

TAHOMA SALT MARSH

YEAR 1 TO YEAR 3 MONITORING REPORT



City of Tacoma
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1.0 INTRODUCTION

This document presents the Year 1 to Year 3 Monitoring Report for the Tahoma Salt Marsh (TSM) Natural Resource Restoration site located in Tacoma, Washington (Figure 1). The City of Tacoma (City) conducted the Year 1 through Year 3 qualitative and quantitative monitoring activities between 2004 and 2006.

The TSM is located along the Ruston Way shoreline at 1741 North Shuster Parkway. The project was constructed on land historically used for lumber production (1869 to 1920s) and for commercial boat building (1960s to 1980s). In 1987, the property was purchased by the United States Department of Defense. They performed a cleanup of the property, but never developed it. Finally, in 1996, the property was transferred to the City with the intent to use it for a restoration site.

The restoration project involved excavation of over 6,000 cubic yards of soil to create the bowl shaped salt marsh area. Approximately 1,000 cubic yards of clean excavated soil was used to create the riparian areas. Approximately 1,000 cubic yards of material had to be disposed of off-site due to unsuitable soil characteristics. Construction of the 1.95 acre salt marsh and riparian habitat was completed in March 2004.

This restoration site was constructed as part of the City's settlement of alleged natural resource damages with the Commencement Bay Natural Resource Trustees¹ (Trustees). This monitoring report is being provided to the Trustees as a part of that settlement.

The City has conducted four monitoring events since completion of construction:

- Year 1 - July 1, 2004 and January 10, 2005
- Year 2 - May 26, 2005
- Year 3 - August 30, 2006

The frequency of these monitoring efforts was modified compared to the plan. The methods of these monitoring events are detailed in the "Monitoring and Adaptive Management Plan: Tahoma Salt Marsh Natural Resources Restoration Project (MAMP)" (Parametrix, 2003) prepared for this site.

2.0 PROJECT OBJECTIVES

The restoration and cleanup objectives for the TSM, as described in the MAMP are:

1. Construct intertidal tidelflat, mudflat, and emergent habitat to provide nesting, refuse, and feeding opportunities for a variety of fish and shorebird species (e.g., salmon, juvenile flatfish, plover, sandpipers, etc.).
2. Restore the shoreline via removal of surficial debris including remnants of the Ruston Formation (a concrete-like mass containing a high fraction of metal shavings and other

¹Commencement Bay Natural Resource Trustees consist of the following entities: National Oceanic and Atmospheric Administration; U.S. Fish and Wildlife Service; Washington State Department of Ecology; Washington State Department of Fish and Wildlife; Washington State Department of Natural Resources; The Puyallup Tribe of Indians; and Muckleshoot Indian Tribe.

debris, often appearing as a rusted/fused mass where exposed directly to seawater) and other anthropogenic materials.

3. Provide a habitat linkage between the nearshore habitat in the vicinity of Ruston Way/Pt. Defiance and intertidal and riverine habitat near the mouth of the Puyallup River.
4. Provide 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.

Attainment of the first and third objectives is being evaluated on the basis of the monitoring program which is the focus of this report. Attainment of the second objective was met during construction of the restoration project. The fourth objective is being attained through the City's many environmental partnerships with People for Puget Sound, Citizens for a Healthy Bay, Tacoma Public Schools, University of Washington–Tacoma, and the Pierce Conservation District Stream Team. In addition, public access to the site is expected to be provided following construction of the Chinese Reconciliation Park adjacent to the site.

Monitoring conducted to measure the success of the TSM project objectives is listed below:

- **Habitat Assessment:** In Year 1 through Year 3, qualitative habitat assessments in the riparian and salt marsh areas were conducted. Quantitative monitoring was conducted in Year 3. This monitoring included observations on:
 - Plant Cover
 - Plant Diversity
 - Invasive Species
- **Erosion and Sedimentation:** In Year 1 through Year 3, qualitative assessments of the amount of erosion and sedimentation were conducted for the riparian area, shoreline/salt marsh, and the intertidal channel/fish mix. Quantitative monitoring of these areas was conducted in Year 1 and Year 3.

3.0 MONITORING METHODS

3.1 General

Environmental professionals from the City's Environmental Services Science and Engineering Division conducted visual inspections and photo documentation in 2004 and 2005. David Adams and the Washington Conservation Corps crew members conducted monitoring in 2006.

Crews from the City's Public Works Department Survey Section, under the direction of the City's Licensed Professional Land Surveyor, conducted conventional topographic surveying in 2004 and 2006 of the five transects (Figure 2) identified in the MAMP. These field activities were scheduled around the low tide events.

3.2 Habitat Assessment

Qualitative data was collected during all site monitoring activities for the riparian and salt marsh areas. These monitoring events included photo documentation, vegetation assessment (e.g., plant cover, invasive species), wildlife observations, and soil/sediment conditions.

Quantitative monitoring conducted during 2006 involved sampling ten 1 m² sampling plots (quadrats) randomly located along each transect (Figure 2). Eight quadrats (Table 1) were identified as being in the riparian area and twenty-two quadrats (Table 2) were identified as being in the salt marsh area based on quadrat elevations and species presence. Due to the random selection of the quadrat locations, several quadrats (e.g., T2-7, T3-2) appear to be in the transition area between the riparian and salt marsh regions.

The Daubenmire cover class (i.e., 0-5%, 5-25%, 25-50%, 50-75%, 75-95%, or 95-100%) was estimated for plants found within each quadrat. The total vegetative cover was calculated for each transect using the Daubenmire cover class midpoint values (i.e. 2.5%, 15%, 37.5%, 62.5%, 85%, or 97.5%). The quadrats were used to monitor the distribution and mean percent frequency (percent of quadrats containing each species at the site) of planted, colonizing, and invasive species².

3.3 Erosion and Sedimentation

Qualitative inspections of erosion and sediment accumulation were conducted during all monitoring events. The location of any deposition or eroded sediment, as well as possible causes and effects, were described in the monitoring notes (Appendix B).

Quantitative monitoring conducted during 2004 and 2006 involved surveying the five transects and twelve sediment monitoring stakes. Five small core samples were taken at random locations in 2006 to assess the depth of the fish mix (Figure 2).

4.0 MONITORING RESULTS

4.1 General Observations

4.1.1 Photo Points

Photo points were established as described in the MAMP and depicted in Figure 2. Year 1 to Year 3 photos are presented in Appendix A. The following general trends were noted:

- Riparian Area: Plant growth and survival was much greater in irrigated areas than in non-irrigated areas.
- Salt Marsh Area: The low salt marsh region appears to be filling in with native vegetation, especially in regions with goose exclusion devices in place (Photo Point 6B). Plant survival in the high salt marsh region is limited.

² Plants were categorized as "native" or "nonnative" according to Plants of the Pacific Northwest Coast (Pojar and MacKinnon, 2004).

4.1.2 Wildlife Observations

Wildlife observed at the site during field visits is listed below and included on the Qualitative Field Notes in Appendix B.

Geese	Deer	Rats
Pigeon	Great Blue Herron	Jellyfish
Fish	Crows	Seagulls
Crickets	Hawks	Crabs
Eagles	Banana Slugs	Bull heads

4.2 Habitat Assessment

4.2.1 Plant Cover

Riparian Area

Qualitative monitoring conducted between Year 1 and Year 3 estimated plant survival in the riparian area to be at least 80% (Appendix B). This satisfies the Year 1 to Year 3 requirements for plant survival.

Quantitative monitoring conducted during 2006 identified new growth on all planted trees and shrubs encountered in the sampling quadrats (Appendix B). Six native plants and four non-native plants were identified in the eight riparian quadrats (Table 1). Five of the six native plants were identified in only one of the quadrats (12.5% mean frequency) and one plant (*Junus effusus*) was found in two of the quadrats (25% mean frequency). This did not satisfy the performance goal for Year 3 of a mean percent frequency greater than 50 percent for the three most abundant herbaceous species.

Field observations of plant species in the riparian area in 2006 (Section 4.2.2) identified many more riparian species than were encountered in the eight riparian quadrats. This suggests that the use of 1 m² sampling quadrats does not provide a representative picture of the riparian area.

Salt Marsh Area

Qualitative monitoring conducted between Year 1 and Year 3 estimated plant survival in the salt marsh area to be at least 80% (Appendix B). This satisfies the Year 1 to Year 3 requirements for plant survival.

Quantitative monitoring conducted during 2006 identified new growth on all herbaceous species encountered in the sampling quadrats (Appendix B). Eight native plants and four non-native plants were identified in the twenty-two salt marsh quadrats (Table 2). Six of the eight native plants were identified in three or fewer of the quadrats (less than or equal to 13.6% mean frequency), one in five of the quadrats (22.7% mean frequency), and one in seven of the quadrats (31.8% mean frequency). This did not satisfy the performance goal for Year 3 of a mean percent frequency greater than 40 percent for the three most abundant herbaceous species.

Quadrats in the salt marsh area (Figure 2) are predominately located within the low salt marsh region. Of the twenty-two salt marsh quadrats, only four appear to be located

within the high salt marsh region based on elevations and plant species (T1-1, T2-7, T3-7, and T3-10).

4.2.2 Plant Diversity

Riparian Area

Plant species identified in the riparian area during field visits conducted in 2006 are listed in Table 3. The majority of the trees and shrubs are doing well at the site, with the exception of plants located on the northern side of the site, which is located outside of the irrigated area. The shore pines (*Pinus contorta* var. *contorta*) in this area do not appear to be doing well, likely due to the recent summer drought.

At least three native, noninvasive trees (*Pseudotsuga menziesii* var. *menziesii*, *Picea sitchensis*, and *Arbutus menziesii*) and three native, noninvasive shrubs (*Holodiscus discolor*, *Ribes sanguineum*, and *Philadelphus lewisii*), and three native, noninvasive herbaceous species (*Atriplex patula*, *Juncus effusus*, and grasses) appear to be surviving and doing well at the site; this satisfies the performance goal for riparian area species.

Salt Marsh Area

Plant species identified at the site in the salt marsh area during field visits conducted in 2006 are listed in Table 4. All of the plants in the low marsh area appear to be doing well at the site especially *Salicornia virginica* and *Distichlis spicata*, which satisfies the performance goal of at least two species surviving at the site. At least two high salt marsh species (*Grindelia integrifolia* and *Atriplex patula*) are surviving at the site which satisfies the performance goal.

4.2.3 Invasive Species

Riparian Area

Trailing buttercup (*Ranunculus cymbalaria*), red clover (*Trifolium pretense*), thistle (*Cirsium* sp.), and Himalayan blackberry (*Rubus discolor*) were identified as non-native species present in the riparian area. Seven of the eight riparian sampling quadrats contained at least one of these non-native, invasive species (Table 1). This does satisfy the performance goal for Year 3 of invasive species found in less than 10 percent of the sampling units.

Salt Marsh Area

Trailing buttercup (*Ranunculus cymbalaria*), red clover (*Trifolium pretense*), thistle (*Cirsium* sp.), and brass buttons (*Cotula coronopifolia*) were identified as non-native species present in the salt marsh area. Although brass buttons is not native, it is not considered invasive since it has been naturalized to the region. Four of the twenty-two quadrats (18.2%) contained one of the non-native, invasive species (Table 2); this does not satisfy the performance goal for Year 3 of invasive species found in less than 5 percent of the sampling units.

4.3 Erosion and Sedimentation

Qualitative inspections were conducted between 2004 and 2006. Field notes are provided in Appendix B. Survey transect elevations from surveys conducted in 2004 and 2006 are presented in Table 5 and graphically in Figure 3.

Riparian Area

Figure 3 shows only slight changes in riparian area elevations occurred between 2004 and 2006. Sedimentation of approximately 8 inches was observed near the transition to the salt marsh on transect T3 (Table 5). This sedimentation does not appear to threaten the loss of vegetation in the area.

Shoreline and Salt Marsh Areas

No exposure of capped contaminated soils or unsuitable substrates was observed during qualitative monitoring. Although some erosion was seen during monitoring near the transitions to the riparian area, it does not appear to be threatening vegetation or affecting the stability of the stormwater outfall retaining wall or other walls.

Transect T1 shows erosion slightly exceeding 6 inches near the edge of the salt marsh (Table 5). Based on field observations, this erosion does not appear to be threatening slope stability or vegetation.

Approximately 16 inches of erosion was noted during the 2006 survey in the middle of the salt marsh area on transect T2 (Table 5). Visual observation of this area noted no significant erosion. This location is very close to erosion marker S5, which has shown no change in elevation (Table 6) between 2004 and 2006. Initial measurements of this area may have been inaccurate either due to errors in measurement or due to a temporary high elevation (e.g. rock or log) following construction.

Erosion transect E1 shows erosion ranging from 6 to 12 inches in the shoreline area between 2004 and 2006. This erosion is likely due to slight changes in riprap as the shoreline area equilibrates. Based on visual observations, this erosion does not appear to be threatening slope stability.

Intertidal Channel/Fish Mix Area

It appears from the visual inspections and the elevation surveys that the fish mix coverage has diminished slightly from the post-construction condition. Some erosion is also evident near the stormwater culverts and between sediment stakes S10 and S11.

Five areas with fish mix material (Figure 2) were sampled to determine the depth of the fish mix material as described in the MAMP. In all five locations, the fish mix material exceeded 8 inches in depth, which satisfies the performance goal of greater than or equal to 6 inches in all locations.

The erosion marker stakes were surveyed in 2004 and 2006 (Table 6). The largest amount of erosion (3.95 cm per year) is occurring at erosion marker 11 located near the outlet of the intertidal channel. All other erosion makers show less than 2 cm of erosion per year. The performance goal of less than 4 cm of erosion per year at any monitoring stake is satisfied.

Erosion transect E2 shows erosion of slightly less than 10 inches (Table 5) in the intertidal armoring area between 2004 and 2006. This slight erosion is likely due to equilibration of the channel in this area; no exposure of capped soils or erosion that might affect the stability of the slope was witnessed during visual inspections.

5.0 MAINTENANCE AND ADAPTIVE MANAGEMENT

5.1 Completed & On-Going Activities

The City has sponsored a Washington Conservation Corps crew since Fall 2005 to provide maintenance to the City's habitat restoration sites. The crew has conducted maintenance of the site on an as needed basis throughout the year.

David Adams (site steward under City contract), frequently visited the site, removed invasive weeds as necessary, and gathered pertinent information on the condition of the site. Mr. Adams also provided advice and expertise on adaptive management options.

5.2 Recommended Adaptive Management Activities

Year 1 to Year 3 monitoring results have shown varying levels of success of the TSM performance goals. Year 3 monitoring results show performance goals for plant cover and invasive species were not satisfied.

Performance goals for erosion were slightly exceeded in a few locations. These exceedances do not appear to be threatening vegetation or the stability of any slopes. No action to correct these changes is planned at this time; the points will continue to be monitored during visual inspections for conditions that threaten the stability of the slopes or the loss of vegetation.

The following adaptive management actions are proposed to satisfy the future performance goals.

5.2.1 Plant Cover & Diversity

Supplemental plantings in the salt marsh area will be conducted during Spring 2007 to help increase the mean percent frequency of selected plants. The City proposes to plant the following species:

- Salt Marsh:
 - Pickleweed (*Salicornia virginica*) – 400 plugs
 - Salt Grass (*Distichlis spicata*) – 400 plugs
 - Seacoast bulrush (*Scirpus maritimus*) – 200 plugs
 - Lyngby Sedge (*Carex lyngbyei*) – 600 plugs

Due to the size of plants in the riparian area, the 1 m² square sampling plots are insufficient to capture the variety of plants in the riparian area. A 28.3 m² (radius of 3 m) sampling quadrat, which was used at the Middle Waterway Estuarine Natural Resources restoration site, is proposed to create a more representative snapshot of the TSM riparian area.

5.2.2 Invasive Species

The City plans to have the Washington Conservation Corps crew implement additional maintenance activities at TSM to reduce the presence of invasive species.

6.0 REFERENCES

Parametrix (2001). Engineering Design Report.

Parametrix (2003, July 10). Monitoring and Adaptive Management Plan: Tahoma Salt Marsh Natural Resource Restoration Project.

Pojar, J. and MacKinnon, A. (2004) Revised Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, & Alaska. Vancouver, British Columbia: Lone Pine Publishing

TABLES

Table 1 – Riparian Area Quadrat Monitoring Results

Riparian										
	T1-5	T1-6	T1-9	T1-10	T2-6	T3-1	T3-2	T3-6		Mean %
	Cover ^a	% Cover	Frequency							
Native Species										
<i>Comus stolonifera</i> (Red Osier Dogwood)	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	12.5%
<i>Philadelphus lewisii</i> (Mock-Orange)	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%	0.0%	1.9%	12.5%
<i>Atriplex petula</i> (Orache)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.5%	0.0%	4.7%	12.5%
<i>Juncus effusus</i> (Soft Rush)	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	37.5%	5.0%	25.0%
<i>Salix lucida ssp. lasiandra</i> (Pacific Willow)	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.3%	12.5%
<i>Salix hookeriana</i> (Hookers Willow)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	1.9%	12.5%
Total->	0.0%	2.5%	2.5%	15.0%	2.5%	0.0%	52.5%	37.5%		
Non-Native Species										
<i>Ranunculus cymbalana</i> (Trailing Buttercup)	2.5%	15.0%	2.5%	15.0%	2.5%	15.0%	0.0%	2.5%	6.9%	87.5%
<i>Trifolium pratense</i> (Red Clover)	2.5%	15.0%	2.5%	0.0%	37.5%	15.0%	0.0%	62.5%	16.9%	75.0%
<i>Cirsium sp.</i> (Thistle sp.)	0.0%	2.5%	0.0%	2.5%	0.0%	2.5%	0.0%	0.0%	0.9%	37.5%
<i>Rubus discolor</i> (Himalayan Blackberry)	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.3%	12.5%
Total->	5.0%	32.5%	5.0%	17.5%	42.5%	32.5%	0.0%	65.0%		
Other										
Grass Sp.	97.5%	85.0%	85.0%	85.0%	62.5%	85.0%	2.5%	37.5%	67.5%	100.0%

a - Using Daubenmire midpoint value for the six cover classes: 0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%.

Table 2 – Salt Marsh Area Quadrat Monitoring Results

	T1-1	T1-2	T1-3	T1-4	T1-7	T1-8	T2-1	T2-2	T2-3	T2-4	T2-
	Cover ^a										
Native Species											
<i>Distichlis spicata</i> (Salt Grass)	0.0%	2.5%	0.0%	2.5%	0.0%	0.0%	15.0%	15.0%	0.0%	0.0%	
<i>Atriplex petula</i> (Orache)	85.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	
Spoonleaf Gumweed	15.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Grindelia integrifolia</i> (Puget Sound Gumweed)	15.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Plantago sp.</i> (Plantain Sp.)	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Juncus effusus</i> (Soft Rush)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Salicornia virginica</i> (Pickleweed)	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Veronica beccabunga</i> <i>ssp. americana</i> (American Brooklime)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total->	117.5%	2.5%	0.0%	2.5%	15.0%	0.0%	17.5%	15.0%	0.0%	0.0%	
Non-Native Species											
<i>Ranunculus cymbalaria</i> (Trailing Buttercup)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Trifolium pratense</i> (Red Clover)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Cirsium sp.</i> (Thistle sp.)	2.5%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	
<i>Cotula coronopifolia</i> (Brass Buttons)	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	2.5%	0.0%	0.0%	0.0%	
Total->	2.5%	0.0%	0.0%	0.0%	5.0%	0.0%	2.5%	0.0%	0.0%	0.0%	
Other											
Grass Sp.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Filamental Algae	0.0%	37.5%	85.0%	0.0%	0.0%	37.5%	0.0%	15.0%	85.0%	0.0%	
Total->	0.0%	37.5%	85.0%	0.0%	0.0%	37.5%	0.0%	15.0%	85.0%	0.0%	

a - Based on the Daubenmire Method (Six cover classes: 0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%)

Marsh												
T2-7	T2-8	T2-9	T2-10	T3-3	T3-4	T3-5	T3-7	T3-8	T3-9	T3-10	% Cover	Mean % Frequency
Cover ^a												
0.0%	0.0%	0.0%	0.0%	37.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	22.7%
0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	62.5%	2.5%	2.5%	15.0%	7.8%	31.8%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	2.5%	1.5%	13.6%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.5%	2.4%	9.1%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.5%
37.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	4.5%
15.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	9.1%
2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.5%
55.0%	2.5%	0.0%	0.0%	37.5%	0.0%	0.0%	77.5%	2.5%	2.5%	55.0%		
2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.5%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.1%	4.5%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	9.1%
0.0%	15.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	1.1%	22.7%
2.5%	15.0%	0.0%	0.0%	2.5%	0.0%	0.0%	2.5%	2.5%	0.0%	0.0%		
62.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	15.0%	4.2%	13.6%
0.0%	15.0%	62.5%	2.5%	0.0%	37.5%	15.0%	0.0%	37.5%	37.5%	0.0%	21.3%	54.5%
62.5%	15.0%	62.5%	2.5%	0.0%	37.5%	15.0%	15.0%	37.5%	37.5%	15.0%		

Table 3 – Riparian Area Species

Trees	Shrubs	Herbaceous Species
Red alder (<i>Alnus rubra</i>)	Vine maple (<i>Acer circinatum</i>)	Orache (<i>Atriplex patula</i>)
Shore pine (<i>Pinus contorta</i> var. <i>contorta</i>)	Twinberry (<i>Lonicera involucrata</i>)	Soft Rush (<i>Juncus effusus</i>)
Madrone (<i>Arbutus menziesii</i>)	Red-Osier dogwood (<i>Cornus stolonifera</i>)	Grass species
Douglas fir (<i>Pseudotsuga menziesii</i> ssp. <i>menziesii</i>)	Hooker willow (<i>Salix hookeriana</i>)	Trailing buttercup (<i>Ranunculus cymbalaria</i>)
Sitka spruce (<i>Picea sitchensis</i>)	Snowberry (<i>Symphoricarpos albus</i>)	Red Clover (<i>Trifolium pratense</i>)
Black cottonwood (<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>)	Red-flowering currant (<i>Ribes sanguineum</i>)	Thistle (<i>Cirsium spp.</i>)
	Mock orange (<i>Philadelphus lewisii</i>)	
	Pacific willow (<i>Salix lucida</i> ssp. <i>lasiandra</i>)	
	Oceanspray (<i>Holodiscus discolor</i>)	
	Oregon grape (<i>Mahonia nervosa</i>)	
	Baldhip rose (<i>Rosa gymncarpa</i>)	
	Beaked hazelnut (<i>Corylus cornuta</i> var. <i>californica</i>)	
	Himalayan Blackberry (<i>Rubus discolor</i>)	

Red Font - Invasive species

Table 4 – Salt Marsh Area Species

Low Marsh Species	High Marsh Species
Brass buttons (<i>Cotula coronopifolia</i>)	Gumweed (<i>Grindelia ssp.</i>)
Pickleweed (<i>Salicornia virginica</i>)	American Brooklime (<i>Veronica beccabunga</i> ssp. <i>americana</i>)
Salt Grass (<i>Distichlis spicata</i>)	Orache (<i>Atriplex patula</i>)
Filamental Algae	Soft Rush (<i>Juncus effusus</i>)
	Plantain (<i>Plantago sp.</i>)
	Grass species
	Red Clover (<i>Trifolium pratense</i>)
	Thistle (<i>Cirsium spp.</i>)

Red Font – Invasive species

Table 5 –Survey Transect Elevations

T1 (Sta 0+00 to 0+46.2)																
Station	0+00	0+03.3	0+06.6	0+09.9	0+13.2	0+16.5	0+19.8	0+23.1	0+26.4	0+29.7	0+33	0+36.3	0+39.6	0+42.9	0+46.2	0+49.5
2004 Elevation	21.85	21.8	21.96	21.94	21.99	22.08	22.05	21.96	21.86	20.99	19.48	18.15	16.75	15.68	14.62	13.56
2006 Elevation	21.44	21.46	21.59	21.67	21.78	21.71	21.78	21.69	21.62	20.77	19.21	18.09	16.7	15.64	14.55	13.47
Change (ft)	-0.41	-0.34	-0.37	-0.27	-0.21	-0.37	-0.27	-0.27	-0.24	-0.22	-0.27	-0.06	-0.05	-0.04	-0.07	-0.09

T1 (Sta 1+12.7 to 1+60.0)																
Station	1+12.7	1+16	1+17.4	1+20.7	1+24	1+27.3	1+30.6	1+33.9	1+37.2	1+40.5	1+43.8	1+47.1	1+50.4	1+53.7	1+57	1+60.0
2004 Elevation	11.44	11.34	11.32	11.42	11.37	11.22	11.23	11.24	11.26	11.21	11.2	11.21	11.17	11.14	11.01	10.89
2006 Elevation	11.35	11.28	11.33	11.37	11.36	11.22	11.17	11.23	11.23	11.17	11.19	11.17	11.16	11.12	10.95	10.83
Change (ft)	-0.09	-0.06	0.01	-0.05	-0.01	0	-0.06	-0.01	-0.03	-0.04	-0.01	-0.04	-0.01	-0.02	-0.06	-0.06

T1 (Sta 2+21.6 to 2+70.0)																
Station	2+21.6	2+24.3	2+27.6	2+30.9	2+34.2	2+37.5	2+40.8	2+44.1	2+47.4	2+50.7	2+54	2+57.3	2+60.6	2+63.9	2+67.2	2+70.0
2004 Elevation	11.2	11.16	11.26	11.27	11.27	11.46	11.64	11.75	12.01	12.45	13.17	14.49	15.17	15.97	16.6	17.2
2006 Elevation	11.14	11.12	11.22	11.23	11.29	11.43	11.5	11.71	12.14	12.32	12.62	14.59	15.13	16.16	16.6	17.2
Change (ft)	-0.06	-0.04	-0.04	-0.04	0.02	-0.03	-0.14	-0.04	0.13	-0.13	-0.55	NA	0.1	-0.04	0.03	0

a - Root in way of measurement

T2 (Sta 0+00 to 0+46.2)																
Station	0+00	0+03.3	0+06.6	0+09.9	0+13.2	0+16.5	0+19.8	0+23.1	0+26.4	0+29.7	0+33	0+36.3	0+39.6	0+42.9	0+46.2	0+49.5
2004 Elevation	20.25	20.33	20.24	20.18	20.14	19.82	19.43	18.44	17.29	16.11	14.94	13.79	12.65	12.29	12.1	1.8
2006 Elevation	20.07	20.41	20.3	20.21	20.05	19.79	19.18	18.21	17.29	15.97	15.06	13.92	12.55	12.24	12.21	12
Change (ft)	-0.18	0.08	0.06	0.03	-0.09	-0.03	-0.25	-0.23	0	-0.14	0.12	0.13	-0.1	-0.05	0.11	-0.2

T2 (Sta 1+10.3 to 1+60.0)																
Station	1+10.3	1+13.6	1+16.9	1+20.2	1+23.5	1+26.8	1+30.1	1+33.4	1+36.7	1+40	1+43.3	1+46.6	1+49.9	1+53.2	1+56.5	1+60.0
2004 Elevation	11.59	11.66	11.6	11.68	11.59	11.55	11.54	11.55	11.53	11.46	11.55	11.4	11.31	11.01	10.97	10
2006 Elevation	11.63	11.63	11.63	11.64	11.57	11.56	11.57	11.54	11.48	11.49	11.39	11.36	11.23	11.09	10.94	10
Change (ft)	0.04	-0.03	0.03	-0.04	-0.02	0.01	0.03	-0.01	-0.05	0.03	-0.16	-0.04	-0.08	0.08	-0.03	-0

T2 (Sta 2+23.1 to 2+70.0)																
Station	2+23.1	2+26.4	2+29.7	2+33	2+36.3	2+39.6	2+42.9	2+46.2	2+49.5	2+52.8	2+56.1	2+59.4	2+62.7	2+66	2+69.3	2+70.0
2004 Elevation	9.58	9.54	9.49	9.4	9.32	9.2	9.23	9.19	9.01	9.08	8.98	9.07	9.06	9.09	8.83	8
2006 Elevation	9.52	9.56	9.47	9.41	9.29	9.22	9.23	9.21	9.06	9.06	9.06	9.05	9.01	9.05	8.91	8
Change (ft)	-0.06	0.02	-0.02	0.01	-0.03	0.02	0	0.02	0.05	-0.02	0.08	-0.02	-0.05	-0.04	0.08	-0

T3 (Sta 0+00 to 0+46.2)																
Station	0+00	0+03.3	0+06.6	0+09.9	0+13.2	0+16.5	0+19.8	0+23.1	0+26.4	0+29.7	0+33	0+36.3	0+39.6	0+42.9	0+46.2	0+49.5
2004 Elevation	21.5	21.6	21.77	21.8	21.84	21.84	21.85	21.84	22.06	21.85	21.42	20.69	19.46	18.44	17.14	15
2006 Elevation	21.43	21.55	21.56	21.69	21.53	21.5	21.73	21.68	21.85	21.69	21.21	20.42	19.42	18.29	17.44	16
Change (ft)	-0.07	-0.05	-0.21	-0.11	-0.31	-0.34	-0.12	-0.16	-0.21	-0.16	-0.21	-0.27	-0.04	-0.15	0.3	0

T3 (Sta 1+12.2 to 1+62.2)																
Station	1+12.2	1+15.5	1+18.8	1+22.1	1+25.4	1+28.7	1+32	1+35.7	1+39	1+42.3	1+45.6	1+48.9	1+52.2	1+55.5	1+58.8	1+62.2
2004 Elevation	11.61	11.56	11.55	11.59	11.38	11.36	11.21	11.32	11.28	11.33	11.18	11.15	11.17	11.17	11.14	11
2006 Elevation	11.61	11.57	11.52	11.47	11.37	11.35	11.32	11.33	11.29	11.26	11.18	11.14	11.15	11.12	11.04	1
Change (ft)	0	0.01	-0.03	-0.12	-0.01	-0.01	0.11	0.01	0.01	-0.07	0	-0.01	-0.02	-0.05	-0.1	-0

E1 (Sta 0+00 to 0+46.2)																
Station	0+00	0+03.3	0+06.6	0+09.9	0+13.2	0+16.5	0+19.8	0+23.1	0+26.4	0+29.7	0+33	0+36.3	0+39.6	0+42.9	0+46.2	0+49.5
2004 Elevation	20.94	21.45	21.62	21.74	21.64	21.65	21.06	20.5	19.6	18.78	17.81	16.84	15.84	15.27	14.31	13
2006 Elevation	20.89	21.43	21.73	21.64	21.65	21.49	20.99	20.53	19.7	18.7	17.79	16.82	15.81	15.02	14.2	13
Change (ft)	-0.05	-0.02	0.11	-0.1	0.01	-0.16	-0.07	0.03	0.1	-0.08	-0.02	-0.02	-0.03	-0.25	-0.11	-0

E1 (Sta 1+12.2 to 1+43.8)																
Station	1+12.2	1+15.5	1+18.8	1+22.1	1+25.4	1+28.7	1+32	1+35.3	1+38.6	1+41.9	1+43.8					
2004 Elevation	15.57	15.65	16.63	16.74	17.98	17.76	17.64	17.67	17.61	18.02	17.12					
2006 Elevation	14.55	15	16.1	16.23	17.38	17.16	17.05	17.1	16.9	17.42	16.66					
Change (ft)	-1.02	-0.65	-0.53	-0.51	-0.6	-0.6	-0.59	-0.57	-0.71	-0.6	-0.46					

E2 (Sta 0+00 to 0+46.2)																
Station	0+00	0+03.3	0+06.6	0+09.9	0+13.2	0+16.5	0+19.8	0+23.1	0+26.4	0+29.7	0+33	0+36.3	0+39.6	0+42.9	0+46.2	0+49.5
2004 Elevation	16.87	16.14	15.18	14.59	13.95	12.98	12.27	11.66	11.35	10.99	10.87	10.85	11.38	9.77	9.42	9
2006 Elevation	16.91	16.03	15.23	14.65	13.8	12.55	12.06	11.66	11.31	11.03	10.86	10.82	11.25	9.78	9.42	9
Change (ft)	0.04	-0.11	0.05	0.06	-0.15	-0.43	-0.21	0	-0.04	0.04	-0.01	-0.03	-0.13	0.01	0	-0

Blue highlight - Change in elevation greater than 0.5 ft

ct T1																	
to 1+09.4)																	
0+52.8	0+56.1	0+59.4	0+62.7	0+66	0+69.3	0+73	0+76.4	0+79.7	0+83	0+86.3	0+89.6	0+92.9	0+96.2	0+99.5	1+02.8	1+06.1	1+09.4
13.18	12.61	12.2	12.19	11.97	11.92	11.89	12.04	12.09	11.88	11.75	11.76	11.84	11.76	11.67	11.59	11.48	11.47
13.07	12.54	12.03	12.05	11.9	11.85	11.87	11.95	11.96	11.79	11.75	11.7	11.77	11.79	11.62	11.52	11.41	11.38
-0.11	-0.07	-0.17	-0.14	-0.07	-0.07	-0.02	-0.09	-0.13	-0.09	0	-0.06	-0.07	0.03	-0.05	-0.07	-0.07	-0.09

7 to 2+18.3)																	
1+63.6	1+66.9	1+70.2	1+72.1	1+75.4	1+78.7	1+82	1+85.3	1+88.6	1+91.9	1+95.2	1+98.5	2+01.8	2+05.1	2+08.4	2+11.7	2+15	2+18.3
10.81	10.76	10.79	10.71	10.76	11.29	11.21	11.06	10.94	11.17	11.25	11.48	11.65	11.67	11.53	11.61	11.45	11.31
10.82	10.75	10.71	10.68	10.67	11.18	11.19	11.04	10.96	11.13	11.23	11.43	11.61	11.61	11.63	11.59	11.37	11.22
0.01	-0.01	-0.08	-0.03	-0.09	-0.11	-0.02	-0.02	0.02	-0.04	-0.02	-0.05	-0.04	-0.06	0.1	-0.02	-0.08	-0.09

3 to 3+27.6)																	
2+73.8	2+77.1	2+80.4	2+83.7	2+87	2+90.3	2+93.6	2+96.9	2+99.2	3+02.5	3+05.8	3+08.1	3+11.4	3+14.7	3+18	3+21.3	3+24.6	3+27.6
17.73	18.73	19.66	20.43	21.56	22.49	23.34	24.11	24.91	25.64	26.1	26	25.96	25.97	26.04	25.93	25.58	25.31
17.81	18.69	19.58	20.43	21.61	22.41	23.18	24	24.62	25.34	25.98	26	25.95	25.95	25.96	25.9	25.83	25.15
0.08	-0.04	-0.08	0	0.05	-0.08	-0.16	-0.11	-0.29	-0.3	-0.12	0	-0.01	-0.02	-0.08	-0.03	0.25	-0.16

ct T2																	
to 1+07)																	
0+52.8	0+56.1	0+59.4	0+62.7	0+66	0+69.3	0+72.5	0+74.1	0+77.4	0+80.7	0+84	0+87.3	0+90.6	0+93.9	0+97.1	1+00.4	1+03.7	1+07
12.15	12.17	12.15	12.12	11.98	11.98	12	12.04	12.01	12.03	11.95	11.83	11.8	11.76	11.81	11.82	11.84	11.59
12.15	12.12	12.08	12.07	12.01	11.98	12.04	12	11.93	11.99	11.88	11.81	11.78	11.74	11.77	11.78	11.77	11.65
0	-0.05	-0.07	-0.05	0.03	0	0.04	-0.04	-0.08	-0.04	-0.07	-0.02	-0.02	-0.02	-0.04	-0.04	-0.07	0.06

3 to 2+19.8)																	
1+64	1+67.3	1+70.6	1+73.9	1+77.2	1+80.5	1+83.8	1+87.1	1+90.4	1+93.7	1+97	2+00	2+03.3	2+06.6	2+09.9	2+13.2	2+16.5	2+19.8
10.7	10.64	11.68	11.42	10.55	10.47	10.35	10.39	10.19	10.04	10.05	9.82	9.72	9.69	9.71	9.81	9.47	9.5
10.61	10.54	10.31	10.93	10.36	10.34	10.33	10.31	10.16	10.05	9.98	9.83	9.71	9.65	9.71	9.59	9.48	9.43
-0.09	-0.1	-1.37	-0.49	-0.19	-0.13	-0.02	-0.08	-0.03	0.01	-0.07	0.01	-0.01	-0.04	0	-0.02	0.01	-0.07

2+75.9	2+79.2	2+82.5	2+85.8	2+89.1	2+92.4	2+95.7	2+99	3+02.3	3+05.6	3+08.9	3+12.2	3+18.4
8.74	8.36	15	15.88	16.42	16.78	17.38	17.54	17.55	17.61	17.65	17.65	17.75
8.68	8.47	14.91	15.79	16.36	16.85	17.5	17.61	17.58	17.74	17.71	17.72	17.68
-0.06	0.11	-0.09	-0.09	-0.06	0.07	0.12	0.07	0.03	0.13	0.06	0.07	-0.07

ct T3																	
to 1+08.9)																	
0+51.8	0+55.1	0+58.4	0+61.7	0+65	0+68.3	0+71.6	0+74.9	0+78.2	0+81.5	0+84.8	0+89.1	0+92.4	0+95.7	0+99	1+02.3	1+05.6	1+08.9
14.77	13.45	12.64	12.4	12.25	12.24	12.25	12.18	12.15	12.07	12.04	12.04	11.9	12	11.92	11.85	11.72	11.75
15.14	14.09	12.77	12.37	12.25	12.18	12.19	12.31	12.14	12.03	11.99	12	11.85	11.94	11.88	11.81	11.65	11.64
0.37	0.64	0.13	-0.03	0	-0.06	-0.06	0.13	-0.01	-0.04	-0.05	-0.04	-0.05	-0.06	-0.04	-0.04	-0.07	-0.11

1+65.4	1+68.7	1+72	1+75.3	1+78.6	1+82.2
11.33	11.58	11.91	12.36	13.24	13.9
11.27	11.56	11.9	12.26	13.19	13.96
-0.06	-0.02	-0.01	-0.1	-0.05	0.06

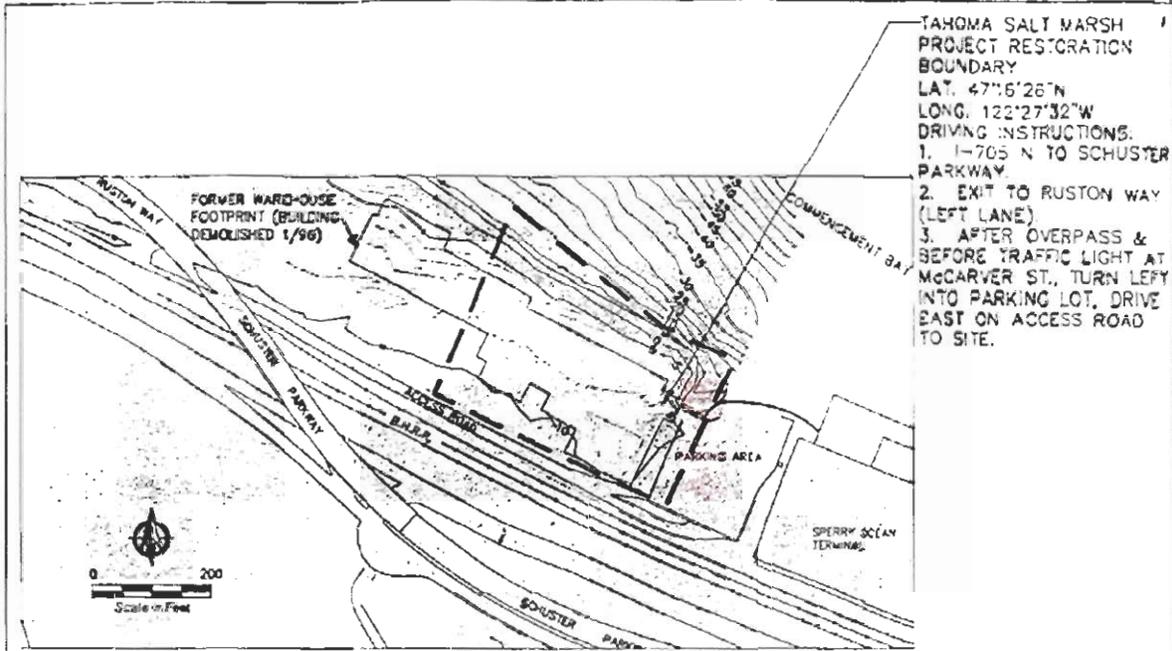
ct E1																	
to 1+08.9)																	
0+52.8	0+56.1	0+59.4	0+62.7	0+66	0+69.3	0+72.6	0+75.9	0+79.2	0+82.5	0+85.8	0+89.1	0+92.4	0+95.7	0+99	1+02.3	1+05.6	1+08.9
12.89	12.7	12.24	12.22	12.1	12.03	11.97	11.89	12.02	12.06	12.12	12.5	12.36	12.58	13.19	13.38	13.57	13.98
12.9	12.63	12.29	12.18	12.05	11.95	11.91	11.9	11.97	12.03	12.03	12.4	12.33	12.61	13.16	13.42	13.5	13.89
0.01	-0.07	0.05	-0.04	-0.05	-0.06	-0.06	0.01	-0.05	-0.03	-0.09	-0.1	-0.03	0.03	-0.03	0.04	-0.07	-0.09

ct E2																	
to 1+08.9)																	
0+52.8	0+56.1	0+59.4	0+62.7	0+66	0+69.3	0+72.6	0+75.9	0+79.2	0+82.5	0+85.8	0+89.1	0+92.4	0+95.7	0+99	1+02.3	1+05.6	1+07.1
9.08	8.85	9.25	9.39	9.64	9.72	10.08	10.91	12.57	14.05	15.15	16.32	17.54	18.25	19.92	19.96	19.94	19.86
9.04	8.93	9.04	9.47	9.6	9.75	10	10.12	11.73	14	15.75	16.5	17.48	17.87	19.83	19.66	19.64	19.6
-0.04	0.08	-0.21	0.08	-0.04	0.03	-0.08	-0.79	-0.84	-0.05	0.6	0.18	-0.06	-0.38	-0.09	-0.3	-0.3	-0.26

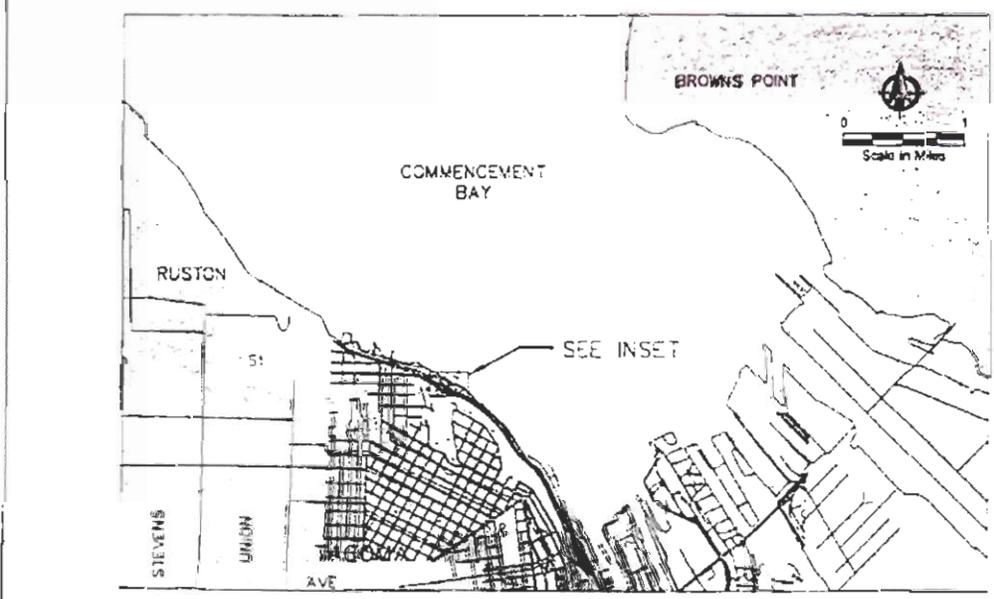
Table 6 – Erosion Marker Elevations

Stake	Year 1 - 2004 Height (cm)	Year 3 - 2006 Height (cm)	Total Change (cm)	Average Change (cm/yr)	Exceed 4 cm/yr
S1	15.54	14.90	-0.64	-0.32	No
S2	11.90	13.10	1.20	0.60	No
S3	19.50	18.90	-0.60	-0.30	No
S4	24.30	20.40	-3.90	-1.95	No
S5	19.20	19.20	0.00	0.00	No
S6	13.40	11.30	-2.10	-1.05	No
S7	15.50	14.90	-0.60	-0.30	No
S8	18.00	17.40	-0.60	-0.30	No
S9	16.50	17.40	0.90	0.45	No
S10	18.60	18.30	-0.30	-0.15	No
S11	19.50	11.60	-7.90	-3.95	No

FIGURES



INSET



PURPOSE: SOIL CLEANUP & HABITAT RESTORATION

Reference # 200300203

DATUM: MLLW

VICINITY MAP

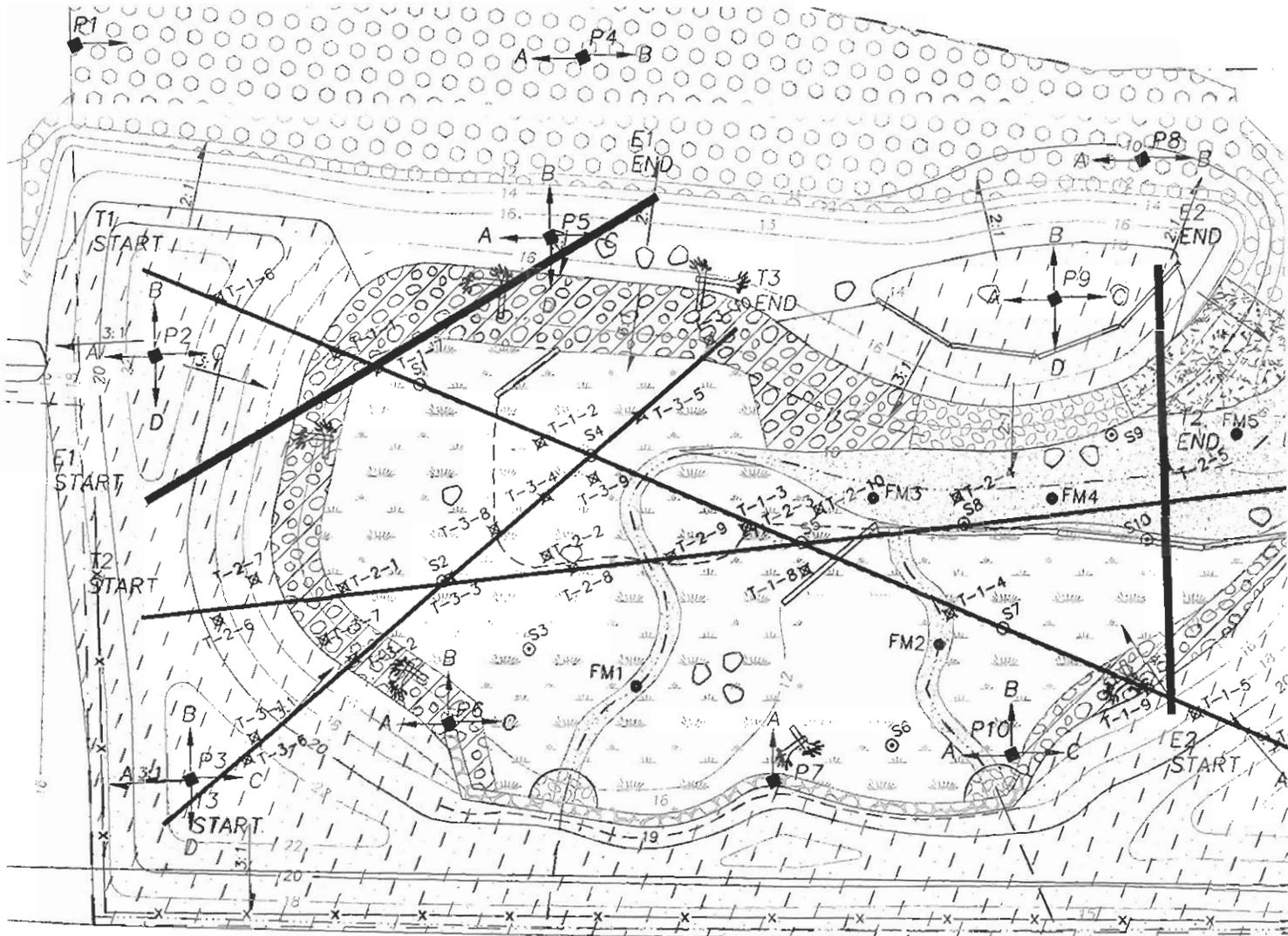
Scale: AS NOTED

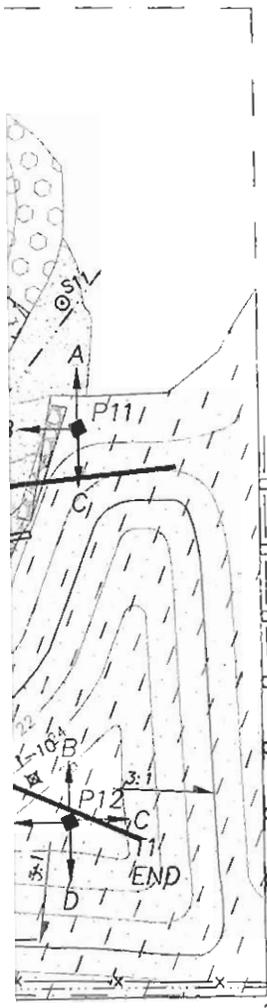
TAHOMA SALT MARSH RESTORATION

IN: SECTION 29, TOWNSHIP 21N, RANGE 3E
 COUNTY OF PIERCE STATE OF WA
 APPLICATION BY: CITY OF TACOMA
 SHEET 1 OF 12 FEBRUARY 2005

2/12/05 10:00AM SIM-COMPLIANCE-00 00743 00773

Figure 1 – Vicinity Map



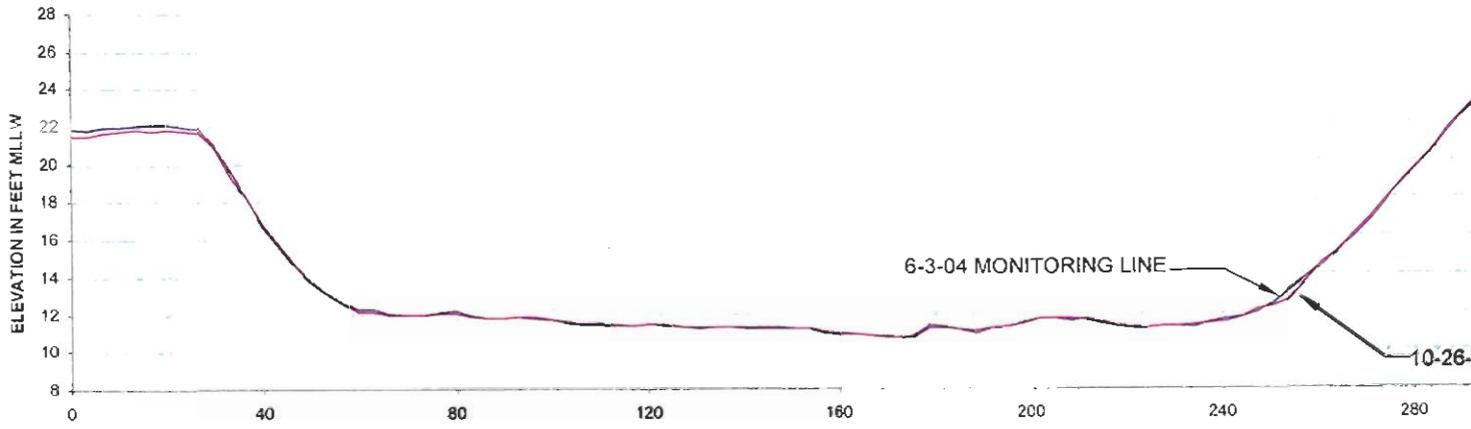


LEGEND

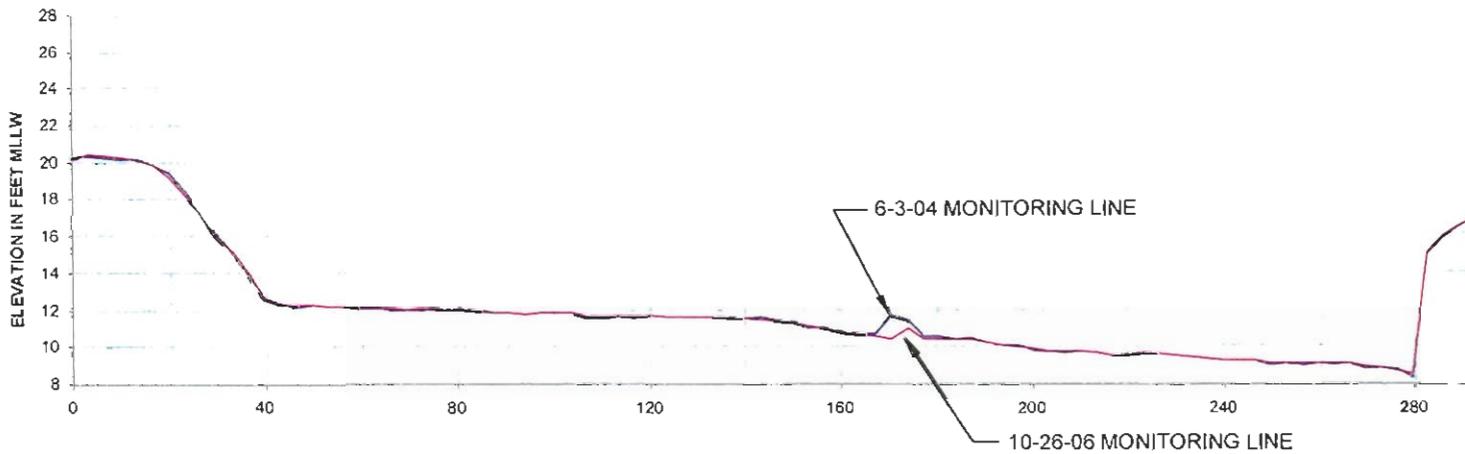
-  RIPARIAN (W/EROSION CONTROL BLANKET & HYDROSEED)
-  SHORELINE ARMORING (RIPRAP W/FISH MIX)
-  SHORELINE ARMORING (RIPRAP)
-  INTERTIDAL CHANNEL ARMORING
-  SALTMARSH (AMENDED SOIL)
-  TIDAL CHANNEL (FISH MIX)
-  SALTMARSH TRANSITION AREA (W/EROSION CONTROL BLANKET)
-  ROUNDED NATURAL BOULDER (1 CY MIN.)
-  LOG BERM
-  EROSION MARKER
-  PHOTO POINT
-  VEGETATION MONITORING TRANSECT
-  EROSION & SEDIMENT TRANSECT
-  FM3 FISH MIX SAMPLE LOCATION
-  QUADRAT LOCATIONS

	DATE 5-28-04	SCALE 1" = 40'	CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS TAHOMA SALT MARSH SITE PLAN FIGURE 2	SHEET NO.
	DESIGNED DSP	CHECKED DSP		
	DRAWN REG	PROJECT NAME TSM		
DRAWING NAME 5-24-04-BASE				SHEET 1 OF 1

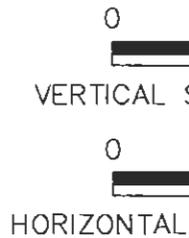
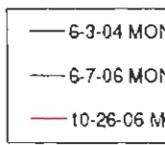
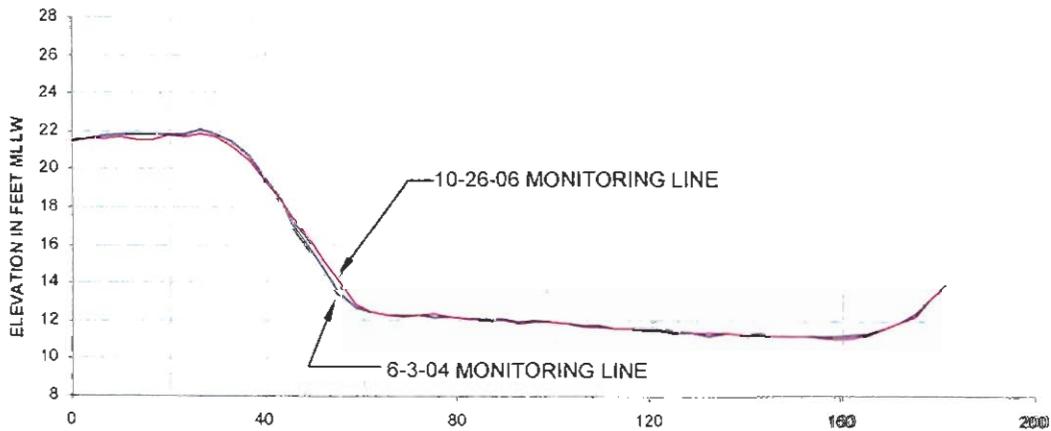
TRANSECT T1

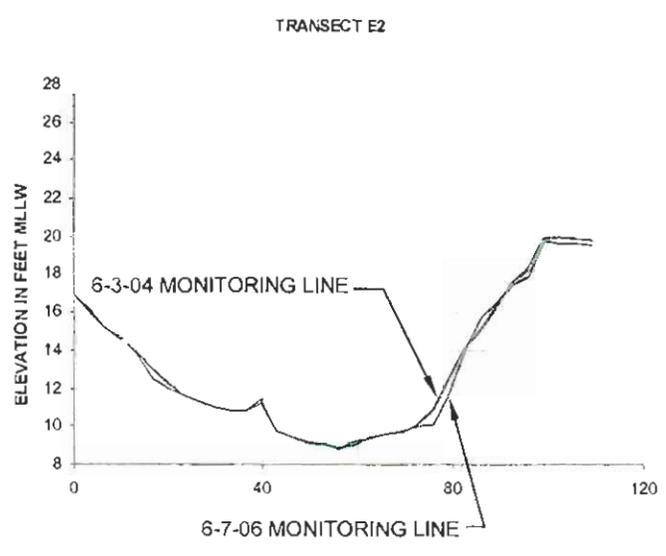
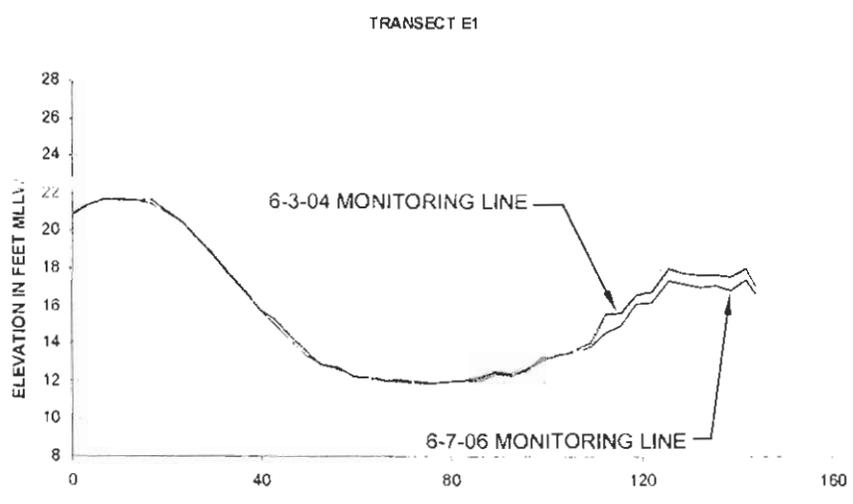


TRANSECT T2



TRANSECT T3





GENERAL NOTES FOR FIGURE 3:

1. SEE FIGURE 2 FOR PLAN VIEW OF TRANSECT LOCATIONS.
2. ELEVATION ALONG THE MONITORING TRANSECT LINES ARE INTERPOLATED BETWEEN THE DISCRETE MONITORING POINTS WHICH ARE LOCATED APPROXIMATELY 1 METER APART.

MONITORING LINE
 MONITORING LINE
 MONITORING LINE

10'
 SCALE 1"=10'
 40'
 SCALE 1"=40'

	DATE	SCALE
	11-29-06	AS NOTED
	DESIGNED	CHECKED
	KB	KB
DRAWN	PROJECT NAME	
REG	TSM	
DRAWING NAME		
5-24-04-BASE		

CITY OF TACOMA
 DEPARTMENT OF PUBLIC WORKS
 TAHOMA SALT MARSH
 TRANSECTS CROSS-SECTIONS
 FIGURE 3

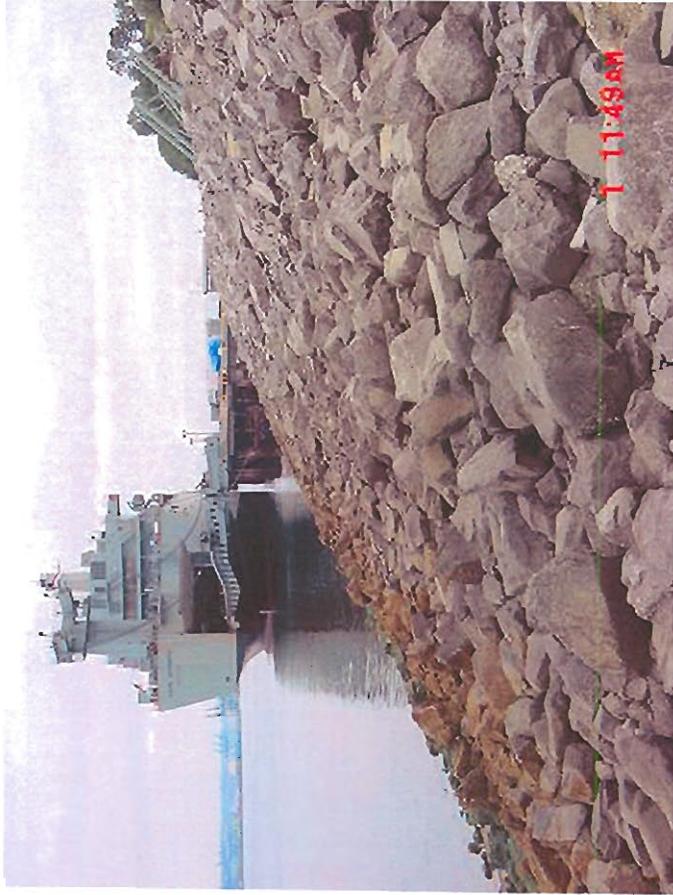
APPENDIX A

VISUAL INSPECTIONS: PHOTOS

Notes on Photo Point Monitoring

Photos were taken from locations noted in Figure 2 from the Maintenance, Monitoring and Adaptive Management Plan (MAMP). Title indicates in which direction the photo is looking.

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



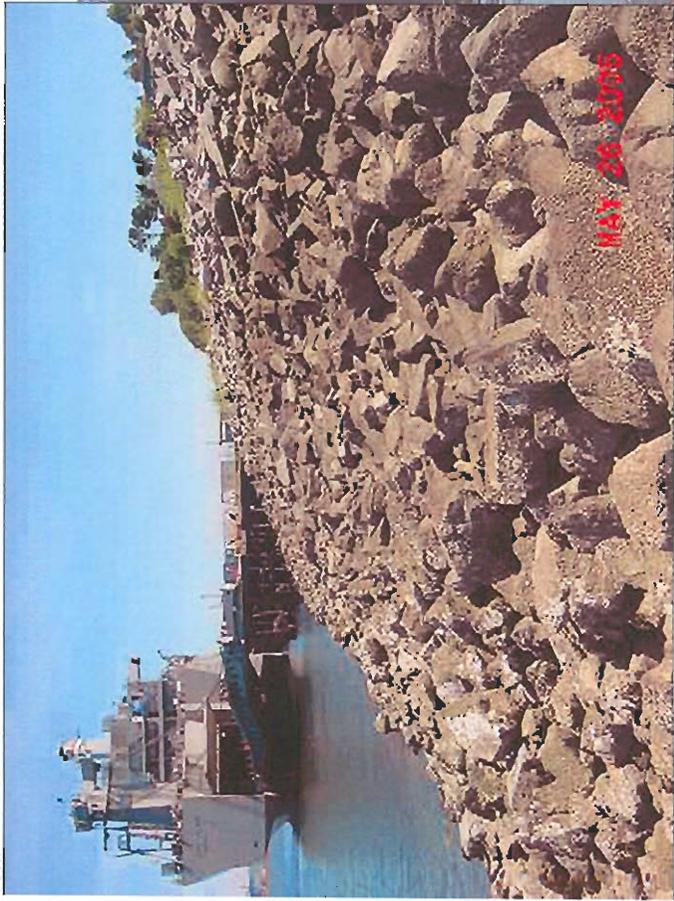
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Photo Point: 1



Date: 1/10/05

Photo Point: 1



Date: 05/26/05

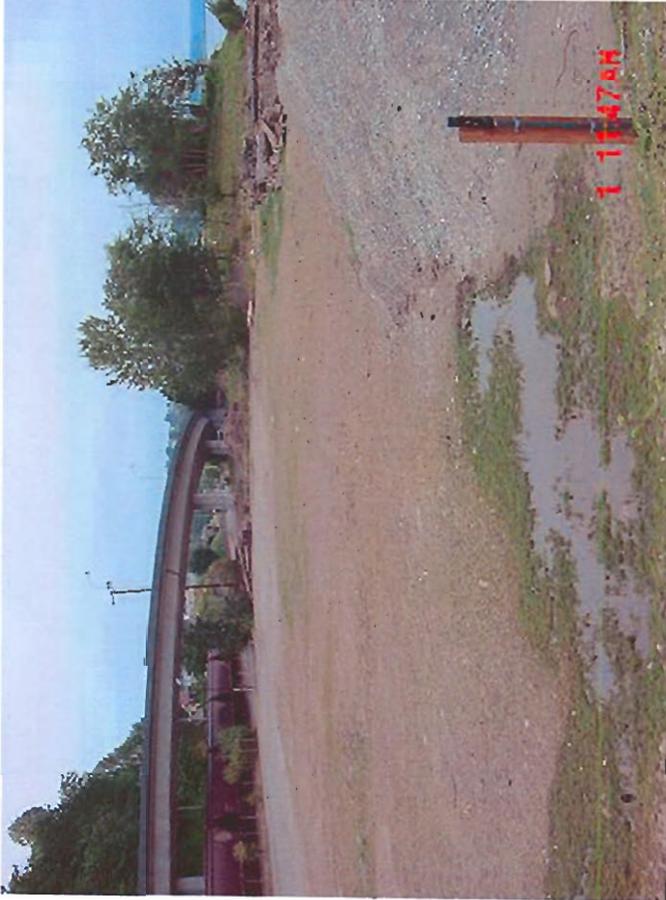
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Date: 8/31/06

Photo Point: 1

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



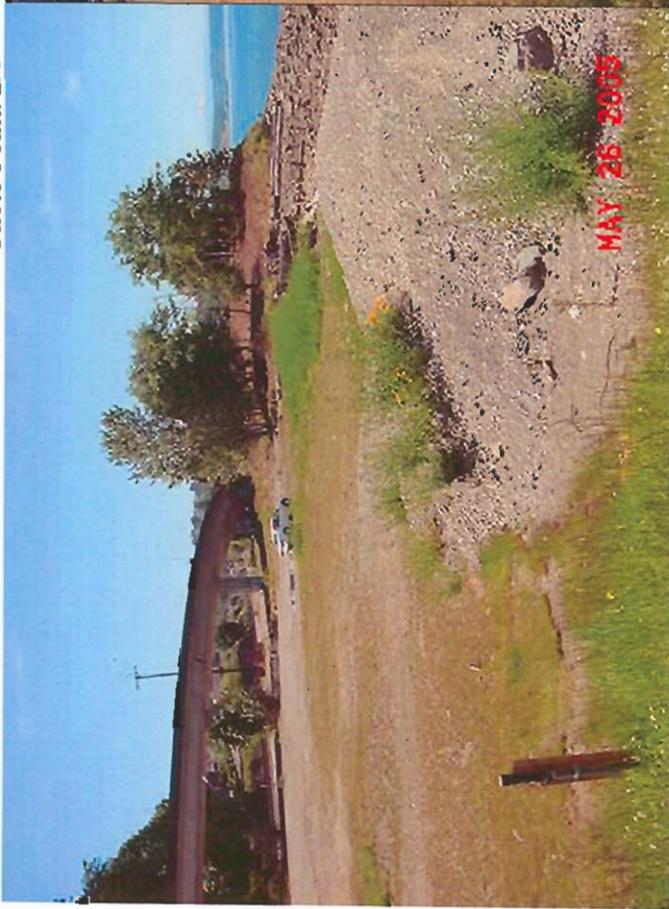
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Date: 1/10/05

Photo Point: 2A



Date: 05/26/05

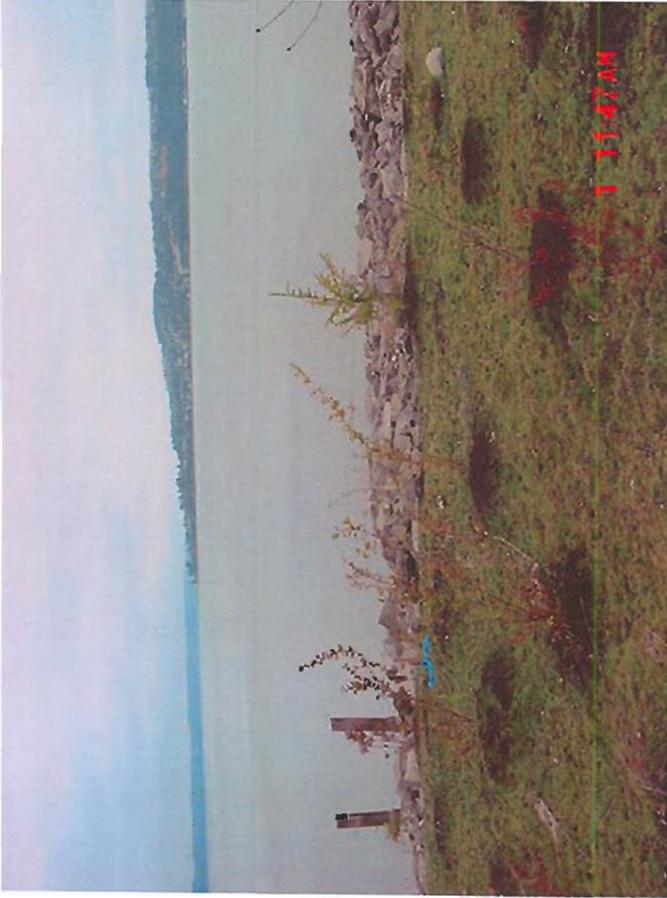
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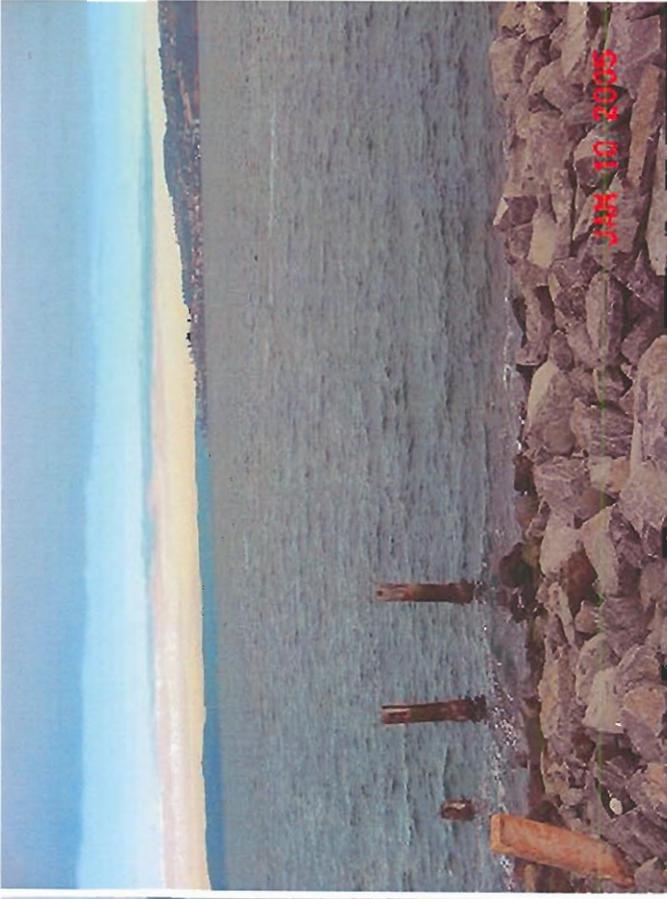
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



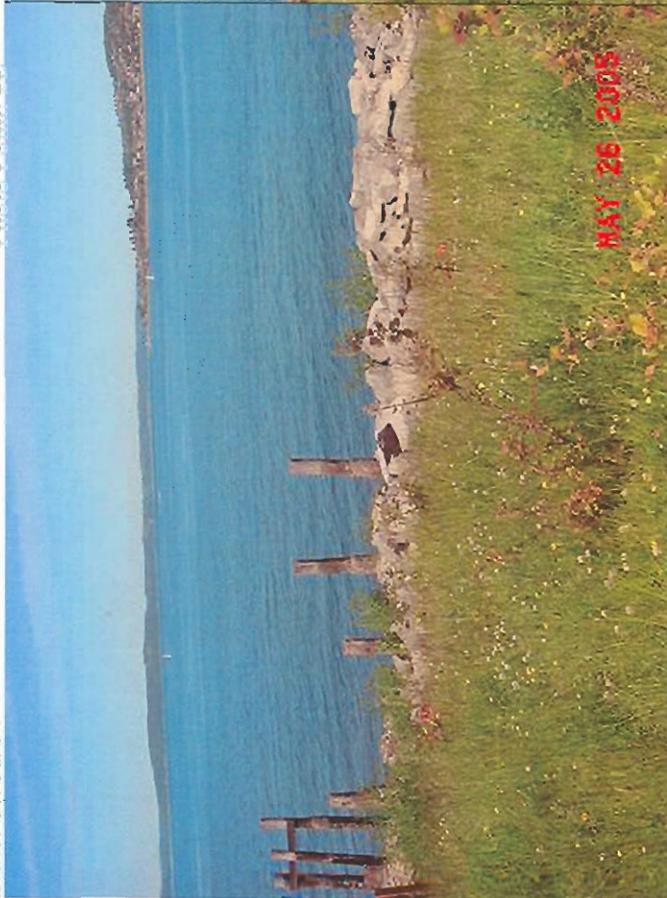
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Photo Point: 2B



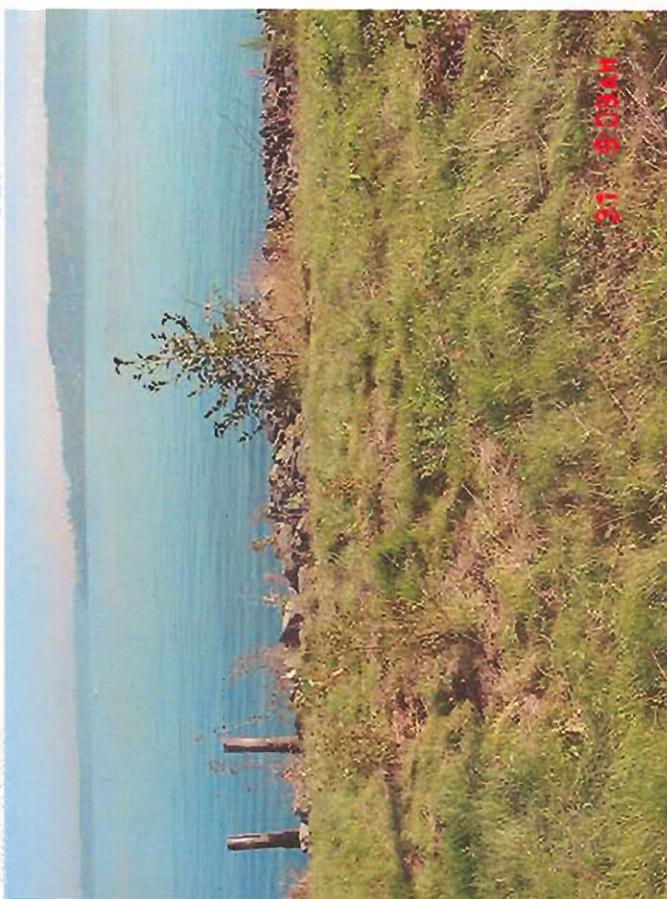
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Photo Point: 2B



Date: 05/26/05

Photo Point: 2B



Date: 8/31/06

Photo Point: 2B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 2C

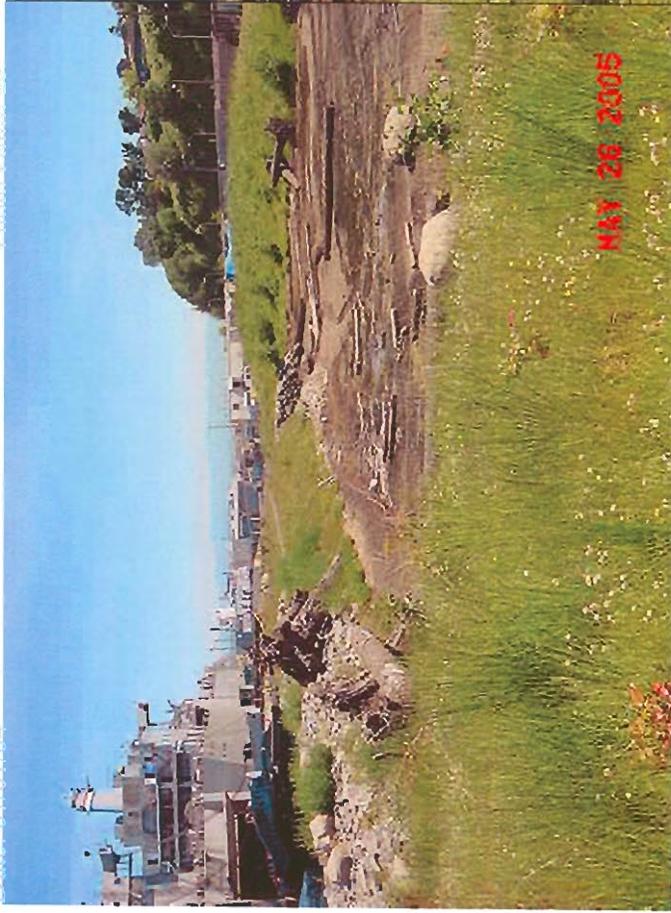
1 11 45 AM



JAN 10 2005

Date: 1/10/05

Photo Point: 2C



Date: 05/26/05

Photo Point: 2C

MAY 26 2005



Date: 8/31/06

Photo Point: 2C

31 8 2006

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 2D



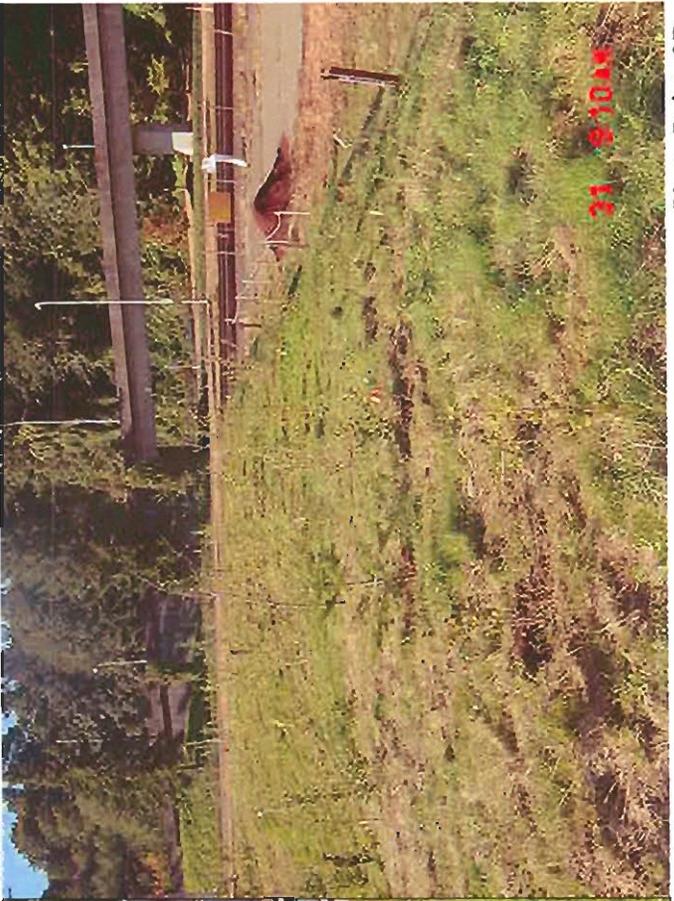
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Photo Point: 2D



Date: 05/26/05

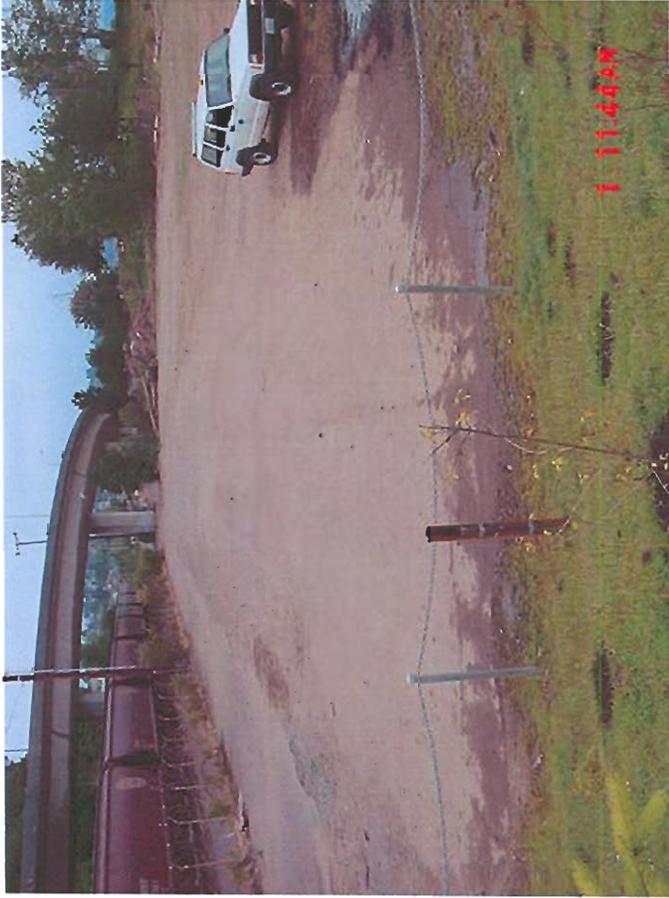
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Date: 8/31/06

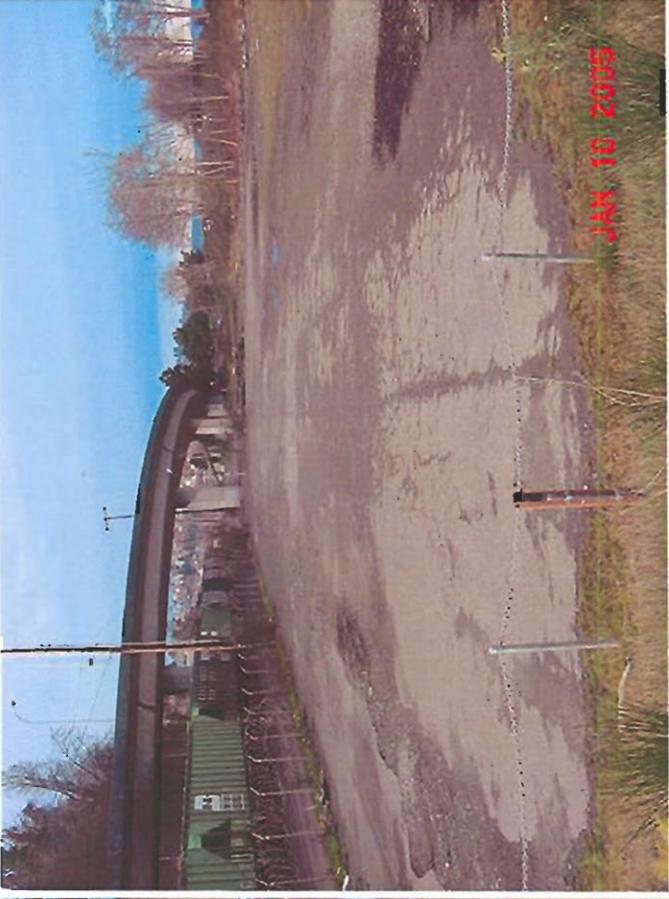
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



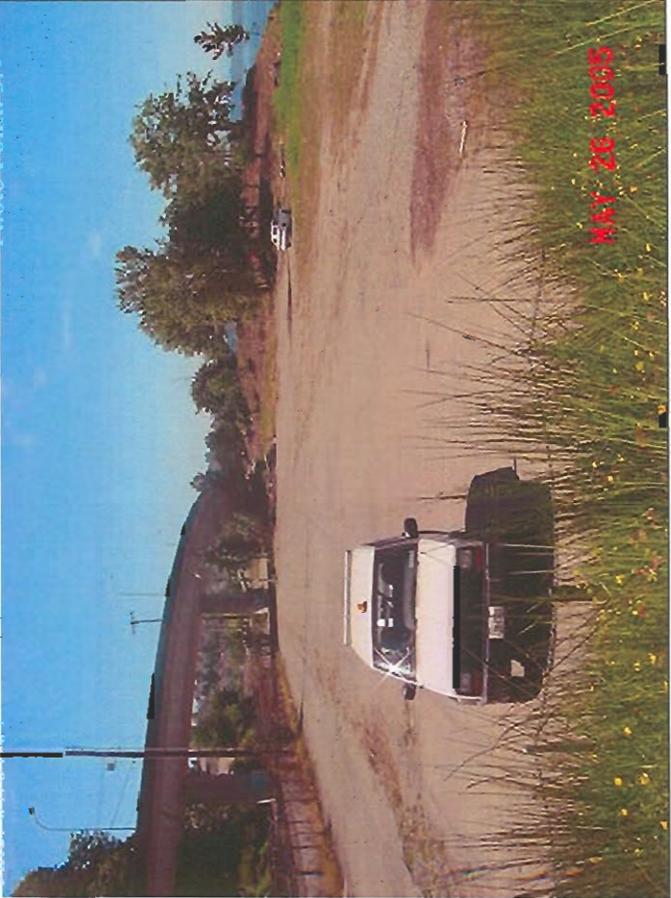
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Photo Point: 3A



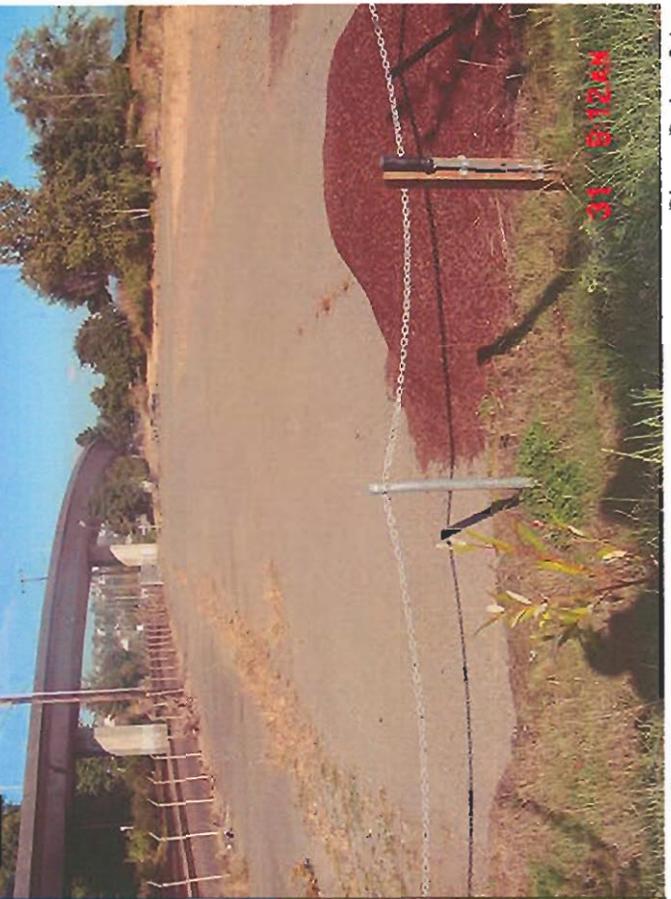
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Photo Point: 3A



Date: 05/26/05

Photo Point: 3A



Date: 8/31/06

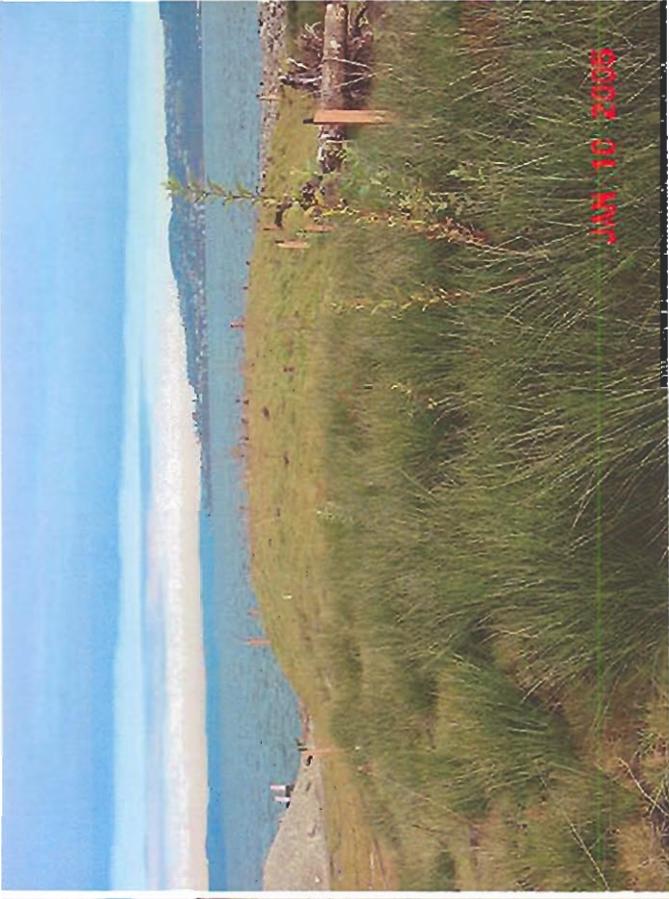
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



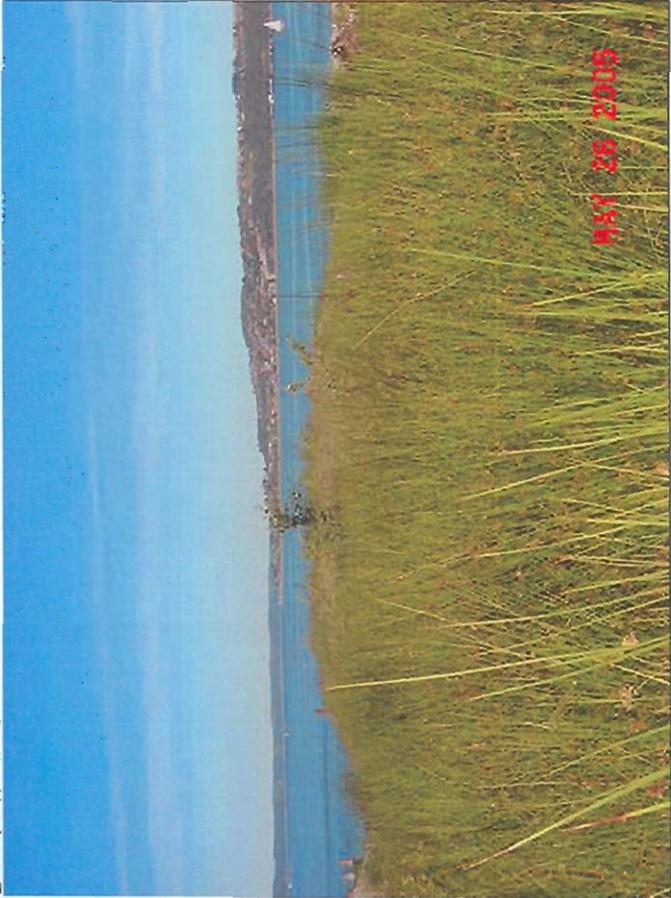
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Photo Point: 3B



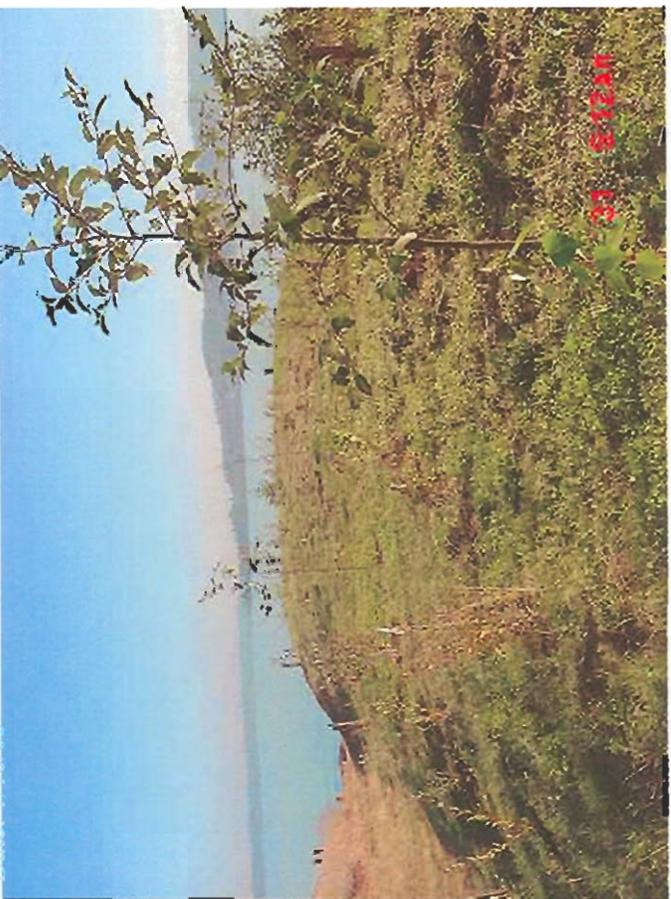
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Date: 05/26/05

Photo Point: 3B



Date: 8/31/06

Photo Point: 3B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



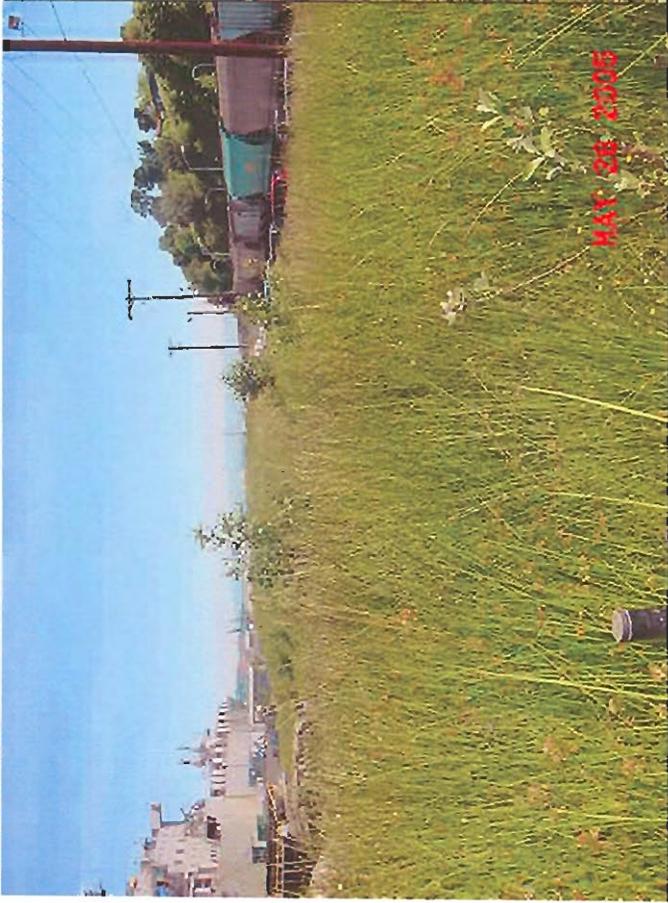
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Photo Point: 3C



Date: 1/10/05

Photo Point: 3C



Date: 05/26/05

Photo Point: 3C



Date: 8/31/06

Photo Point: 3C

APPENDIX A: Tahoma Salt Marsh — Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 3D



Date: 1/10/05

Photo Point: 3D



Date: 05/26/05

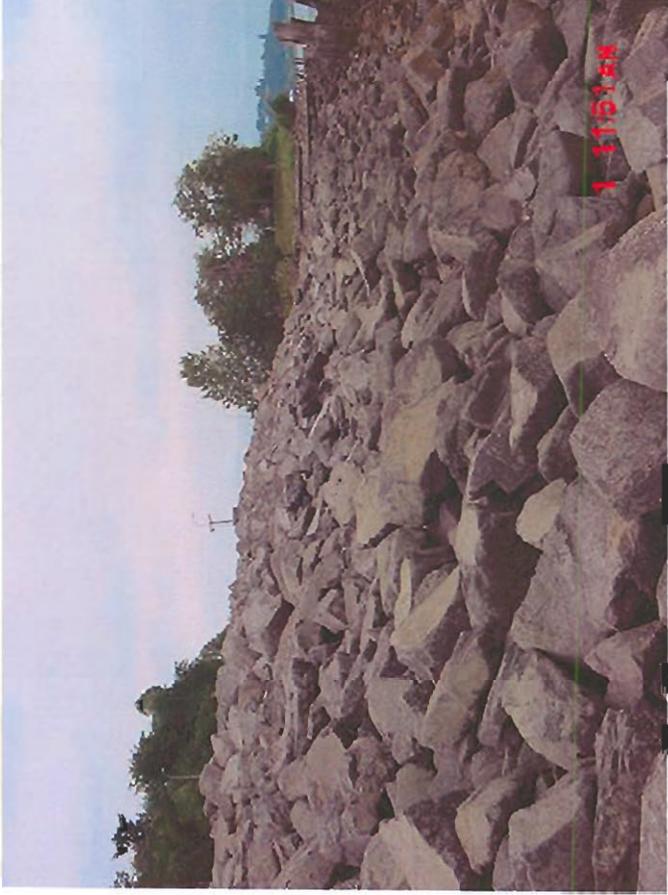
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Date: 8/31/06

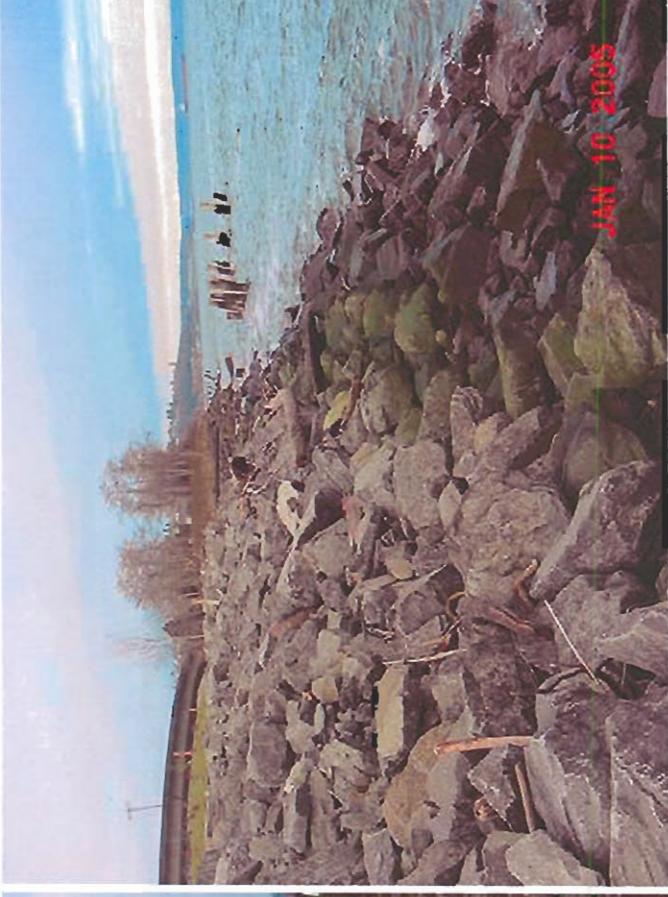
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



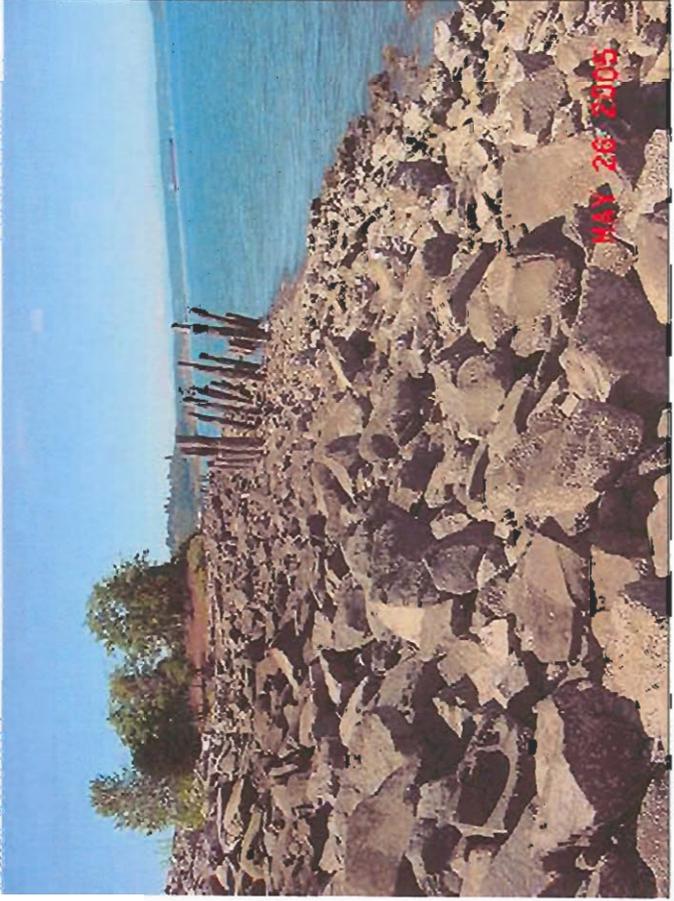
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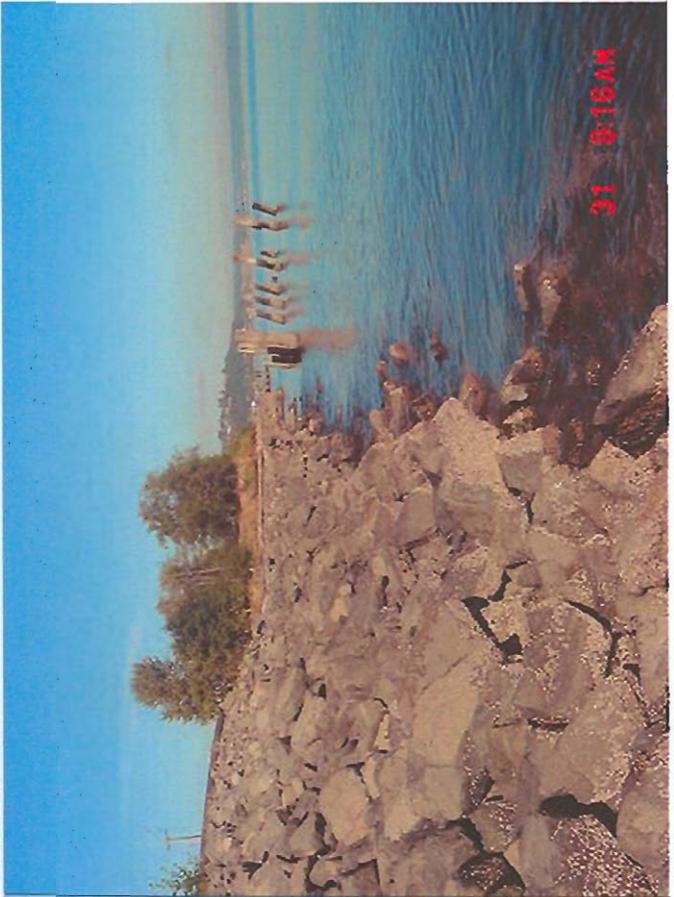
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Date: 8/31/06

Photo Point: 4A

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



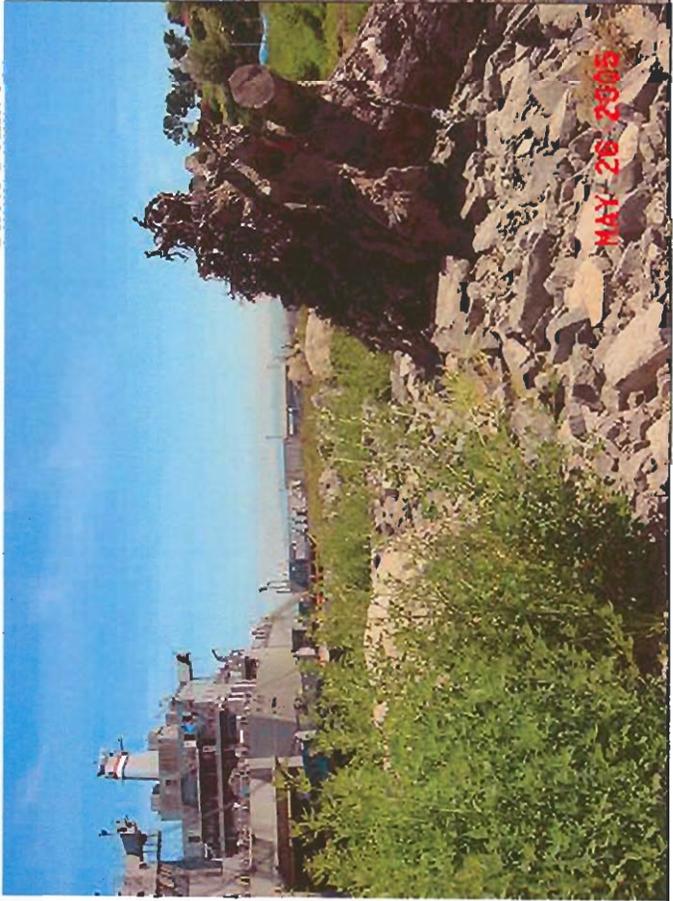
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Date: 1/10/05

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Date: 05/26/05

Photo Point: 5C



Date: 8/31/06

Photo Point: 5C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



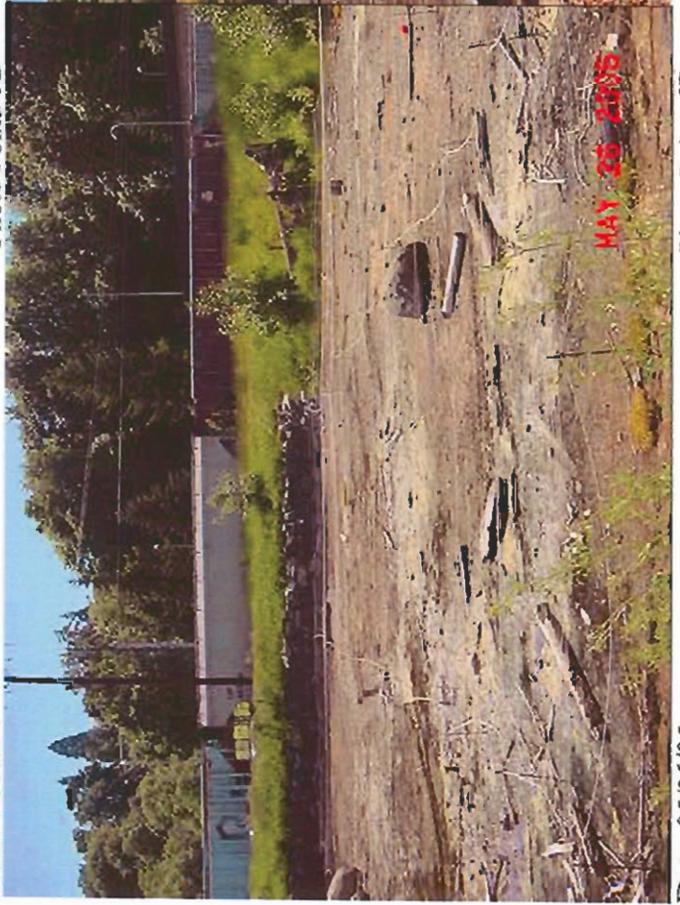
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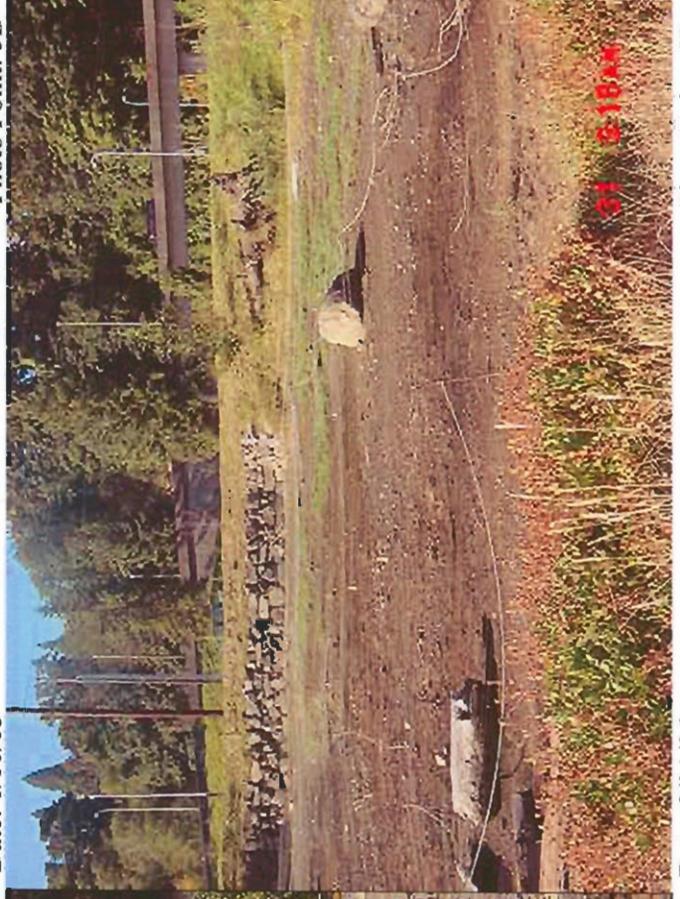
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Date: 05/26/05

Photo Point: 5D



Date: 8/31/06

Photo Point: 5D

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



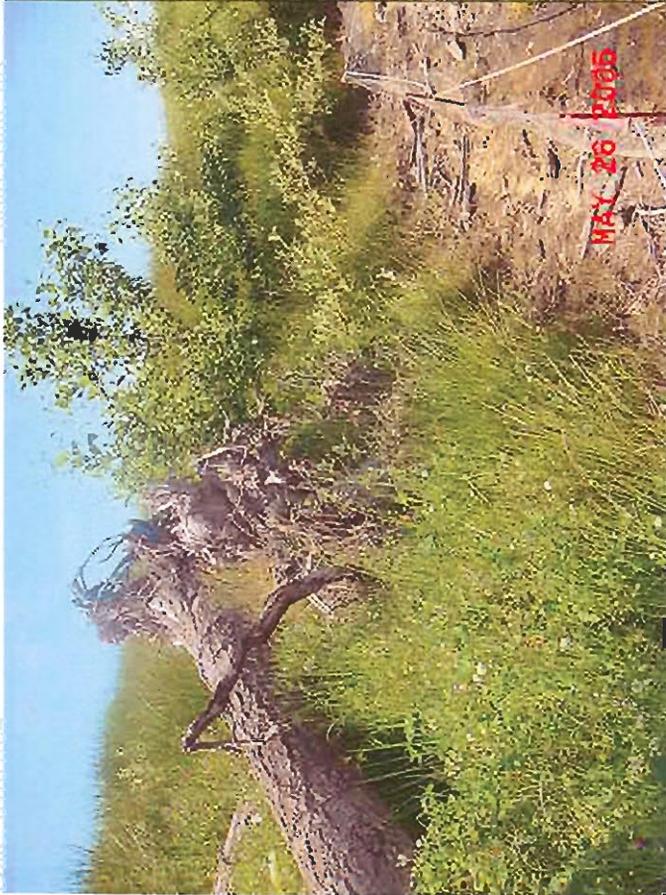
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Photo Point: 6A



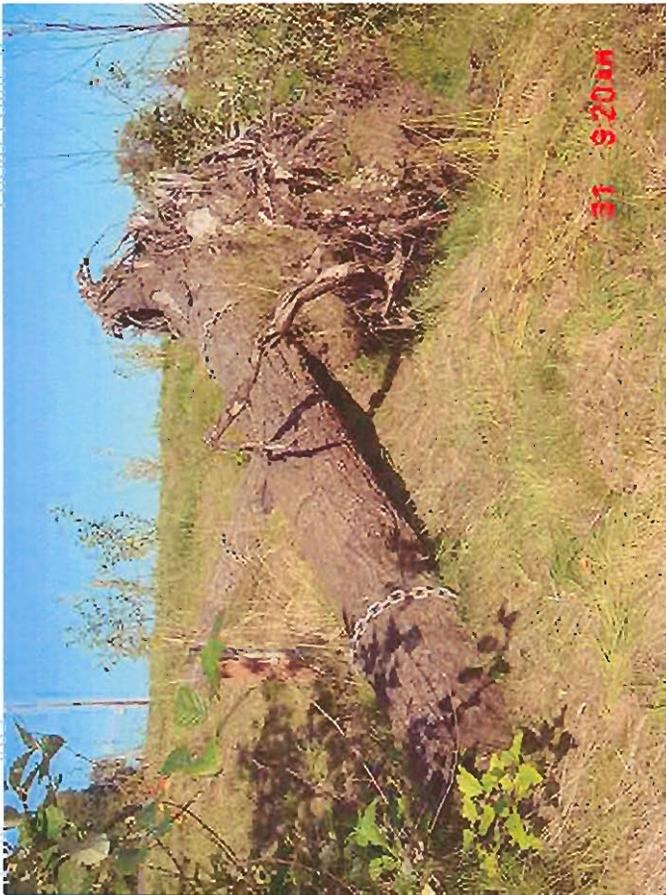
Date: 1/10/05

Photo Point: 6A



Date: 05/26/05

Photo Point: 6A



Date: 8/31/06

Photo Point: 6A

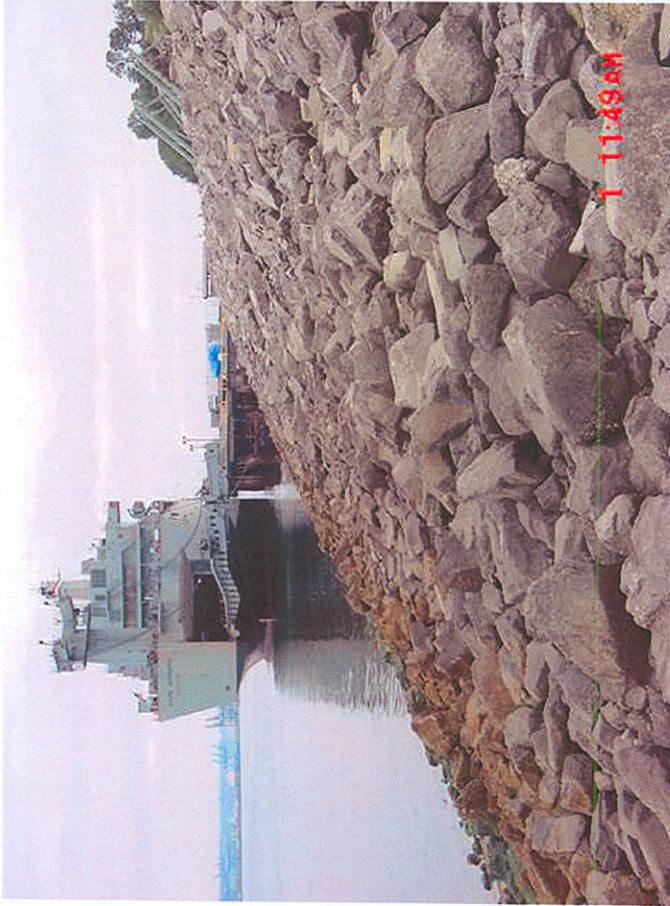
APPENDIX A

VISUAL INSPECTIONS: PHOTOS

Notes on Photo Point Monitoring

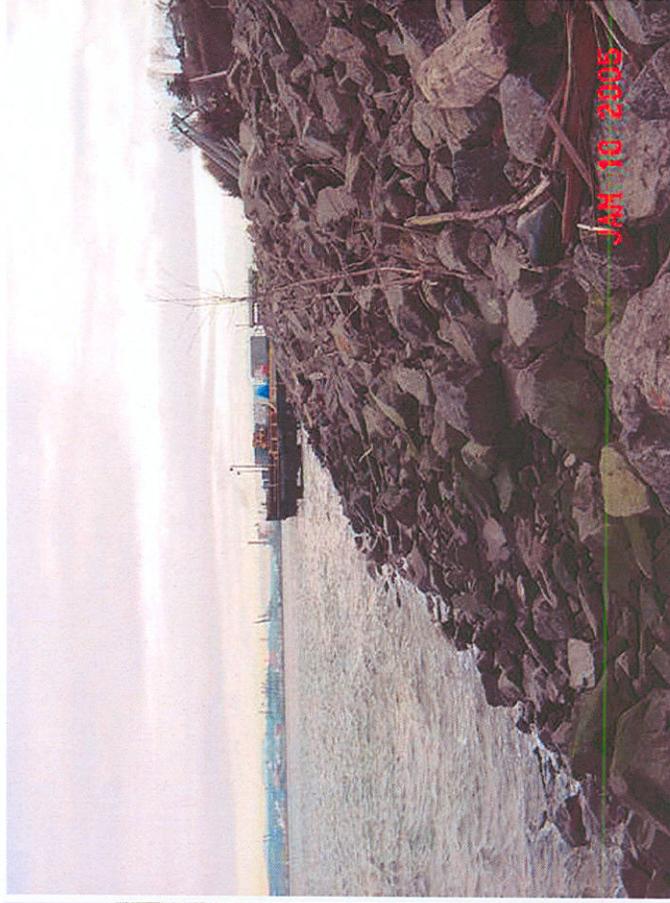
Photos were taken from locations noted in Figure 2 from the Maintenance, Monitoring and Adaptive Management Plan (MAMP). Title indicates in which direction the photo is looking.

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



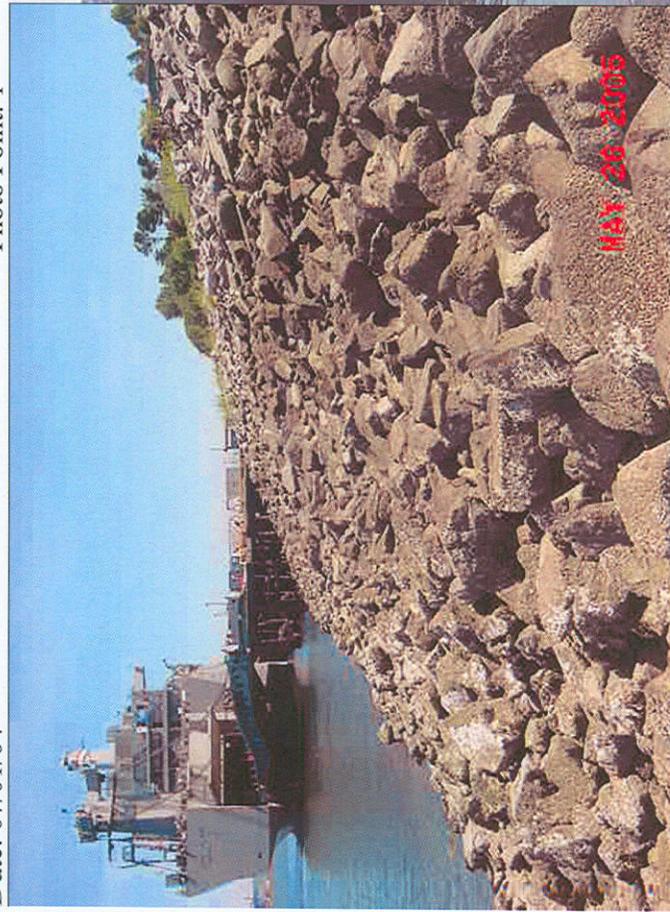
Date: 07/01/04

Photo Point: 1



Date: 1/10/05

Photo Point: 1



Date: 05/26/05

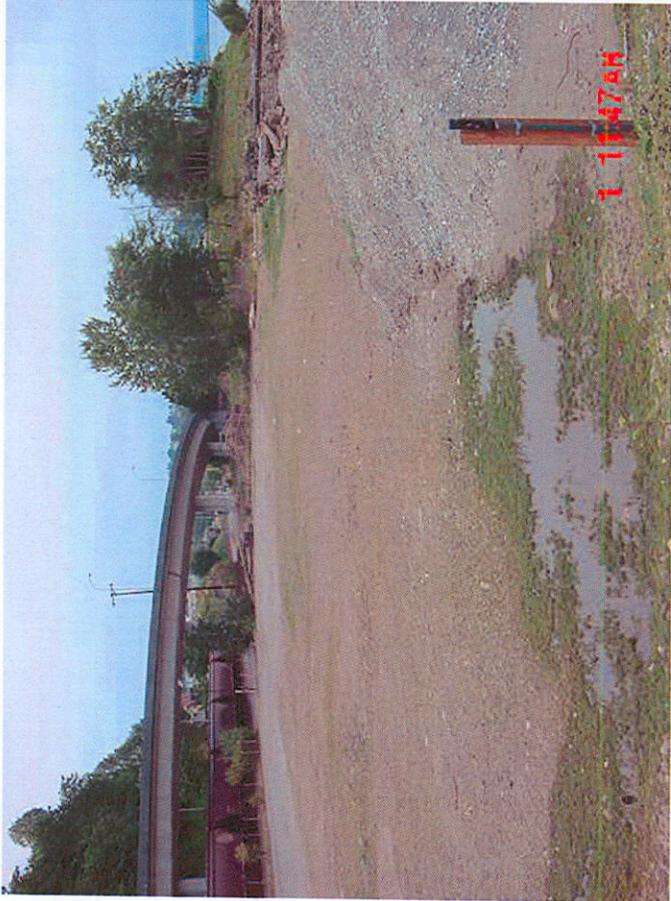
Photo Point: 1



Date: 8/31/06

Photo Point: 1

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 2A

1 11 47 AM



Date: 1/10/05

Photo Point: 2A

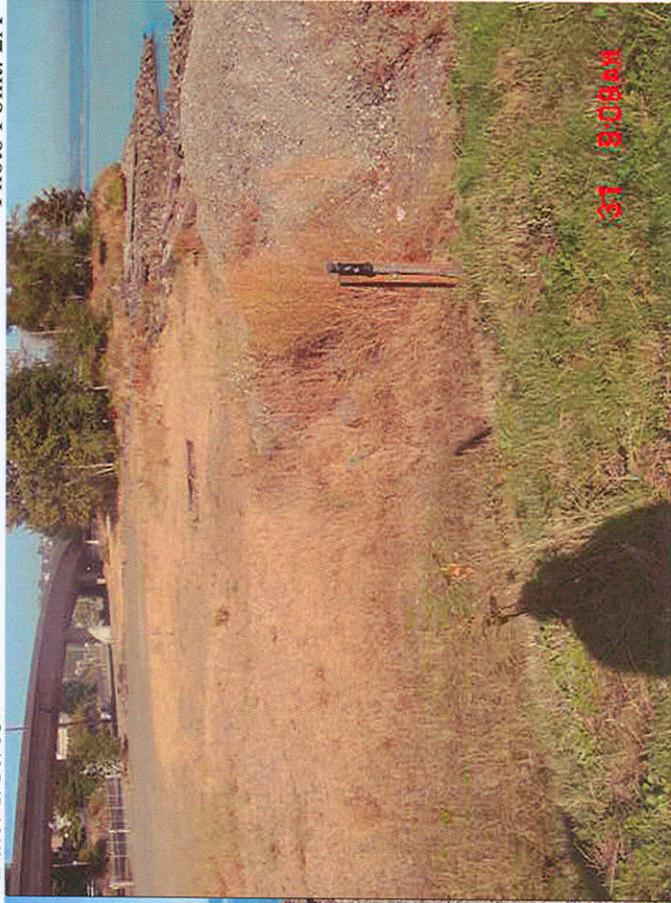
JAN 10 2005



Date: 05/26/05

Photo Point: 2A

MAY 26 2005

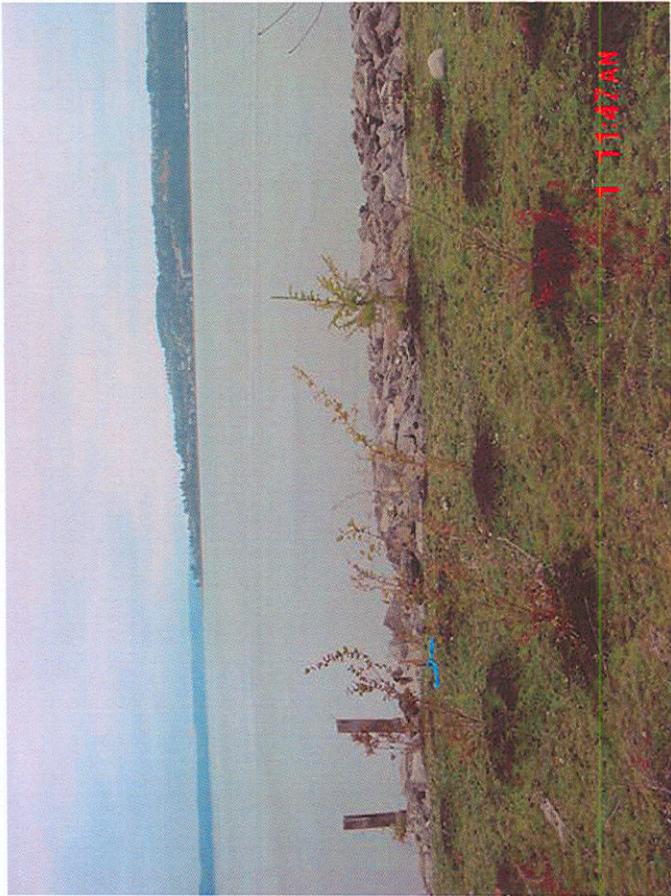


Date: 8/31/06

Photo Point: 2A

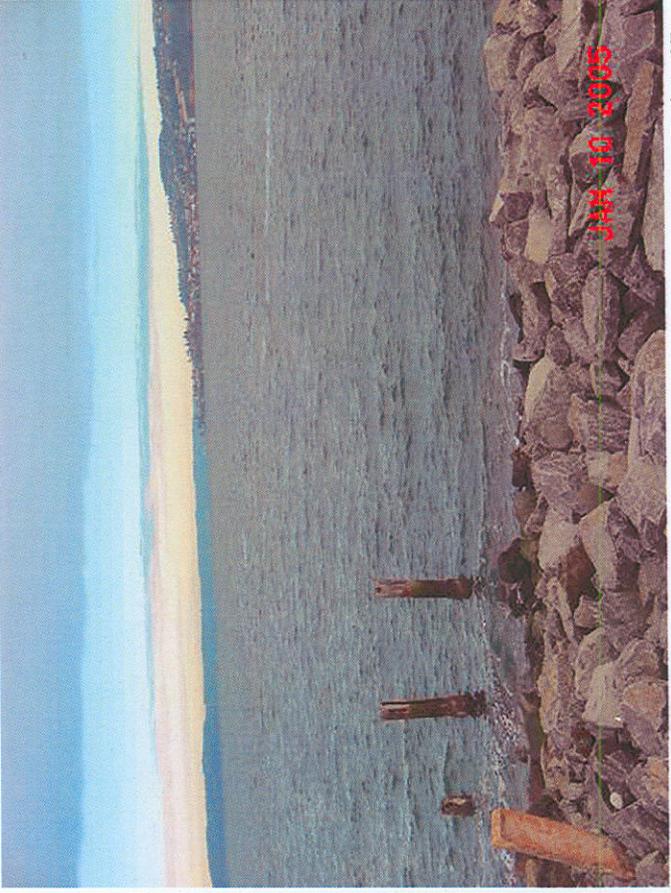
31 8 06 AM

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



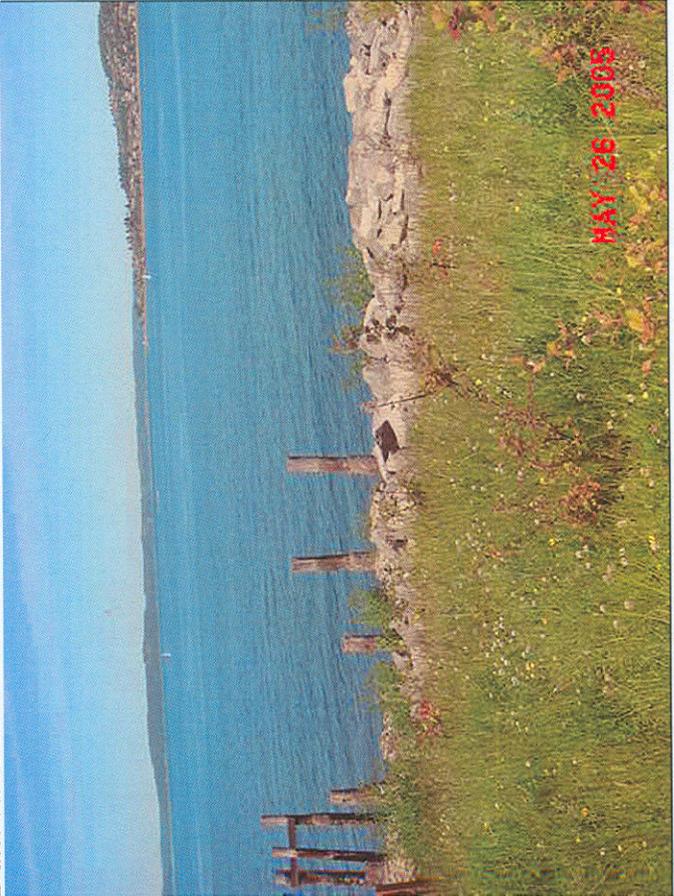
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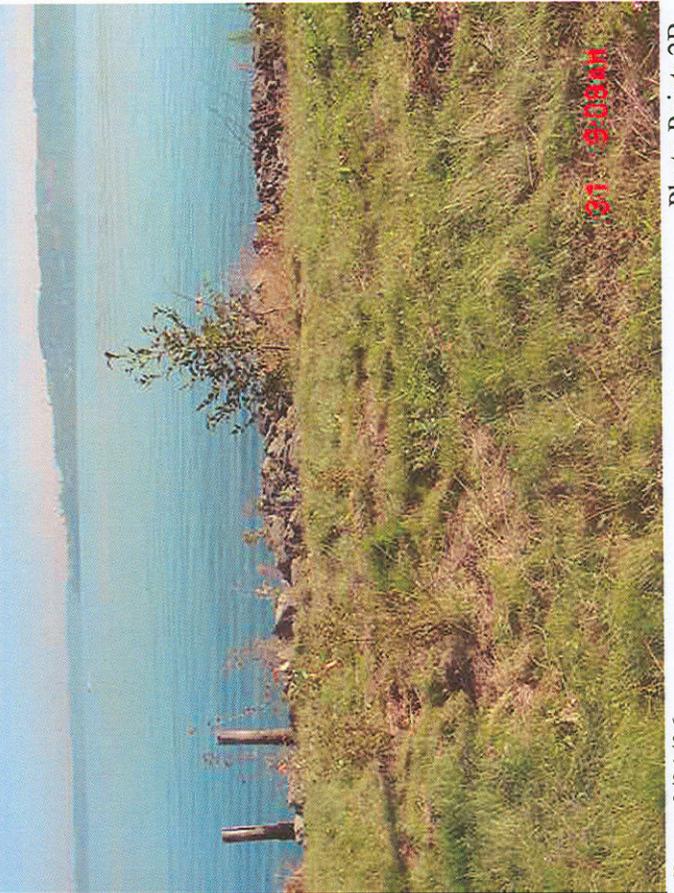
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Photo Point: 2B



Date: 05/26/05

Photo Point: 2B



Date: 8/31/06

Photo Point: 2B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



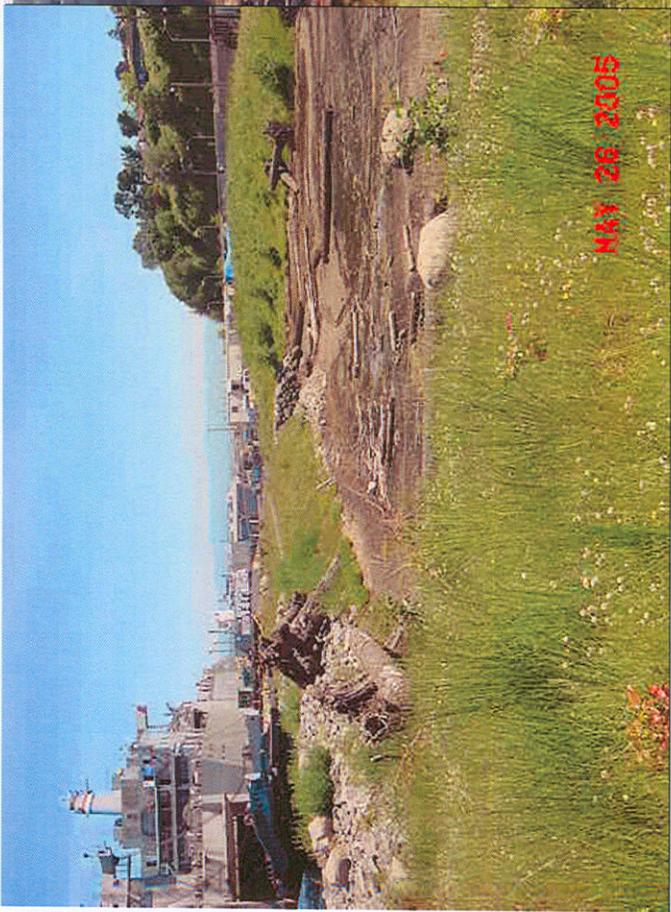
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Date: 1/10/05

Photo Point: 2C



Date: 05/26/05

Photo Point: 2C



Date: 8/31/06

Photo Point: 2C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



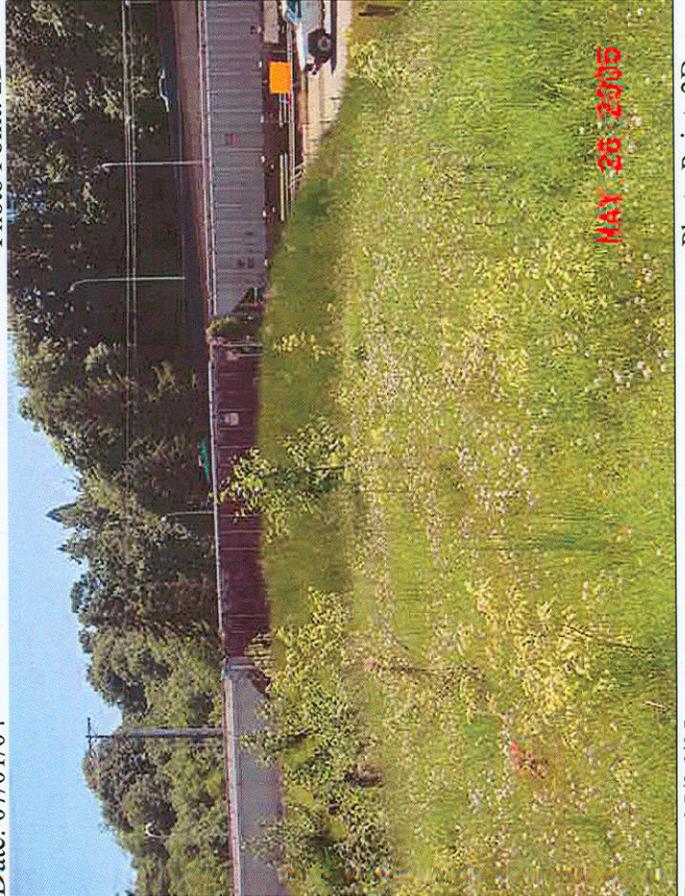
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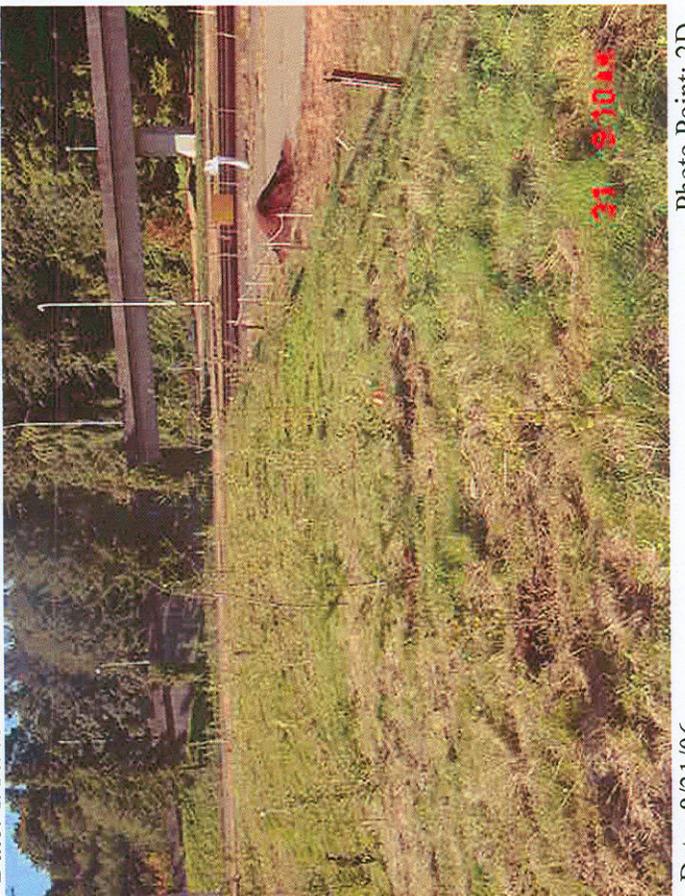
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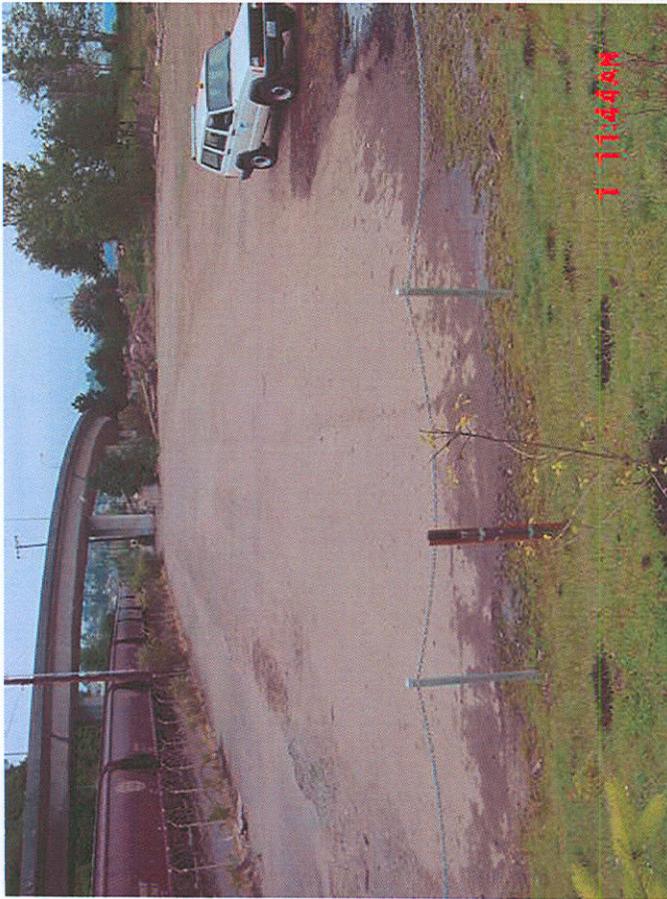
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Date: 8/31/06

Photo Point: 2D

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



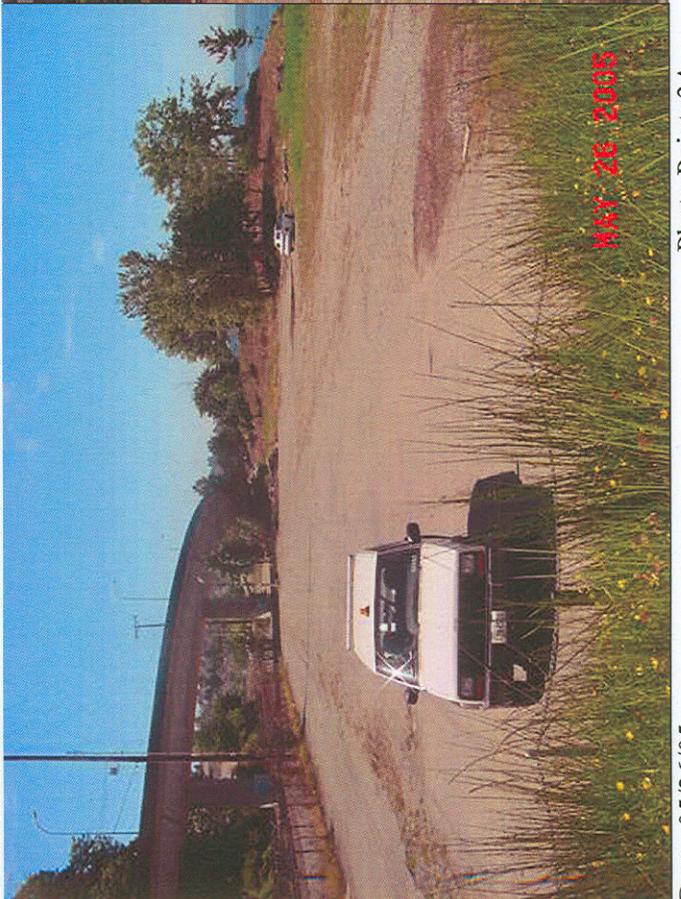
Date: 07/01/04

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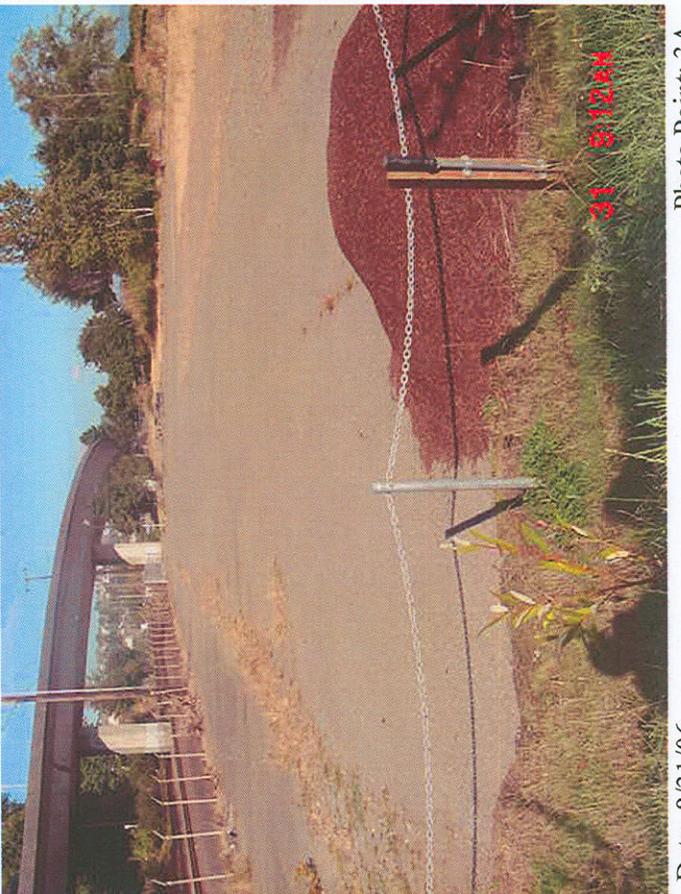
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Date: 05/26/05

Photo Point: 3A



Date: 8/31/06

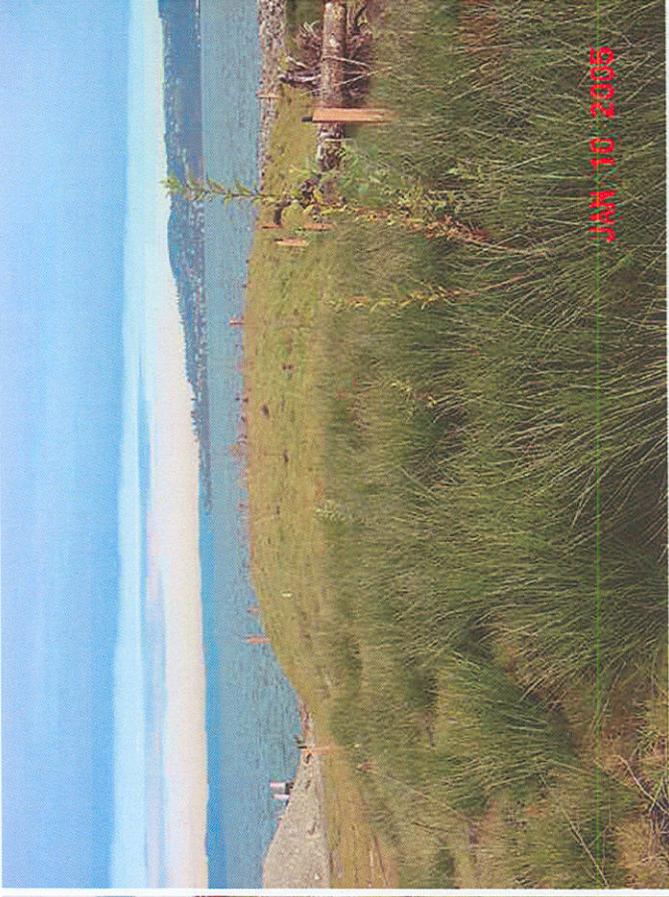
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



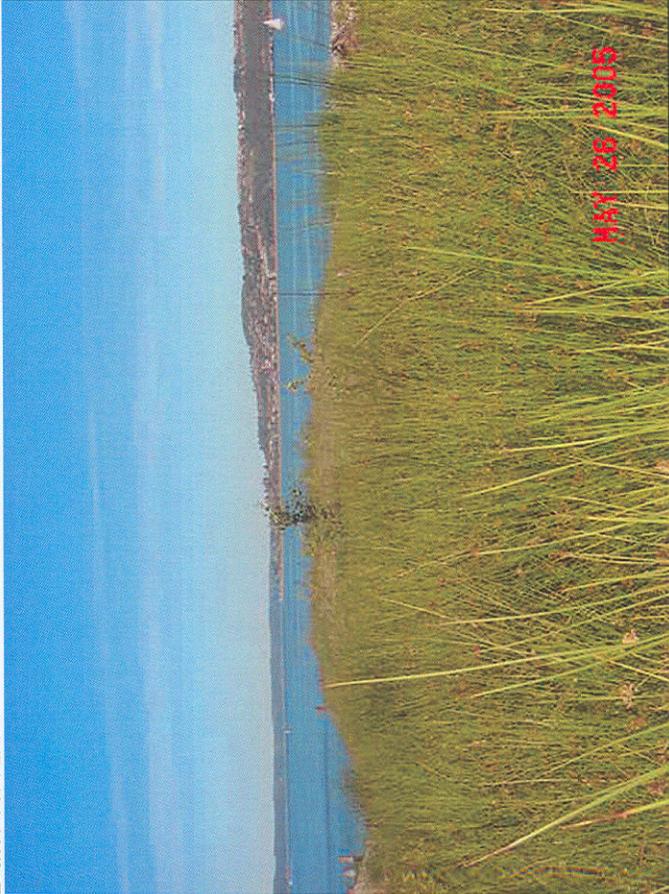
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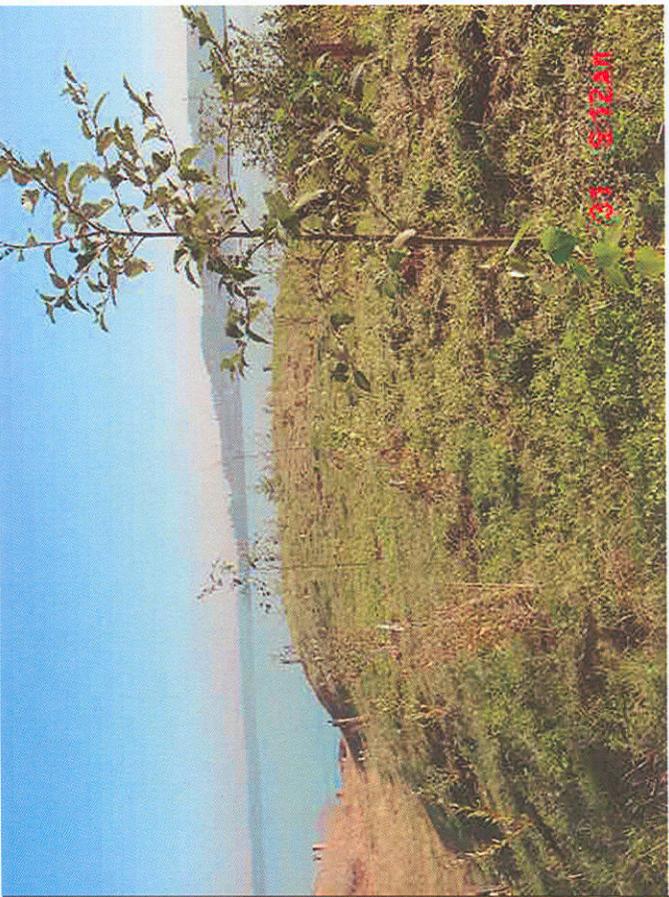
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Date: 05/26/05

Photo Point: 3B



Date: 8/31/06

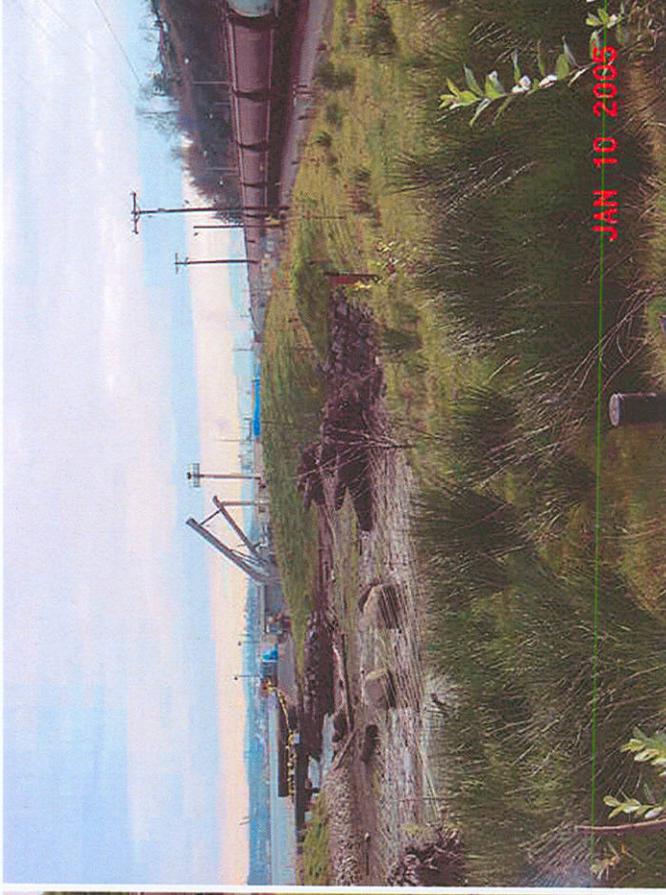
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



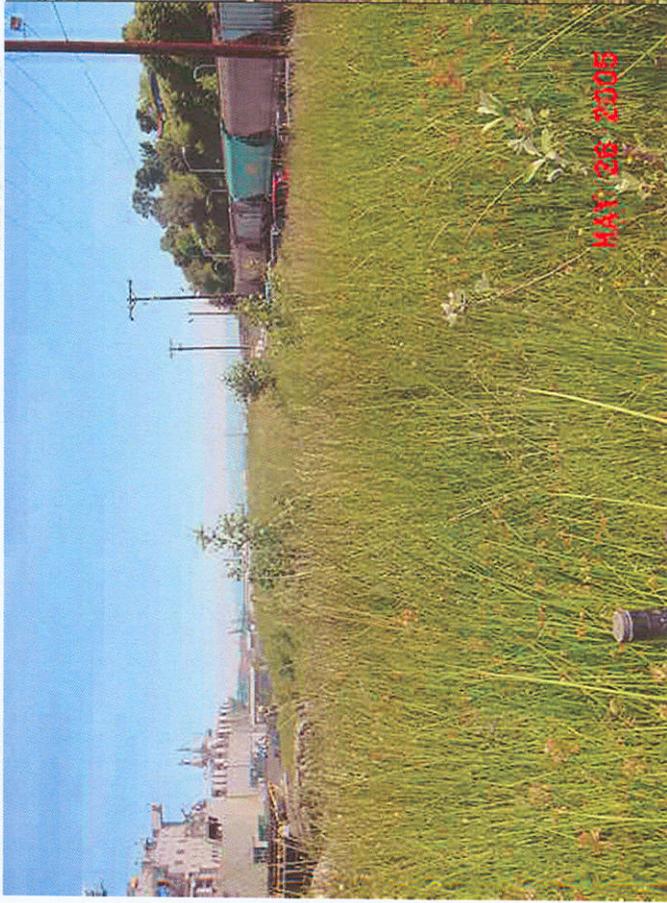
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Date: 1/10/05

Photo Point: 3C



Date: 05/26/05

Photo Point: 3C



Date: 8/31/06

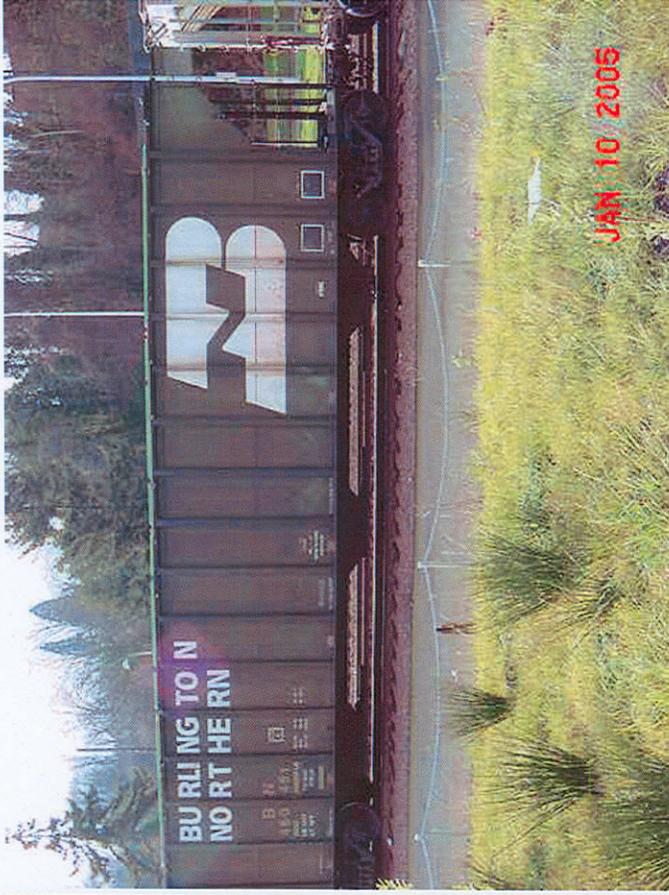
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 3D



Date: 1/10/05

Photo Point: 3D



Date: 05/26/05

Photo Point: 3D



Date: 8/31/06

Photo Point: 3D

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



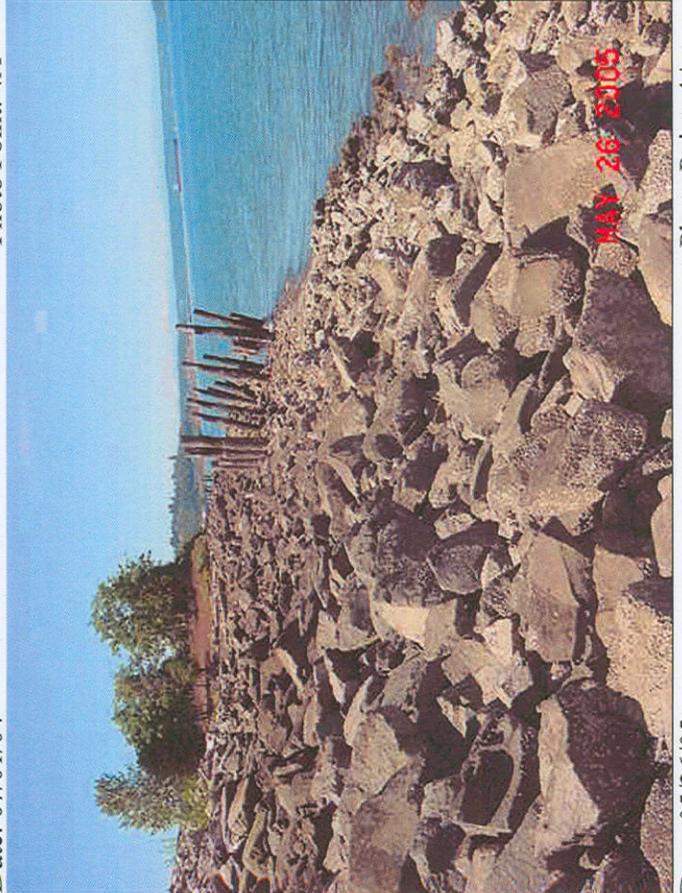
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Photo Point: 4A



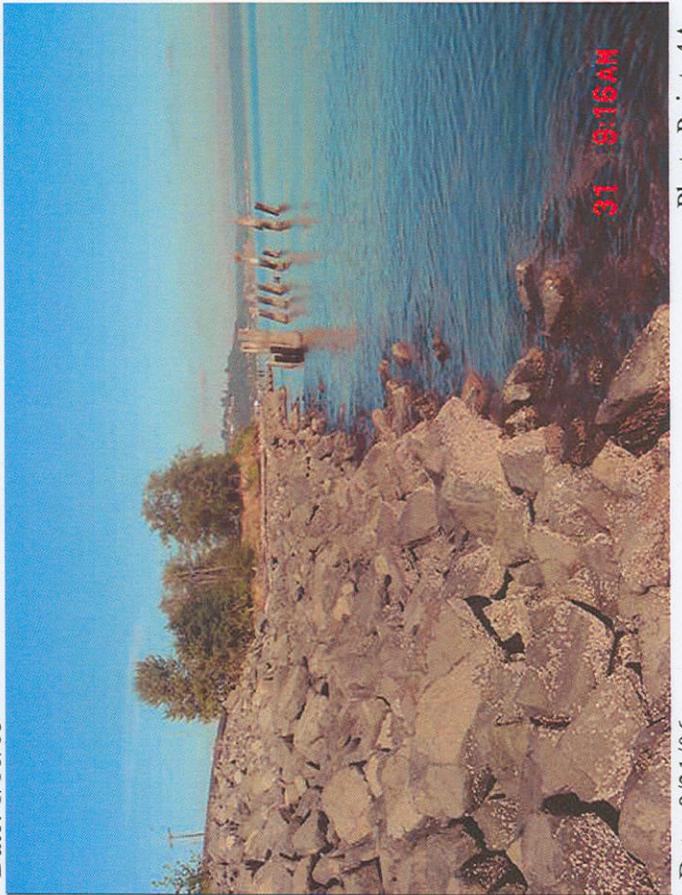
Date: 1/10/05

Photo Point: 4A



Date: 05/26/05

Photo Point: 4A



Date: 8/31/06

Photo Point: 4A

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 5C

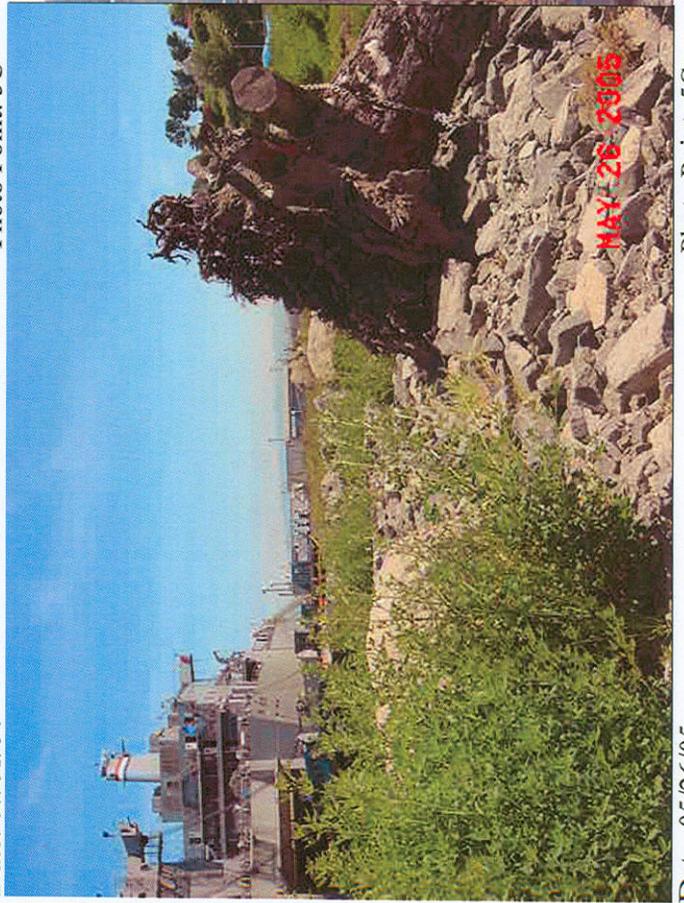
JAN 11 11:53 AM



Date: 1/10/05

Photo Point: 5C

JAN 10 2:03 PM



Date: 05/26/05

Photo Point: 5C

MAY 26 2:30 PM



Date: 8/31/06

Photo Point: 5C

AUG 31 9:18 AM

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



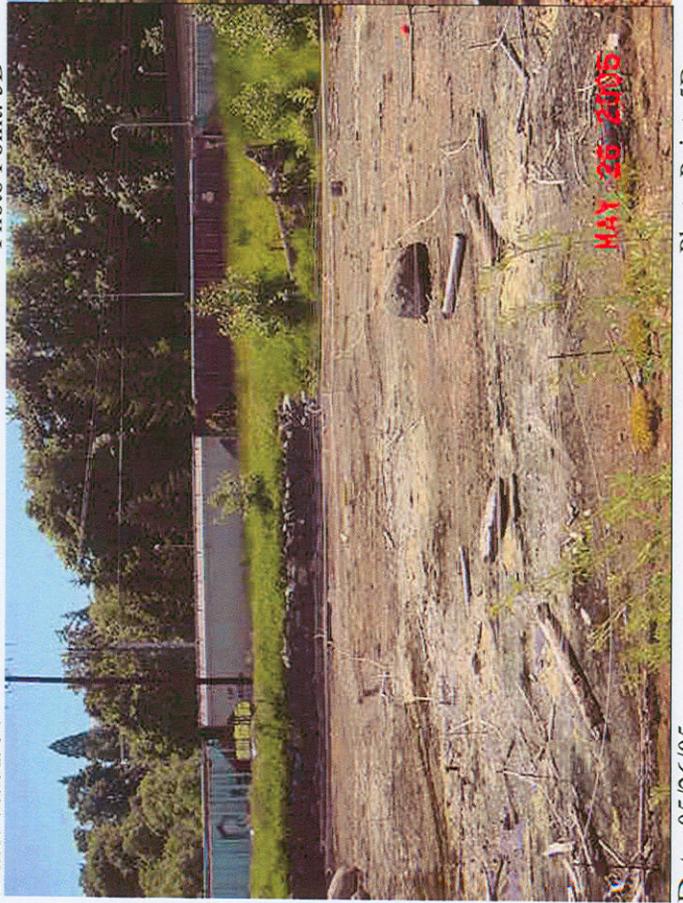
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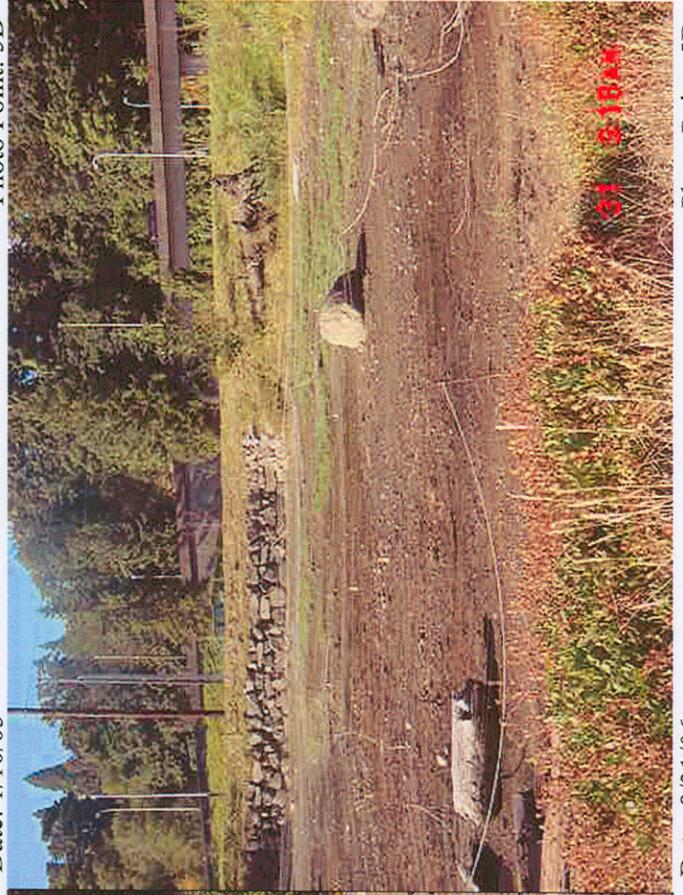
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Photo Point: 5D



Date: 05/26/05

Photo Point: 5D



Date: 8/31/06

Photo Point: 5D

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



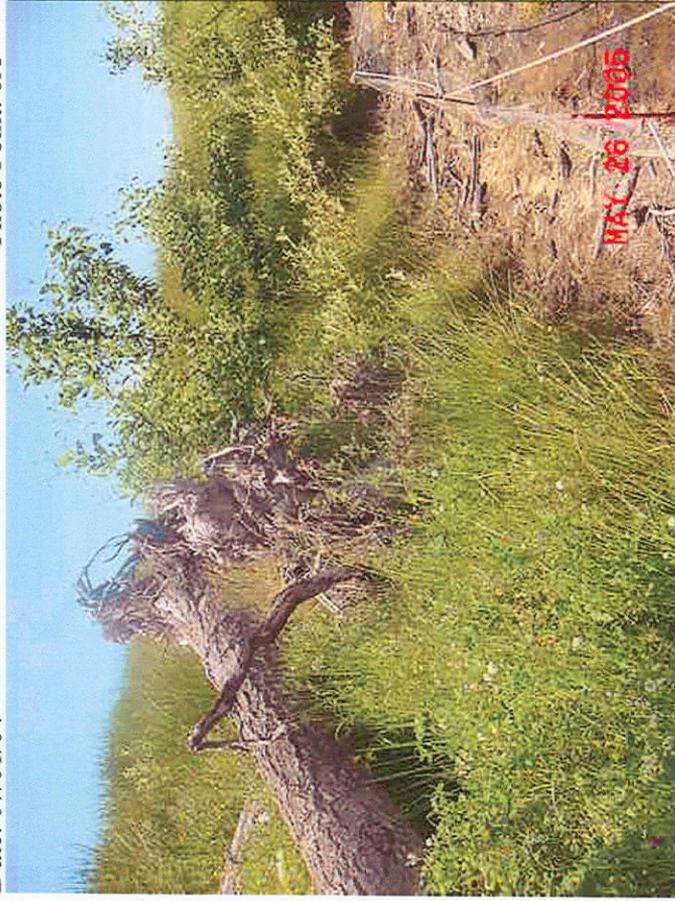
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Photo Point: 6A



Date: 1/10/05

Photo Point: 6A



Date: 05/26/05

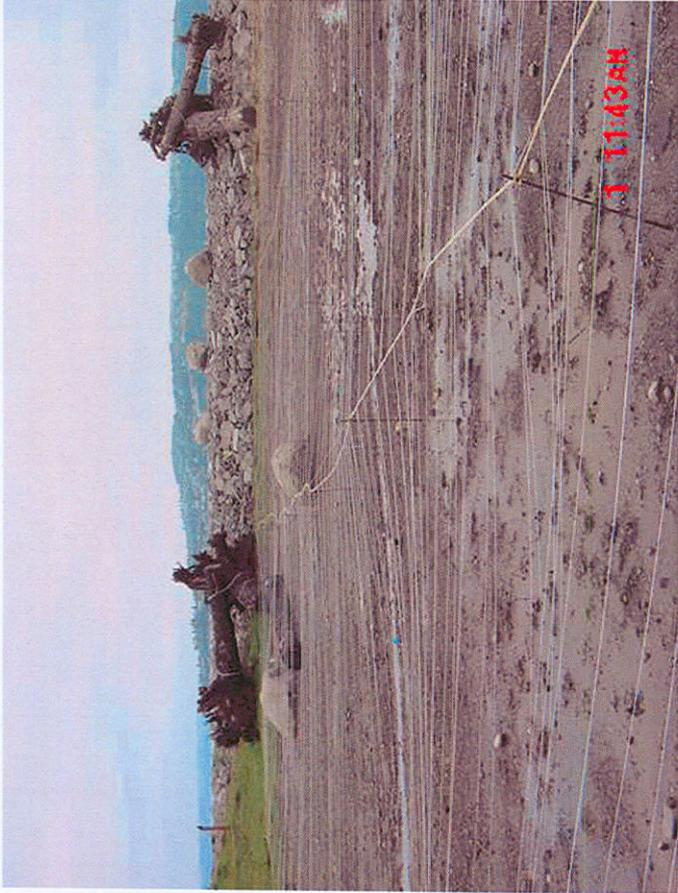
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Date: 8/31/06

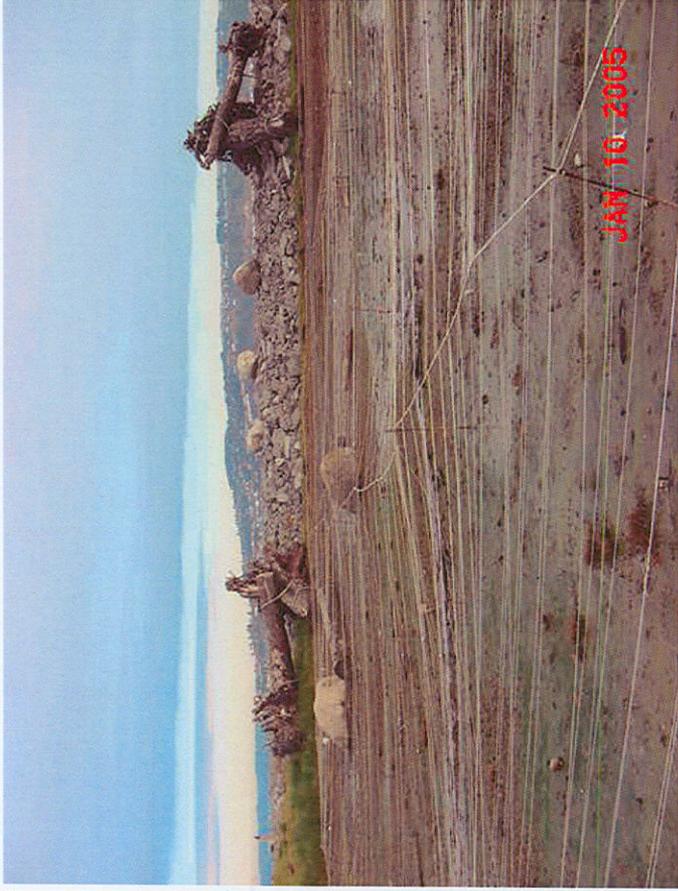
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APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



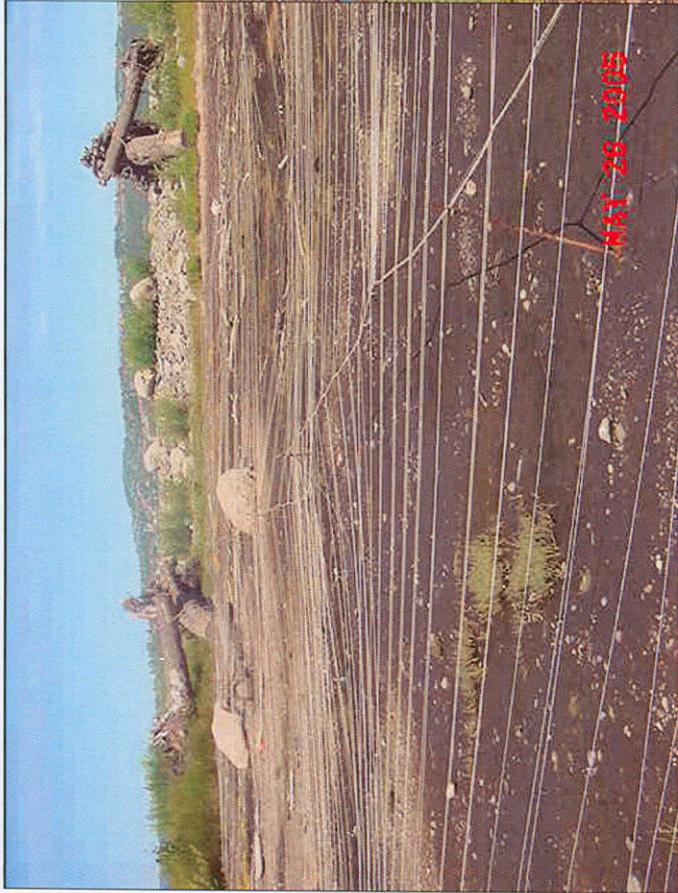
Date: 07/01/04

Photo Point: 6B



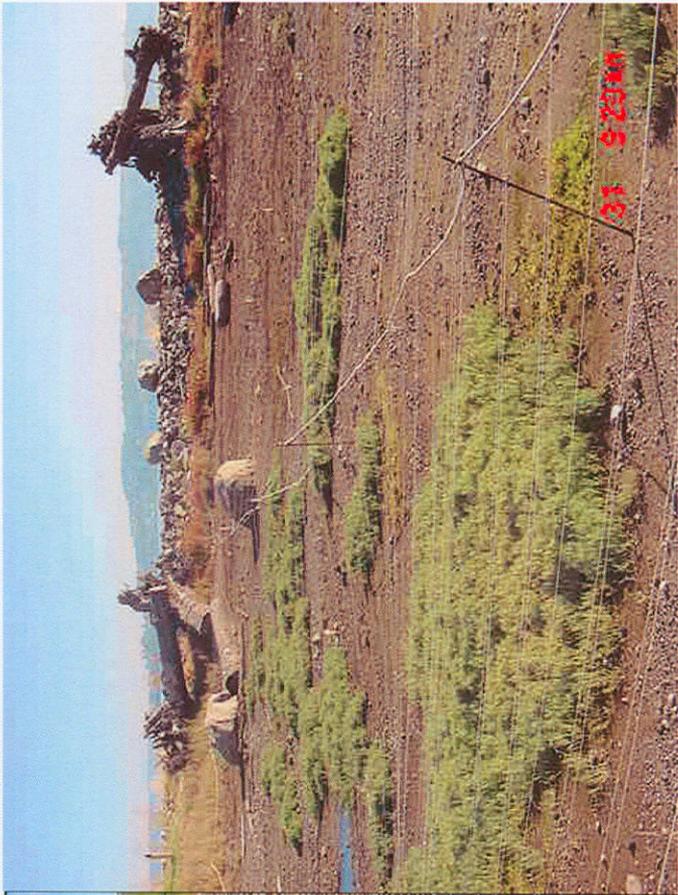
Date: 1/10/05

Photo Point: 6B



Date: 05/26/05

Photo Point: 6B



Date: 8/31/06

Photo Point: 6B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



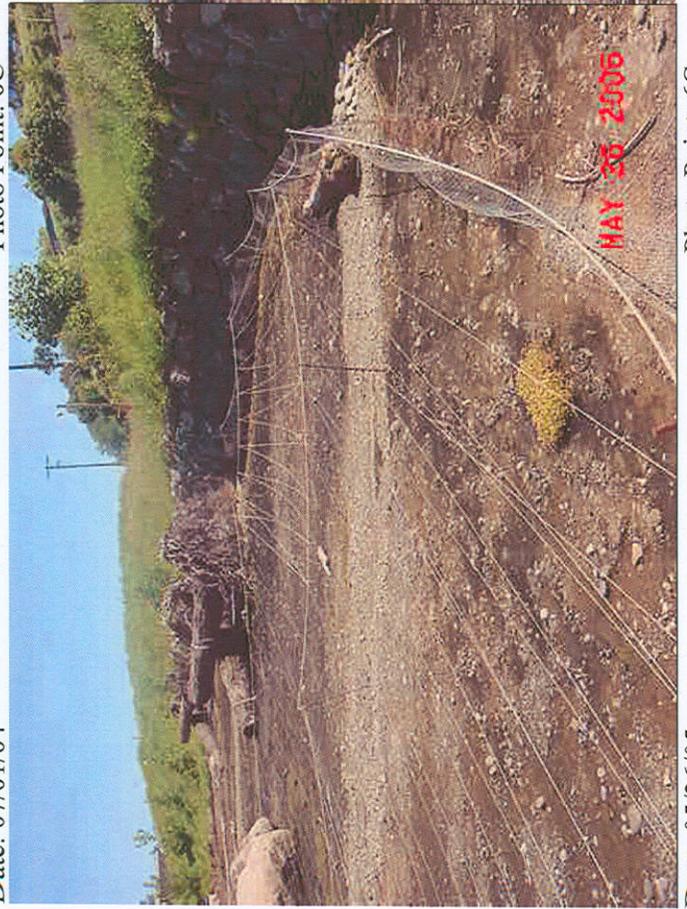
Date: 07/01/04

Photo Point: 6C



Date: 1/10/05

Photo Point: 6C



Date: 05/26/05

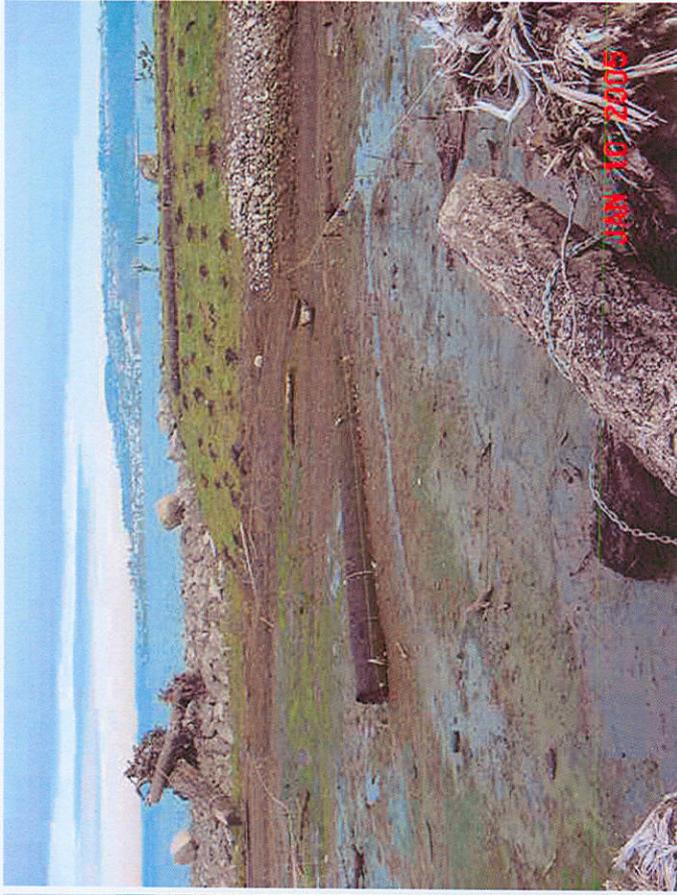
Photo Point: 6C



Date: 8/31/06

Photo Point: 6C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



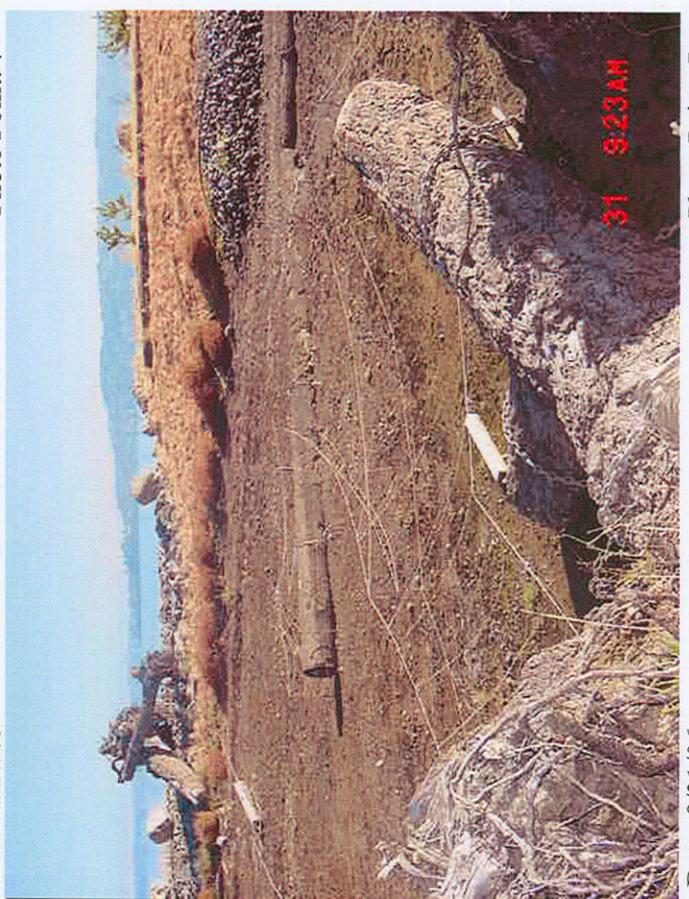
Date: 07/01/04

Photo Point: 7



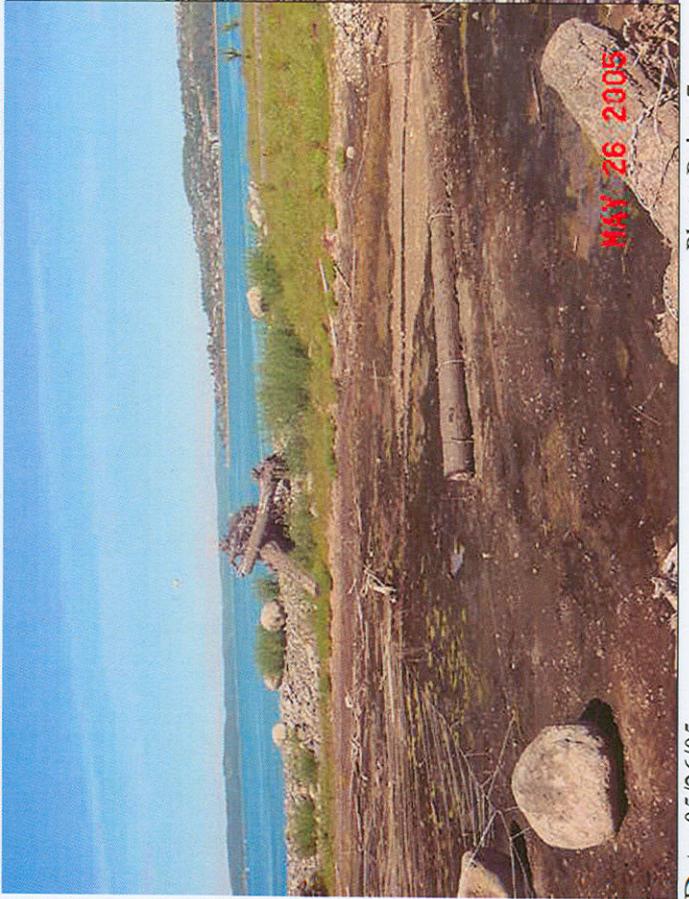
Date: 1/10/05

Photo Point: 7



Date: 8/31/06

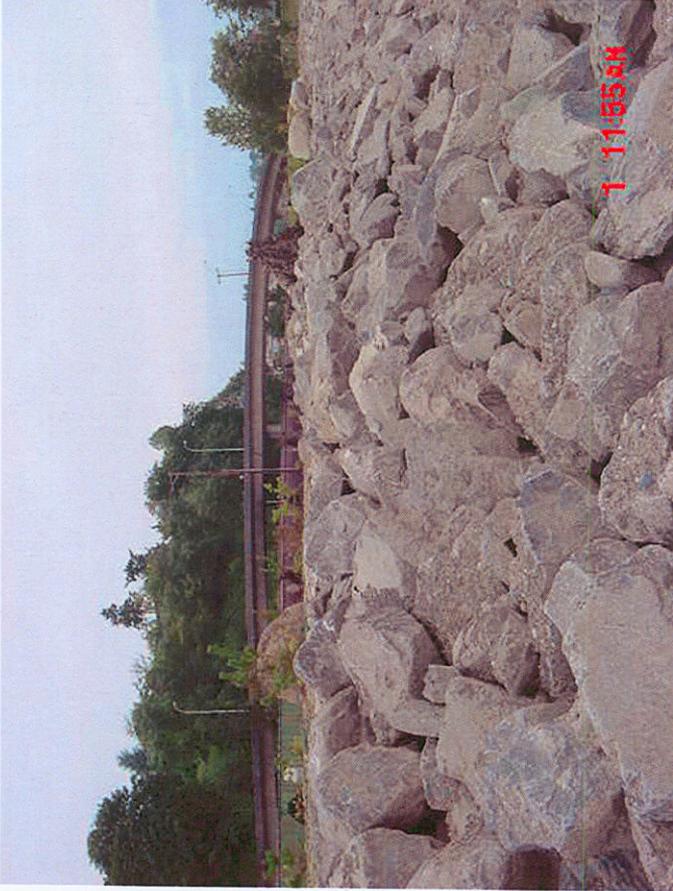
Photo Point: 7



Date: 05/26/05

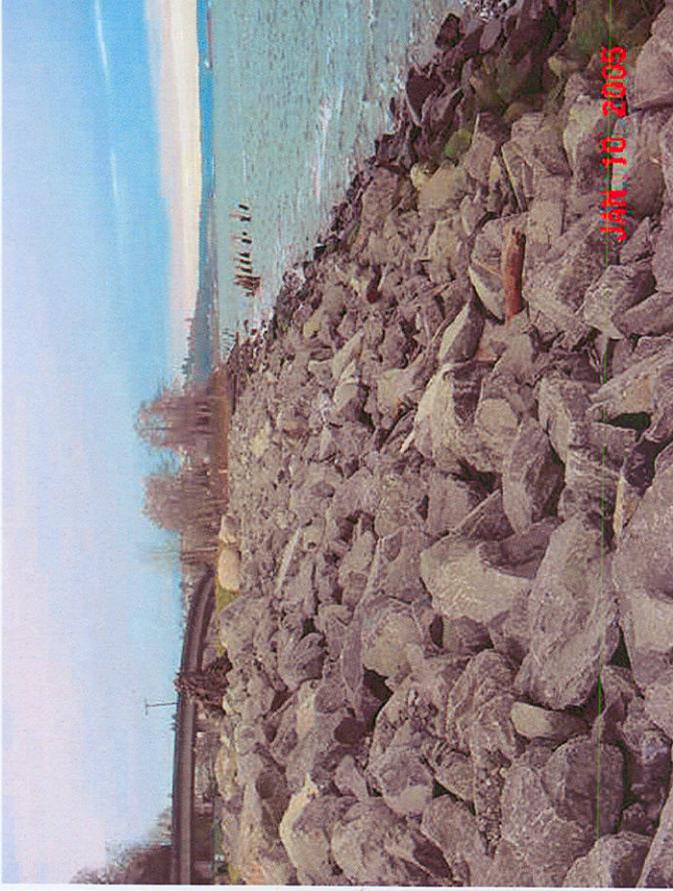
Photo Point: 7

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



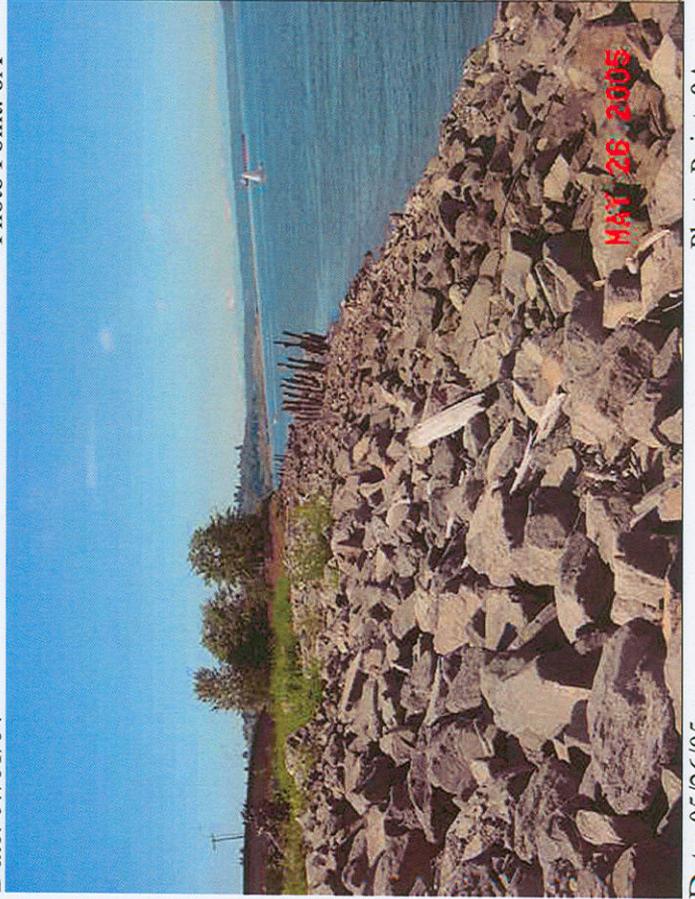
Date: 07/01/04

Photo Point: 8A



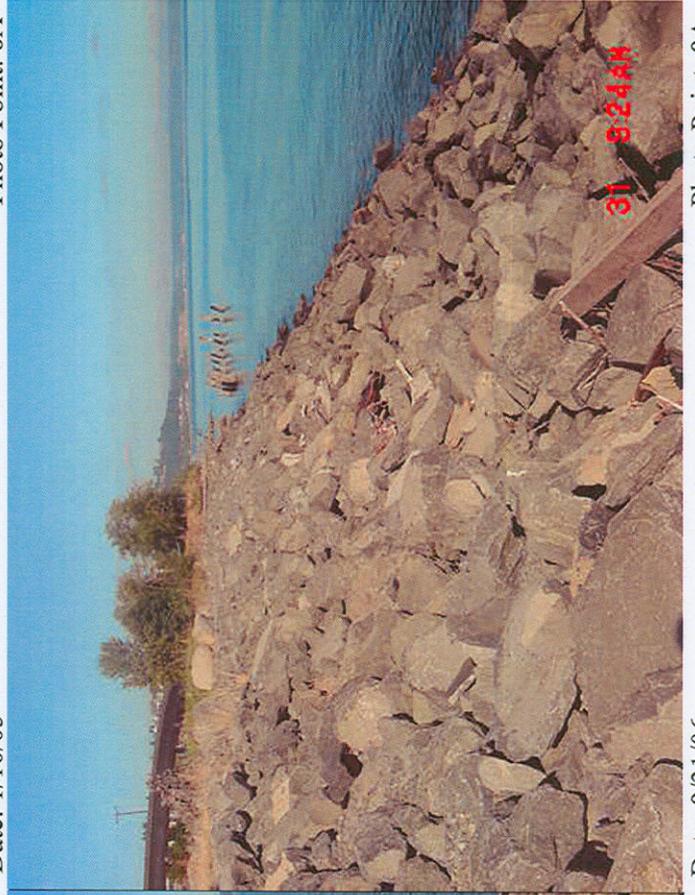
Date: 1/10/05

Photo Point: 8A



Date: 05/26/05

Photo Point: 8A



Date: 8/31/06

Photo Point: 8A

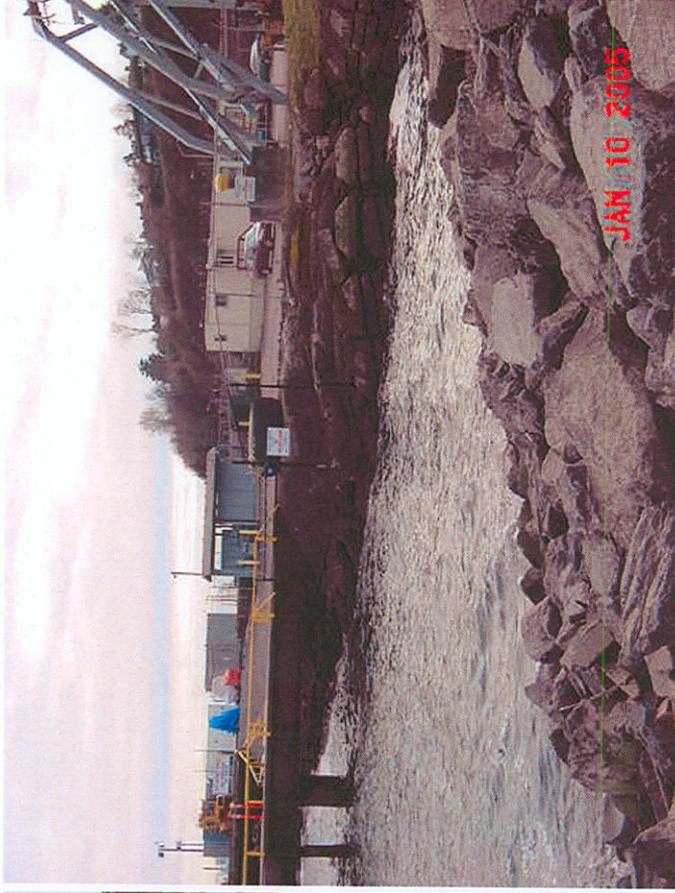
APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 8B

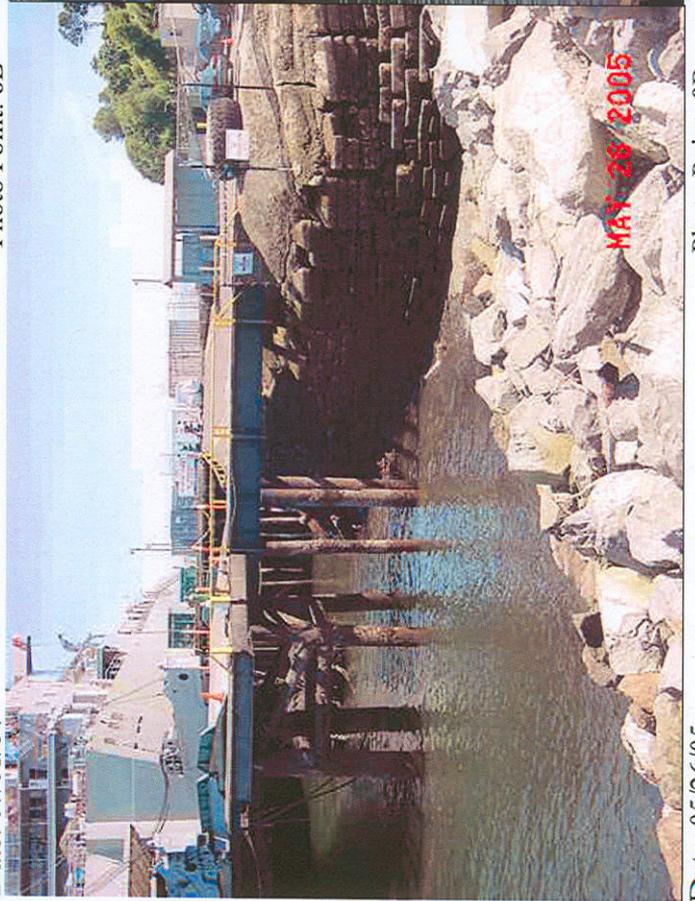
JAN 11 11:55 AM



JAN 10 2005

Date: 1/10/05

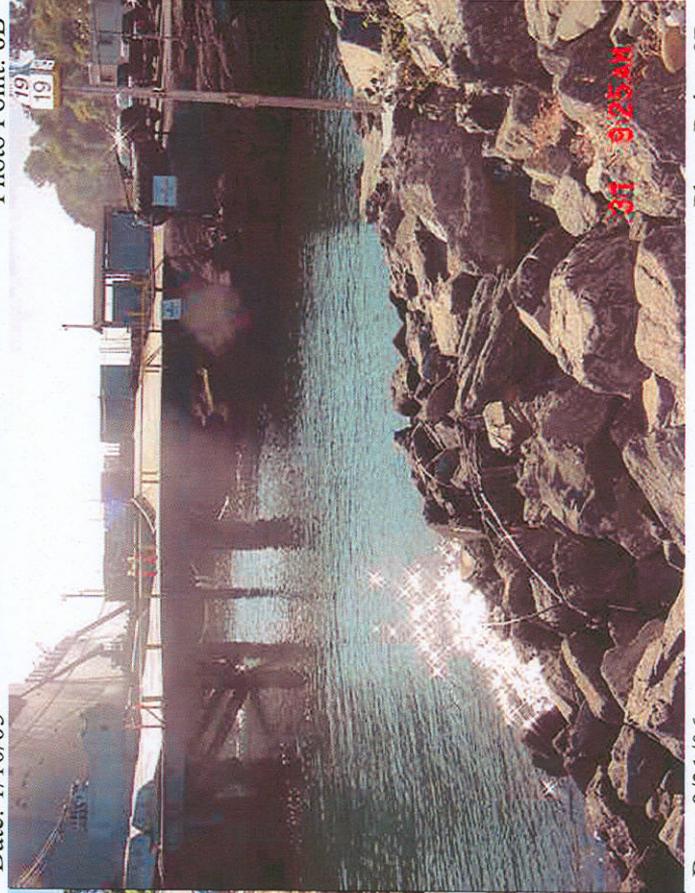
Photo Point: 8B



Date: 05/26/05

Photo Point: 8B

MAY 26 2005



Date: 8/31/06

Photo Point: 8B

AUG 31 9:25 AM

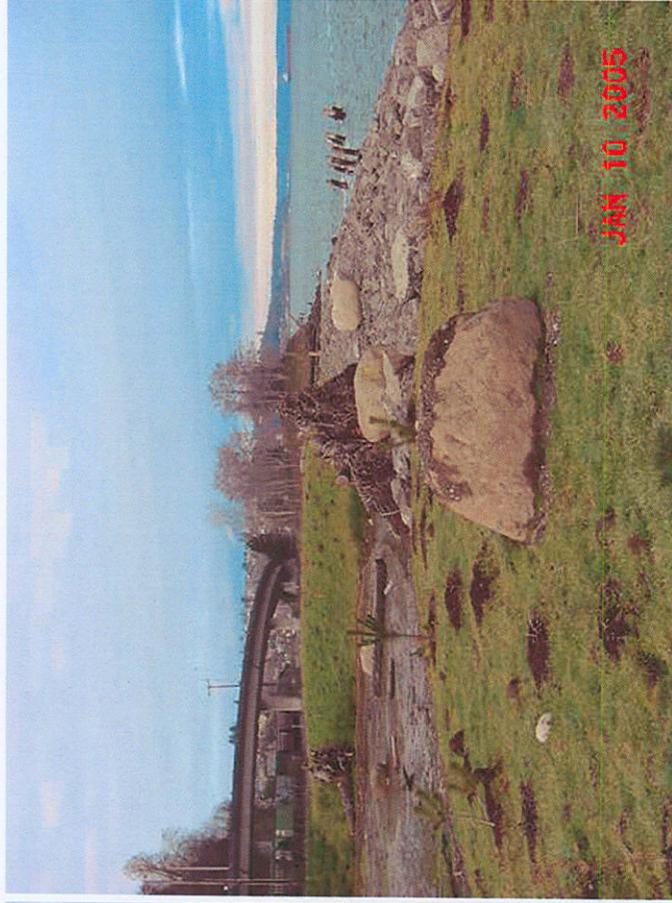
APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 9A

1 11:54 AM



JAN 10 2005

Date: 1/10/05

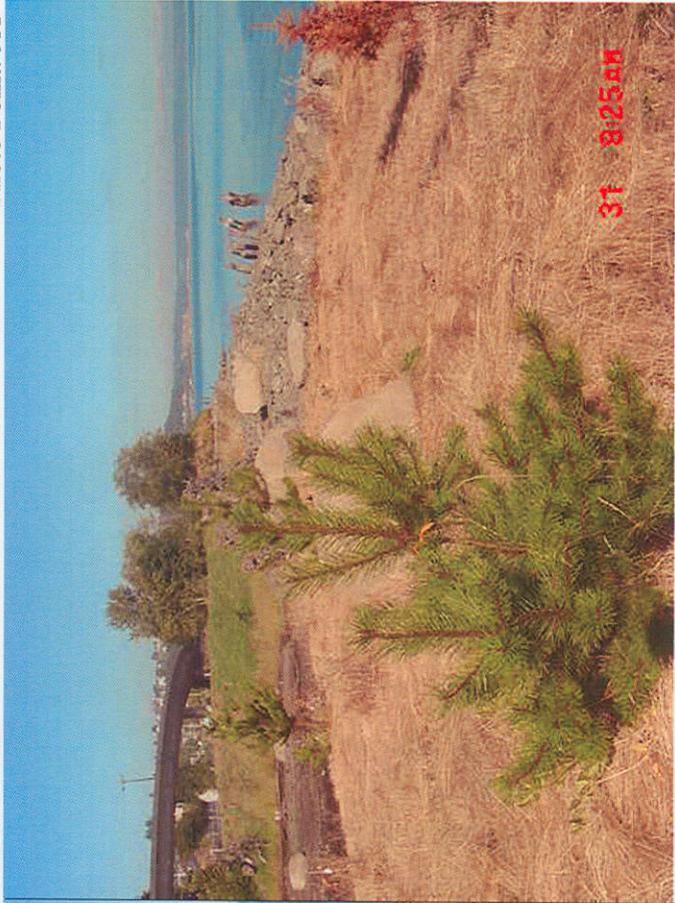
Photo Point: 9A



Date: 05/26/05

Photo Point: 9A

MAY 26 2005



Date: 8/31/06

Photo Point: 9A

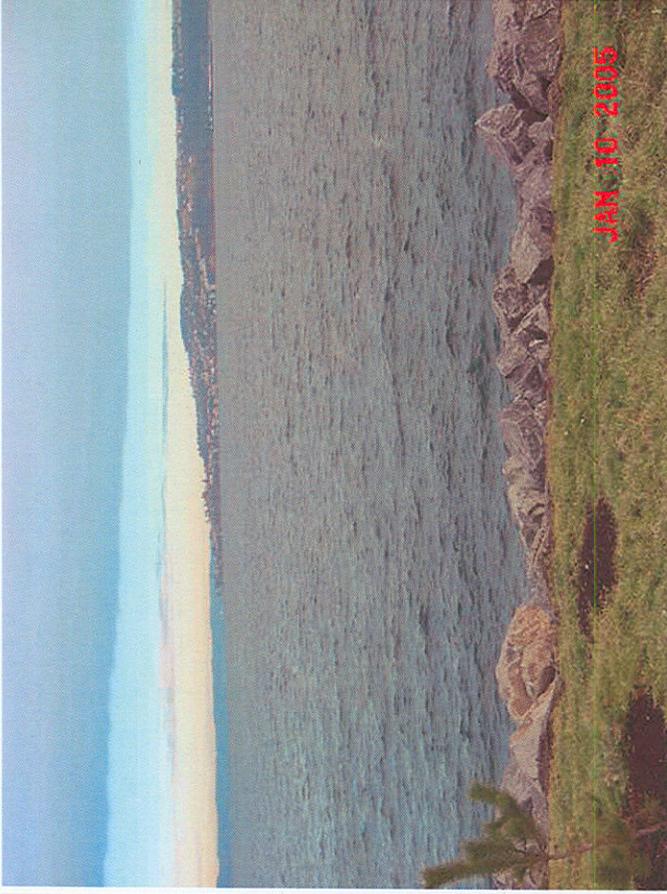
31 8:25 AM

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



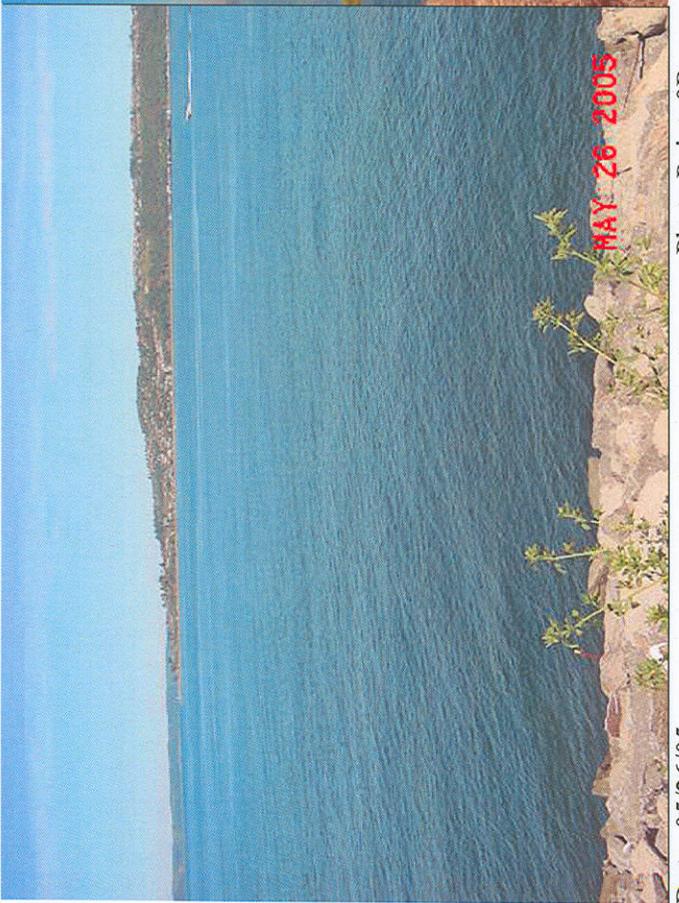
Date: 07/01/04

Photo Point: 9B



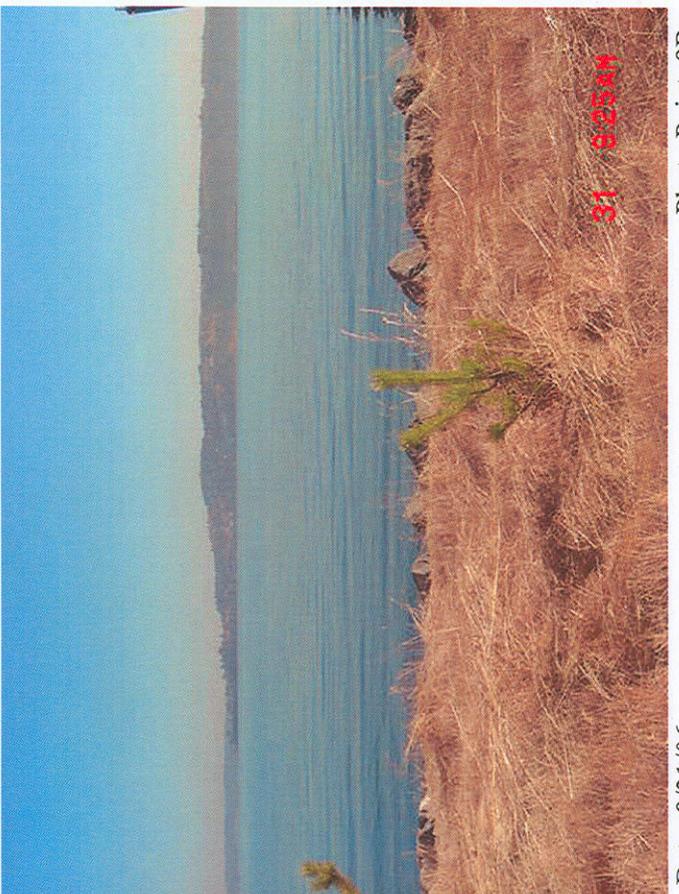
Date: 1/10/05

Photo Point: 9B



Date: 05/26/05

Photo Point: 9B



Date: 8/31/06

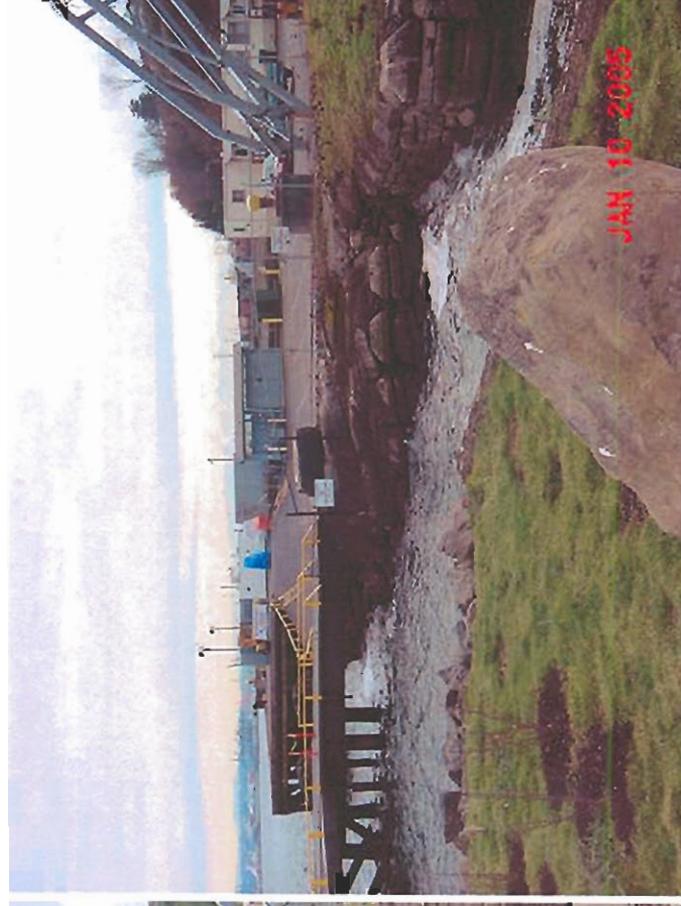
Photo Point: 9B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 9C



Date: 1/10/05

Photo Point: 9C



Date: 05/26/05

Photo Point: 9C



Date: 8/31/06

Photo Point: 9C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



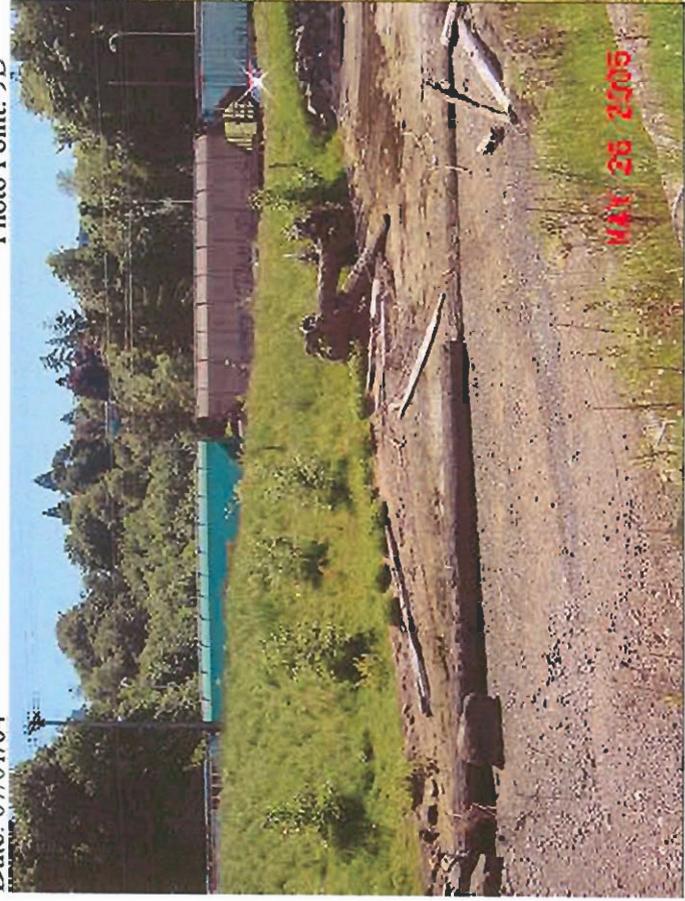
Date: 07/01/04

Photo Point: 9D



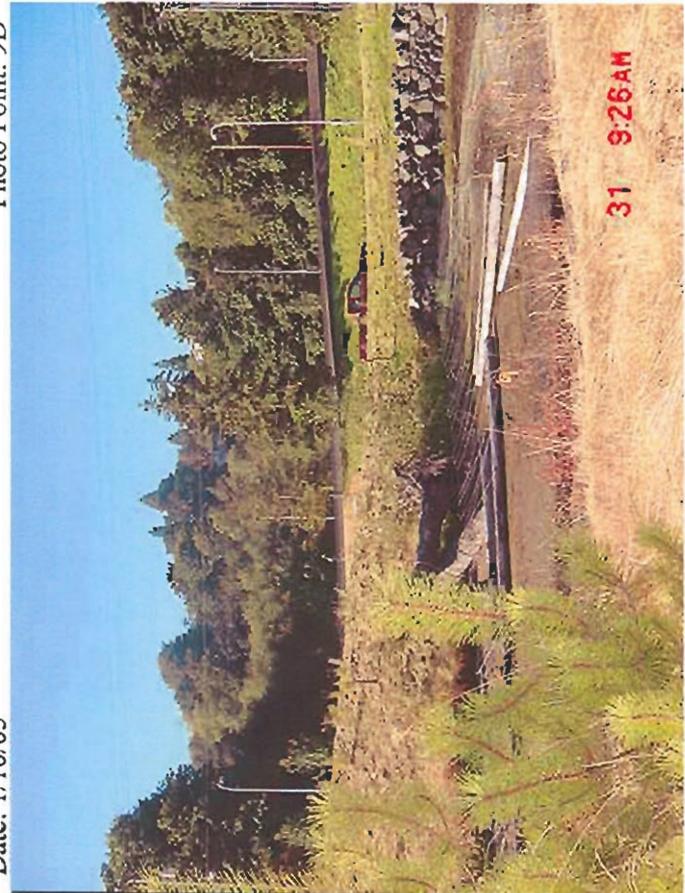
Date: 1/10/05

Photo Point: 9D



Date: 05/26/05

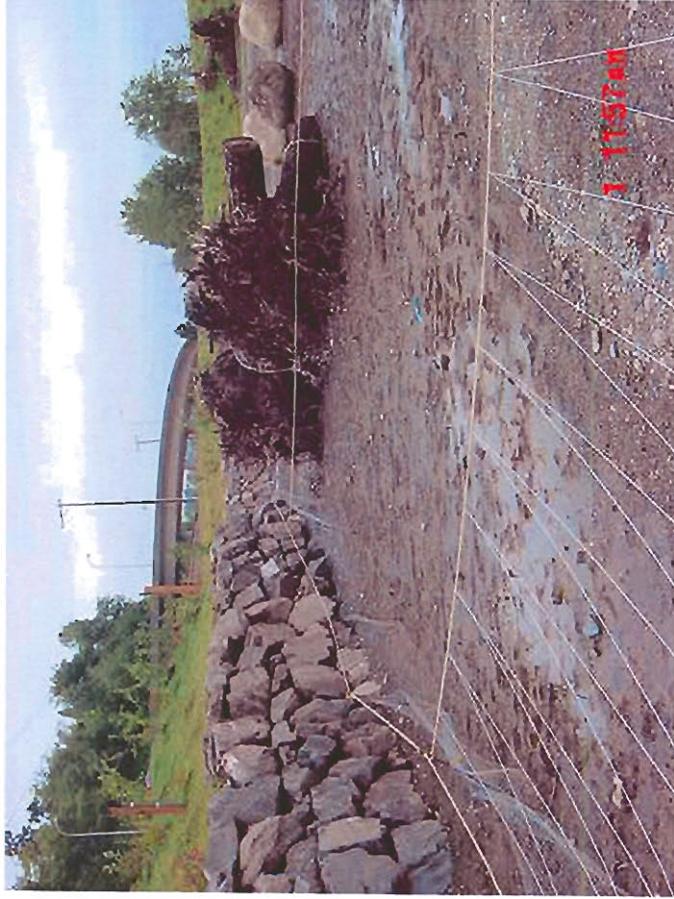
Photo Point: 9D



Date: 8/31/06

Photo Point: 9D

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 10A

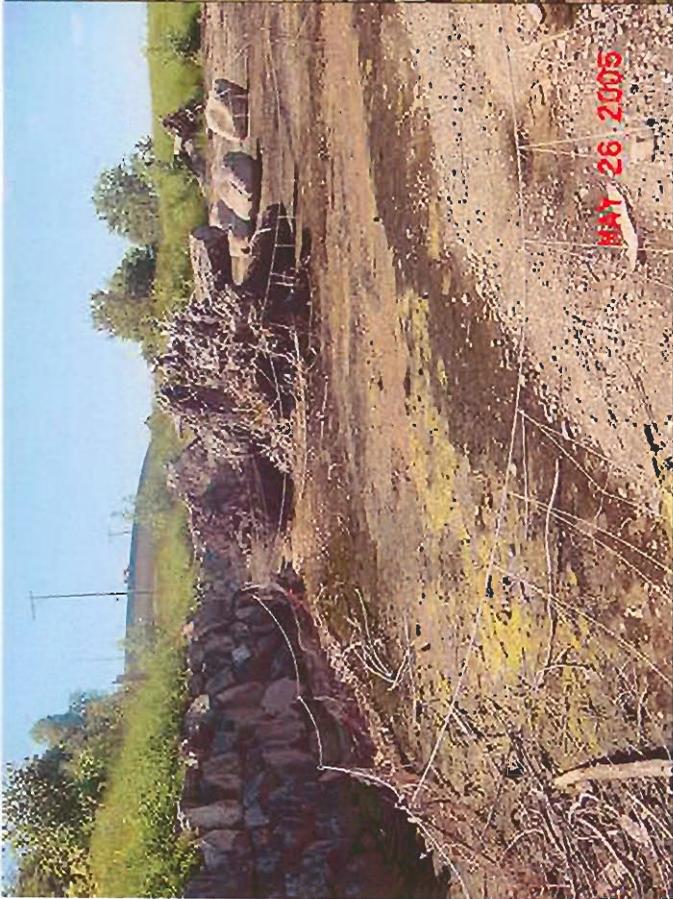
MAY 26 2005



Date: 1/10/05

Photo Point: 10A

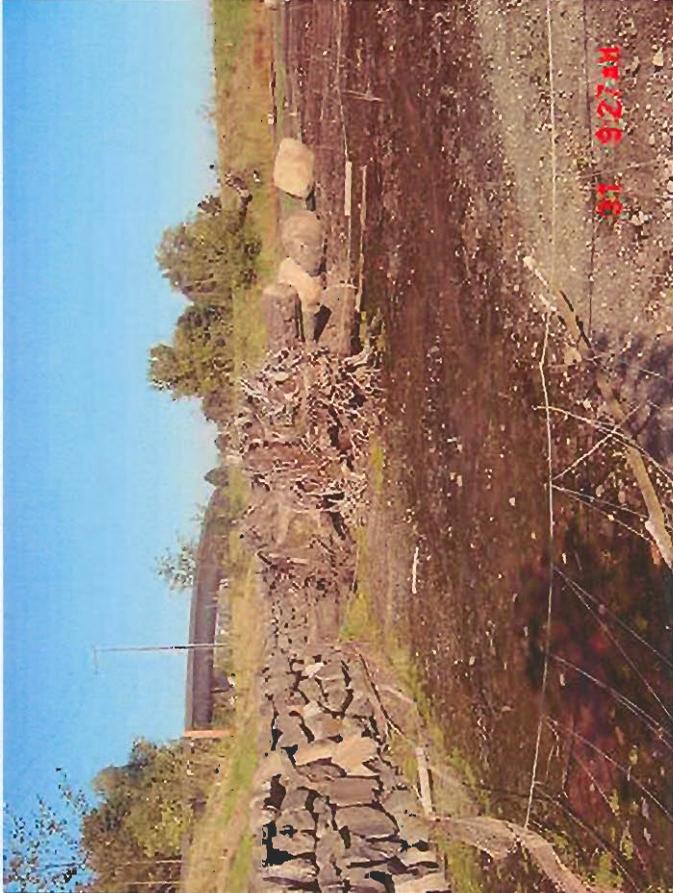
JAN 10 2005



Date: 05/26/05

Photo Point: 10A

MAY 26 2005



Date: 8/31/06

Photo Point: 10A

8/31 9:27 AM

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos

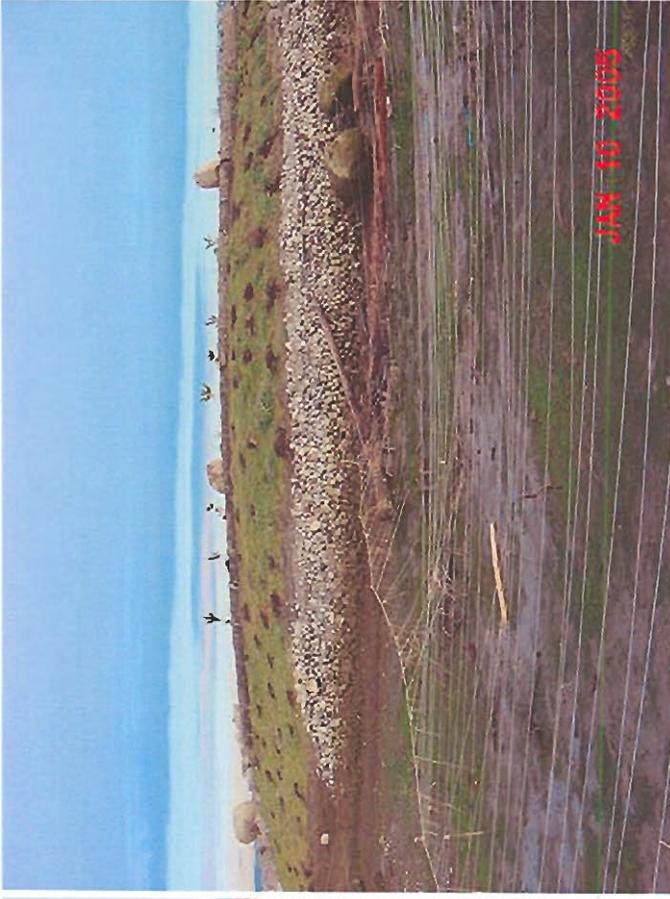


Photo Point: 10B

Date: 1/10/05

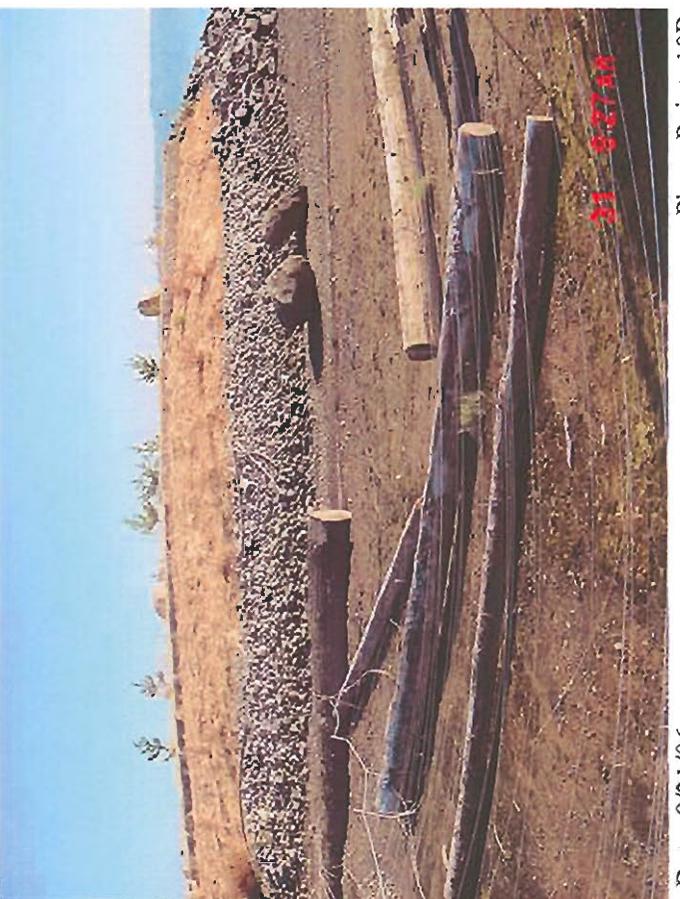


Photo Point: 10B

Date: 8/31/06



Photo Point: 10B

Date: 07/01/04

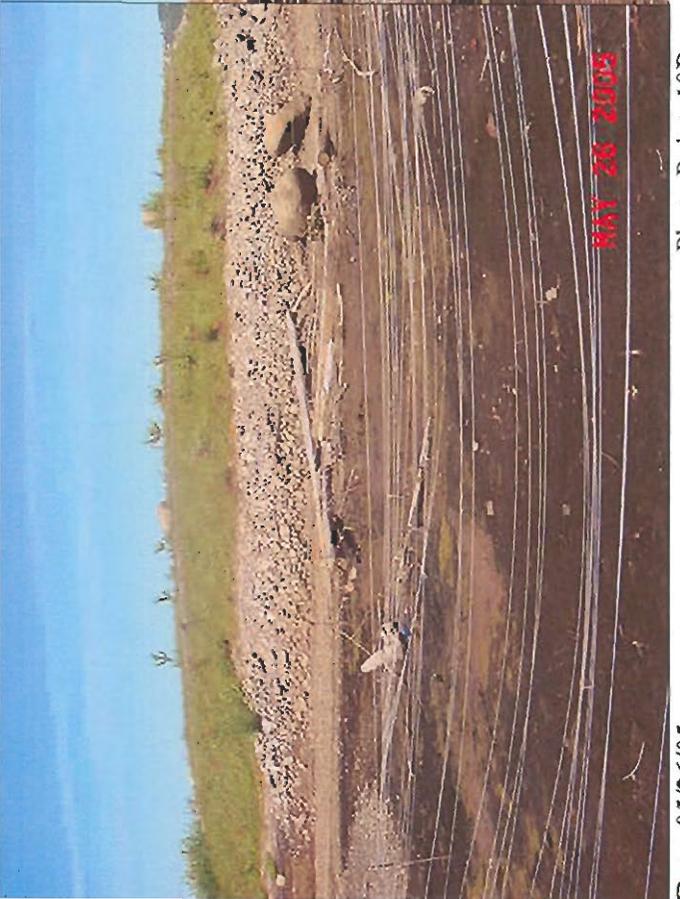


Photo Point: 10B

Date: 05/26/05

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



1 11 57 AM

Date: 07/01/04

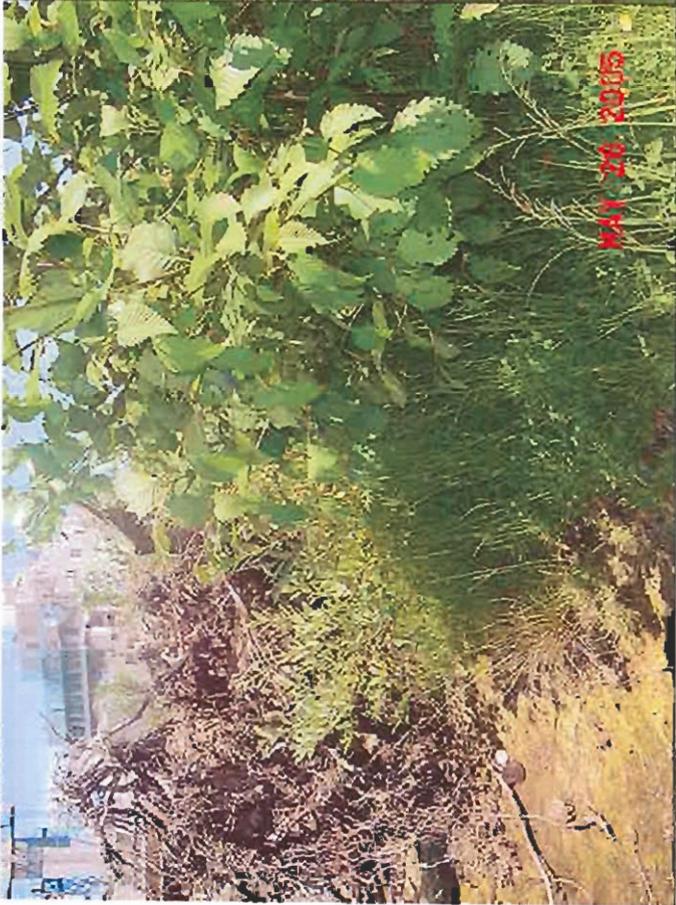
Photo Point: 10C



3:28:10 2/10/05

Date: 1/10/05

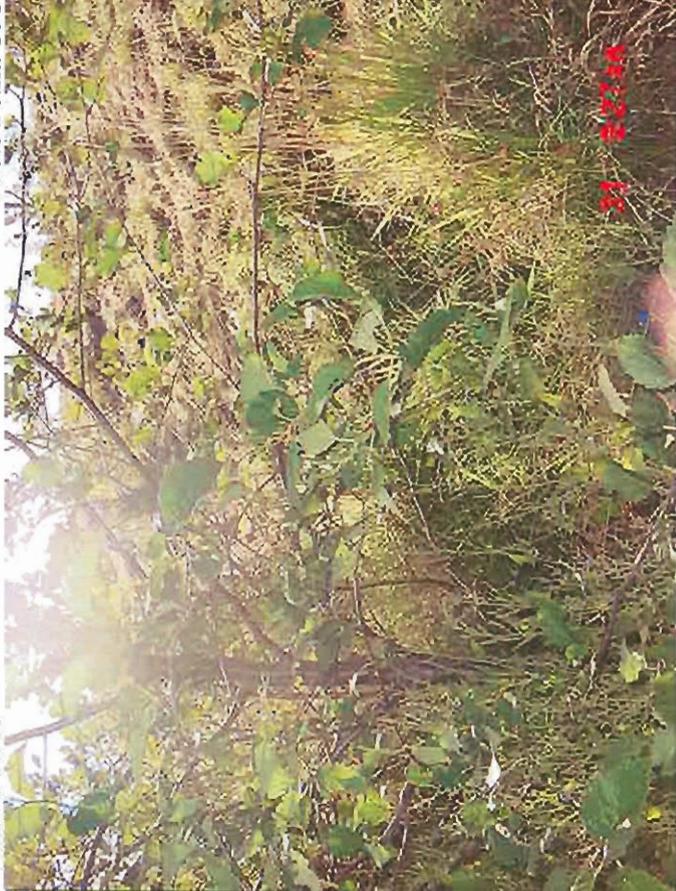
Photo Point: 10C



4:41:26 2/10/05

Date: 05/26/05

Photo Point: 10C



3:1 2:23 AM

Date: 8/31/06

Photo Point: 10C

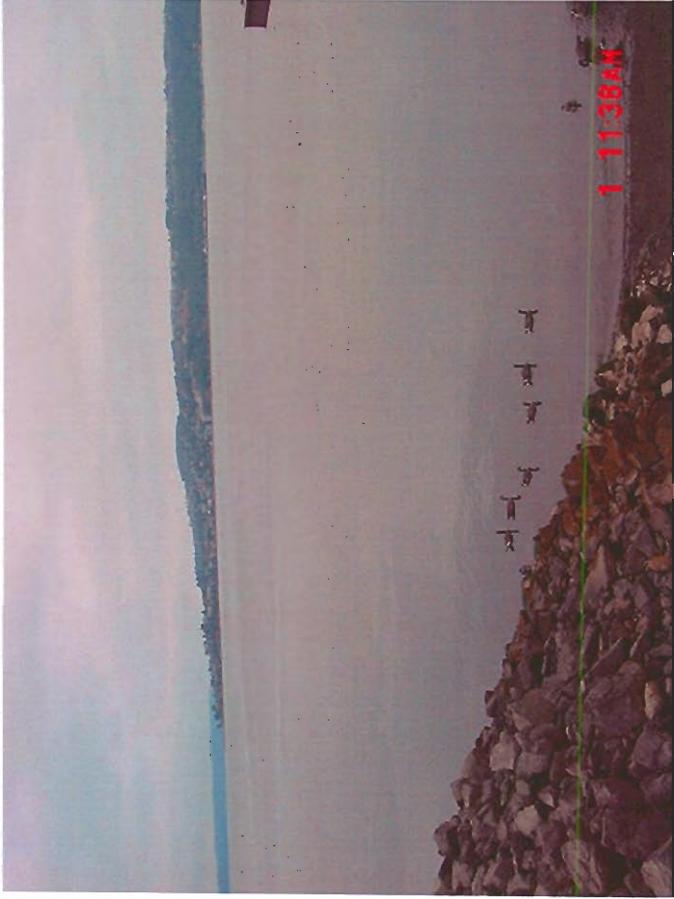
Date: 05/26/05

Photo Point: 10C

Date: 8/31/06

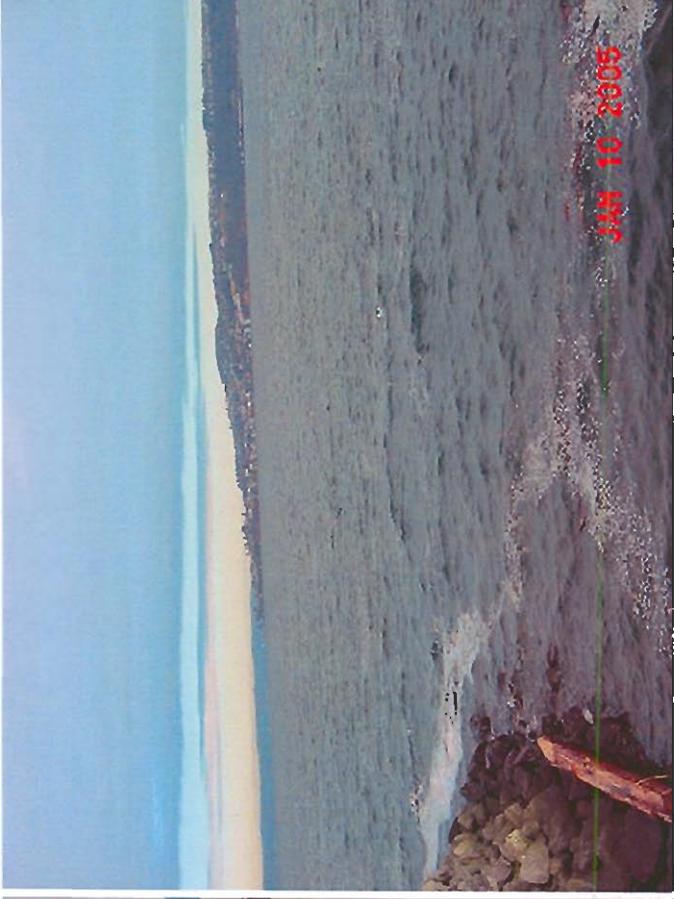
Photo Point: 10C

APPENDIX A: Tahoma Salt Marsh — Year 1 to Year 3 Photos



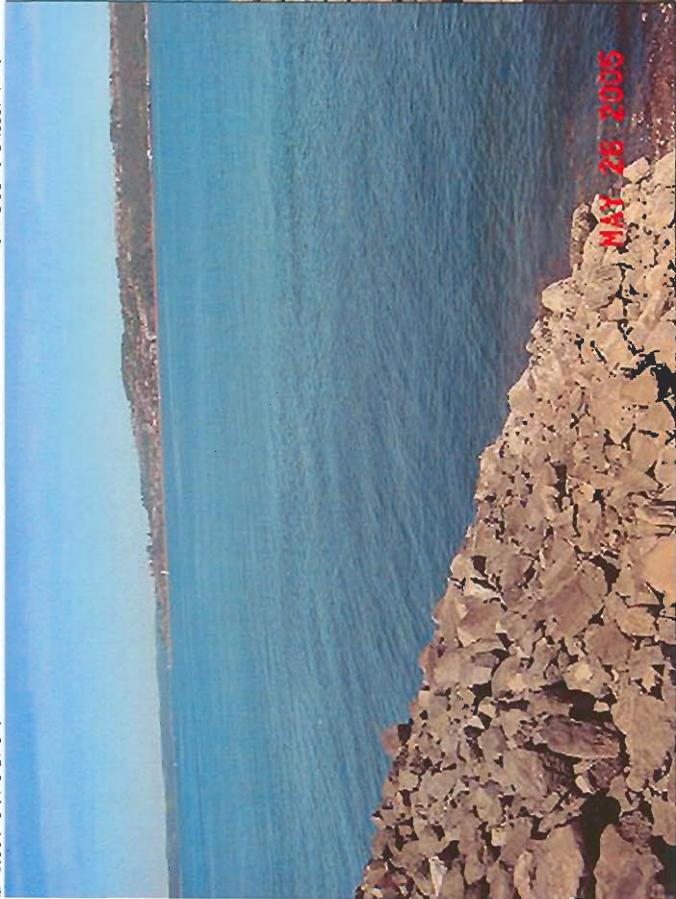
Date: 07/01/04

Photo Point: 11A



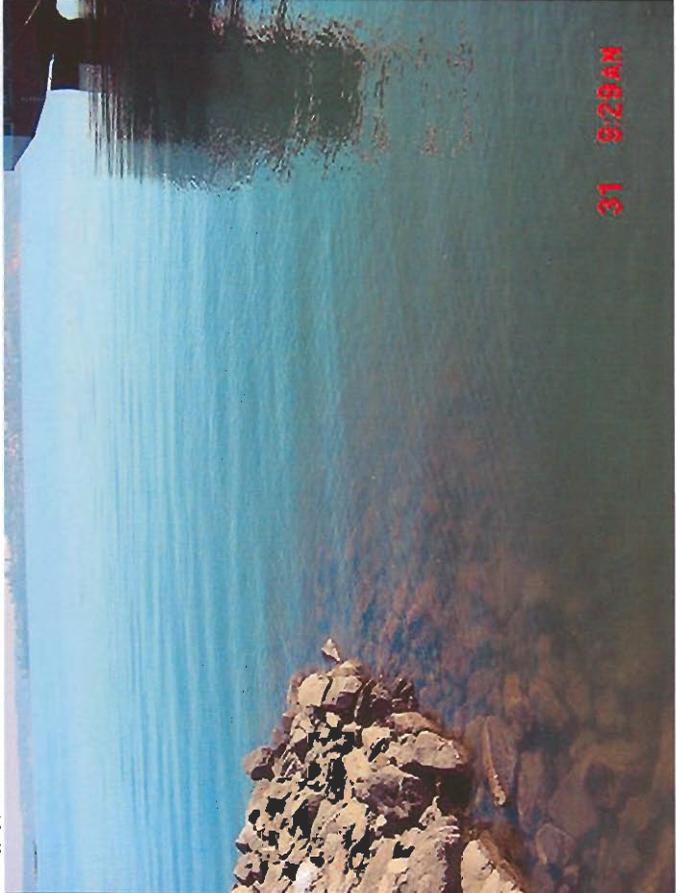
Date: 1/10/05

Photo Point: 11A



Date: 05/26/05

Photo Point: 11A



Date: 8/31/06

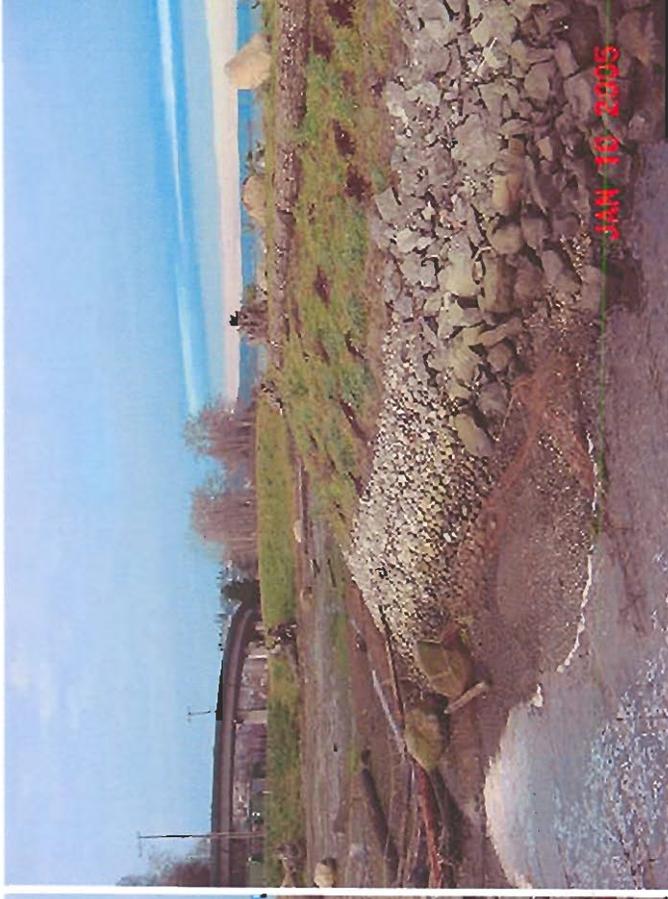
Photo Point: 11A

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



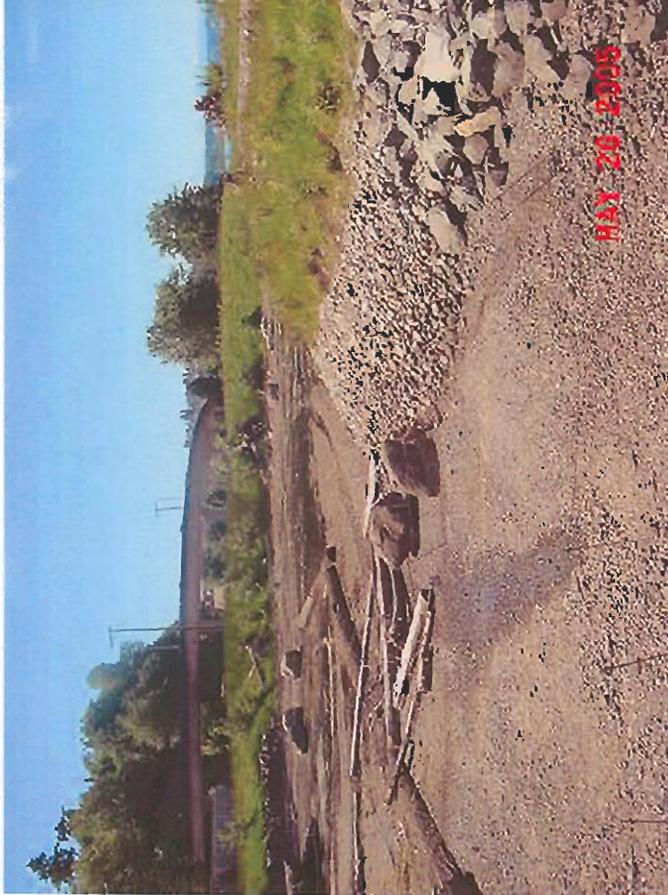
Date: 07/01/04

Photo Point: 11B



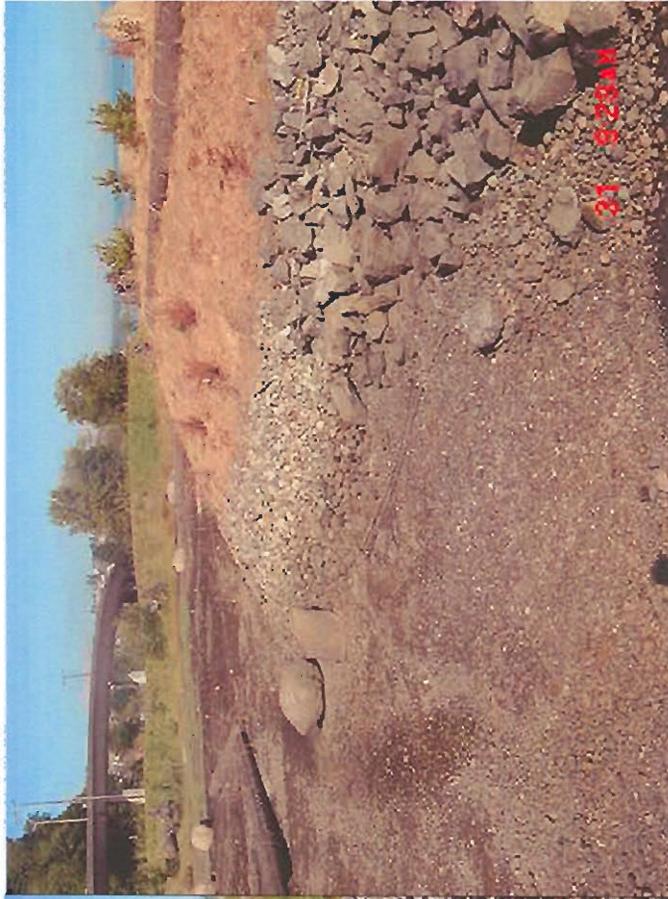
Date: 1/10/05

Photo Point: 11B



Date: 05/26/05

Photo Point: 11B



Date: 8/31/06

Photo Point: 11B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



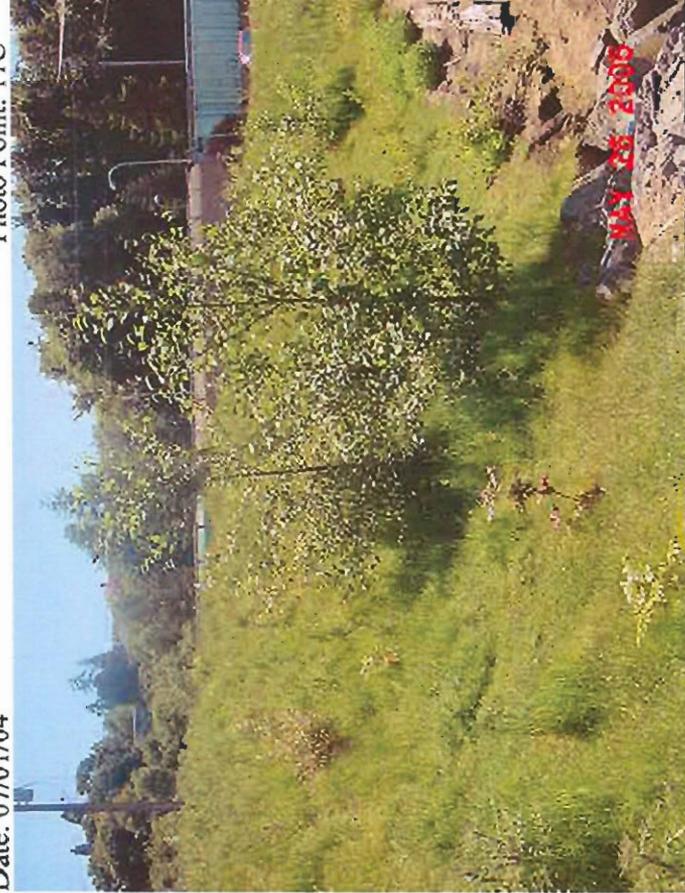
Date: 07/01/04

Photo Point: 11C



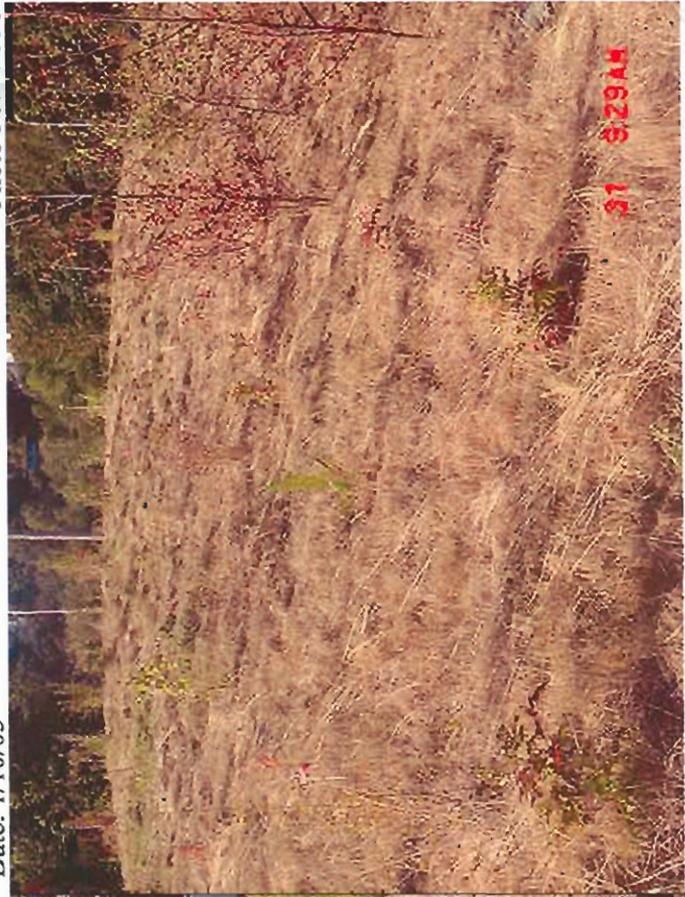
Date: 1/10/05

Photo Point: 11C



Date: 05/26/05

Photo Point: 11C



Date: 8/31/06

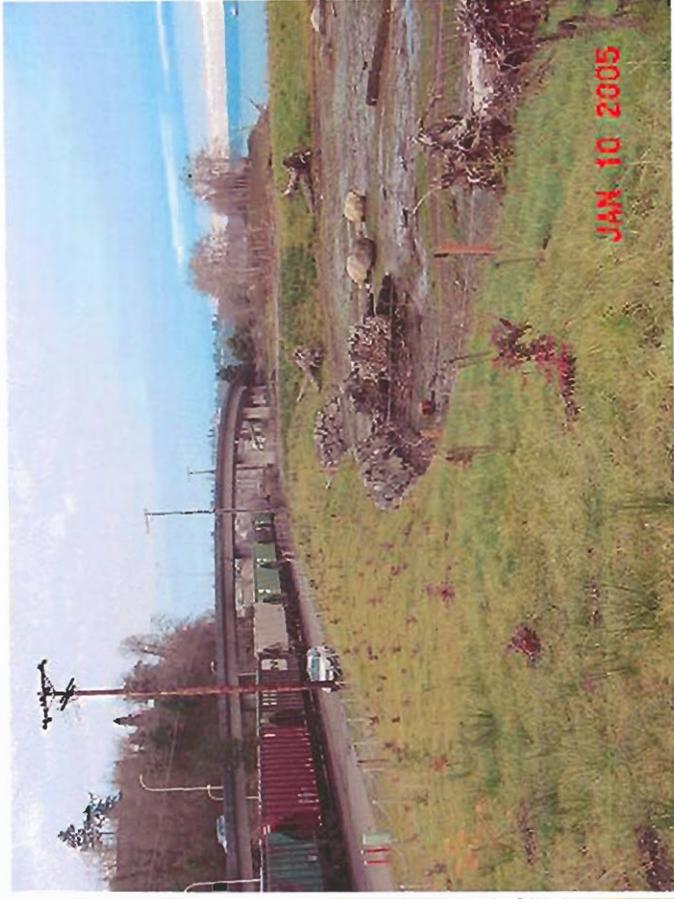
Photo Point: 11C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 12A



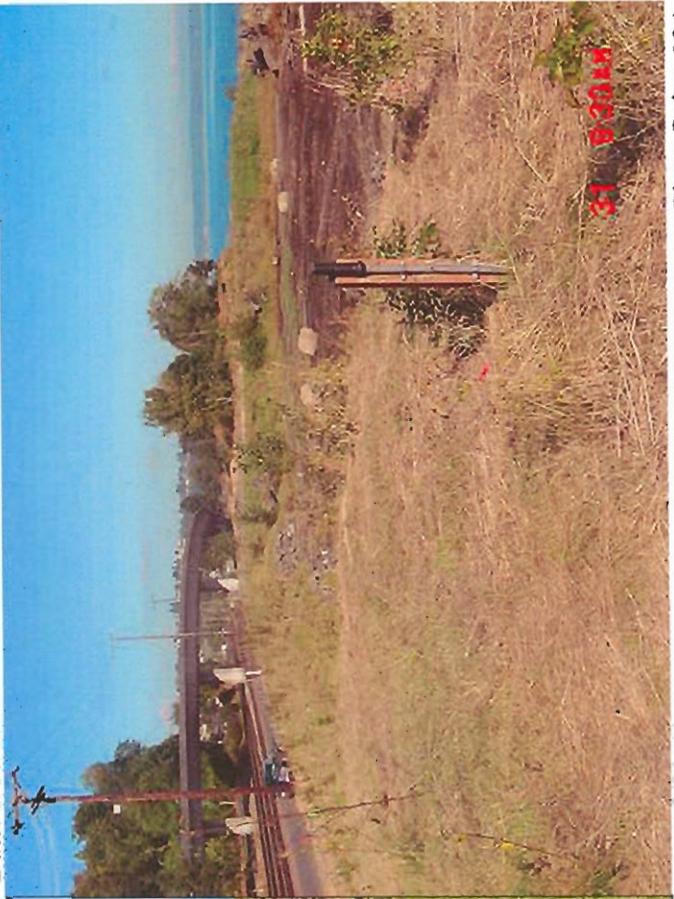
Date: 1/10/05

Photo Point: 12A



Date: 05/26/05

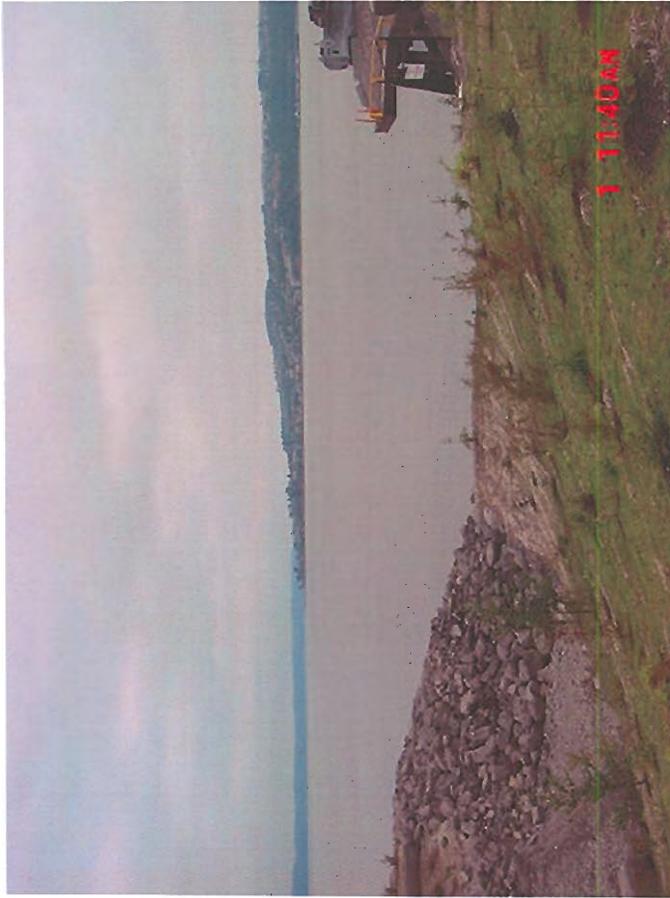
Photo Point: 12A



Date: 8/31/06

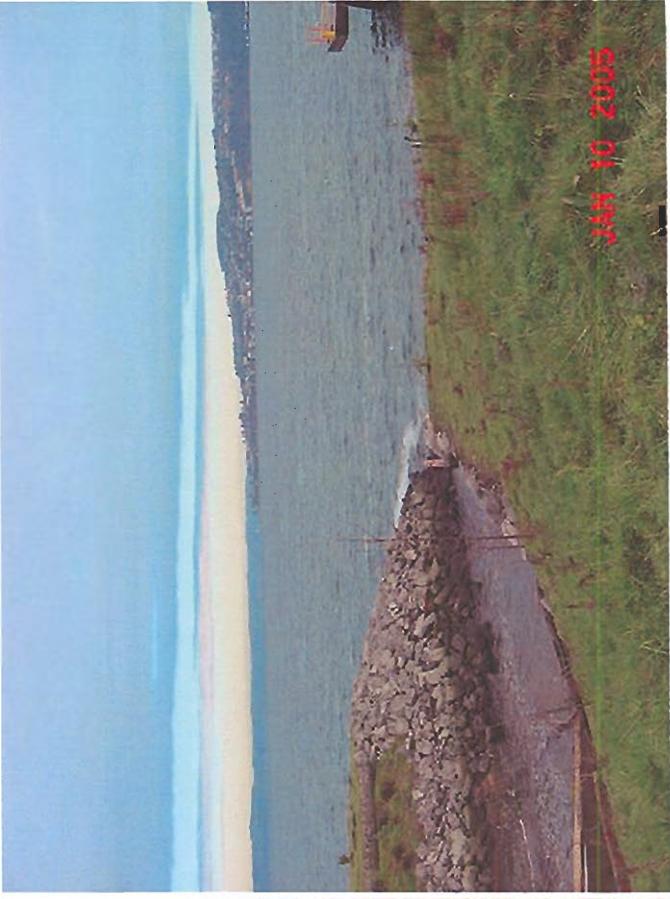
Photo Point: 12A

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



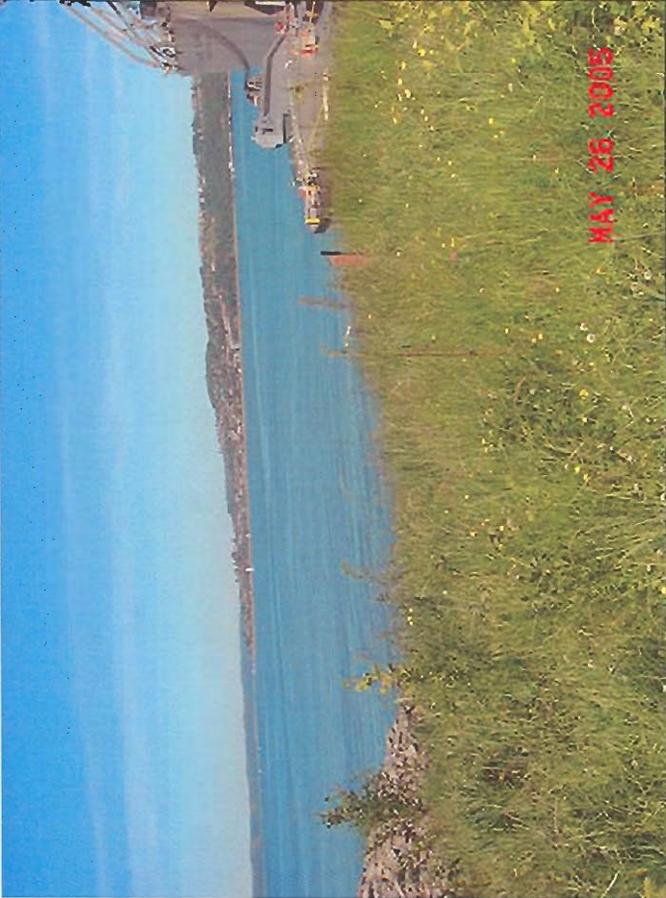
Date: 07/01/04

Photo Point: 12B



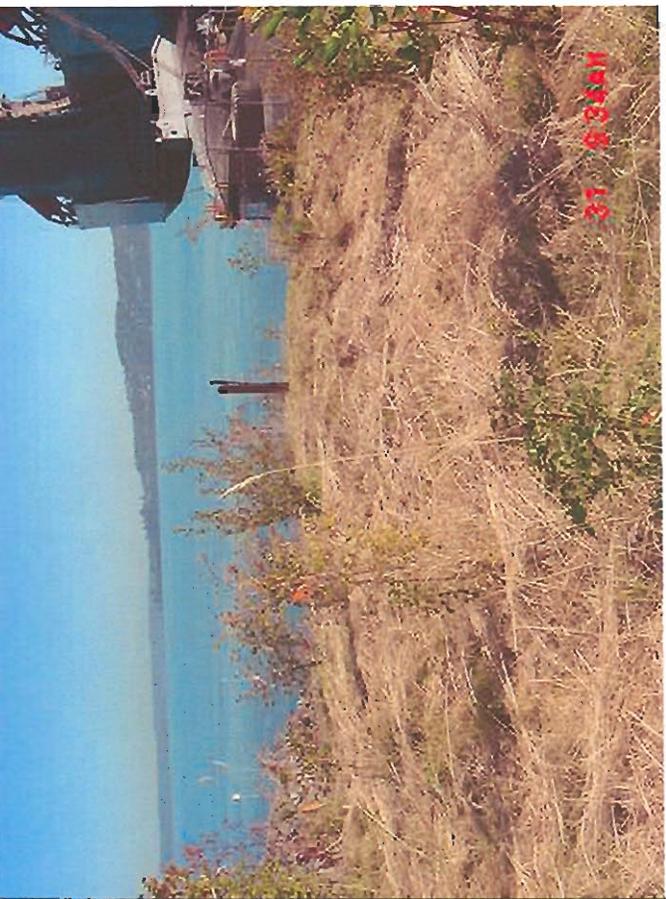
Date: 1/10/05

Photo Point: 12B



Date: 05/26/05

Photo Point: 12B



Date: 8/31/06

Photo Point: 12B

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



Date: 07/01/04

Photo Point: 12C



Date: 1/10/05

Photo Point: 12C



Date: 05/26/05

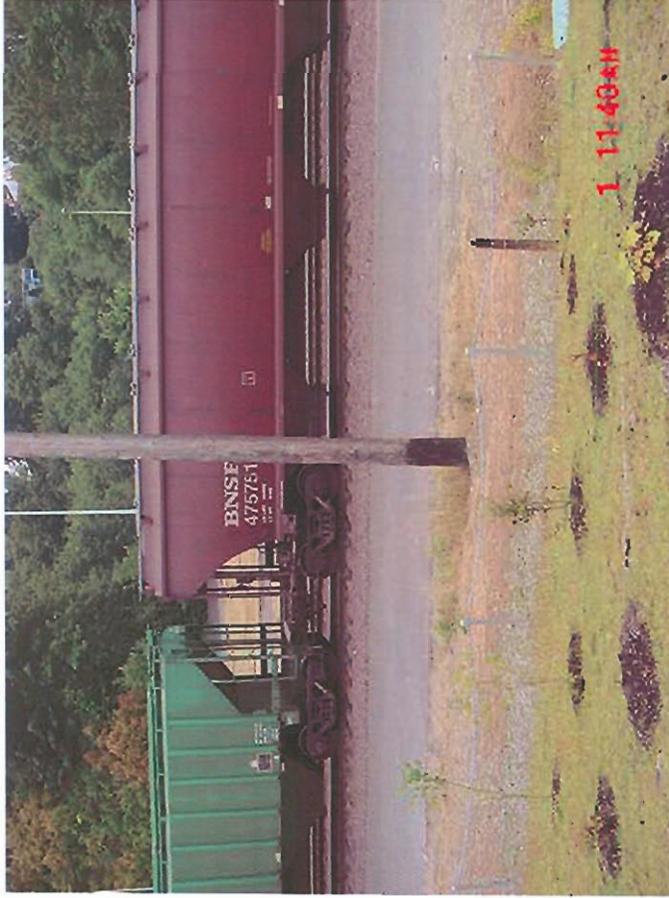
Photo Point: 12C



Date: 8/31/06

Photo Point: 12C

APPENDIX A: Tahoma Salt Marsh – Year 1 to Year 3 Photos



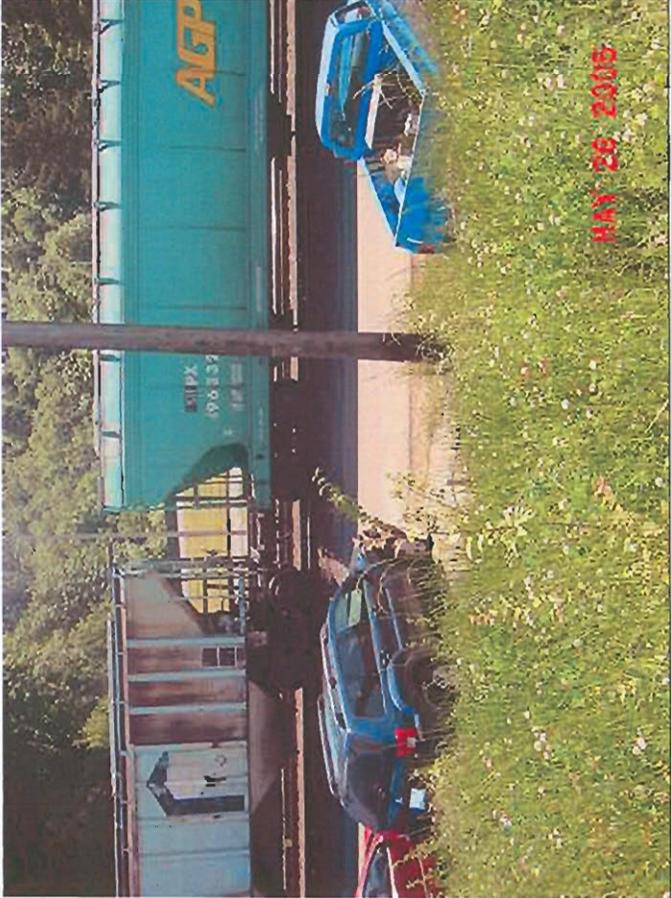
Date: 07/01/04

Photo Point: 12D



Date: 1/10/05

Photo Point: 12D



Date: 05/26/05

Photo Point: 12D



Date: 8/31/06

Photo Point: 12D

APPENDIX B

VISUAL INSPECTIONS: FIELD NOTES

**Tahoma Salt Marsh Restoration
Monitoring Report Form**

Date 7/1/04

Year: Y1Q1 Y1Q2 Y1Q3 Y1Q4
Y2Q1 Y2Q2 Y2Q3 Y2Q4 3 4 5

Staff Present: D. Dooley

Weather Conditions: Sunny Low tide -3.0
Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Salt Marsh Area	Comments
Erosion	—	some	behind log berms, seems to have equalized since insta
Sedimentation	—	—	
Wildlife	yes	yes	geese, killdeer
Vegetation			grass coming in nicely.
Invasive	yes		thistle on peninsula
Volunteer	yes		weedy species.
Survival (%)	95%	??	sm - so small - can tell better in spring.
Animal Damage	yes		geese eating grass
Disease	—	—	n/a
Trash	—	—	n/a
Vandalism	—	—	n/a
Large Organic Debris		X	1 piece

Wildlife Observed: geese, killdeer, GBH seen in previous visit. *fish @ outfall (pic) jellyfish seen @ outfall. Crows/Seagulls.

SM: Soil/Sediment Quality: soil in sm is firming up nicely.
Odor: n/a
Sheen: n/a
Color: brown
Texture: sandy

Notes: Definitely tell b/t irrigated & non-irrigated areas (green vs. brown) - Plants OK
FED is 3/4 done - Restraining w/of 7/12/04.
Gumweed doing well (pic)

Some willows didn't make it due to tidal inundation.
Oceanspray on top of berms where irrigation water ponds have died.
Willows to be planted on top of riparian berms (w)
→ other than these fatalities → veg. looks good

Photo Points:

Disk Count: ① ② 3

1	2A	2B	2C	2D	3A
D2, 3	D2, 1	D2, 2	D1, 30	D1, 31	D1, 26

3B	3C	3D	4A	4B	5A
D1, 27	D1, 28	D1, 29	D2, 4	D2, 5	D2, 7

5B	5C	5D	6A	6B	6C
D2, 8	D2, 9	D2, 6	D1, 25	D1, 23	D1, 24

7	8A	8B	9A	9B	9C
D1, 22	D2, 14	D2, 15	D2, 12	D2, 13	D2, 10

9D	10A	10B	10C	11A	11B
D2, 11	D2, 19	D2, 17	D2, 18	D1, 15	D1, 17

11C	12A	12B	12C	12D	
D1, 16	D1, 18	D1, 19	D1, 20	D1, 21	

Quantitative Measurements:

Sediment Stake #	Current Measurement (cm)	Year 1	3	5
		Starting Measurement (cm)		
1	not measured @ this time			
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Erosion and Sedimentation Key Locations of Concern:

Tidal channel - n/a

Salt marsh substrate - n/a

Soil fill behind log berms: some, looks to be equalizing

Stormwater swales - n/a

Tidal channel side slopes - n/a

Slopes b/t riparian area and salt marsh - n/a

Riparian mounds - n/a

Fish mix in voids - yes - fish mix appears to have disappeared ≈ 20%

30" Stormwater outfall - no

**Tahoma Salt Marsh Restoration
Monitoring Report Form**

Date 5/26/05

Year: Y1Q1 Y1Q2 Y1Q3 Y1Q4
Y2Q1 Y2Q2 Y2Q3 Y2Q4 3 4 5

Staff Present: D. Padem

Weather Conditions: Sunny 70-80°

Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Salt Marsh Area	Comments
Erosion			n/a
Sedimentation			n/a
Wildlife			pigeon geese
Vegetation			
Invasive	X		Canada thistle, bog rush
Volunteer		X	brass buttons @ high tide line.
Survival (%)			90% in rip / ↓ in sm
Animal Damage			n/a
Disease			n/a
Trash			n/a
Vandalism	X		Irrigation system head removed, but
Large Organic Debris		X	Yes! now fixed.

Wildlife Observed: pigeon geese

Soil/Sediment Quality:

Odor: no

Sheen: no

Color: brown w/ dark brown & bright green algae?

Texture: consistent, sandy, coarse, gravels.

Notes: needs weeding around individual plants
very few pickleweed
wh leaves, needs to be weed wacked in riprap
Canada thistle
Shore pine → lots of new candle
Roots Rose → flowering
Woody debris seems to have increased
since winter monitoring.

Photo Points:

Disk Count: 1 2 3

1	2A	2B	2C	2D	3A
D1, 26	D1, 25	D1, 22	D1, 23	D1, 24	D1, 27

3B	3C	3D	4A	4B	5A
D1, 26	D1, 29	D1, 28	D1, 20	D1, 21	D1, 17

5B	5C	5D	6A	6B	6C
D1, 18	D1, 19	D1, 20	D2, 5	D1, 31	D1, 30

7	8A	8B	9A	9B	9C
D2, 6	D1, 13	D1, 14	D1, 9	D1, 12	D1, 11

9D	10A	10B	10C	11A	11B
D1, 10	D2, 9	D2, 8	D2, 7	D2, 14	D2, 15

11C	12A	12B	12C	12D	
D2, 16	D2, 12	D2, 13	D2, 10	D2, 11	

Quantitative Measurements:

Year 1 3 5

Sediment Stake #	Current Measurement (cm)	Starting Measurement (cm)
1	/	
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

not measured @ this time

Erosion and Sedimentation Key Locations of Concern:

Tidal channel	n/a
Salt marsh substrate	n/a
Soil fill behind log berms	minimal
Stormwater swales	n/a
Tidal channel side slopes	n/a
Slopes b/t riparian area and salt marsh	n/a
Riparian mounds	n/a
Fish mix in voids	Minimal - still visible in voids
30" Stormwater outfall	low tide newing - no change

**Tahoma Salt Marsh Restoration
Monitoring Report Form**

Date 8/30/06

Year: Y1Q1 Y1Q2 Y1Q3 Y1Q4
Y2Q1 Y2Q2 Y2Q3 Y2Q4 (3) 4 5

Staff Present: WCC - Shave, Melody Britkany, Sara, Ryan, Jesse
Weather Conditions: Fair, partly cloudy
Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Salt Marsh Area	Comments
Erosion	<u>None</u>	<u>Some</u>	<u>near the inlet of commencement bay and near the storm water swales</u>
Sedimentation	<u>None</u>	<u>Yes</u>	<u>around culverts, behind logs</u>
Wildlife	<u>Yes</u>	<u>Yes</u>	
Vegetation	<u>—</u>	<u>—</u>	
Invasive	<u>Yes</u>	Yes	<u>Riparian: Thistle, Himalayan Blackberry, Trillium, Buttercup</u>
Volunteer	<u>Yes</u>	<u>Yes</u>	<u>Riparian: Thistle, Blackberry, Buttercup, Willow Marsh: atriplex, Petaluma salt grass</u>
Survival (%)	<u>85%</u>	<u>80%</u>	
Animal Damage	<u>Yes</u>	<u>Yes</u>	<u>Riparian: Nibbles on tree trunks Marsh: Nibbles on grass</u>
Disease	<u>None</u>	<u>None</u>	
Trash	<u>Yes</u>	<u>Minimal</u>	<u>Riparian: Beer bottles, snack food wrappers Marsh: Waxed up shoes</u>
Vandalism	<u>Yes</u>	<u>None</u>	<u>sprinklerheads were tampered with</u>
Large Organic Debris	<u>None</u>	<u>Yes</u>	<u>Marsh: 4 inch diameter branches and 6 logs</u>

Wildlife Observed: Deer, Geese, Rats, seagulls, Crickets, Hawks, Crabs, Eagles, Pidgeons, Banana Slices, Bull Heats, Crows

Soil/Sediment Quality:

Odor: normal
Sheen: normal aerobic excitation present
Color: slight redish-brown
Texture: sandy loam

Notes: Large woody debris are destroying geese exclusions

Photo Points:

Disk Count: 1 2 3

1	2A	2B	2C	2D	3A
Disk 1-1	D1-2	D1-3	D1-4	D1-5	D1-6
3B	3C	3D	4A	4B	5A
D1-7	D1-8	D1-9	D1-10	D1-11	D1-12
5B	5C	5D	6A	6B	6C
D1-13	D1-14	D1-15	D1-16	D1-17	D1-18
7	8A	8B	9A	9B	9C
D1-19	D1-20	D1-21	D1-22	D1-23	D1-24
9D	10A	10B	10C	11A	11B
D1-25	D1-26	D1-27	D1-28	D1-29	D1-30
11C	12A	12B	12C	12D	
D1-31	D1-32	Disk 2-1	D2-2	D2-3	

Quantitative Measurements:

Year ~~1~~ 3 5

Sediment Stake #	Current Measurement (cm)	Starting Measurement (cm)
1	14.605 cm	
2	10.795 cm	
3	19.685 cm	
4	20.320 cm	
5	19.050 cm	
6	10.795 cm	
7	15.240 cm	
8	16.510 cm	
9	17.145 cm	
10	19.685 cm	
11	Under Water	

Erosion and Sedimentation Key Locations of Concern:

Tidal channel \circledast nothing of concern

Salt marsh substrate \circledast erosion from culvert flow, esp. @ joint of logs between S5 & S8

Soil fill behind log berms \circledast Yes, at most logs

Stormwater swales \circledast small sediment accumulation channels; some slight erosion

Tidal channel side slopes \circledast good shape

Slopes b/t riparian area and salt marsh \circledast slight erosion near inlet between P11 & P10

Riparian mounds \circledast good shape

Fish mix in voids \circledast gone

30" Stormwater outfall \circledast

Picture #

gravel channels