

## Summary of Fish Habitat Conditions

The habitat conditions in Swan Creek between the outlet of the Pioneer Way culvert and the inlet of the Northern Pacific Railroad culvert lack suitable spawning habitat for fish living in this system. Additionally, this portion of Swan Creek does not have suitable substrate to foster invertebrate communities. Based on this information, the enhancement plan for Swan Creek will include the creation of a 530-ft, meandering spawning and rearing channel for coho and possibly cutthroat trout. This channel will connect Swan Creek with the Haire Wetland, and will provide coho and cutthroat trout rearing habitat for both summer and winter months. Off-channel winter and summer habitat has been shown to increase coho smolt production (Everest et al. 1985). The enhancement plan also will call for adding gravel and cobble substrate to Swan Creek to enhance the invertebrate populations, which will increase the food available to fish in the system. Additionally, a flow constrictor structure will be placed in conjunction with the cobble and gravel substrate to increase flow, which will flush out fine sediment and slow the sedimentation process.

## Vegetation

Before conducting the site reconnaissance to characterize vegetation of the project area, Pentec reviewed the following sources of information to better understand land use, soils, geology, and site conditions within the Swan Creek watershed that may influence final design of the wetland and stream restoration:

- Pierce County Wetland Atlas (1987)
- Soil Survey of Pierce County, Washington (Zulauf, A.S. 1979)
- National Wetlands Inventory, Puyallup, Washington, Quadrangle (US Fish and Wildlife Service [USFWS] 1988)

## Methods

Vegetation communities were distinguished by dominant plant species, habitat structure, topography, and apparent hydrologic regime. An area was identified as a wetland if it exhibited the following three characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland

hydrology. Wetland plant communities were classified according to the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). The location and geographic extent of each community was determined by visual estimation and the use of a base map carried during the field investigation. Identification of some plant communities as wetlands is tentative, and will be confirmed using the information gathered during the jurisdictional wetland delineation performed by the City of Tacoma.

Although these plant communities are represented as distinct units, community boundary lines are approximate and are not always abrupt or distinct in the field. This is due to interspersions of plant species between adjacent vegetation communities. In addition, the degree to which the vegetation communities are distinguished from each other varies across the site.

## Results

The Haire Wetland and riparian vegetation associated with Swan Creek cover most of the site. In total, eight plant communities were identified within the project area (Figure C-1). The communities classified as wetland appeared to meet the criteria for hydrophytic vegetation, hydric soils, and wetland hydrology. The general characteristics of these communities, including plant community composition, topography, soils, and hydrology, are described in this section. In addition, the wildlife habitat and known or likely species present on the site are discussed.

### Community A

Community A is an approximately 1-acre upland area located in the southernmost portion of the site. This community is bounded by Pioneer Way to the south and west and Swan Creek to the east.

Much of the area contains a mature, second-growth forest dominated by broad-leaved deciduous trees. It has a fairly open canopy (approximately 50 percent cover) and little undergrowth due in part to the area's abundant dirt and gravel driveways. Black cottonwood (*Populus trichocarpa*) is dominant in this community, but scattered throughout are mature Douglas fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), and pine (*Pinus* sp.) trees, and a few immature big-leaf maple (*Acer macrophyllum*) and spruce (*Picea* sp.) trees. English ivy (*Hedera helix*) has infested a few of the mature cottonwood trees. Shrubs, including one-seeded hawthorn (*Crataegus monogyna*), cherry laurel (*Prunus laurocerasus*) and red-osier dogwood

(*Cornus sericea*) are scattered in this area too. Dense patches of invasive species, including Himalayan blackberry (*Rubus discolor*) and Scot's broom (*Cytisus scoparius*) occur in this community. One patch of Himalayan blackberry is adjacent to Swan Creek. Several large black cottonwood snags also exist in this area. These will either be saved as standing snags or possibly cut down and used as habitat features in Community B (see below). In addition, this community includes a small area dominated by bentgrass (*Agrostis* sp.) and tall fescue (*Lolium arundinaceum* formerly *Festuca arundinacea*).

Three structures exist within this community, including an approximately 2,500-ft<sup>2</sup> smokehouse, an approximately 120-ft<sup>2</sup> gray shack, and an approximately 1,500-ft<sup>2</sup> white shack. In addition, an approximately 400-ft<sup>2</sup> debris pile consisting of wood, concrete, and some kitchen appliances lies in an open area just north of the white shack. The smokehouse is off site.

Soil in this community includes fill material from previous development as well as what appear to be well-drained native sandy loam soils. In driveways and around structures, the soil is dense and compacted. Although lower-lying portions of this area adjacent to Swan Creek may occasionally flood from overbank flows, there was no evidence of hydric soil development anywhere in this community.

## Community B

Community B is an approximately 3-acre wetland community located in the center of the site. This community shares a boundary with every community except Community A.

Community B is primarily emergent persistent vegetation (PEM1), interspersed with aquatic bed (PAB) and what appear to be permanently inundated areas with unconsolidated bottom (PUB). Standing water appears to exist all year in the PUB portions of this wetland, though water level seems to fluctuate throughout the year. The dominant plant species in the emergent areas are mild waterpepper (*Polygonum hydropiperoides*) and yellow iris (*Iris pseudacorus*). A few other herbaceous plants exist in this community, including marsh cinquefoil (*Comarum palustre*), wool grass (*Scirpus atrocinctus*), and purple loosestrife (*Lythrum salicaria*). Common cattail (*Typha latifolia*), Sitka willow (*Salix sitchensis*), and water starwort (*Callitriche heterophylla*) also occur in shallow (< 2 ft) areas. Aquatic bed communities are dominated by yellow pondlily (*Nuphar lutea* ssp. *polysepala*) and small patches of floating-leaved pondweed

(*Potamogeton natans*), which are found in deeper, possibly permanently inundated areas (approximately 2 to 4 ft deep). Algal blooms were observed in some areas that appeared to be unvegetated and composed of unconsolidated bottom substrate, possibly mud. Pacific willow (*Salix lasiandra*), Sitka willow, hardhack (*Spiraea douglasii*), and red-osier dogwood occur along the shore of the Haire Wetland, on small islands or isolated patches, and in what appear to be seasonally inundated areas along the sides of the wetland.

The small islands or isolated patches also supported immature (or stunted) red alder, and mature salmonberry (*Rubus spectabilis*), lady fern (*Athyrium filix-femina*), bentgrasses (*Agrostis* sp.), and bittersweet nightshade (*Solanum dulcamara*). The largest red alder is approximately 35 ft tall and 0.75 ft diameter at breast height (dbh), but most are approximately 25 ft tall and about 0.25 ft dbh. Along the margin of this wetland exist a number of mature and immature black cottonwood trees, some of which are dead and exist as snags. The largest black cottonwood is a decadent specimen on the western shore that has only a few live branches and is approximately 130 ft tall and over 4 ft dbh. Most of the black cottonwoods on the west shore of the Haire Wetland are about 100 ft tall and 1.5 to 2 ft dbh. Floating logs up to about 1-ft diameter are found throughout much of the wetland. Some of these appear to have been felled into the wetland by beaver. Although historic beaver activity was evident, Pentec did not observe any recent evidence of beaver activity, such as cuttings or chewings.

On the north end of the wetland, there are two, 100- to 125 ft arms of the wetland with somewhat different vegetation than the rest of Community B (see Figure C-1). The western arm possesses plant species and abundance similar to the main body of Community B, but has more black cottonwood snags. The eastern arm is moderately shaded by trees in adjacent communities and supports relatively less vegetation. Standing water appears fairly deep in the western arm, which is dominated by purple-fringed riccia (*Ricciocarpos natans*), a floating aquatic plant. The east arm is dominated by emergent vegetation such as narrowleaf bur-reed (*Sparganium emersum*) and common cattail. It is approximately 7 ft wide, has shallow water (approximately 0.5 ft) that is fairly turbid (visibility to 2 inches), and has deep, silty soil.

Soil below the ordinary high water mark (OHWM) throughout the wetland appears to be silt- and organic-rich and may best be classified as a muck. Soil above the OHWM appears to be a silt loam with little leaf litter or duff and moderate amounts of organic matter. The OHWM appeared to be approximately 6 inches above the water level observed during the time of the

investigation. The standing water was fairly turbid during the investigation, permitting visibility to only a 2-inch depth. However, clear pools existed among the more vegetated areas near the western shore. Iron bacteria was observed in some areas, suggesting that groundwater discharge may be an important source of wetland hydrology.

### **Community C**

Community C is an approximately 1.5-acre upland community located in the southern portion of the site. It covers a portion of the east-facing slope below Pioneer Way, the north-facing slope south of Community B, and a portion of the gently sloping area separating Community B from Swan Creek. This community is bounded by Pioneer Way to the west and Community B to the east.

Community C is a mature, second-growth forest dominated by broad-leaved deciduous trees. It has a fairly open canopy (approximately 50 percent cover) dominated by mature and immature black cottonwood, red alder, and big-leaf maple. These trees are 20 to 100 ft tall and 0.3 to 2 ft dbh. Most mature trees are rooted upslope, but many immature and some mature black cottonwood and big-leaf maple trees exist near the edge of this community and Community B. Himalayan blackberry strongly dominates the understory below the canopy and in the relatively abundant open areas; however, there are well-developed patches of common snowberry (*Symphoricarpos albus*) throughout the area. Community C is not dominated by hydrophytic vegetation.

Both the east-facing and north-facing slopes are about 20 to 30 percent along much of their length. These slopes appear to consist of moderately well-drained sandy loam to silt loam soils.

### **Community D**

Community D is an approximately 2.4-acre upland community located in the northwestern portion of the site. This community is bounded by Pioneer Way to the west and Communities B and E and the railroad tracks to the east. This community extends off site to the north.

Community D is a mature, second-growth forest dominated by broad-leaved deciduous trees. It has a relatively closed canopy (approximately 80 percent cover) dominated by mature big-leaf maple. A few mature black cottonwoods are scattered throughout the community. Both the

big-leaf maples and the black cottonwoods are about 80 to 100 ft tall and about 1 to 2 ft dbh. Many of the black cottonwoods are infested with English ivy. Several immature and mature black cottonwood and big-leaf maple trees exist along the edge of this community near the border of Community B. These trees are 70 to 100 ft tall with 1 to 2-ft dbh.

Beneath the forest canopy is a well-developed shrub stratum dominated by common snowberry. Also present in this stratum are Indian plum (*Oemleria cerasiformes*), Himalayan blackberry, thimbleberry (*Rubus parviflorus*), and red alder saplings. The herb layer, which is very sparse, is dominated by sword fern (*Polystichum munitum*) and trailing blackberry (*Rubus ursinus*).

Most of this community is situated on an east-facing slope that ranges in slope from approximately 5 to 30 percent. Soil in this community was similar to that observed in Community C.

### **Community E**

Community E is an approximately 0.6-acre wetland community located in the northern portion of the site. This community is bounded by Communities B and D to the west and Community F, Swan Creek, and the train tracks to the east.

Community E is a mature, second-growth palustrine forested wetland (PFO1) dominated by broad-leaved deciduous trees. The canopy is dominated by mature black cottonwood and red alder and total vegetation cover is estimated to be over 100 percent. Cover is over 100 percent because of the different tiers of vegetation within this community, including shrubs and trees. The black cottonwood trees are 100 to 120 ft tall and 1 to 2 ft dbh, whereas the red alder trees are 80 to 100 ft tall and 1 to 2 ft dbh. There is also a well-developed midlevel stratum that is dominated by salmonberry. Because of the dense tree and shrub cover, there is no herb layer in this community.

The ground surface is fairly level, but shows evidence of overbank deposition near the creek and pit-and-mound topography farther from the creek. The soil appears to be a hydric silt loam. The source of wetland hydrology in this community appears to be seasonally high groundwater, but may also include periodic overbank flooding from Swan Creek.

### Community F

Community F is an approximately 2-acre wetland community oriented parallel to Swan Creek. This community is bounded by Community B to the west and the train tracks to the east.

Community F is a mature, second-growth palustrine forested wetland dominated by broad-leaved deciduous trees. The canopy is dominated by mature Pacific willow, black cottonwood, and red alder trees. Cover is estimated to be over 100 percent. Cover is over 100 percent because of the different tiers of vegetation within this community, including herbs, shrubs, and trees. Most of the trees are 80 to 120 ft tall and 1 to 2-ft dbh. The midstory layer is fairly well developed and dominated by Sitka willow, but also contains common snowberry, Himalayan blackberry, and red-osier dogwood. Bittersweet nightshade is found growing on many of these shrubs, especially in the more open areas. Communities of herbaceous vegetation present, including reed canarygrass (*Phalaris arundinacea*) and marsh skullcap (*Veronica scutellata*), also occur in this area. Reed canarygrass is generally confined to more open areas, whereas marsh skullcap occurs in discrete patches in more shaded areas.

The ground surface is fairly level, but a berm produced by overbank deposition and incision exists near the creek, and pit-and-mound topography produced by tree-fall exists farther from the creek. The soil is likely hydric and appears to be a loam with moderate amounts of organic matter. Overbank flooding and seasonally high groundwater levels likely are the dominant sources of wetland hydrology.

### Community G

Community G is composed of two separate wetland communities that cover approximately 1.2 acres. The northern portion is bounded by Community F to the west and south and the train tracks to the east. The southern portion is bounded by Community F to the west and the train tracks to the north.

Community G is an emergent wetland community dominated by persistent emergent vegetation (PEM1). Reed canarygrass is the only plant species found growing in this community. Several black cottonwood snags ranging from 20 to 100 ft in height were found in both the northern and southern areas containing this community. At least two small (15- to 25-ft-diameter) pools of open water up to 3 ft deep were observed in this community.

The topography in these areas is relatively level and may be the result of flood plain processes. The soil appears to be a silt loam. The source of wetland hydrology in this community appears to be from seasonally high groundwater table and periodic overbank flooding from Swan Creek.

## **WILDLIFE HABITAT**

Swan Creek, the Haire Wetland complex (including Communities B, E, F, and G), and adjacent forested uplands (including Communities A, C, and D), support a diverse array of habitat for fish and wildlife. However, many of these habitats provide relatively limited value due, in part, to relatively low structural and habitat diversity. Dense communities of invasive species, including Himalayan blackberry and reed canarygrass, contribute to the relatively low structural diversity and diminished habitat values.

The wetland on site contains a number of different wetland vegetation classes and habitat types, including forested, emergent, and unconsolidated bottom. Also, there are some other specific habitat features within the wetland complex, including snags, LWD, and apparently permanently inundated areas (sometimes called open water). These features are most abundant in Community B. The relatively large size, edge habitat, and continuity with mature forested uplands likely provides habitat for many mammals, birds, reptiles, and amphibians commonly found in western Washington.

Results of the reconnaissance investigations done on the site were used to develop enhancement and restoration plans within the different communities. Proposed plantings of shrubs and trees were selected for their compatibility with existing vegetation and based on existing site conditions. In addition, plant species also were selected based on their ability to contribute to habitat diversity and complexity.

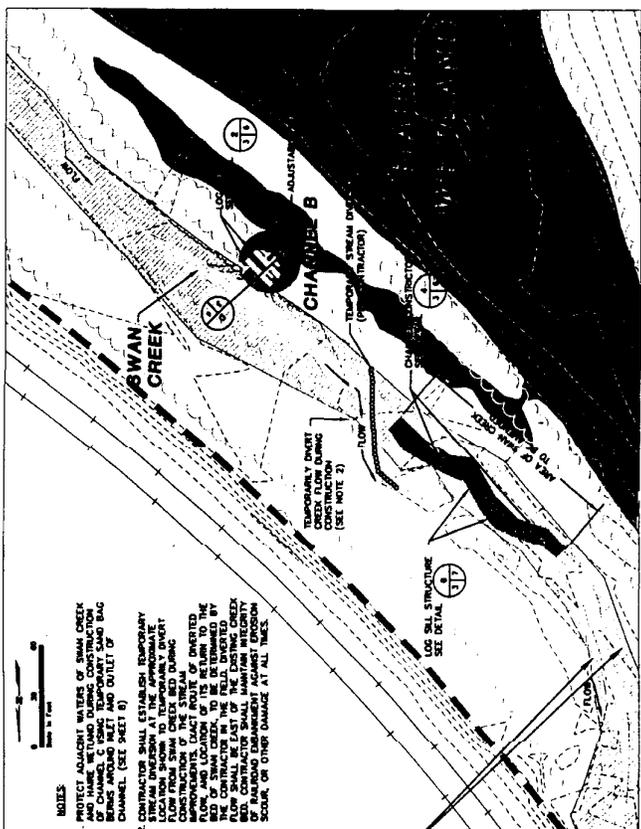
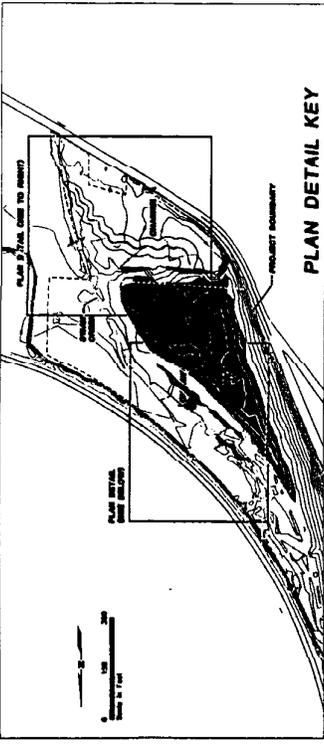
## REFERENCES

- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. US Fish and Wildlife Service, Office of Biological Services, Publication FWS/OBS-79/31, Washington, DC.
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- Pierce County Wetland Atlas. 1987. Department of Land Use Services, Tacoma, Washington.
- Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. Habitat suitability information: rainbow trout. US Department of the Interior, Fish and Wildlife Service, FWS/OBS-82/10.60.
- Zulauf, A.S. 1979. Soil survey of Pierce County area, Washington. US Department of Agriculture, Soils Conservation Service, Washington, DC.

***Attachment—  
Project Constructions  
Plans***

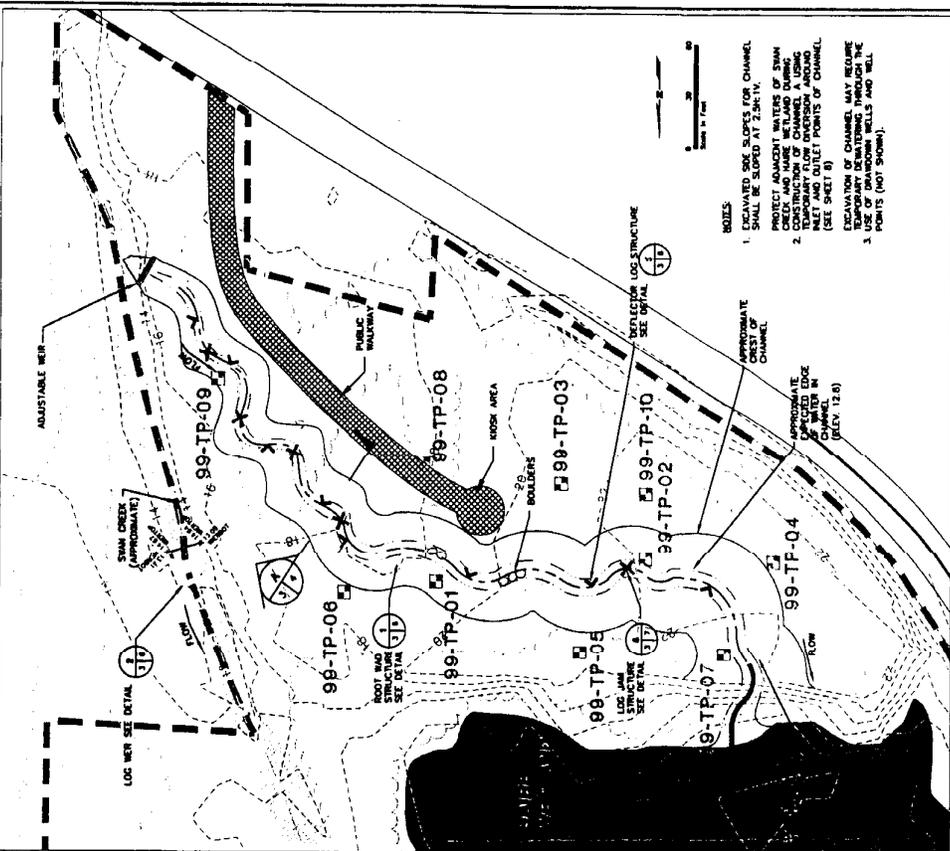
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**NOTES**

- PROTECT ADJACENT WATERS OF SWAN CREEK AND CHANNEL B FROM TEMPORARY SAND BAG CHANNEL (SEE SHEET B).
- CONTRACTOR SHALL ESTABLISH TEMPORARY STREAM DIVERSION AT THE APPROXIMATE LOCATION SHOWN TO TEMPORARILY DIVERT CONSTRUCTION OF THE STREAM CHANNEL. FLOW SHALL BE MAINTAINED AT ALL TIMES. FLOW SHALL BE EAST OF THE EXISTING CHECK BED. CONTRACTOR SHALL MAINTAIN INTEGRITY OF STREAM CHANNEL AND ADJACENT WATERS, SCOUR, OR OTHER DAMAGE AT ALL TIMES.



**NOTES**

- EXCAVATED SIDE SLOPES FOR CHANNEL SHALL BE SLOPED AT 2:1 H:1 V.
- PROTECT ADJACENT WATERS OF SWAN CREEK AND CHANNEL B FROM TEMPORARY SAND BAG CHANNEL (SEE SHEET B).
- CONTRACTOR SHALL ESTABLISH TEMPORARY STREAM DIVERSION AT THE APPROXIMATE LOCATION SHOWN TO TEMPORARILY DIVERT CONSTRUCTION OF THE STREAM CHANNEL. FLOW SHALL BE MAINTAINED AT ALL TIMES. FLOW SHALL BE EAST OF THE EXISTING CHECK BED. CONTRACTOR SHALL MAINTAIN INTEGRITY OF STREAM CHANNEL AND ADJACENT WATERS, SCOUR, OR OTHER DAMAGE AT ALL TIMES.

**PLAN DETAIL**  
**EXCAVATED POND AND CHANNEL A**

**50 PERCENT DESIGN SUBMITTAL**  
 CITY OF TACOMA  
 DEPARTMENT OF PUBLIC WORKS

**SWAN CREEK**  
**STREAM RESTORATION PROJECT**  
**GRADING PLAN Figure 4**

DATE: 11/11/09  
 DRAWN BY: [Name]  
 CHECKED BY: [Name]  
 SCALE: 1" = 20'-0"

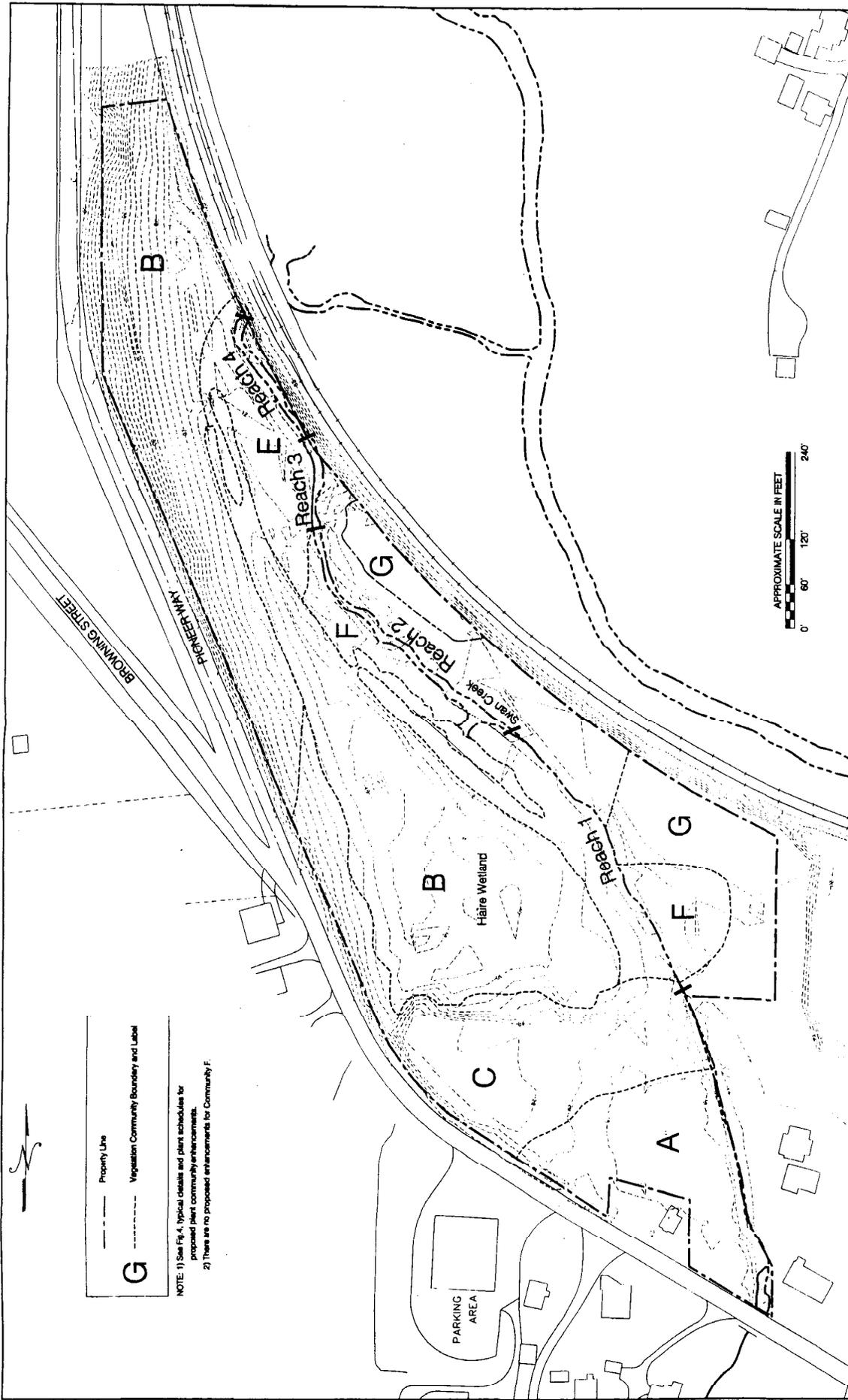
**HARTCROWSER**  
 Not a Contractor, Inc.  
 1810 Parkside Avenue East  
 Seattle, Washington 98148  
 TEL: 206.324.3000  
 FAX: 206.324.6500

**PLAN DETAIL**  
**CHANNEL B AND STREAM**  
**IMPROVEMENTS**

REVISIONS:  
 NO. DATE BY  
 1 11/11/09 [Name]  
 2 11/11/09 [Name]

UNITY SERVICES ENGINEERING - DIVISION MANAGER

IF SHEET MEASURES LESS THAN 36"x24", IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.



**G**

Property Line  
 Vegetation Community Boundary and Label

NOTE: 1) See Fig. 4, typical details and plant schedules for proposed plant community enhancements.  
 2) There are no proposed enhancements for Community F.

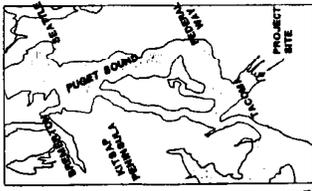
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**Figure 5**  
 Existing plant communities and reach locations.

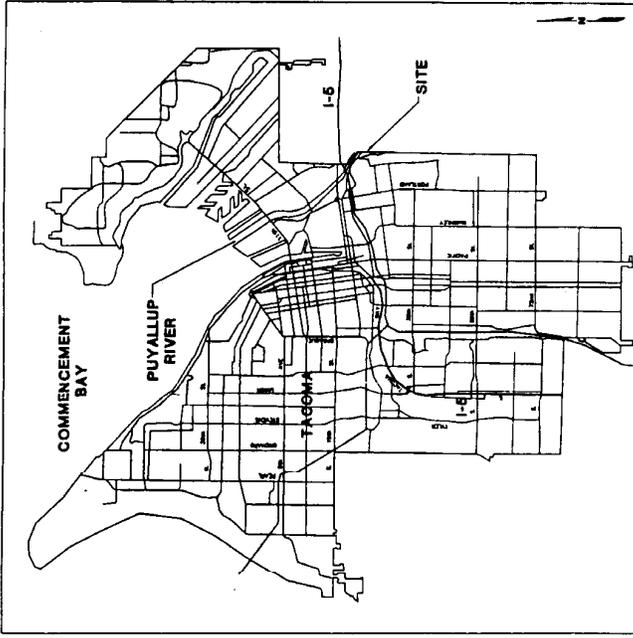
Swan Creek Haire Wetland Restoration  
 Tacoma, Washington  
 for City of Tacoma

Pentec Environmental, Inc.  
 10000 1st Ave. S.E.  
 Bellevue, WA 98006  
 (206) 775-4682

**Pentec**  
 Environmental, Inc.



AREA MAP



VICINITY MAP



WORK ORDER: DC 1094  
**SWAN CREEK**  
**STREAM RESTORATION PROJECT**  
 SPECIFICATION NO. \_\_\_\_\_  
**REVISED 50 PERCENT DESIGN SUBMITTAL**

**SHEET INDEX**

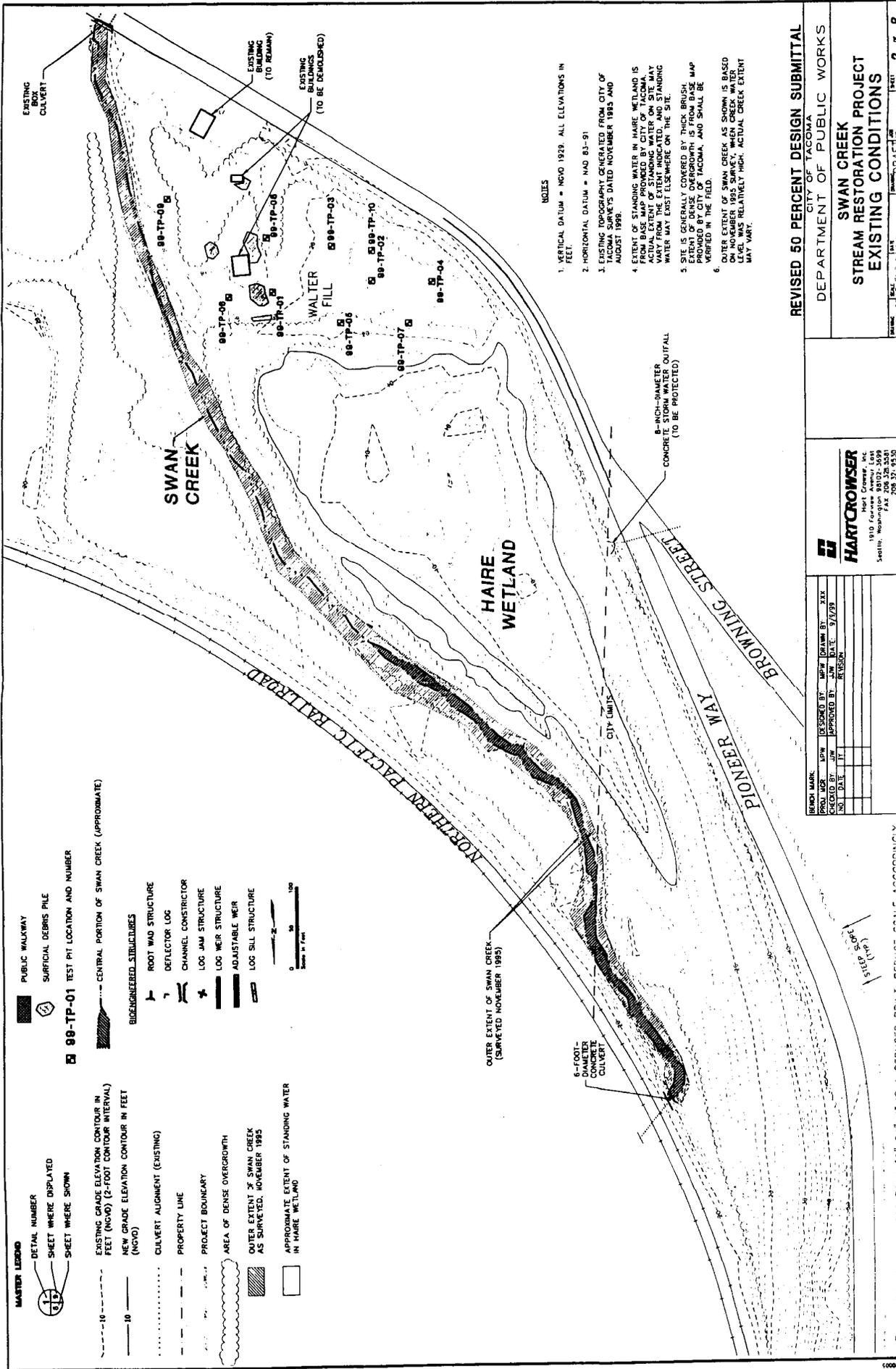
- 1 TITLE SHEET
- 2 EXISTING CONDITIONS
- 3 GRADING PLAN
- 4 CROSS SECTIONS
- 5 PLANTING PLAN
- 6 BIOENGINEERING DETAILS (SHEET 1 OF 2)
- 7 BIOENGINEERING DETAILS (SHEET 2 OF 2)
- 8 EROSION AND SEDIMENT CONTROL PLAN

PROJ. NO.	MPW	DRAWN BY	SKZ
CHECKED BY	JUN	DATE	3/2/99
DATE	BY	BY	BY

**HARTCROWSER**  
 Hart Crowser, Inc.  
 1010 Franklin  
 Seattle, Washington 98102-3699  
 FAX: 206.326.5381

**Pentec**  
 ENVIRONMENTAL

REVISED 50 PERCENT DESIGN SUBMITTAL  
 CITY OF TACOMA  
 DEPARTMENT OF PUBLIC WORKS  
 SWAN CREEK  
 STREAM RESTORATION PROJECT  
 TITLE SHEET



**MASTER LEGEND**

DETAIL NUMBER  
SHEET WHERE DISPLAYED  
SHEET WHERE SHOWN

EXISTING GRADE ELEVATION CONTOUR IN FEET (NOVD) (2-FOOT CONTOUR INTERVAL)  
NEW GRADE ELEVATION CONTOUR IN FEET (NOVD)

CULVERT ALIGNMENT (EXISTING)  
PROPERTY LINE  
PROJECT BOUNDARY  
AREA OF DENSE OVERGROWTH  
OUTER EXTENT OF SWAN CREEK AS SURVEYED, NOVEMBER 1995  
APPROXIMATE EXTENT OF STANDING WATER IN HAIRE WETLAND

**99-TP-01** TEST PIT LOCATION AND NUMBER

CENTRAL PORTION OF SWAN CREEK (APPROXIMATE)

**BIOENGINEERED STRUCTURES**

ROOT WAD STRUCTURE  
DEFLECTOR LOG  
CHANNEL CONSTRUCTOR  
LOG JAM STRUCTURE  
LOG WEIR STRUCTURE  
ADJUSTABLE WEIR  
LOG SILL STRUCTURE

PUBLIC WALKWAY  
SURFICIAL DEBRIS PILE

EXISTING BUT NOT CULVERT  
EXISTING BUILDING (TO REMAIN)  
EXISTING STRUCTURES (TO BE DEMOLISHED)

8-FOOT DIAMETER CONCRETE CULVERT

CONCRETE SURFACE WATER OUTFALL (TO BE PROTECTED)

5-FEET DIAMETER CONCRETE CULVERT

OUTER EXTENT OF SWAN CREEK (SURVEYED NOVEMBER 1995)

CITY LIMITS

PIONEER WAY  
BROWNING STREET

**NOTES**

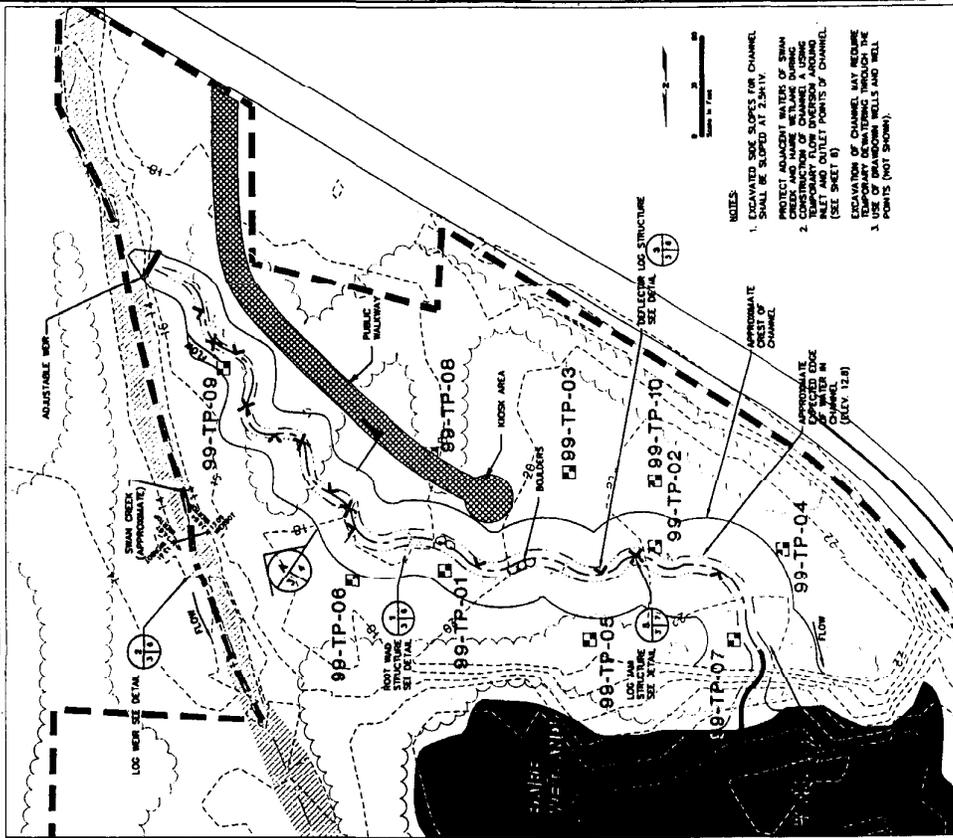
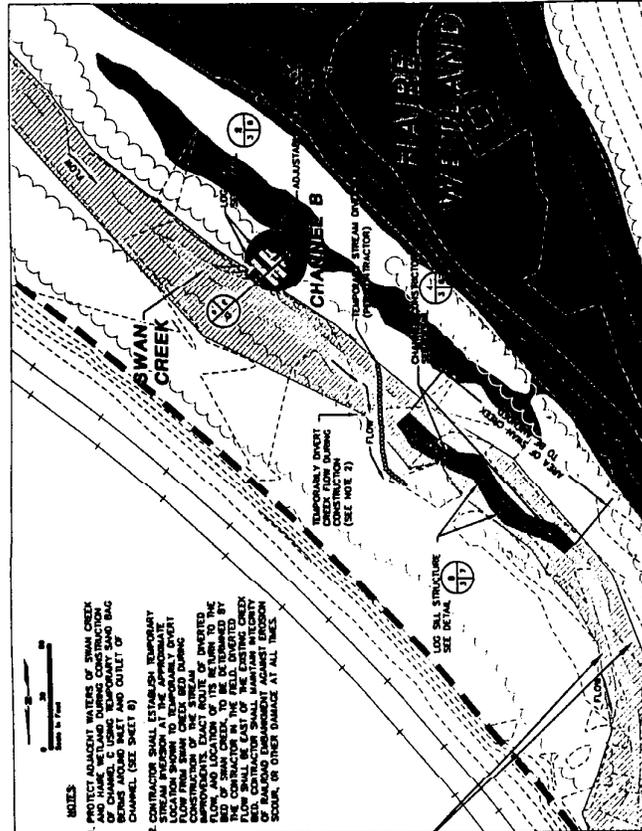
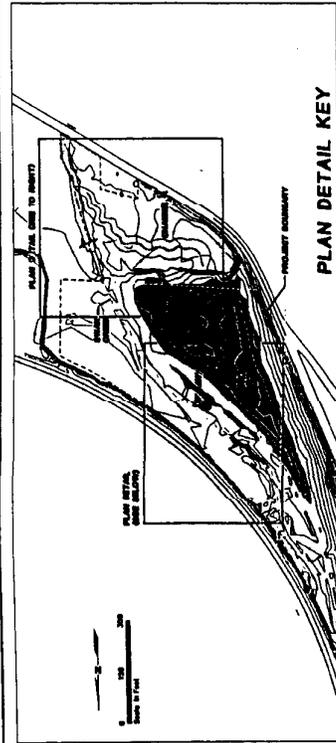
1. VERTICAL DATUM = MVD 1929. ALL ELEVATIONS IN FEET.
2. HORIZONTAL DATUM = NAD 83-91
3. EXISTING TOPOGRAPHY GENERATED FROM CITY OF TACOMA SURVEYS DATED NOVEMBER 1995 AND AUGUST 1998.
4. EXTENT OF STANDING WATER IN HAIRE WETLAND IS APPROXIMATE. ACTUAL EXTENT OF STANDING WATER ON SITE MAY VARY FROM THE EXTENT INDICATED, AND STANDING WATER MAY EXIST ELSEWHERE ON THE SITE.
5. SITE IS GENERALLY COVERED BY THICK BRUSH. PHOTOGRAPHS AND AERIAL PHOTOGRAPHS PROVIDED BY CITY OF TACOMA, AND SHALL BE REFERRED TO IN THE FIELD.
6. OUTER EXTENT OF SWAN CREEK AS SHOWN IS BASED ON NOVEMBER 1995 SURVEY. WHEN CREEK WATER LEVEL WAS RELATIVELY HIGH, ACTUAL CREEK EXTENT MAY VARY.

**REVISED 50 PERCENT DESIGN SUBMITTAL**  
CITY OF TACOMA  
DEPARTMENT OF PUBLIC WORKS  
**SWAN CREEK  
STREAM RESTORATION PROJECT  
EXISTING CONDITIONS**

**HARTCROWSER**  
1800 Courthouse Avenue, Lehi, WA 98025-3599  
Seattle, Washington 206.272.9530

REVISION	DATE	BY	DESCRIPTION

APPROXIMATE SLOPE (TOP)



- NOTES:**
- EXCAVATED SIDE SLOPES FOR CHANNEL SHALL BE SLOPED AT 2:1H:1V.
  - PROTECT ADJACENT WATERS OF SWAN CREEK AND LAKE WELLS DURING CONSTRUCTION.
  - TEMPORARILY DIVERT AND/OR DIVERSION AND/OR INLET AND OUTLET POINTS OF CHANNEL (SEE SHEET 5).
  - EXCAVATION OF CHANNEL MAY REQUIRE USE OF SHALLOWS WELLS AND WELL POINTS (NOT SHOWN).

**50 PERCENT DESIGN SUBMITTAL**

CITY OF PASADENA  
 DEPARTMENT OF PUBLIC WORKS

**SWAN CREEK  
 STREAM RESTORATION PROJECT  
 GRADING PLAN Figure 4**

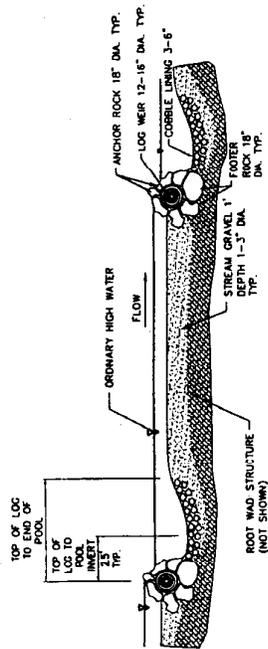
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 DRAWN BY: J. J. HART  
 CHECKED BY: J. J. HART

**HARTCROWSER**  
 Civil Engineers, Inc.  
 1015 E. 10th Street  
 Seattle, Washington 98102-3500  
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 FAX: 206.325.3501

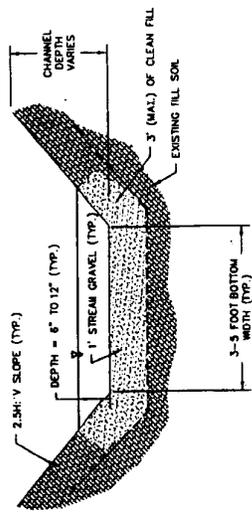
**PLAN DETAIL EXCAVATED POND AND CHANNEL A**

DATE: 11/17/99  
 DRAWN BY: J. J. HART  
 CHECKED BY: J. J. HART

IF SHEET MEASURES LESS THAN 36"x24", IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.



PARTIAL CROSS SECTION ALONG CHANNEL C (TYP.)  
NOT TO SCALE



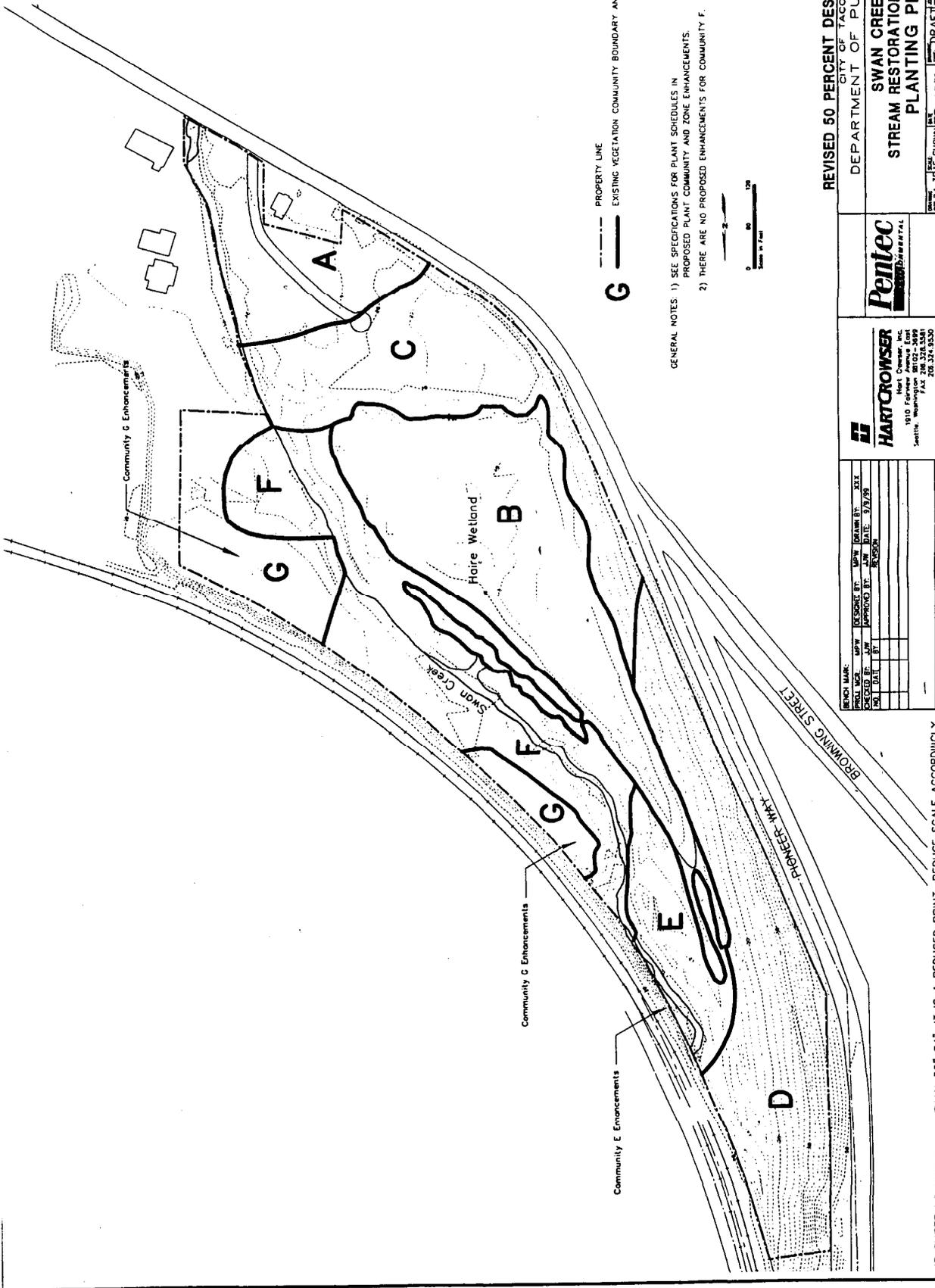
CROSS SECTION THROUGH CHANNELS (TYP.)  
NOT TO SCALE

REVISED 50 PERCENT DESIGN SUBMITTAL  
CITY OF TACOMA  
DEPARTMENT OF PUBLIC WORKS  
SWAN CREEK  
STREAM RESTORATION PROJECT  
CROSS SECTIONS

**HARTCROWSER**  
1810 Farwell Avenue East  
Seattle, Washington 98148  
206.324.3500  
206.324.9530

DESIGNED BY	UPW	DRAWN BY	JAK
CHECKED BY	SM	APPROVED BY	9/3/95
DATE	9/3/95		

IF SHEET MEASURES LESS THAN 36" x 24", IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.



PROPERTY LINE  
 ---  
 EXISTING VEGETATION COMMUNITY BOUNDARY AND LABEL  
 —

GENERAL NOTES 1) SEE SPECIFICATIONS FOR PLANT SCHEDULES IN PROPOSED PLANT COMMUNITY AND ZONE ENHANCEMENTS.  
 2) THERE ARE NO PROPOSED ENHANCEMENTS FOR COMMUNITY F.



REVISED 50 PERCENT DESIGN SUBMITTAL  
 CITY OF TACOMA  
 DEPARTMENT OF PUBLIC WORKS  
 SWAN CREEK  
 STREAM RESTORATION PROJECT  
 PLANTING PLAN

DESIGNER:	DATE:
CHECKED BY:	DATE:
IN CHARGE:	DATE:
APPROVED BY:	DATE:

**HARTCROWSER**  
 1810 Eastern Avenue, East  
 Seattle, Washington 98102-3899  
 TEL: 206.324.8350  
 FAX: 206.324.8350

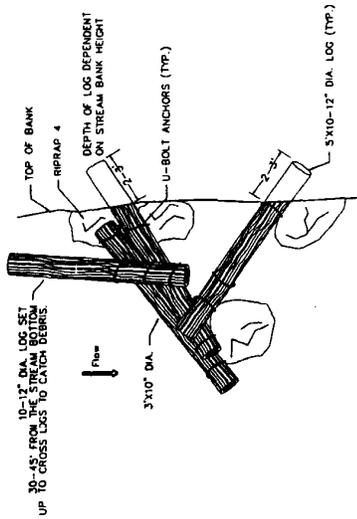
**Pentec**  
 Environmental

IF SHEET MEASURES LESS THAN 36"x24", IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.

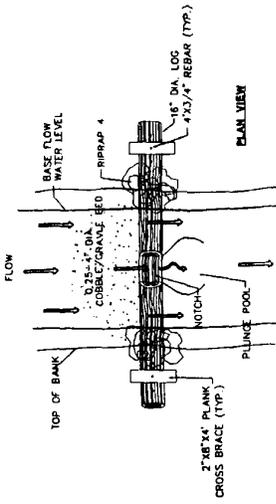
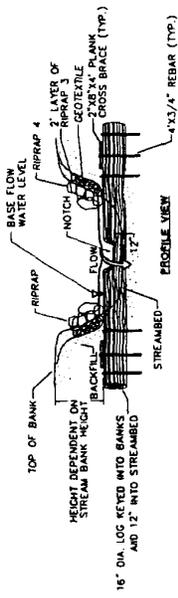
5A of 8







LOG JAM STRUCTURE  
NOT TO SCALE



LOG SILL STRUCTURE  
NOT TO SCALE

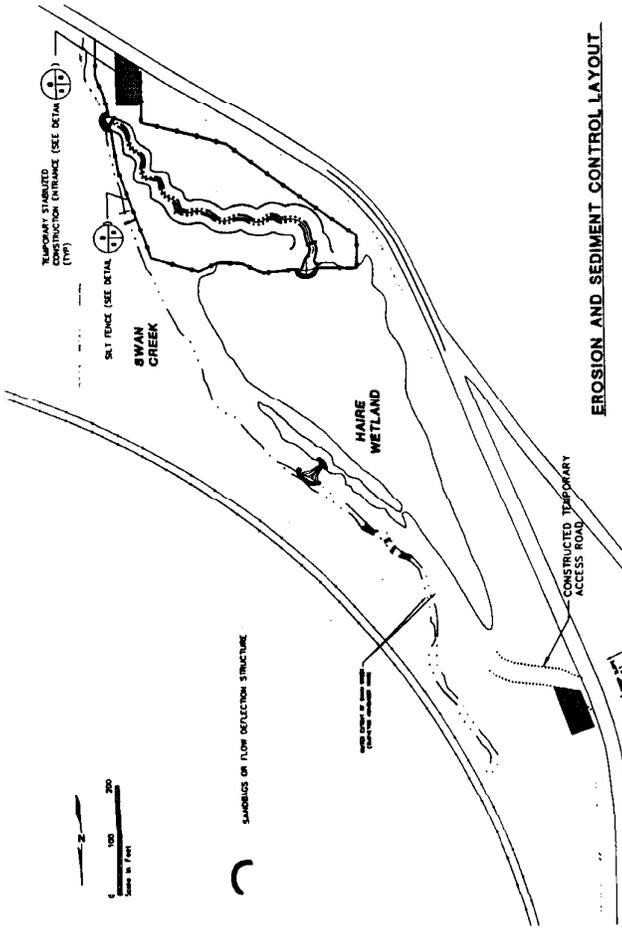
REVISED 50 PERCENT DESIGN SUBMITTAL  
CITY OF TACOMA  
DEPARTMENT OF PUBLIC WORKS  
SWAN CREEK  
STREAM RESTORATION PROJECT  
BIOENGINEERING DETAILS (2 OF 2)

**HARTCROWSER**  
1918 Parkside Avenue, SE  
Seattle, Washington 98107-5419  
TEL: 206.324.8200

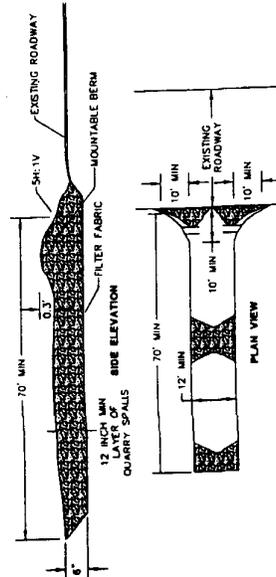
**Penlec**  
ENGINEERING

DESIGNED BY:	SPW	DATE:	11/97
CHECKED BY:	JUN	DATE:	9/2/99
APPROVED BY:	REDA		
LOG NO.:			
LOG DATE:			

IF THIS IS A REVISION, PLEASE IDENTIFY THE REVISION NUMBER AND DATE. OTHERWISE, THIS IS A REVISION OF THE ORIGINAL DESIGN.

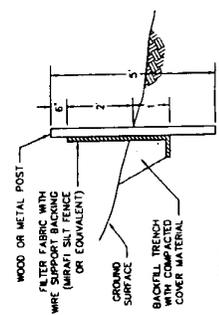


**EROSION AND SEDIMENT CONTROL LAYOUT**



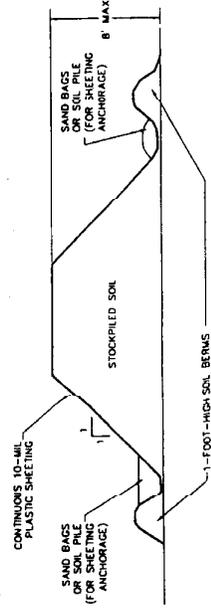
- NOTES:**
1. MUST EXTEND FULL WIDTH OF INGRESS AND EGRESS OPERATION.
  2. VEHICLES AND HEAVY EQUIPMENT LEAVING THE SITE WITH THE POTENTIAL TO TRACK SOIL OR DEBRIS ONTO PROMPTS MUST BE CLEANED TO REMOVE EXCESSIVE MUD AND DEBRIS BEFORE ENTERING THE STABILIZED CONSTRUCTION ENTRANCE.
  3. AT THE END OF THE PROJECT, PROMPT WAY SHALL BE CLEANED AND PROMPT WAY SHALL BE RECONSTRUCTED WITH APPROX. 200 FEET BEYOND BOTH EDGES OF EACH CONSTRUCTION ENTRANCE.

**TEMPORARY STABILIZED CONSTRUCTION ENTRANCE**  
NOT TO SCALE



- NOTES:**
1. WOOD OR METAL POSTS SHALL BE SPACED NO MORE THAN 6 FEET APART.
  2. EXCAVATE TRENCH 12" DEEP TO BURY BASE OF FILTER FABRIC BACKFILL TRENCH WITH COMPACTED COVER MATERIAL.

**CROSS SECTION - SILT FENCE (TYP.)**  
NOT TO SCALE



- NOTES:**
1. PLACE SAND BAGS OR SOIL PILES AS NECESSARY TO ANCHOR SHEETING AGAINST WINDS, ETC.
  2. SURROUND ENTIRE STOCKPILE PERIMETER WITH SOIL BERMS.

**CROSS SECTION - TEMPORARY STOCKPILE**  
NOT TO SCALE

**GENERAL NOTES:**

1. THE EROSION AND SEDIMENT CONTROL LAYOUT AND DETAILS SHOWN IN THESE PLANS ADDRESS PROCEDURES, EQUIPMENT, AND MATERIALS NECESSARY TO CONTROL AND MINIMIZE EROSION, LOSS OF SEDIMENTS, AND ENTRY OF SEDIMENT INTO SWAN CREEK AND HAIRE WETLAND DURING REHABILITATION WORK.
2. SILT FENCING SHALL BE ESTABLISHED IMMEDIATELY DOWN-SLOPE OF ALL CONSTRUCTION ACTIVITIES, INCLUDING CLEARING, EXCAVATION, AND SOIL PLACEMENT, TO PREVENT TRANSPORT OF SOIL TO SWAN CREEK AND THE SURROUNDING ENVIRONMENT.
3. THE AREAS AVAILABLE FOR STOCKPILING OF IMPORTED OR EXCAVATED SOILS ARE INDICATED ON THIS PLAN. ALL STOCKPILES SHALL BE COVERED WITH CONTINUOUS PLASTIC SHEETING TO MINIMIZE EROSION AND LOSS OF SOILS DUE TO PRECIPITATION OR WIND.
4. STOCKPILE AND/OR STAGING AREAS SHALL NOT ENCRUST WITHIN 70 FEET OF THE CREST OF THE SLOPE TO HAIRE WETLAND, OR EXCAVATED SOIL SLOPES, OR WITHIN 20 FEET OF SWAN CREEK, OR OF EXPOSED SOIL WITH WATER.
5. BLOWING DUST IN DRY WEATHER CONDITIONS SHALL BE MINIMIZED BY SPRAYING ALL ACTIVE AREAS WITH WATER.
6. ALL INGRESS AND EGRESS TO THE PROJECT SITE BY HEAVY EQUIPMENT AND TRUCK/TRAILERS SHALL BE CONTROLLED UTILIZING THE STABILIZED CONSTRUCTION ENTRANCES, LOCATED AS SHOWN ON THIS SHEET.
7. CONTRACTOR SHALL PLACE SANDBAGS OR OTHER FLOW DEFLECTION STRUCTURES AS SHOWN TO KEEP WATER FROM ENTERING THE EXCAVATED AREAS.
8. TEMPORARY ACCESS ROAD TO BE CONSTRUCTED BY LAYING DOWN 12 INCHES OF QUARRY SPALLS OVER A LAYER OF FILTER FABRIC, OVER THE CLEARED SUBGRADE, WHILE MINIMIZING REMOVAL OF TREES. EXACT ROUTE OF TEMPORARY ACCESS ROAD TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR.
9. ALL TEMPORARY EROSION AND SEDIMENT CONTROLS AND TEMPORARY ACCESS ROADS SHALL BE FULLY REMOVED AND SITE RESTORED TO ITS PREVIOUS CONDITION FOLLOWING COMPLETION OF CONSTRUCTION.

**REVISED 50 PERCENT DESIGN SUBMITTAL**  
CITY OF TACOMA  
DEPARTMENT OF PUBLIC WORKS  
SWAN CREEK  
STREAM RESTORATION PROJECT  
EROSION AND SEDIMENT CONTROL PLAN

**HARTCROWSER**  
Soil Conservation Engineers  
1810 Franklin Street  
Seattle, Washington 98102-3699  
TEL: 206.324.9300  
FAX: 206.324.9300

DESIGNED BY:	UPN	DATE:	2/21/01
CHECKED BY:	UPN	DATE:	9/7/01
APPROVED BY:	UPN	DATE:	9/7/01
DATE:	JULY	DATE:	2001
CITY OF TACOMA ENGINEER/PROJECT MANAGER			

IF PLOTter MAGNITUDE LESS THAN 16"x24" IT IS A REDUCED PRINT REDUCE SCALE ACCORDINGLY.

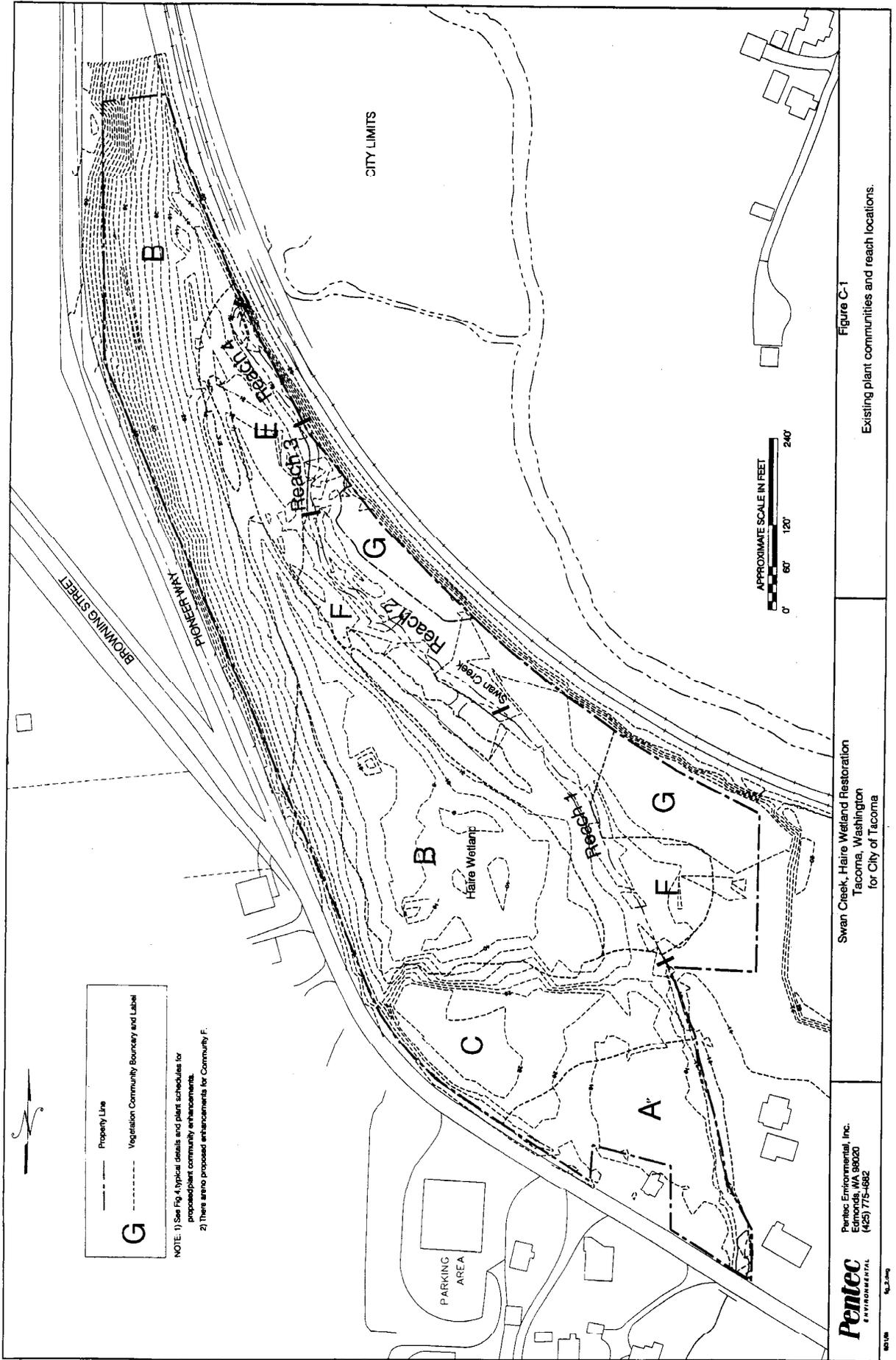


Figure C-1  
 Existing plant communities and reach locations.

Swan Creek, Haire Wetland Restoration  
 Tacoma, Washington  
 for City of Tacoma

Pentec Environmental, Inc.  
 Edmonds, WA 98020  
 (425) 775-682

**Pentec**  
 ENVIRONMENTAL