service, United States Department of Commerce, National Oceanographic and Atmospheric Administration. Seattle, WA.

Mitsch, W.J. and J.G Gosselink. 1986. *Wetlands*. Van Nostrand Reinhold.

United States Army Corps of Engineers, US Fish and Wildlife Service, National Oceanic and Atmospheric Administration, US Environmental Protection Agency. 1993. *Commencement Bay Cumulative Impact Study. Vol. 1, Assessment of Impacts*. United States Army Corps of Engineers, Seattle District Office, Seattle, WA.

Washington Administrative Code Chapter 173-201A. *Water Quality Standards for Surface Waters for the State of Washington.*

Woodward-Clyde Consultants. 1991. *Tacoma Cogeneration Project Phase 2 Site Assessment*. Prepared for Sithe Energies of San Diego, CA, by Woodward-Clyde Consultants, Seattle, WA.

Additional Source Material

Downing, J. 1983. *The Coast of Puget Sound*. University of Washington Press. Seattle, WA.

Franklin, J.F. and C.T. Dyrness. 1988. *Natural Vegetation of Oregon and Washington*. Oregon State University Press.

Kozloff, E.N. 1976. *Plants and Animals of the Pacific Northwest: An Illustrated Guide to the Natural History of Western Oregon, Washington, and British Columbia*. University of Washington Press, Seattle, WA.

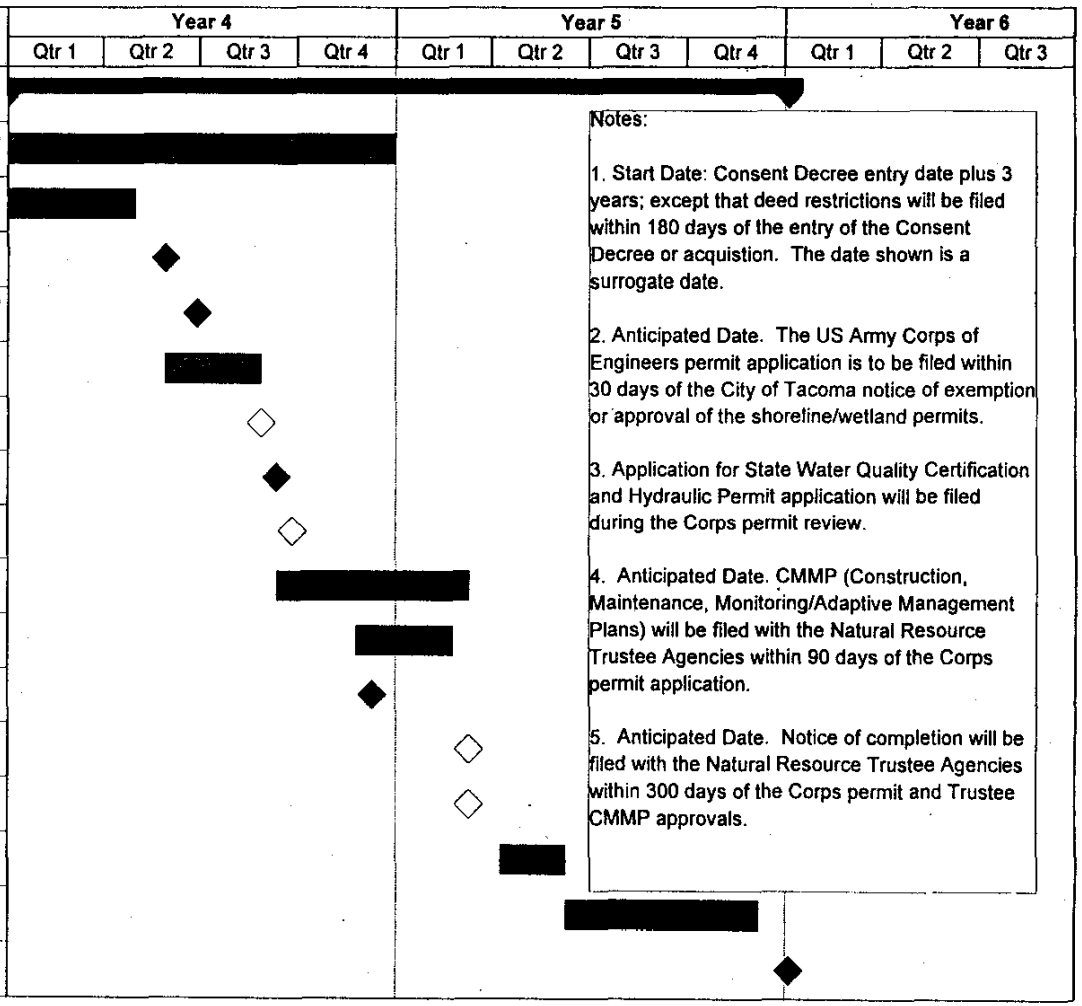
Shapiro and Associates. 1993. Assessment of Habitat Loss, in, *Commencement Bay Cumulative Impact Study Vol. 1 Assessment of Impacts*. United States Army Corps of Engineers, United States Environmental Protection Agency, United States Fish and Wildlife Service, United States Department of Commerce, National Oceanographic and Atmospheric Administration. Seattle, WA.

Appendix A

Project Schedule

CITY OF TACOMA
HYLEBOS MARSH AND WILDLIFE HABITAT RESTORATION
PROJECT SCHEDULE

ID	Task Name	Start Day	Finish Day
1	**Hylebos Marsh and Wildlife Habitat Restoration**	1	0
2	Baseline Habitat Data Collection	0	365
3	Preliminary Design	0	120
4	Shoreline/Wetland Permit Applications	150	150
5	Deed Restrictions Filed (1)	180	180
6	Shoreline/Wetland Permit Review	150	240
7	City Shoreline/Wetland Permit Approval	240	240
8	Corps Of Engineers Permit Application (2)	255	255
9	State Shoreline Permit Approval	270	270
10	Corps Of Engineers Permit Review (3)	255	435
11	Final Design	330	420
12	CMMP Submittal (4)	345	345
13	Corps Of Engineers Permit Approval	435	435
14	CMMP Approval	435	435
15	Bid and Contract	465	525
16	Construction (5)	525	705
17	Notice of Completion (6)	735	735



Notes:

1. Start Date: Consent Decree entry date plus 3 years; except that deed restrictions will be filed within 180 days of the entry of the Consent Decree or acquistion. 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.

Project: Hylebos Marsh
Date: Mar 6 '97

Task ▬ Summary ▬ Date ◇
Milestone Date ◆ Multiple Dates ▥

C:\MYDOCU~1\PROJEC~1\GREGZE~1\HYLEBOS.MPP

Mar 6 '97

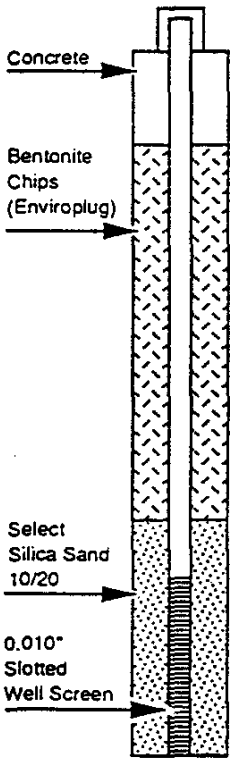
Appendix B

Photo Log

Appendix C

Well Logs
Phase II Site Assessment

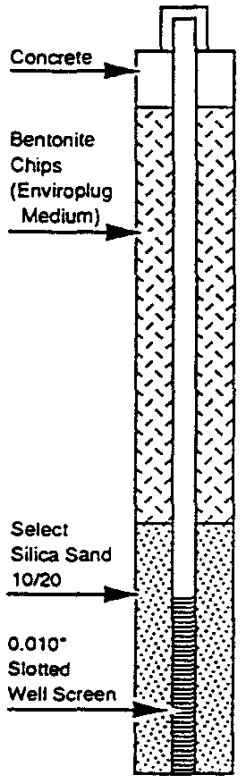
BORING NO. SB-1		ELEVATION: 11.32 ft	
LOCATION:		DATE STARTED: 3/28/91	
DRILLING AGENCY: Soil Sampling Service		DATE COMPLTED: 3/28/91	
DRILLING EQUIPMENT: All-terrain CME-50		DRILLER: W. Lindholm	LOGGED BY: K. Teague
DRILLING METHOD: 4" ID HSA		SAMPLER: SPT	



DEPTH (FEET)	BLOWS / 6 IN.	SAMPLE	GRAPHIC LOG	DESCRIPTION
5	1 4 2			(2.5 - 4.0) Loose, saturated, brown, medium grained sand (SP), trace of calcareous shell material (FILL)
10	1 0 0	AIR		(8.5 - 10.0) No recovery. Likely fine to medium grained saturated sand
15	0 0 4			(13.5 - 15.0) Very soft, plastic, saturated, clay (CL) with loose, saturated, gray, fine sand (SP)
20	7 11 16			(18.5 -20.0) Medium dense, saturated, gray, fine to medium sand (SP)

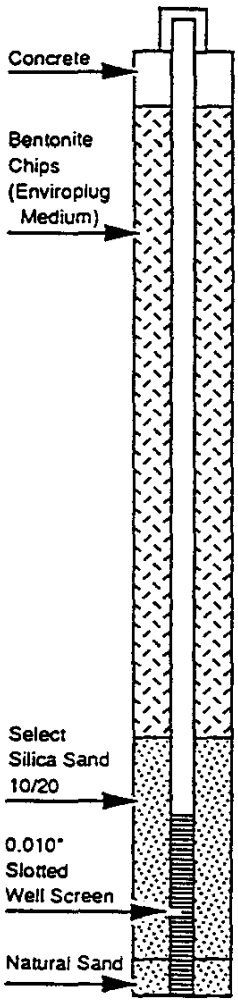
Project No. 91C0191A	Sithe Energies, U.S.A., Inc. Tacoma Cogeneration Project	LOG OF BORING SB-1	SHEET 1 of 7
Woodward-Clyde Consultants			

BORING NO. SB-2		ELEVATION: 10.91 ft	
LOCATION:		DATE STARTED: 3/29/91	
DRILLING AGENCY: Soil Sampling Service		DATE COMPLTED: 3/29/91	
DRILLING EQUIPMENT: All-terrain CME-50		DRILLER: W. Lindholm	LOGGED BY: K. Teague
DRILLING METHOD: 4" ID HSA		SAMPLER: SPT	



DEPTH (FEET)	BLOWS / 6 IN.	SAMPLE	GRAPHIC LOG	DESCRIPTION
5	2 2 2			(3.5 - 5.5) Loose, wet to saturated, dark gray to brown fine to medium sand (SP), trace of silt, trace of clayey blebs to 4mm diameter (FILL)
10	2 2 1			(8.5 - 10.5) Soft, saturated, gray-brown clay (CL) with abundant roots and rootlets
15	0			(13.5 - 15.5) Very soft, saturated, gray clay (CL)
20	1 8 14 12			(18.5 -20.5) Medium dense, saturated, dark gray, fine to medium sand (SP)

BORING NO. SB-3		ELEVATION: 14.07 ft	
LOCATION:		DATE STARTED: 3/29/91	
DRILLING AGENCY: Soil Sampling Service		DATE COMPLTED: 3/29/91	
DRILLING EQUIPMENT: All-terrain CME-50		DRILLER: W. Lindholm	LOGGED BY: K. Teague
DRILLING METHOD: 4" ID HSA		SAMPLER: SPT	



DEPTH (FEET)	BLOWS / 6 IN.	SAMPLE	GRAPHIC LOG	DESCRIPTION
				Surface: Coarse sandy gravel with cobbles mixed with white powdery lime
	4 6 8			(3.5 - 5.5) Loose to medium, dense, saturated, medium sand (SP) trace of fine sand (FILL)
5				
	1 2 1-1/2			(8.5 - 10.5) Very soft, saturated, gray-tan clay (CL) with some darker gray vertically oriented streaks
10				
	0			(13.5 - 15.5) Very soft, saturated, gray clay (CL), trace to some silt in lower 3"
15				
	5 4 1 2			(18.5 -20.5) Very soft, saturated gray clay (2 layers, 4" and 7" thick) interbedded with loose, saturated, gray, medium sand
20				
	5 8 19			(23.5 - 25.5) Loose, saturated, poorly sorted gray silty fine sand (SW) with trace of clay, grading to dense, saturated, gray, medium sand (SP) with serveral white-tan clam shell fragments
25				

Project No. 91C0191A	Sithe Energies, U.S.A., Inc. Tacoma Cogeneration Project	LOG OF BORING SB-3	SHEET 3 of 7
Woodward-Clyde Consultants			

BORING NO.	SB-4	ELEVATION:	13.82 ft
LOCATION:		DATE STARTED:	4/1/91
DRILLING AGENCY:	Soil Sampling Service	DATE COMPLTED:	4/1/91
DRILLING EQUIPMENT:	All-terrain CME-50	DRILLER: W. Lindholm	LOGGED BY: K. Teague
DRILLING METHOD:	4" ID HSA	SAMPLER:	SPT

DEPTH (FEET)	BLOWS / 6 IN.	SAMPLE	GRAPHIC LOG	DESCRIPTION
				Surface - sandy gravel
				(1.0) Wood pulp & chunks of rubber
	3			(3.5 - 5.5) Tan wood, fibrous (FILL)
5	3			
	2			
	3			(8.5 - 10.5) Dark brown saturated, wood waste, with bits of black rubber material
	4			
10	3			
	0			(13.5 - 15.5) Very soft, saturated, gray clay (CL) uniform
15				
	3			(18.5 -20.5) Soft, saturated, interbedded gray clay (CL) and gray sandy silt (ML)
	2			
20	1			
	1			(23.5 - 25.5) Soft, saturated, gray silty clay (CL) grading at 25.0 to loose, saturated, gray fine to medium sand
	3			
25	3			
	9			(28.5 30.5) Dense, saturated, gray medium sand (SP) with thin 1/2" - 3/4" interbedded fine sand stringers and one 4" silt lense
	18			
30	14			

Project No. 91C0191A	Sithe Energies, U.S.A., Inc. Tacoma Cogeneration Project	LOG OF BORING SB-4	SHEET 4 of 7
Woodward-Clyde Consultants			