



THEA FOSS AND WHEELER-OSGOOD WATERWAYS REMEDIATION PROJECT

YEAR 0 BASELINE MONITORING

HABITAT MITIGATION AREA MONITORING PRELIMINARY FINDINGS MEMORANDUM

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Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY

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PRELIMINARY FINDINGS MEMORANDUM HABITAT MITIGATION AREA MONITORING

INTRODUCTION

This memorandum presents the findings from the Year 0, baseline habitat mitigation area monitoring performed at the Thea Foss Waterway habitat mitigation and enhancement area sites. This habitat mitigation area monitoring was performed in accordance with the Operations, Maintenance, and Monitoring Plan (OMMP) for the Thea Foss and Wheeler-Osgood Waterways Remediation Project (City of Tacoma 2006). The OMMP requires that various components of habitat mitigation monitoring occur throughout the first ten years following completion of the remedial action. After 10 years of monitoring, the City and EPA will evaluate the need for and scope of additional monitoring. A summary of the habitat area monitoring activities performed during this baseline monitoring year is provided in Table 1.

The following sections summarize the habitat mitigation area monitoring requirements and the findings of these inspections. As described in the OMMP, both the habitat mitigation areas (North Beach Habitat, Middle Waterway Tidelat Habitat, Puyallup River Side Channel, and the Hylebos Creek Mitigation Site) and the Thea Foss Habitat Enhancement Areas (Johnny's Dock Habitat Enhancement, Head of Thea Foss Shoreline Habitat, SR 509 Esplanade Riparian Habitat, and the Log Step Habitat Enhancement) were inspected. Monitoring activities were performed in accordance with the OMMP. Provided with this memorandum are attachments that contain copies of the field forms and photographs documenting observations and site conditions identified during the inspections.

SUMMARY OF HABITAT MITIGATION AREA BASELINE MONITORING REQUIREMENTS

The OMMP specifies that habitat mitigation monitoring be performed to achieve the following objectives:

- To evaluate the effectiveness of the development of biological features and physical features at the mitigation and enhancement sites to confirm that they are on a trajectory to provide habitat function necessary to meet the objectives for each site; and
- To confirm that the habitat sites have attained and continue to meet the objectives for each site over time.

As required by the OMMP, habitat monitoring activities are generally performed when tidal elevations are below 0.0 feet Mean Lower Low Water (MLLW) except at the Hylebos Creek Mitigation Site where the primary monitoring activities are performed when tidal elevations are below 8.78 feet MLLW.

Standardized field forms are used to document observations of conditions at the sites. The following types of information are recorded during the monitoring activities:

- Various qualitative observations including evidence of erosion or sedimentation, evidence of damage or disease, and condition of large woody debris and goose exclosures;

- Conditions/types of vegetation;
- Species of wildlife observed; and
- Soil/sediment quality.

In addition, photographs are taken during the inspection at designated photo point locations to allow for comparison in subsequent monitoring years. Additional photographs are taken at high tide at the Hylebos Creek Mitigation Site to show conditions at the site during periods of tidal inundation.

Additional baseline monitoring activities include installation and photographing of elevation stakes to monitor sediment erosion/accretion over time at the mitigation areas; brackish marsh monitoring at the Middle Waterway Tideflat Habitat to track the effectiveness of the irrigation system; and surface water elevation monitoring at the Hylebos Creek Mitigation Site.

SUMMARY OF FIELD ACTIVITIES

Year 0 baseline habitat monitoring activities were initiated in April 2006 with the placement of the surface water elevation monitoring probe at the Hylebos Creek Mitigation Site. Salinity monitoring at the Middle Waterway Tideflat Habitat was performed in May, July, August, and September 2006. Qualitative ground surveys, photo documentation, and elevation monitoring were initiated in July 2006. The surface water elevation monitoring at Hylebos Creek was completed on November 2, 2006. A site-by-site discussion follows. Copies of the inspection forms, photographs, and survey information are included in Attachment A.

Mitigation Site Monitoring Activities

NORTH BEACH HABITAT

The St. Paul Beach Habitat, Peninsula Habitat, and Middle Waterway Corridor Habitat areas as defined during the construction process are collectively referred to as the North Beach Habitat. These habitat areas are buffered from upland activities by a 10- to 20-foot wide riparian buffer.

The completed St. Paul Beach portion of the habitat area is composed of low gradient, fine grained beach habitat. The beach slopes at a low angle (10H:1V or flatter) to approximately 8 feet MLLW and is composed of habitat mix. The beach then slopes more steeply upward (approximately 3H:1V), meeting the St. Paul Confined Disposal Facility (CDF) berm at an elevation of approximately 13.5 feet MLLW. The beach surface in this area is comprised of habitat mix and rounded cobbles similar to the nearby Olympic View Resource Area beach. The containment berm face and the adjacent area are planted with native plants to form a riparian buffer.

The peninsula portion of the habitat area is composed of restored littoral habitat including a continuation of the shallow water habitat contours of the St. Paul Beach. Over 1,900 creosote treated piles were removed from this area so that the existing contours could be covered with sand ranging in depth from six inches to several feet. This portion of the habitat area includes the development of an undulating band of marsh habitat at an elevation of 10 feet MLLW to 12 feet MLLW, above the steeper transition between 8 feet MLLW and 10 feet MLLW. The upper beach slopes to a relatively low pass across the central area of the peninsula. This pass allows juvenile salmonids moving across the face of the St. Paul Beach at tides above MLLW to continue their migration in relatively protected shallow water into the entrance of the Middle

Waterway. North of the pass, the habitat area rises to an offshore shoal or reef at 12 feet MLLW. This shoal partially shelters areas to the south and east from waves from the northwest.

Existing uplands at the tip of the Middle/St. Paul Peninsula have been cut back and excavated to provide new marine habitat area at the southwest corner of the site. Eight nodes of marsh species appropriate for lower and upper saltmarsh elevations are planted in this habitat area. Large woody debris has been placed in the southwest corner to increase habitat complexity and to provide protective cover for juvenile salmonids.

The Middle Waterway Corridor portion of the habitat area consists of a narrow shoreline that connects the peninsula portion of the site with the broad mudflats and brackish marsh in the southern portion of Middle Waterway. Approximately 250 feet of stacked concrete bulkhead along the east shore of the Middle Waterway were removed and the slope protected with a thick slope cap and habitat mix. This design provides shallow-water, fish-passable shoreline access to and from the inner Middle Waterway habitat areas during most tidal conditions.

Performance standards for this site include minimal change in elevation; development of saltmarsh and riparian vegetation coverage; and juvenile salmonid presence. Performance standards are intended to ensure that created aquatic and riparian habitat are maintained over time, and to verify that habitat is not lost in the future. Note that for this habitat area, saltmarsh performance standards apply to only five of the eight nodes; the three nodes planted in the most exposed areas of the site were planted on a pilot basis and do not have performance standards associated with them.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 11, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -3.0 feet MLLW. Upon arrival, there were some Canada Geese, Caspian Terns, seagulls, great blue heron, crows, cormorant, pigeon guillemot, a white fronted goose, and a harbor seal present at the site. No significant amounts of erosion or sedimentation were identified at the site, however, a slight amount of material movement at the toe of the slope near Photo Point 3 was noted. There were no indications of animal damage, disease, or vandalism found, and only minimal amounts of trash. One piece of a containment boom had floated onto the beach, and will be removed and placed on the upland area near the drainage ditch per Simpson's request. Both the goose exclusion grid and the large woody debris were in place and in good condition and no maintenance activities on these elements were determined to be necessary.

Since the time of the inspection, more erosion of the toe of the slope at the exposed face has been identified. The City has been in contact with both EPA, and a coastal geologist from the Washington State Department of Ecology to discuss corrective actions for this area. A site meeting is planned for early December to assess the situation and to determine follow-up actions.

During the July inspection, the surface soils in the riparian area were noted to be brownish sandy topsoil, and the soils in the aquatic area were brown to brownish-gray cobbly to silty sand. There was no indication of odor or sheen in either area. Overall, there was no apparent site disturbance and no follow-up actions were needed.

The site had been planted in accordance with the approved planting plans. A combination of pickleweed and saltgrass were planted in eight marsh planting nodes. Of these, three are considered pilot nodes due to their exposure. It was noted during the inspection that the

grasses were doing relative poorly in all of the marsh areas, while the pickleweed was doing fairly well in most of the nodes. Overall, there was an estimated 50% survival rate of the plantings in the nodes.

The riparian area is planted with a combination of American dunegrass, Hooker's willow, and oceanspray. Overall, there was an estimated 90% survival rate for the riparian plantings. There were no volunteer species in either the marsh or riparian area, but a few invasive weeds were present in the riparian area, including clover and thistle. Minor weeding of this area is therefore required.

Photo Documentation – Six permanent photo points were established at the locations shown on Figure E-5 of the OMMP. A total of 17 photographs were taken at these points at tidal elevations ranging from approximately -1.66 feet MLLW to 1.91 feet MLLW. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

Elevation Monitoring – Five elevation stakes were placed at the locations shown on Figure E-5 of the OMMP. These graduated stakes are embedded one-foot into the ground and two feet of the stake is visible above ground. One-inch increments are marked on the stakes both above and below the ground surface to allow for measurement of erosion/sedimentation in subsequent monitoring years. The stakes were surveyed following installation to allow for replacement if needed, and the top and ground surface elevations were also measured. Photographs showing the elevation stakes in place are included in Attachment A.

MIDDLE WATERWAY TIDEFLAT HABITAT

The Middle Waterway Tideflat Habitat with its associated mudflats and tidal channel was constructed on excavated uplands and existing tideflat along approximately 1,450 linear feet of the 1,800-foot long eastern shoreline of the Middle Waterway. This habitat area begins immediately south of the relocated log haul out and immediately to the north of the existing Trustees/Simpson pilot restoration project site along the southeast side of the waterway, and across Middle Waterway from the City's NRDA settlement restoration project and the Middle Waterway Action Committee shoreline restoration project.

The habitat area was excavated from elevations of 18 feet MLLW down to approximately 0 feet MLLW. A meandering tidal channel was excavated down to -4 feet MLLW at the north end, rising to -2 feet MLLW at the south end. The upper shoreline between 13 feet MLLW and 8 feet MLLW is enhanced with at least six inches of topsoil to support riparian plantings.

The marsh site is buffered from adjacent industrial activities with a 10- to 25-foot wide riparian area planted with native tree and shrub species. A freshwater sprinkler irrigation system irrigates approximately 40,000 sq. ft. of the site between elevation 11.5 feet MLLW and 12.5 feet MLLW for the purpose of establishing brackish marsh habitat. Freshwater flow is considered essential to the development of the desired emergent brackish marsh community at this habitat area. The brackish marsh is in the 10 feet MLLW to 13 feet MLLW elevation range, which varies between 10 and 60 feet in width. The irrigation system generally follows the 13 feet MLLW contour and is designed to reduce sediment pore water salinity in the elevation band between 11.5 feet MLLW and 12.5 feet MLLW.

Daily irrigation is controlled by an adjustable timer, sensor switch, and rain gauge, and can be adjusted to achieve the salinity and plant health requirements. The system automatically shuts

off when tidal elevations exceed 11.5 feet MLLW or when precipitation during the run time exceeds 0.1 inch. Typically the irrigation system will loop to irrigate for a short duration several times per day. For example, seven minutes of watering every 30 minutes, 24 hours per day, with no watering during high tide or heavy rainfall. The frequency and duration of watering may be adjusted depending on, but not limited to, field observations of soil and vegetation, pore water salinity monitoring results, and weather conditions.

Twelve 10- by 50-foot (3- by 15-meter) nodes of brackish marsh species have been planted in this zone. Plots are planted to stimulate development of a brackish marsh at the Middle Waterway Tideflat Habitat. Brackish marsh plantings consist of Lyngby's sedge (*Carex lyngbeyi*) and Seacoast bulrush (*Scirpus maritimus*). It is anticipated that these introduced brackish marsh plants will establish a seed source allowing expansion between the initial planting nodes.

Performance standards for this site include minimal change in elevation over time; development of a brackish marsh and riparian vegetation cover; and juvenile salmonid presence. Performance standards are intended to ensure that created aquatic and riparian habitat are maintained over time, and to verify that habitat is not lost in the future.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 11, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -3.0 feet MLLW. Upon arrival, there were some Canada Geese, great blue heron, gulls, crows, barn swallows, and violet green swallows present at the site. No significant erosion or sedimentation were identified at the site, however, some minor amounts of erosion from springs and seeps were observed, as expected. There were no indications of animal damage, disease, or vandalism, and only small amounts of trash present. Both the goose exclusion grids and the large woody debris were in good condition and no maintenance activities were determined to be necessary. Small amounts of bark were present at the site, likely from the log haul out facility located north of the habitat area. This bark did not appear to be impacting establishment of the marsh.

The surface soils in the aquatic area consisted of brown silty sand with some presence of algae. The surface soils in the riparian area were brown topsoil/sandy silt. There was no indication of odor or sheen in the riparian area and only small areas of organic sheen in the aquatic area. Overall, there was no apparent site disturbance and no follow-up actions were needed.

The site had been planted in accordance with the approved planting plans. A combination of Lyngby sedge and Seacoast bulrush were planted in 12 planting nodes between elevation 11.5 feet MLLW and 12.5 feet MLLW. A combination of trees and shrubs, including black cottonwood, red alder, shore pine, Douglas fir, big-leaf maple, Hooker's willow, oceanspray, Sitka willow, and red-flowering currant were planted in the riparian area. It was noted during the inspection that all of the plantings were doing very well, with 90% and 95% survival estimated in the marsh and riparian areas, respectively. Some weeds, including clover and thistle were present in the riparian area at the site, and minor weeding is needed. No volunteer species were observed in either the riparian or marsh area, but sources of pickleweed are present at the south end of the site and are expected to colonize in this area in a short time frame.

Photo Documentation – Four permanent photo points were established at the locations shown on Figure E-6 of the OMMP. A total of eleven photographs were taken at these points at tidal elevations ranging from approximately -3.25 feet MLLW to -2.77 feet MLLW. Copies of the

photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

Elevation Monitoring – Six elevation stakes were placed at the locations shown on Figure E-6 of the OMMP. These graduated stakes are embedded one-foot into the ground and two feet of the stake are visible above ground. One inch increments are marked on the stakes both above and below the ground surface to allow for measurement of erosion/sedimentation in subsequent monitoring years. The stakes were surveyed following installation to allow for replacement if needed, and the top and ground surface elevations were also measured. Photographs showing the elevation stakes in place are included in Attachment A.

Brackish Marsh Salinity Monitoring – Salinity of the substrate pore-water was monitored in the area where irrigation is being used to maintain conditions suitable for brackish marsh vegetation. Nine salinity monitoring locations were established at the locations shown on Figure E-6 of the OMMP. Six of these stations are located along the contour between 11.5 feet MLLW and 12.5 feet MLLW. In addition, there are three background monitoring locations. Figure E-6 of the OMMP shows the sample locations with their corresponding identification numbers. Salinity measurements were taken at a descending tide, approximately two hours after the tidal elevation had dropped below 11.5 feet MLLW.

In accordance with the OMMP, initial salinity measurements were taken prior to brackish marsh planting. Three rounds of samples were taken in May 2006 as the irrigation system was being adjusted and prior to plant installation. Results of the sampling performed for salinity can be found in Table 2. Data are included in Attachment B.

Plantings at the site were performed in June and July 2006. Following completion of planting in July, additional salinity measurements were taken monthly for three months in July, August, and September in accordance with the OMMP. These results are also shown on Table 2.

Performance criteria established for the salinity measurements are that, in Year 0, if less than 50% of the results meet the salinity threshold of 10 ppt, adjustment of the irrigation system may be needed if plants appear to be stressed. If that situation occurs, sampling is to be continued weekly as tides allow until the threshold is met.

Based on the results shown in Table 2, during the initial monitoring event on May 23, the criteria were exceeded at 4 of the 6 stations, and data could not be collected from the other two locations. Following adjustment to the system, and prior to planting, additional monitoring was performed. In these next two events, 5 out of 6 of the stations monitored in the brackish marsh zone met the 10 ppt criteria. In both sampling events, BW3 was the site that exceeded the threshold. Based on achievement of the performance criteria, the site was planted.

In the July and August monthly monitoring events, again, 5 of the 6 stations met the criteria. Different stations exceeded the criteria in these two events (i.e., BW2 in July and BW6 in August). In September, the third monthly sampling event was required. Prior to this time, an electrical failure had caused the system to shut down for a short period of time. The sampling performed during this period, 50% of the locations did not meet the salinity threshold, and a reading was not available for one of the sites. The system is now back in operation and the plants appear to be doing well. An additional round of sampling will be performed in late November/early December to confirm compliance with the performance criteria. Those results will be included in the Baseline Monitoring Report.

PUYALLUP RIVER SIDE CHANNEL

The Puyallup River Side Channel (PRSC) provides off-channel habitat intended for use by juvenile salmonids for rearing and refuge during their outmigration to the estuary. The project merged an existing isolated wetland and an adjacent parcel that was excavated to as deep as -2 feet MLLW from existing uplands, into a single off-channel habitat area. The existing flood control levee structure was breached following construction of a new levee to allow the river and the associated tidal hydrology to enter. The excavated channel and reconfigured existing wetland contain water during most tides.

A substantial area was left between about 6 feet MLLW and 13 feet MLLW to allow development of brackish marsh and riparian assemblages. The area on the inside of the existing Puyallup River dike has been planted with riparian vegetation. The mudflat areas below Ordinary High Water (OHW) have been left for natural colonization by native brackish marsh species (as occurred at the Gog-Le-Hi-Te site across the river).

Performance standards for this site include the development of riparian vegetation cover and juvenile salmonid presence. Performance standards are intended to ensure that created aquatic and riparian habitat are maintained over time, and to verify that habitat is not lost in the future.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 10, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -1.5 feet MLLW. Upon arrival, there were some Canada geese, marsh wren, gulls, crows, great blue heron, ducks, and killdeer present at the site. Only very minimal erosion on the old levee and sedimentation in the breach area were identified at the site. There were no indications of animal damage, disease, or vandalism, and only minimal trash was present at the site. Small quantities of organic material were present in the ends of the channels.

The surface soils in the upland area were gray, sandy gravel. Surface soils in the aquatic area ranged from dark brown to light gray, silty to silty sand. There was no indication of odor or sheen in the upland area and only small areas of organic sheen in the aquatic area. Overall, there was no apparent site disturbance and no follow-up actions were needed.

The site had been planted in accordance with the approved planting plans. A combination of trees and shrubs, including black cottonwood, red alder, shore pine, Douglas fir, big-leaf maple, hooker's willow, oceanspray, red-flowering currant, and Sitka willow were planted on the top of the old, cutdown levee. It was noted during the inspection that overall, the plants were doing very well, and there was a 95% survival rate estimated. Some weeds, including blackberry, thistle, and canary grass were present. Minor weeding of this area is therefore required. A few willows were noted to have volunteered in the upland area.

Photo Documentation – Six permanent photo points were established at the locations shown on Figure E-7 of the OMMP. A total of ten photographs were taken at these points at tidal elevations ranging from approximately -3.10 feet MLLW to -0.83 feet MLLW. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

Elevation Monitoring – Six elevation stakes were placed at the locations shown on Figure E-7 of the OMMP. These graduated stakes are embedded one-foot into the ground and two feet of the

stake is visible above ground. One-inch increments are marked on the stakes both above and below the ground surface to allow for measurement of erosion/sedimentation in subsequent monitoring years. The stakes were surveyed following installation to allow for replacement if needed, and the top and ground surface elevations were also measured. Photographs showing the elevation stakes in place are included in Attachment A.

HYLEBOS CREEK MITIGATION SITE

Hylebos Creek is the major tributary to the Hylebos Waterway. The project area is located on the right bank of lower Hylebos Creek. Hylebos Creek has a large watershed, the majority of which extends north into King County. The project site is bordered by the 4th Street Bridge at its southern end and the stream reach lies completely within the saltwater wedge associated with Commencement Bay's tidal prism. Approximately 400 feet of creek reach is within the project area. The total project area includes a riparian/forested wetland enhancement and created aquatic habitat.

On-site native vegetation includes: Oregon ash, red osier dogwood, salmonberry, and black cottonwood. This project complements the neighboring restored areas, including the Milgard mitigation project and the NRDA Trustees' Jordan project. Both projects are located to the south of the Hylebos Creek Mitigation Site. The Jordan project is designed to provide off-channel salmon habitat to the east of the creek's bank, while the Milgard project restored the creek's western wetland buffer. The Hylebos Creek Mitigation Site adds to the area's habitat value and extends the wildlife corridor already established.

Habitat in this area was enhanced within a linear band paralleling Hylebos Creek. Enhancements included removal of non-native invasive Himalayan blackberry, reed canary grass, and yellow-flag iris. These species were replaced with native plants appropriate to the new hydrological regime, including Sitka willow, Sitka spruce, nootka rose, mock orange, hooker's willow, and oceanspray.

Where possible with the least disturbance to native vegetation, small channel "fingers" were excavated into the existing bank to allow water inundation during periods of high freshwater flows or tidal surges. The off-channel area provides habitat for the creek's out-migrating juvenile salmonids that need refuge areas while acclimatizing to saltwater. The added aquatic habitat, water retention and wetland enhancement provide a more diverse habitat and increased wildlife protection by screening it from the adjacent open areas. Preservation of the existing mature native bankside vegetation allows for the continued contribution of leaf litter, shade, and nutrients to the creek.

Performance standards for this site include minimal change in elevation; development of forested wetlands vegetative cover; water surface elevation of 2 feet (NGVD 29) at least 30% of the time, and juvenile salmonid presence. Performance standards are intended to ensure that created aquatic habitat is maintained over time, and to verify that habitat is not lost in the future.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 11, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately 2.0 feet MLLW. Upon arrival, there were some violet green swallows, goldfinch, red-tail hawk, flycatchers, barn swallows, belted kingfishers, and mallard ducks present at the site. No significant erosion and only minor sedimentation were identified at the site. There were no indications of disease or trash, and only minor herbivory of the grasses. There was some indication of human presence at the site

based on the movement and stacking of some of the rocks. The large woody debris that is currently in place were in good condition although one anchor required repair. Additional large woody debris, and some smaller branches, will be placed at the site before the end of 2006 in accordance with discussions held during the final site approval.

The upland surface soils were light brown gravelly sand and surface soils in the aquatic areas were brown to gray, sandy silt to gravelly sand. There was no indication of odor or sheen in either area. Overall, there was no apparent site disturbance and no follow-up actions were needed.

The site had been planted in accordance with the approved planting plans. The upland forest had been planted with a variety of trees and shrubs, including Douglas fir, Sitka spruce, big-leaf maple, shore pine, thimbleberry, oceanspray, snowberry, mock orange, kinnickinick, western service berry, baldhip rose and bracken fern. Erosion control seed mix had also been placed at the site. It was noted during the inspection that there was slight water stress on the upland forest area due to the difficulty in watering the new plants because of the steep topography. An approximately 75% survival rate was estimated at the time of the inspection. Water stress is expected to become less of a problem as the site becomes established.

The forested wetland portion of the site was also planted with a combination of trees and shrubs, including red alder, Oregon ash, western red cedar, black cottonwood, western crabapple, beaked hazelnut, Pacific ninebark, black twinberry, vine maple, red-osier dogwood, hooker's willow, and Sitka willow. This portion of the site appeared to be doing well and no required maintenance activities were noted. Additional alders will be planted at the site in spring 2007 in accordance with discussions held during the final site approval.

The emergent wetland was planted with a combination of sawbeak sedge, slough sedge, small-fruited bulrush, hardstem bulrush, and reed mannagrass. This portion of the site appeared to be doing well with a 95% survival rate estimated. As noted above, minor herbivory of the grasses was found, but no maintenance activities were determined to be necessary.

Some invasive weeds were identified at the edges of the site, including blackberries, and minor weeding as a part of regularly scheduled maintenance is needed. It was noted that there were some bulrush in the downstream lobe that appeared to be volunteering.

Photo Documentation – Seven permanent photo points were established at the locations shown on Figure E-8 of the OMMP. A total of 21 photographs were taken at these points at tidal elevations ranging from approximately 0.58 feet MLLW to 3.3 feet MLLW. In addition, a second set of photographs were taken at six of the seven photo point locations at a tidal elevation ranging from approximately 12.69 feet MLLW to 12.74 feet MLLW to show site conditions during periods of inundation. Photo Point 5 was inaccessible during the high water photo event. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points surveyed to allow for reproducibility in subsequent monitoring years.

Elevation Monitoring – Six elevation stakes were placed at the locations shown on Figure E-8 of the OMMP. These graduated stakes are embedded one-foot into the ground and two feet of the stake is visible above ground. One-inch increments are marked on the stakes both above and below the ground surface to allow for measurement of erosion/sedimentation in subsequent monitoring years. The stakes were surveyed following installation to allow for replacement if

needed, and the top and ground surface elevations were also measured. Photographs showing the elevation stakes in place are included in Attachment A.

Surface Water Elevation Monitoring – Surface water elevation monitoring was performed between April 18, 2006 and November 2, 2006. Descriptive statistics and a graph of all the measurements can be found in Table 3 and Figure 1, respectively. A total of 28,482 water elevation measurements were determined using the water level logger. There were 13,320 measurements with an elevation of 2 feet NGVD29 or higher. This represents 47% of the time and meets the performance criteria of 30%.

Thea Foss Habitat Enhancement Areas

JOHNNY'S DOCK HABITAT ENHANCEMENT

This area is a pocket beach constructed to enhance the habitat between the Foss Landing and Johnny's Dock Marinas. Prior to remediation, an old timber access pier with a brick foundation was present at the site. As part of construction of this habitat area, this structure was removed from the marine environment. A thick quarry spall cap consisting of an 18-inch deep layer of filter material overlain by an 18-inch deep layer of quarry spalls was then placed. Habitat mix was placed on the slope over the quarry spalls between elevations -10 feet MLLW and 13 feet MLLW. Saltmarsh vegetation was planted between 10 feet MLLW and 13 feet MLLW, and large woody debris was added to the slope to add complexity to the habitat feature. A goose exclusion grid was installed to minimize herbivory.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 10, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -2.75 feet MLLW. Upon arrival, there were some geese present at the site on the lower beach. No significant erosion or sedimentation were identified at the site. There were no indications of animal damage, disease, trash, or vandalism. Both the goose exclusion grid and the large woody debris were in good condition and no maintenance activities were determined to be necessary.

The surface soils were gravelly sand habitat mix. There was no indication of odor or sheen. Overall, there was no apparent site disturbance and no follow-up actions were needed.

The site had been planted in accordance with the approved planting plans. A combination of pickleweed and saltgrass were planted between elevations 10 feet MLLW and 12 feet MLLW. Tufted hairgrass had been planted above that, between 12 feet MLLW and 13 feet MLLW. It was noted during the inspection that the distichilis was doing very well, and the pickleweed was vigorous in places. There was little evidence of the tufted hairgrass in the higher area where it was planted. Some lady's thumb had volunteered at the site and there was no indication of invasive species present.

As a follow-up to the apparent failure of the hairgrass, a survey was performed to confirm the elevation at the top of the planting area. The survey indicated that the top of the goose exclusion fence was between approximate elevations 13.7 feet MLLW and 14.6 feet MLLW, higher than the top of the planting zone which was 13 feet MLLW. Therefore, the tufted hairgrass was likely planted at a somewhat higher elevation than is optimum for its growth. Additional plants have been ordered and will be installed at a slightly lower elevation in spring 2007.

Photo Documentation – Two permanent photo points were established at the locations shown on Figure E-2 of the OMMP. A total of four photographs were taken at these points at tidal elevations ranging from -2.82 feet MLLW to -2.75 feet MLLW. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

HEAD OF THEA FOSS SHORELINE HABITAT

A portion of the eastern shoreline at the head of the waterway was cut back as part of the Utilities' remediation project, to create aquatic habitat below ordinary high water. Saltmarsh and littoral vegetation were planted in a 5- to 8-foot side strip landward of a log step structure (at approximately 12.4 feet MLLW) along the shoreline. A goose exclusion grid was constructed across the area to minimize herbivory.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 10, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -2.90 feet MLLW. Upon arrival, there were some geese, goldfinch, white crown sparrows, and crows present at the site. No significant erosion or sedimentation were identified at the site. There were no indications of animal damage, disease, or vandalism. Small amounts of trash were found. The log step appeared to be in good condition, but minor repairs to the goose exclusion grid were found to be necessary

The surface soils were grayish-brown silty sand. There was no indication of odor or sheen. Overall, there was no apparent site disturbance and no deficiencies in soil conditions were identified.

The site had been planted in accordance with the approved planting plans. A combination of fleshy jaumea, distichilis, tufted hairgrass, and hooker's willow were planted in the bench behind the log step. The log step was constructed as part of the Utilities project, and plantings in this area were completed in 2005. It was noted during the inspection that the distichilis was doing very well and the other species had a survival rate of approximately 50%. Some gumweed had volunteered both in the riparian area behind the log step and in the planting strip. In addition, there were various weeds, including clover, both in the planting strip and in the riparian area behind. Some weeding is needed, along with some replacement of plants in spring 2007.

Photo Documentation – Two permanent photo points were established at the locations shown on Figure E-1 of the OMMP. A total of two photographs were taken at these points at tidal elevations ranging from approximately -2.96 feet MLLW to -2.89 feet MLLW. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

SR 509 ESPLANADE RIPARIAN HABITAT

Upland vegetation was planted above the ordinary high water level along the shoreline south of Alber's Mill. In order to account for shading by the SR 509 Bridge, two different assemblages of riparian vegetation were planted: one tree and shrub assemblage appropriate for full sun exposure, and a shrub assemblage appropriate for partial shade. An irrigation system was initially constructed under the bridge in the shaded area and was subsequently extended to the north and south ends of the enhancement area.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 10, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -2.5 feet MLLW. Upon arrival, there were some goldfinch, house sparrows, geese, and barn swallows present at the site. No significant sedimentation, and only one very minor area of erosion were identified at the site. There is no wrack or organic material present at the site. There were no indications of animal damage, disease, trash, or vandalism. The sprinkler appears to be in good, working order.

The surface soils were grayish-brown, silty sand. There was no indication of odor or sheen. Overall, there was no apparent site disturbance and no deficiencies in soil conditions were identified.

The site had been planted in accordance with the approved planting plans. As indicated above, two different assemblages were planted due to the shading provided by the SR 509 Bridge. In the area with full sun, a combination of Pacific madrone, shore pine, oceanspray, red-flowering currant, and tall Oregon grape were planted. In the shaded area beneath the bridge, a combination of Pacific rhododendron, salal, and red huckleberry were planted. There were no volunteer species identified during the inspection. Several invasive species of weeds were found including clover, thistle, morning glory, and Himalayan blackberry.

Overall, the plant survival rate was estimated at approximately 90%, with a somewhat lesser percentage for the Pacific madrone. Some weeding is needed, however, no replanting appears to be necessary at this time.

Photo Documentation – Three permanent photo points were established at the locations shown on Figure E-3 of the OMMP. A total of four photographs were taken at these points at tidal elevations ranging from approximately -2.68 feet MLLW to -2.28 feet MLLW. Copies of the photographs can be found in Attachment A. Rebar were placed at the photo point locations in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

LOG STEP HABITAT ENHANCEMENT

Approximately 35 treated timber piling, a 12- by 14-foot concrete vault, and other debris were removed from an area on the west side of the waterway between the Colonial Fruit warehouse and the Foss Waterway Marina. A portion of the area was dredged, and a thick quarry spall cap consisting of 18 inches of filter material overlain by 18 inches of riprap was constructed. Habitat mix was placed over the area between the elevations of -10 feet MLLW and 11 feet MLLW.

A 2-step log transition was constructed between elevations 11 feet MLLW and 13 feet MLLW and a 3-foot bench was constructed using 18 inches of filter material overlain with an 18-inch deep layer of quarry spalls. Habitat mix was placed over the quarry spalls, and saltmarsh grasses planted at elevation 13 feet MLLW along the 65-foot long high intertidal bench.

Qualitative Ground Survey – The baseline qualitative ground survey at this site was conducted on July 10, 2006. A copy of the completed field form can be found in Attachment A. At the time of the survey, the tidal elevation was approximately -1.24 feet MLLW. Upon arrival, there were some crows and seagulls present at the site. No significant erosion or sedimentation were identified at the site. There were no indications of animal damage, disease, trash, or vandalism. There was no wrack or organic material present at the site. Some algae was present below the log step. The log step appeared to be in good condition, although the anchors needed some minor tightening. The goose exclusion grid was in good condition.

The surface soils were grayish-brown gravelly sand. There was no indication of odor or sheen. Overall, there was no apparent site disturbance and no deficiencies in soil conditions were identified.

The site had been planted in accordance with the approved planting plans. A combination of American dunegrass and tufted hairgrass was planted in a 3-foot wide bench behind the log step at an elevation of approximately 13 feet MLLW. It was noted during the inspection that the dunegrass was doing very well while the hairgrass had a fairly low survival rate. Some invasive species including dandelions, clover, and butterfly bushes are present above the upland edge of the area. Therefore, some weeding is needed, along with replacement of the hairgrass in spring 2007.

Photo Documentation – One permanent photo point was established at the location shown on Figure E-4 of the OMMP. One photograph was taken at this point at a tidal elevation of approximately -1.24 feet MLLW. A copy of the photograph can be found in Attachment A. Rebar was placed at the photo point location in July and the points were surveyed to allow for reproducibility in subsequent monitoring years.

SUMMARY OF PRELIMINARY FINDINGS

The primary purpose of the Year 0 monitoring event was to document that the habitat mitigation and enhancement sites were constructed and planted in accordance with the approved plans and that they are in an appropriate and healthy condition required for establishment. In addition, this monitoring event provides documentation of the baseline conditions at the various sites.

Very few follow-up actions were identified during this monitoring event. Those that were identified were discussed in the sections above, and are summarized in Table 4. The status of these follow-up actions will be discussed in the Baseline Monitoring Report.

Table 1
Baseline Monitoring Activities

	North Beach Habitat	Middle Waterway Tideflat Habitat	Puyallup River Side Channel	Hylebos Creek Mitigation Site	Thea Foss Enhancement Areas
Qualitative Ground Survey	x	x	x	x	x
Photo Documentation	x	x	x	x	x
Quantitative Vegetation Monitoring					
Invertebrate Monitoring					
Elevation Monitoring	x	x	x	x	
Surface Water Elevation Sampling				x	
Brackish Marsh Salinity Monitoring		x			
Juvenile Salmonid Monitoring					

Table 2
Middle Waterway Tideflat Habitat Salinity Monitoring Results (ppt)

Location	May 23, 2006	May 26, 2006	May 30, 2006	July 2006	August 2006	September 2006
BW1	17.2	9.3	9.8	2.9	2.0 U	11.6
BW2	15.5	9.9	8.0	11.2	2.0 U	7.8
BW3	N/A	18.8	15.8	3.6	2.0 U	27.9
BW4	N/A	8.6	2.8	4.6	2.0 U	5.8
BW5	16.5	5.2	2.0	N/A	2.0 U	N/A
BW6	13.4	8.5	7.1	3.1	14.7	24.2
BMC1	N/A	24.4	32.2	22.0	27.3	31.7
BMC2	N/A	27.7	28.0	32.8	12.3	26.0
BMC3	N/A	N/A	18.7	17.5	22.3	20.5

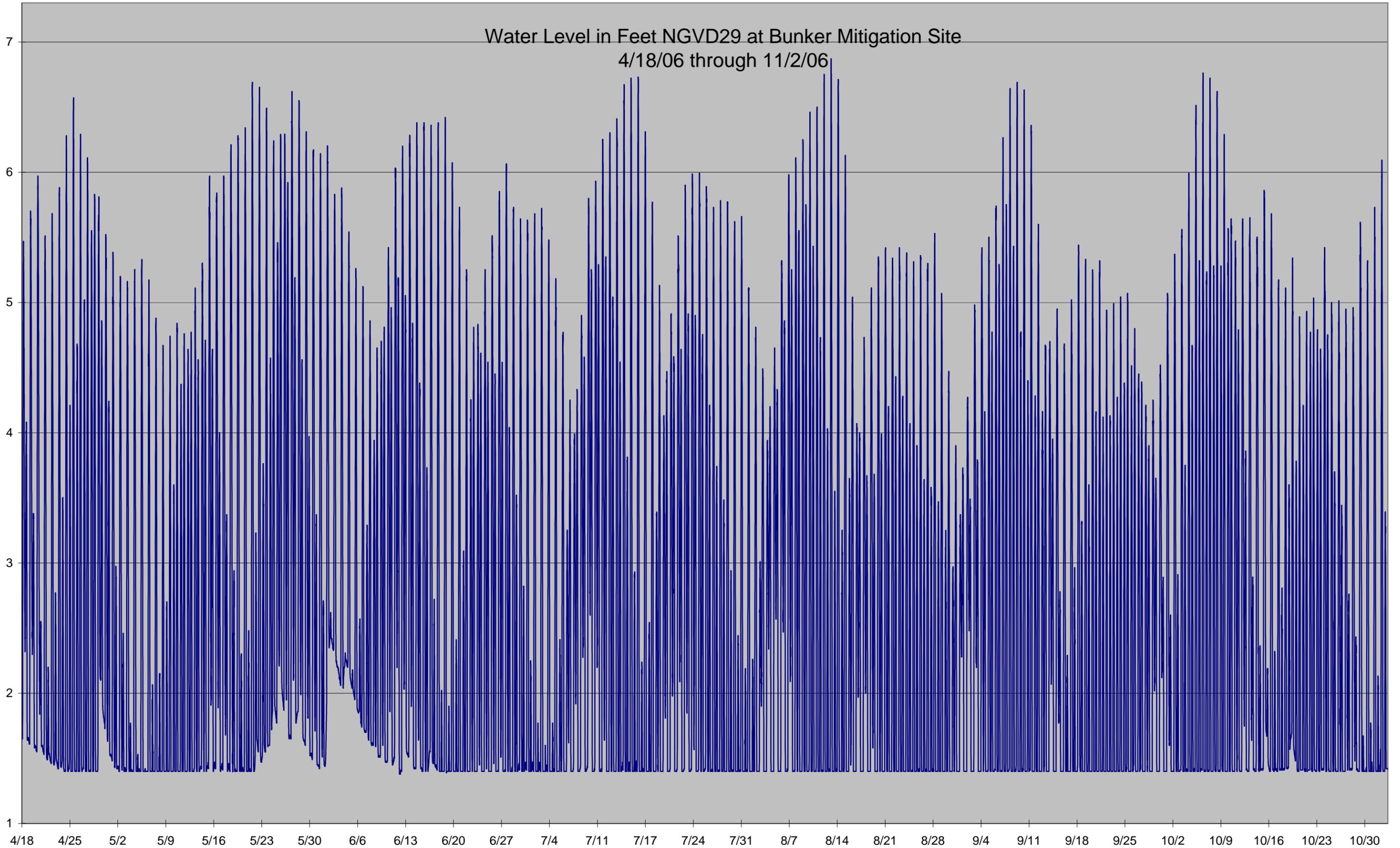
U indicates that the analyte was not detected at or above the reported value.
 N/A in result means "not analyzed" due to insufficient liquid to analyze.

Table 3
Hylebos Creek Water Level Measurement Data

Univariate Statistics	
Average	2.6
Median	1.8
Minimum	1.4
Maximum	6.9
Range	5.5
Standard Deviation	1.4
50th Percentile	1.8
75th Percentile	3.6
90th Percentile	4.9
95th Percentile	5.4
99th Percentile	6.2
# of values ≥ 2	13320
# of Measurements	28482
Percent of Values ≥ 2	47%

Table 4
Summary of Preliminary Findings

Site	Corrective Action Tasks
North Beach Habitat	<ul style="list-style-type: none"> - minor repairs to the goose exclusion grid - minor weeding - replanting
Middle Waterway Tideflat Habitat	<ul style="list-style-type: none"> - minor repairs to the goose exclusion grids - removal of wood debris within goose exclusion
Puyallup River Side Channel	<ul style="list-style-type: none"> - minor weeding - trash removal
Hylebos Creek Mitigation Site	<ul style="list-style-type: none"> - minor weeding - repair of anchor on LWD - place additional LWD, small branches, and plant additional red alder per final site approval agreement
Log Step Habitat Enhancement	<ul style="list-style-type: none"> - minor weeding - tighten anchors on logs
SR 509 Esplanade Riparian Habitat	<ul style="list-style-type: none"> - minor weeding
Head of Thea Foss Shoreline Habitat	<ul style="list-style-type: none"> - minor repairs to the goose exclusion grid - minor weeding - replanting
Johnny's Dock Habitat Enhancement	<ul style="list-style-type: none"> - survey to confirm elevation at top of planting - replanting of Tufted Hairgrass



Attachment A

Habitat Mitigation Area Monitoring Field Forms and Photographs

North Beach Habitat

Qualitative Ground Survey, Mitigation Sites

Date: 7-11-06 9:30 am Year: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Site (circle): North Beach Habitat (NBH), Middle Waterway Tidelat (MWT), Puyallup River Side Channel (PRS), Hylebos Creek Habitat (HCH)

Staff Present: John O'Loughlin, Mary Henley

Weather Conditions: Partly cloudy, dry

Overall health and vigor of plants: Excellent Fair Poor
 except grasses which are poor

Qualitative Observations:

	Riparian Area	Marsh Area	Comments
Erosion	slight	wave sorting	slight movement @ top of slope
Sedimentation	—	slight	
Wildlife	see below		various birds
Vegetation			
Invasive	some	none	thistle, clover
Volunteer	none	none	
Survival (%)	~90%	~50%	grasses poor, pickleweed excellent
Animal Damage	none	none	
Disease	none	none apparent	— grasses?
Trash	none	minimal	
Vandalism	none	none	
Large Woody Debris	—	present	good condition
Wrack or Organic Material	none	minor	as expected

* For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

Caspian terns, seagulls, Canada geese, Great blue heron, crows, cormorant, harbor seal, pigeon guillemot, white fronted goose.

Insect Sampling Notes (Hylebos Creek and PRSC only):

N/A

Observable Prey (e.g., amphipods, mycids, larvae):

N/A

Soil/Sediment Quality:	upland	aquatic areas
Odor:	none	none
Sheen:	none	none
Color:	brown	brown — brownish gray
Texture:	topsoil	cobbly sand - silty sand

Presence/condition of habitat mix/fine-grained material at surface (North Beach and PRSC only):

yes

Notes:

- Grasses in nodes not doing well. Give another year to see if it is related to shock. Pickleweed good in some nodes.
- minor weeding needed
- Goose exclusion grids in good shape
- Contact Simpson to remove piece of boom @ St. Paul beach.

Photo Points (Circle Site):

Year 0, 1, 2, 4, 7, 10

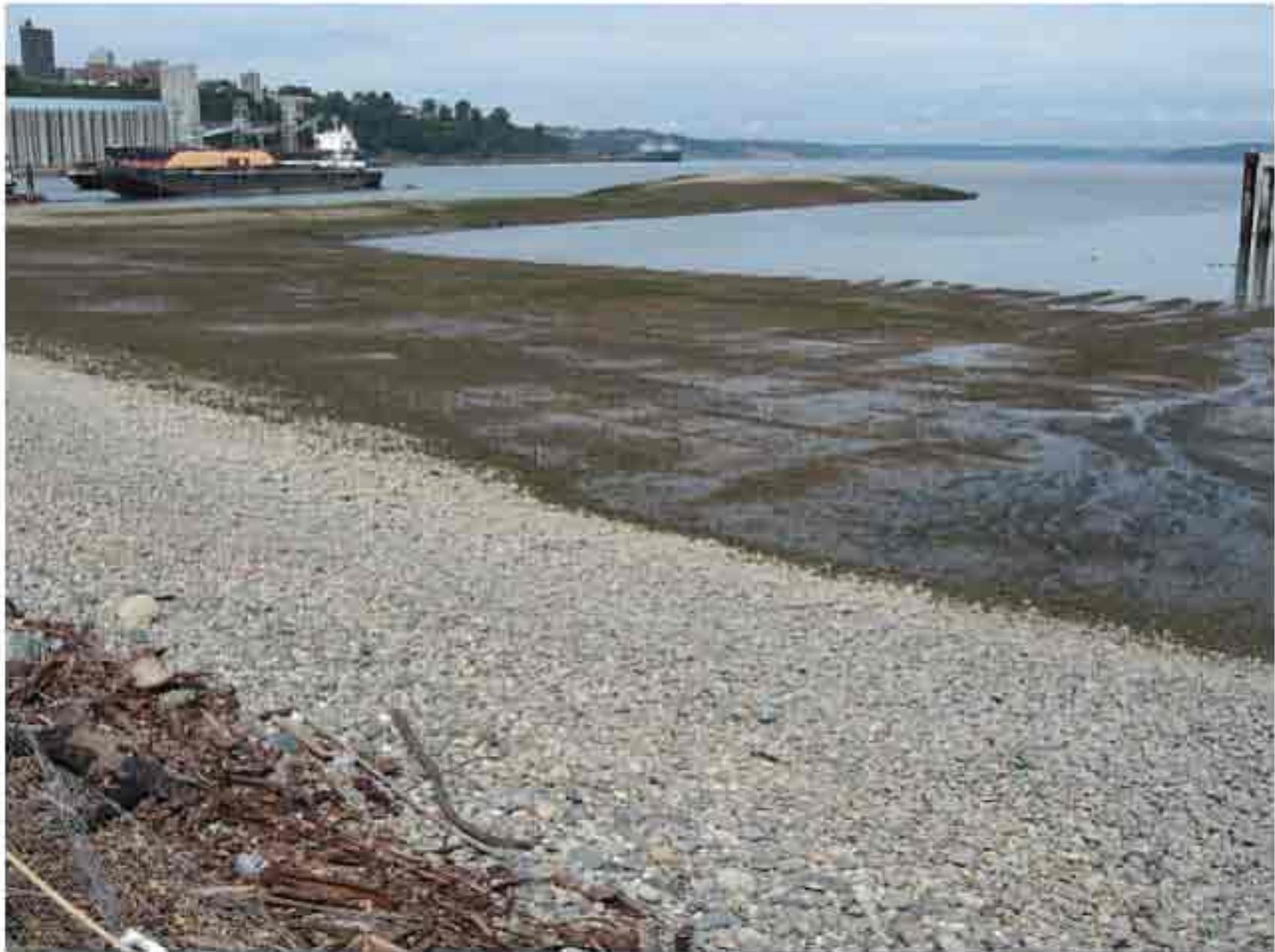
North Beach	1A #2 (W)	1B #3 (NW)	2A #4 (E)	2B #5 (N)
2C #6 (W)	3A #7 (E)	3B #8 (N)	3C #9 (NW)	3D #10 (S)
4A #11 (S)	4B #12 (SW)	4C #13 (NW)	5A #14 (S)	5B #15 (W)
5C #16 (N)	5D #17 (E)	6 #1		
Middle Waterway Tideflat	1A	1B	2A	2B
2C	3A	3B	4A	4B
4C	4D			
Puyallup River Side Channel	1	2A	2B	3A
3B	4A	4B	5A	5B
6				
Hylebos Creek	1A	1B	2A	2B
2C	3A	3B	3C	4A
4B	4C	5A	5B	5C
5D	6A	6B	6C	6D
7A	7B			

Additional Notes/Photos:

#2 and #3 in middle were taken of wildlife



North Beach Habitat, Photo Point 1A, facing west. Photo taken July 11, 2006 at 10:53 AM, tide at approximately -2.72 feet MLLW. [IM G_0006]



North Beach Habitat, Photo Point 1B, facing northwest. Photo taken July 11, 2006 at 10:54 AM, tide at approximately -2.72 feet MLLW. [M G_0007]



North Beach Habitat, Photo Point 2A, facing east. Photo taken July 11, 2006 at 10:56 AM, tide at approximately -2.76 feet MLLW.
[M G_0008]



North Beach Habitat, Photo Point 2B, facing north. Photo taken July 11, 2006 at 11:56 AM, tide at approximately -2.76 feet MLLW [M G_0009]



North Beach Habitat, Photo Point 2C, facing west. Photo taken July 11, 2006 at 10:56 AM, tide at approximately -2.76 feet MLLW. [IM G_0010]



North Beach Habitat, Photo Point 3A, facing east. Photo taken July 11, 2006 at 11:10 AM, tide at approximately -3.03 feet MLLW. [M G_0011]



North Beach Habitat, Photo Point 3B, facing north. Photo taken July 11, 2006 at 11:10 AM, tide at approximately -3.03 feet MLLW [IM G_0012]



North Beach Habitat, Photo Point 3C, facing northwest. Photo taken July 11, 2006 at 11:10 AM, tide at approximately -3.03 feet MLLW. [IM G_0013]



North Beach Habitat, Photo Point 3D, facing south. Photo taken July 11, 2006 at 11:10 AM, tide at approximately -3.03 feet MLLW. [M G_0014]



North Beach Habitat, Photo Point 4A, facing south. Photo taken July 11, 2006 at 11:19 AM, tide at approximately -3.15 feet MLLW [IMG_0015]



North Beach Habitat, Photo Point 4B, facing southwest. Photo taken July 11, 2006 at 11:19 AM, tide at approximately -3.15 feet MLLW. [M G_0016]



North Beach Habitat, Photo Point 4C, facing northwest. Photo taken July 11, 2006 at 11:19 AM, tide at approximately -3.15 feet MLLW. [IMG_0017]



North Beach Habitat, Photo Point 5A, facing south. Photo taken October 17, 2006 at 8:40 AM, tide at approximately 1.91 feet MLLW. [M G_0058]



North Beach Habitat, Photo Point 5B, facing west. Photo taken October 17, 2006 at 8:40 AM, tide at approximately 1.91 feet MLLW. [IM G_0059]



North Beach Habitat, Photo Point 5C, facing north. Photo taken October 17, 2006 at 8:40 A.M., tide at approximately 1.91 feet MLLW. [M G_0060]



North Beach Habitat, Photo Point 5D, facing east. Photo taken October 17, 2006 at 8:40 AM, tide at approximately 1.91 feet MLLW. [M G_0061]



North Beach Habitat, Photo Point P6, facing west. Photo taken July 11, 2006 at 10:18 AM, tide at approximately -1.66 feet MLLW. [M G_0003]



North Beach Habitat, elevation stake E1. Photo taken July 13, 2006.
[IMG_0075]



North Beach Habitat, elevation stake E2. Photo taken July 13, 2006.
[IMG_0076]



North Beach Habitat, elevation stake E3. Photo taken July 13, 2006.

[IMG_0077]



North Beach Habitat, elevation stake E4. Photo taken July 13, 2006.

[IMG_0078]



North Beach Habitat, elevation stake E5. Photo taken July 13, 2006.

[IMG_0079]

Middle Waterway Tideflat Habitat

Qualitative Ground Survey, Mitigation Sites

Date 7/11/06 12⁰⁰ noon Year () 1 2 3 4 5 6 7 8 9 10
 Site (circle): North Beach Habitat (NBH), Middle Waterway Tidelat (MWT), Purgator River Side Channel (PRS), Hylebos Creek Habitat (HCH)

Staff Present John O'Loughlin, Mary Henley
 Weather Conditions Partly cloudy, dry
 Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations

	Riparian Area	Marsh Area	Comments
Erosion	none	Some	from springs & seeps as expected
Sedimentation	none	minor	
Wildlife		yes	see below
Vegetation			
Invasive	Some	none	clover, thistle, various weeds
Volunteer	none	none	pickweed sources at south end
Survival (%)	~85%	~90%	
Animal Damage	none	none	
Disease	none	none	
Trash	none	Some	minimal from water source
Vandalism	none	none	
Large Woody Debris	N/A	present	good condition
Wrack or Organic Material	none	minor	as expected

* For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):
(great blue heron, gulls, crows, Canada geese, barn swallow, violet green swallow)

Insect Sampling Notes (Hylebos Creek and PRSC only):
N/A

Observable Prey (e.g., amphipods, mycids, larvae):
N/A

Soil/Sediment Quality	Upland	aquatic areas
Odor	none	none
Sheen	none	some organic
Color	brown	brown - green w/ algae
Texture	topsoil / sandy silt	silty sand

Presence/condition of habitat mix/fine-grained material at surface (North Beach and PRSC only):
N/A

Notes
Goose exclusion grid in good condition
Minor weeding needed

Photo Points (Circle Site):

Year (0, 1, 2, 4, 7, 10)

North Beach	1A	1B	2A	2B
2C	3A	3B	3C	3D
4A	4B	4C	5A	5B
5C	5D	6		
Middle Waterway Tideflat	1A # 18 (NW)	1B # 19 (SW)	2A # 20 (N)	2B # 21 (W)
2C # 22 (S)	3A # 23 (N)	3B # 24 (W)	4A # 25 (S)	4B # 26 (W)
4C # 27 (N)	4D # 28 (E)			
Puyallup River Side Channel	1	2A	2B	3A
3B	4A	4B	5A	5B
6				
Hylebos Creek	1A	1B	2A	2B
2C	3A	3B	3C	4A
4B	4C	5A	5B	5C
5D	6A	6B	6C	6D
7A	7B			

Additional Notes/Photos:



Middle Waterway Tideflat Habitat, Photo Point 1A, facing northwest. Photo taken July 11, 2006 at 11:59 AM, tide at approximately -3.25 feet MLLW.
[IMG_0018]



Middle Waterway Tideflat Habitat, Photo Point 1B, facing southwest. Photo taken July 11, 2006 at 11:59 AM, tide at approximately -3.25 feet MLLW.
[IMG_0019]



Middle Waterway Tideflat Habitat, Photo Point 2A, facing north. Photo taken July 11, 2006 at 12:15 PM, tide at approximately -3.08 feet MLLW.
[IMG_0020]



Middle Waterway Tideflat Habitat, Photo Point 2B, facing west. Photo taken July 11, 2006 at 12:15 PM, tide at approximately -3.08 feet MLLW.
[IMG_0021]



Middle Waterway Tideflat Habitat, Photo Point 2C, facing south. Photo taken July 11, 2006 at 12:15 PM, tide at approximately -3.08 feet MLLW.
[IMG_0022]



Middle Waterway Tideflat Habitat, Photo Point 3A, facing north. Photo taken July 11, 2006 at 12:30 PM, tide at approximately -2.83 feet MLLW.
[IMG_0023]



Middle Waterway Tideflat Habitat, Photo Point 3B, facing west. Photo taken July 11, 2006 at 12:30 PM, tide at approximately -2.83 feet MLLW.
[IMG_0024]



Middle Waterway Tideflat Habitat, Photo Point 4A, facing south. Photo taken July 11, 2006 at 12:33 PM, tide at approximately -2.77 feet MLLW.
[IMG_0025]



Middle Waterway Tideflat Habitat, Photo Point 4B, facing west. Photo taken July 11, 2006 at 12:33 PM, tide at approximately -2.77 feet MLLW.
[IMG_0026]



Middle Waterway Tideflat Habitat, Photo Point 4C, facing north. Photo taken July 11, 2006 at 12:33 PM, tide at approximately -2.77 feet MLLW.
[IMG_0027]



Middle Waterway Tideflat Habitat, Photo Point 4D, facing east. Photo taken July 11, 2006 at 12:33 PM, tide at approximately -2.77 feet MLLW.
[IMG_0028]



Middle Waterway Tideflat Habitat, elevation stake E1. Photo taken July 13, 2006.

[IMG_0070]



Middle Waterway Tideflat Habitat, elevation stake E2. Photo taken July 13, 2006.
[IMG_0071]



Middle Waterway Tideflat Habitat, elevation stake E3. Photo taken July 13, 2006.

[IMG_0072]



Middle Waterway Tideflat Habitat, elevation stake E4. Photo taken July 13, 2006.

[IMG_0073]



Middle Waterway Tideflat Habitat, elevation stake E5. Photo taken July 13, 2006.
[IMG_0074]



Middle Waterway Tideflat Habitat, elevation stake E6. Photo taken July 13, 2006.

[IMG_0092]

Puyallup River Side Channel

Qualitative Ground Survey, Mitigation Sites

Date: 7/10/06 12:00 noon Year: 0 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Site (circle): North Beach Habitat (NBH), Middle Waterway Tidelat (MWT), Puyallup River Side Channel (PRS), Hylebos Creek Habitat (HCH)

Staff Present: John O'Loughlin
 Weather Conditions: cloudy, dry
 Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Marsh Area	Comments
Erosion	minimal	none	
Sedimentation	none	minimal	at breach
Wildlife	yes	yes	gulls - see below
Vegetation			
Invasive	some	none	see below
Volunteer	some	none	Few willows
Survival (%)	~95%	N/A	
Animal Damage	none	none	
Disease	none	none	
Trash	none	some	- minimal debris
Vandalism	none	none	
Large Woody Debris	N/A		
Wrack or Organic Material		some	in ends of channels

* For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

marsh wren, gulls, Canada geese, crows, Great blue heron, ducks, killdeer

Insect Sampling Notes (Hylebos Creek and PRSC only):

N/A for Year 0

Observable Prey (e.g., amphipods, mycids, larvae):

N/A for Year 0

Soil/Sediment Quality:	upland	aquatic areas
Odor:	none	none
Sheen:	none	slight organic
Color:	gray	dark brown → light gray
Texture:	sandy gravel	silty - silty sand

Presence/condition of habitat mix/fine-grained material at surface (North Beach and PRSC only):

Yes

Notes:

- invasive weeds - blackberry, thistle, canary grass, etc.
- small erosion area on old levee, riverside ~ midway between breach and upriver end. No action needed - keep watching.
- periodic trash removal likely necessary

Photo Points (Circle Site):

Year: 0, 1, 2, 4, 7, 10

North Beach	1A	1B	2A	2B
2C	3A	3B	3C	3D
4A	4B	4C	5A	5B
5C	5D	6		
Middle Waterway Tideflat	1A	1B	2A	2B
2C	3A	3B	4A	4B
4C	4D			
Puyallup River Side Channel	1 # 14	2A # 15 old levee	2B # 16 new levee	3A # 17 breach
3B # 18 el stake	4A # 19 breach	4B # 20 upriver	5A # 21 new levee	5B # 22 old levee
6 # 23 *	# 13 camera check. * note - photo retaken 7/12/06 due to tech problem - cloudy, light rain			
Hylebos Creek	1A	1B	2A	2B
2C	3A	3B	3C	4A
4B	4C	5A	5B	5C
5D	6A	6B	6C	6D
7A	7B			

cloudy, light
rain
12:57 pm

Additional Notes/Photos:



Puyallup River Side Channel, Photo Point 1, facing west. Photo taken July 10, 2006 at 12:12 PM, tide at approximately -1.86 feet MLLW [MAG0014]



Puyallup River Side Channel, Photo Point 2A, facing south. Photo taken July 10, 2006 at 12:27 PM, tide at approximately -1.38 feet MLLW. [MAG0015]



Puyallup River Side Channel, Photo Point 2B, facing southwest. Photo taken July 10, 2006 at 12:27 PM, tide at approximately -1.38 feet MLLW.
[IMAG0016]



Puyallup River Side Channel, Photo Point 3A, facing southeast. Photo taken July 10, 2006 at 12:30 PM, tide at approximately -1.28 feet MLLW.
[IMAG0017]



Puyallup River Side Channel, Photo Point 3B, facing east. Photo taken July 10, 2006 at 12:30 PM, tide at approximately -1.28 feet MLLW. [MAG0001]



Puyallup River Side Channel, Photo Point 4A, facing northeast. Photo taken July 10, 2006 at 12:37 PM, tide at approximately -1.02 feet MLLW.
[IMAG0002]



Puyallup River Side Channel, Photo Point 4B, facing southeast. Photo taken July 10, 2006 at 12:37 PM, tide at approximately -1.02 feet MLLW.
[IMAG0003]



Puyallup River Side Channel, Photo Point 5A, facing north. Photo taken July 10, 2006 at 12:42 PM, tide at approximately -0.83 feet MLLW. [MAG0004]



Puyallup River Side Channel, Photo Point 5B, facing northeast. Photo taken July 10, 2006 at 12:42 PM, tide at approximately -0.83 feet MLLW.
[IMAG0005]



Puyallup River Side Channel, Photo Point 6, facing west. Photo taken July 12, 2006 at 12:57 PM, tide at approximately -3.10 feet MLLW [IM G_0069]



Puyallup River Side Channel, elevation stake E1. Photo taken July 13, 2006.

[IMG_0080]



Puyallup River Side Channel, elevation stake E2. Photo taken July 13, 2006.

[IMG_0081]



Puyallup River Side Channel, elevation stake E3. Photo taken July 13, 2006.

[IMG_0082]



Puyallup River Side Channel, elevation stake E4. Photo taken July 13, 2006.

[IMG_0083]



Puyallup River Side Channel, elevation stake E5. Photo taken July 13, 2006.

[IMG_0084]



Puyallup River Side Channel, elevation stake E6. Photo taken July 13, 2006.

[IMG_0085]

Hylebos Creek Mitigation Site

Qualitative Ground Survey, Mitigation Sites

Date: 7/11/06 2:00 pm Year: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRS) Hylebos Creek Habitat (HCH)

Staff Present: John O'Loughlin, Mary Henley
 Weather Conditions: partly cloudy, dry
 Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Marsh Area	Comments
Erosion	none	none	
Sedimentation	none	minor	
Wildlife	yes		see below
Vegetation			
Invasive	minor	minor	see below
Volunteer	none	possible	some bulrush at downstream lobe:
Survival (%)	~75%	~95%	
Animal Damage	none	minor herbivory of grasses	
Disease	none	none	
Trash	none	none	
Vandalism	none	minor	minimal rock movement
Large Woody Debris	none	OK	one anchor needs repair
Wrack or Organic Material	none	none	

* For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

Violet green swallow, goldfinch, red-tail hawk, Flycatcher, barn swallow, belted kingfisher, mallard duck

Insect Sampling Notes (Hylebos Creek and PRSC only):

N/A for Year 0

Observable Prey (e.g., amphipods, mycids, larvae):

N/A for Year 0

Soil/Sediment Quality:	upland	aquatic areas
Odor:	none	none
Sheen:	none	none
Color:	light brown	brown → gray
Texture:	gravelly sand	sandy silt → gravelly sand

Presence/condition of habitat mix/fine-grained material at surface (North Beach and PRSC only):

N/A

Notes:

Some blackberries @ edges, few weeds
Little water stress on upland forest

Photo Points (Circle Site):

Year: 0, 1, 2, 4, 7, 10

North Beach	1A	1B	2A	2B
2C	3A	3B	3C	3D
4A	4B	4C	5A	5B
5C	5D	6		
Middle Waterway Tideflat	1A	1B	2A	2B
2C	3A	3B	4A	4B
4C	4D			
Puyallup River Side Channel	1	2A	2B	3A
3B	4A	4B	5A	5B
6				
Hylebos Creek	1A #48 (E) Hi → #94	1B #49 (S) #95	2A #45 (SE) #96	2B #47 #97
2C #46 (W) #98	3A #38 (SW) #99	3B #39 (W) #100	3C #40 (NW) #101	4A #35 (NE) #102
4B #36 (N) #104	4C #37 (NW) #105	5A #41 (S) *	5B #42 (W) *	5C #43 (N) *
5D #44 (E) *	6A #31 (N) #108	6B #32 (NE) #109	6C #33 (SE) #110	6D #34 (S) #111
7A #29 (NE) #112	7B #30 (N) #113			

Additional Notes/Photos:

* Photo Point 5 is inaccessible at high tide.

Photos 106 + 107 were taken from upstream
land lobe looking northwest and northeast,
respectively

High tide photos taken 7/13/06 at approximately 8:15 - 8:30 pm



Hylebos Creek, Photo Point 1A, facing east. Photo taken July 11, 2006 at 2:53 PM, tide at approximately 3.30 feet MLLW. [IM G_0048]



Hylebos Creek, Photo Point 1A, facing east. Photo taken July 13, 2006 at 8:20 PM, tide at approximately 12.69 feet MLLW. [IM G_0094]



Hylebos Creek, Photo Point 1B, facing south. Photo taken July 11, 2006 at 2:53 PM, tide at approximately 3.30 feet MLLW. [M G_0050]



Hylebos Creek, Photo Point 1B, facing south. Photo taken July 13, 2006 at 8:20 P.M., tide at approximately 12.69 feet MLLW. [IM G_0095]



Hylebos Creek, Photo Point 2A, facing southeast. Photo taken July 11, 2006 at 2:49 PM, tide at approximately 3.05 feet MLLW. [IM G_0045]



Hylebos Creek, Photo Point 2A, facing southeast. Photo taken July 13, 2006 at 8:22 PM, tide at approximately 12.7 feet MLLW. [IM G_0096]



Hylebos Creek, Photo Point 2B, facing southwest. Photo taken July 11, 2006 at 2:49 PM, tide at approximately 3.05 feet MLLW. [M G_0047]



Hylebos Creek, Photo Point 2B, facing southwest. Photo taken July 13, 2006 at 8:22 PM, tide at approximately 12.7 feet MLLW. [M G_0097]



Hylebos Creek, Photo Point 2C, facing west. Photo taken July 11, 2006 at 2:49 PM, tide at approximately 3.05 feet MLLW. [IM G_0046]



Hylebos Creek, Photo Point 2C, facing west. Photo taken July 13, 2006 at 8:22 PM, tide at approximately 12.7 feet MLLW. [IM G_0098]



Hylebos Creek, Photo Point 3A, facing southwest. Photo taken July 11, 2006 at 2:32 PM, tide at approximately 2.14 feet MLLW. [IM G_0038]



Hylebos Creek, Photo Point 3A, facing southwest. Photo taken July 13, 2006 at 8:28 PM, tide at approximately 12.73 feet MLLW. [M G_0099]



Hylebos Creek, Photo Point 3B, facing west. Photo taken July 11, 2006 at 2:32 PM, tide at approximately 2.14 feet MLLW. [M G_0039]



Hylebos Creek, Photo Point 3B, facing west. Photo taken July 13, 2006 at 8:28 P.M., tide at approximately 12.73 feet MLLW. [IMG_0100]



Hylebos Creek, Photo Point 3C, facing northwest. Photo taken July 11, 2006 at 2:32 PM, tide at approximately 2.14 feet MLLW. [M G_0040]



Hylebos Creek, Photo Point 3C, facing northwest. Photo taken July 13, 2006 at 8:28 PM, tide at approximately 12.73 feet MLLW. [M G_0101]



Hylebos Creek, Photo Point 4A, facing northeast. Photo taken July 11, 2006 at 2:20 PM, tide at approximately 1.5 feet MLLW. [IM G_0035]



Hylebos Creek, Photo Point 4A, facing northeast. Photo taken July 13, 2006 at 8:32 PM, tide at approximately 12.73 feet MLLW. [IM G_0102]



Hylebos Creek, Photo Point 4B, facing north. Photo taken July 11, 2006 at 2:20 PM, tide at approximately 1.5 feet MLLW.
[IM G_0036]



Hylebos Creek, Photo Point 4B, facing north. Photo taken July 13, 2006 at 8:32 P.M., tide at approximately 12.73 feet MLLW.
[M G_0104]



Hylebos Creek, Photo Point 4C, facing northwest. Photo taken July 11, 2006 at 2:20 PM, tide at approximately 1.5 feet MLLW.
[M G_0037]



Hylebos Creek, Photo Point 4C, facing northwest. Photo taken July 13, 2006 at 8:32 PM, tide at approximately 12.73 feet MLLW. [IM G_0105]



Hylebos Creek, Photo Point 5A, facing south. Photo taken July 11, 2006 at 2:41 PM, tide at approximately 2.65 feet MLLW. [M G_0041]



Hylebos Creek, Photo Point 5B, facing west. Photo taken July 11, 2006 at 2:41 P.M., tide at approximately 2.65 feet MLLW. [IM G_0042]



Hylebos Creek. Photo taken July 13, 2006 at 8:34 PM, tide at approximately 12.74 feet MLLW.
[IMG_0107]



Hylebos Creek, Photo Point 5C, facing north. Photo taken July 11, 2006 at 2:41 PM, tide at approximately 2.65 feet MLLW.
[M G_0043]



Hylebos Creek, Photo Point 5D, facing east. Photo taken July 11, 2006 at 2:41 PM, tide at approximately 2.65 feet MLLW. [IM G_0044]



Hylebos Creek. Photo taken July 13, 2006 at 8:34 PM, tide at approximately 12.74 feet MLLW.
[M G_0106]



Hylebos Creek, Photo Point 6A, facing north. Photo taken July 11, 2006 at 2:06 P.M., tide at approximately 0.77 feet MLLW.
[IM G_0031]



Hylebos Creek, Photo Point 6A, facing north. Photo taken July 13, 2006 at 8:35 P.M., tide at approximately 12.74 feet MLLW. [IM G_0108]



Hylebos Creek, Photo Point 6B, facing northeast. Photo taken July 11, 2006 at 2:06 PM, tide at approximately 0.77 feet MLLW. [IM G_0032]



Hylebos Creek, Photo Point 6B, facing northeast. Photo taken July 13, 2006 at 8:35 PM, tide at approximately 12.74 feet MLLW. [M G_0109]



Hylebos Creek, Photo Point 6C, facing southeast. Photo taken July 11, 2006 at 2:06 PM, tide at approximately 0.77 feet MLLW. [IM G_0033]



Hylebos Creek, Photo Point 6C, facing southeast. Photo taken July 13, 2006 at 8:35 PM, tide at approximately 12.74 feet MLLW. [IMG_0110]



Hylebos Creek, Photo Point 6D, facing south. Photo taken July 11, 2006 at 2:06 PM, tide at approximately 0.77 feet MLLW. [IM G_0034]



Hylebos Creek, Photo Point 6D, facing south. Photo taken July 13, 2006 at 8:35 PM, tide at approximately 12.74 feet MLLW. [IM G_0111]



Hylebos Creek, Photo Point 7A, facing northeast. Photo taken July 11, 2006 at 2:02 PM, tide at approximately 0.58 feet MLLW. [IM G_0029]



Hylebos Creek, Photo Point 7A, facing northeast. Photo taken July 13, 2006 at 8:36 PM, tide at approximately 12.74 feet MLLW. [IM G_0112]



Hylebos Creek, Photo Point 7B, facing north. Photo taken July 11, 2006 at 2:02 P.M., tide at approximately 0.58 feet MLLW.
[M G_0030]



Hylebos Creek, Photo Point 7B, facing north. Photo taken July 13, 2006 at 8:36 P.M., tide at approximately 12.74 feet MLLW.
[M G_0113]



Hylebos Creek, elevation stake E1. Photo taken July 13, 2006.

[IMG_0086]



Hylebos Creek, elevation stake E2. Photo taken July 13, 2006.

[IMG_0087]



Hylebos Creek, elevation stake E3. Photo taken July 13, 2006.
[IMG_0088]



Hylebos Creek, elevation stake E4. Photo taken July 13, 2006.
[IMG_0089]



Hylebos Creek, elevation stake E5. Photo taken July 13, 2006.

[IMG_0090]



Hylebos Creek, elevation stake E6. Photo taken July 13, 2006.

[IMG_0091]

Johnny's Dock Habitat Enhancement

Photo Points (Circle Site):

Year 0, 1, 2, 4, 7, 10

<u>Johnny's Dock</u>	1A #9 (SW)	1B #10 (NW)	2A #11 (NW)	2B #12 (NE)
Head of Thea Foss	1	2		
SR509 Esplanade	1	2A	2B	3
Log Step	1			
Additional Photos				

Exclusion Grid Status (Johnny's Dock) Head of Thea, Log Step)

Good condition

Vegetation Diversity Notes:

RIPARIAN

Planted Species

N/A

Volunteer Species

none

Invasive Species

none

MARSH

Planted Species

distichilis - doing very well
 Hairgrass - none apparent above ground
 Pickleweed - vigorous in areas

Volunteer Species

N/A

Invasive Species

Few lady's thumb

MISCELLANEOUS ADDITIONAL NOTES:

Check survey for elevation of upper end of planting - Hairgrass may have been planted too high + need to be replaced.



Johnny's Dock, Photo Point 1A, facing southwest. Photo taken July 10, 2006 at 11:25 AM, tide at approximately -2.82 feet MLLW. [MAG0009]



Johnny's Dock, Photo Point 1B, facing northwest. Photo taken July 10, 2006 at 11:25 AM, tide at approximately -2.82 feet MLLW. [MAG0010]



Johnny's Dock, Photo Point 2A, facing northwest. Photo taken July 10, 2006 at 11:31 AM, tide at approximately -2.75 feet MLLW. [MAG0011]



Johnny's Dock, Photo Point 2B, facing northeast. Photo taken July 10, 2006 at 11:31 AM, tide at approximately -2.75 feet MLLW. [MAG0012]

Head of Thea Foss Shoreline Habitat

Qualitative Ground Survey, Thea Foss Enhancement Sites

Date: 7/10/06 10:45 am Year (0) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Site (circle): Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: John O'Loughlin, Mary Henley
 Weather Conditions: cloudy, dry
 Overall health and vigor of plants: Excellent (Fair) Poor

Qualitative Observations:

	Riparian Area	Marsh Area	Comments
Erosion	/	none	
Sedimentation		none	
Wildlife		yes	goldfinch, geese
Vegetation			
Invasive		yes	
Volunteer		yes	gumweed
Survival (%)		~50%	
Animal Damage		none	
Disease		none	
Trash		some	minor
Vandalism	none		
Large Woody Debris		good	(log step)
Wrack or Organic Material		none	

Wildlife Notes (species observed, other evidence):

Goldfinch, Canada Geese, crows, white crown sparrow

Soil/Sediment Quality: upland aquatic areas
 Odor: none
 Sheen: none
 Color: grayish-brown
 Texture: silty sand

Notes:

Log step in good condition
Minor repairs on goose exclusion grid needed.
Weeding needed

Photo Points (Circle Site):

Year 0 1, 2, 4, 7, 10

Johnny's Dock	1A	1B	2A	2B
Head of Thea Foss	1 # 7	2 # 8		
SR509 Esplanade	1	2A	2B	3
Log Step	1			
Additional Photos				

Exclusion Grid Status (Johnny's Dock, Head of Thea, Log Step)

Generally in good condition, minor repairs only

Vegetation Diversity Notes:

RIPARIAN

Planted Species

N/A

Volunteer Species

Gumweed

Invasive Species

clover - various weeds

MARSH

Planted Species

willow stakes - good in higher areas ~ 50%
distichilis - excellent
jaumea - few
hairgrass - few

Volunteer Species

Gumweed

Invasive Species

various weeds

MISCELLANEOUS ADDITIONAL NOTES:



Head of Thea Foss, Photo Point 1, facing south. Photo taken July 10, 2006 at 10:41 AM, tide at approximately -2.89 feet MLLW. [MAG0007]



Head of Thea Foss, Photo Point 2, facing north. Photo taken July 10, 2006 at 10:55 AM, tide at approximately -2.96 feet MLLW. [MAG0008]

SR 509 Esplanade Riparian Habitat

Photo Points (Circle Site)

Year: 0 1 2 4 7 10

Johnny's Dock	1A	1B	2A	2B
Head of Tree Foss	1	2		
SR500 Esplanade	1 #5	2A #4 (C)	2B #3 (S)	3 #2
Log Step	1			
Additional Photos #6 weed at area north of bridge				

Exclusion Grid Status (Johnny's Dock, Head of Tree, Log Step)

N/A

Vegetation Diversity Notes

RIPARIAN

Planted Species

- 50% survival on madrone - doesn't appear to be caused by beehivings

also planted: shore pine, ocean spray, red-flowering currant
Tall Oregon grape, Pacific Rhodod, Salal + red buckthorn

Volunteer Species

none

Invasive Species

general weeds - clover, thistle, morning glory, blackberry

MARSH

Planted Species

Volunteer Species

N/A

Invasive Species

MISCELLANEOUS ADDITIONAL NOTES

Little mold on some currant



SR509 Esplanade, Photo Point 1, facing south. Photo taken July 10, 2006 at 10:23 AM, tide at approximately -2.68 feet MLLW. [MAG0005A]



SR509 Esplanade, Photo Point 2A, facing east. Photo taken July 10, 2006 at 10:15 A.M, tide at approximately -2.54 feet MLLW. [MAG0004A]



SR509 Esplanade, Photo Point 2B, facing south. Photo taken July 10, 2006 at 10:15 AM, tide at approximately -2.54 feet MLLW. [MAG0003A]



SR509 Esplanade, Photo Point 3, facing north. Photo taken July 10, 2006 at 10:03 AM, tide at approximately -2.28 feet MLLW. [MAG0002A]

Log Step Habitat Enhancement

Qualitative Ground Survey, Thea Foss Enhancement Sites

Date: 7/10/06 9:30 am Year: 0 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Site (circle): Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: John O'Laughlin, Mary Henley

Weather Conditions: cloudy, dry

Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area	Marsh Area	Comments
Erosion		none	
Sedimentation		none	
Wildlife		yes	crows, seagulls
Vegetation			
Invasive		none	butterfly bush at edge of site
Volunteer		none	
Survival (%)		~100% for dune grass - minimal for hairgrass	
Animal Damage		none	
Disease		none	
Trash		none	
Vandalism		none	
Large Woody Debris		present	tighten anchors
Wrack or Organic Material		none	some algae below step

Wildlife Notes (species observed, other evidence).

crows + seagulls

Soil/Sediment Quality:	upland	aquatic areas
Odor:		none
Sheen:		none
Color:		gray brown, gravelly sand
Texture:		gravelly sand

Notes:

Anchors on LWD require tightening (log step)
Goose exclusion grid in good condition

Photo Points (Circle Site)

Year: 0, 1, 2, 4, 7, 10

Johnny's Dock	1A	1B	2A	2B
Head of Thea Foss	1	2		
SR509 Esplanade	1	2A	2B	3
Log Step	1			
Additional Photos				

Exclusion Grid Status (Johnny's Dock, Head of Thea, Log Step)

Good Condition

Vegetation Diversity Notes:

RIPARIAN

Planted Species

N/A

Volunteer Species

Invasive Species

above planted area - dandelions, clover, butterfly bush

MARSH

Planted Species

American Dunegrass - near 100%
Tufted Hairgrass - minimal

Volunteer Species

N/A

Invasive Species

N/A

MISCELLANEOUS ADDITIONAL NOTES:



Log Step, Photo Point 1, facing north. Photo taken July 10, 2006 at 9:28 AM, tide at approximately -1.24 feet MLLW.
[MAG0001A]

Attachment B

Middle Waterway Tideflat Habitat Salinity Monitoring Data



City of Tacoma
Environmental Services
Science and Engineering Division

Memorandum

TO: Desiree Pooley, Sr. Environmental Specialist
FROM: Christopher L. Getchell, Sr. Environmental Specialist
SUBJECT: Middle Waterway Sediment Salinity SAP ENV-00042-03-10
DATE: July 27, 2006

Attached are the corrected data reports for the Middle Waterway Sediment Salinity samples collected May 23, 26, and 30, 2006. The Soil Salinity values in the original reports were reported with the wrong units.

All raw data concerning the analysis of these samples is stored in the Science and Engineering Division's archives and is immediately available.

If you have any questions concerning these results, call me at (253) 502-2130. Please note that the samples associated with this report will be discarded six months from the date of this report unless requested otherwise.

A handwritten signature in black ink, appearing to read "Christopher L. Getchell", with a stylized flourish at the end.

Christopher L. Getchell
Sr. Environmental Specialist

CLG:LAZ

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Fs005\lab_reports\SurfaceWater\Miscellaneous\MWW_20060523a.pdf



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523163
Sample ID: MWTF-BW1
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	26100	uS/cm
Soil Salinity	17.2	ppt

Lori A. Zboralski *July 27, 2006*
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

- Flags:
- U: The analyte was not detected at or above the reported value
 - UJ: The analyte was not detected at or above the reported estimated value
 - NJ: There is evidence the analyte is present. The associated value is an estimate
 - J: The analyte was positively identified. The associated value is an estimate
 - B: The analyte was detected but is less than the reporting limit goal



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523164
Sample ID: MWTF-BW2
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	23800	uS/cm
Soil Salinity	15.5	ppt

Leri A Zgoralski July 27, 2006
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523165
Sample ID: MWTF-BW3
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: Date

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Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523166
Sample ID: MWTF-BW4
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523167
Sample ID: MWTF-BW5
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	25300	uS/cm
Soil Salinity	16.5	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

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2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523168
Sample ID: MWTF-BW6
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	20700	uS/cm
Soil Salinity	13.4	ppt

Lori A Zboralski *July 27, 2006*
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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 - J: The analyte was positively identified. The associated value is an estimate
 - B: The analyte was detected but is less than the reporting limit goal



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523169
Sample ID: MWTF-BMCI
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

- Flags:
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 - J: The analyte was positively identified. The associated value is an estimate
 - B: The analyte was detected but is less than the reporting limit goal



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523170
Sample ID: MWTF-BMC2
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060523171
Sample ID: MWTF-BMC3
Sample Type: Water
Sample Date: 5/23/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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 - B: The analyte was detected but is less than the reporting limit goal



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526187
Sample ID: MWTF-BW1
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	14200	uS/cm
Soil Salinity	9.30	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: Date

ppt in Units indicates parts per thousand. N/A in Result means "not analyzed" due to insufficient liquid to analyze.

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526188
Sample ID: MWTF-BW2
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	15000	uS/cm
Soil Salinity	9.90	ppt

Lori A. Zboralski *July 27, 2006*
Reviewed By: _____ **Date** _____

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253 591.5588 Fax: 253 502 2170

Project: Stormwater Investigation

Date: July 27, 2006

Lab#: 20060526189

Sample ID: MWTF-BW3

Sample Type: Water

Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	28000	uS/cm
Soil Salinity	18.8	ppt

Lori A. Zporalski *July 27, 2006*

Reviewed By: **Date**

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526190
Sample ID: MWTF-BW4
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	13700	uS/cm
Soil Salinity	8.60	ppt

Lori A. Zboralski *July 27, 2006*

Reviewed By: **Date**

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526191
Sample ID: MWTF-BW5
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	8330	uS/cm
Soil Salinity	5.20	ppt

Leri A. Zboralski *July 27, 2006*

Reviewed By: **Date**

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City of Tacoma

Science and Engineering Division

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526192
Sample ID: MWTF-BW6
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	13000	uS/cm
Soil Salinity	8.50	ppt

Lori A. Zboralski *July 27, 2006*
Reviewed By: _____ Date: _____

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526193
Sample ID: MWTF-BMC1
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	3400	uS/cm
Soil Salinity	24.4	ppt

Lori A. Zboralski *July 27, 2006*
Reviewed By: _____ **Date** _____

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City of Tacoma

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526194
Sample ID: MWTF-BMC2
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	38700	uS/cm
Soil Salinity	27.7	ppt

Lori A. Zboralski *July 27, 2006*
Reviewed By: _____ **Date** _____

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060526195
Sample ID: MWTF-BMC3
Sample Type: Water
Sample Date: 5/26/2006

Test	Result	Units
CONVENTIONAL		
Conductivity	N/A	uS/cm
Soil Salinity	N/A	ppt

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

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City of Tacoma

Science and Engineering Division

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530198
Sample ID: MWTF-BW1
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	9.80	ppt
FIELD		
Conductivity	12200	uS/cm

Lori A. Zboralski *July 27, 2006*

Reviewed By:

Date

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530199
Sample ID: MWTF-BW2
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	8.00	ppt
FIELD		
Conductivity	10100	uS/cm

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

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Science and Engineering Division

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530200
Sample ID: MWTF-BW3
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	15.8	ppt
FIELD		
Conductivity	18900	uS/cm

Lesi A. Zboralski July 27, 2006
Reviewed By: **Date**

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Science and Engineering Division

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Phone: 253 591.5588 Fax: 253 502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530201
Sample ID: MWTF-BW4
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	2.80	ppt
FIELD		
Conductivity	3800	uS/cm

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530202
Sample ID: MWTF-BW5
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	2.00	ppt
FIELD		
Conductivity	2800	uS/cm

Lori A. Zbaralski July 27, 2006
Reviewed By: **Date**

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530203
Sample ID: MWTF-BW6
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	7.10	ppt
FIELD		
Conductivity	9000	uS/cm

Lori A. Zboralski July 27, 2006
Reviewed By: **Date**

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530205
Sample ID: MWTF-BMC2
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	28.0	ppt
FIELD		
Conductivity	31900	uS/cm

Lori A. Zgoralski *July 27, 2006*
Reviewed By: Date

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Project: Stormwater Investigation
Date: July 27, 2006

Lab#: 20060530206
Sample ID: MWTF-BMC3
Sample Type: Water
Sample Date: 5/30/2006

Test	Result	Units
CONVENTIONAL		
Soil Salinity	18.7	ppt
FIELD		
Conductivity	22100	uS/cm

Lori A. Zboralski *July 27, 2006*
Reviewed By: **Date**

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City of Tacoma
Environmental Services
Science and Engineering Division

Memorandum

TO: Mary Henley, Senior Engineer, Foss Construction Management
FROM: Christopher L. Getchell, Sr. Environmental Specialist
SUBJECT: Middle Waterway Sediment Salinity SAP ENV-00042-03-10
DATE: August 1, 2006

Attached are the data reports for the Middle Waterway Sediment Salinity samples collected July 24, 2006. These samples are associated with the sprinkler system placement on the Middle Waterway restoration sites.

The Science and Engineering Division Laboratory personnel collected and analyzed the samples for Soil Salinity and Conductivity.

All raw data concerning the analysis of these samples is stored in the Science and Engineering Division's archives and is immediately available.

If you have any questions concerning these results, call me at (253) 502-2130. Please note that the samples associated with this report will be discarded six months from the date of this report unless requested otherwise.

A handwritten signature in black ink that reads "Christopher L. Getchell". The signature is written in a cursive, flowing style.

Christopher L. Getchell
Sr. Environmental Specialist

CLG:BJP

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation

Date: August 01, 2006

Lab#:	20060725141	20060725142	20060725143
Sample ID:	MWTF-BW4	MWTF-BW5	MWTF-BW6
Sample Type:	Water	Water	Water
Sample Date:	7/24/2006	7/24/2006	7/24/2006

	Test	Result	Result	Result	Units
CONVENTIONAL					
	Soil Salinity	4.60	Too dry	3.10	PPT
FIELD					
	Conductivity	7480	Too dry	5200	uS/cm

Barbara J. Emberton
Reviewed By:

August 1, 2006
Date

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City of Tacoma

Science and Engineering Division
2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation

Date: August 01, 2006

Lab#:	20060725144	20060725145	20060725146
Sample ID:	MWTF-BMC1	MWTF-BMC2	MWTF-BMC3
Sample Type:	Water	Water	Water
Sample Date:	7/24/2006	7/24/2006	7/24/2006

	Test	Result	Result	Result	Units
CONVENTIONAL					
	Soil Salinity	22.0	32.8	17.5	PPT
FIELD					
	Conductivity	31500	45200	25600	uS/cm

Barbara J. Pemberton _____ *August 1, 2006* _____
 Reviewed By: Date

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City of Tacoma
Environmental Services
Science and Engineering Division

Memorandum

TO: Mary Henley, Senior Engineer, Foss Construction Management
FROM: Christopher L. Getchell, Sr. Environmental Specialist
SUBJECT: Middle Waterway Sediment Salinity SAP ENV-00042-03-10
DATE: August 30, 2006

Attached are the data reports for the Middle Waterway Sediment Salinity samples collected August 21, 2006. These samples are associated with the sprinkler system placement on the Middle Waterway restoration sites.

The Science and Engineering Division Laboratory personnel collected and analyzed the samples for Soil Salinity and Conductivity.

All raw data concerning the analysis of these samples is stored in the Science and Engineering Division's archives and is immediately available.

If you have any questions concerning these results, call me at (253) 502-2130. Please note that the samples associated with this report will be discarded six months from the date of this report unless requested otherwise.

Christopher L. Getchell
Sr. Environmental Specialist

CLG:BJP

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Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation

ENV-00042-03-10

Date: August 30, 2006

Lab#:	20060829318	20060829319	20060829320
Sample ID:	MWTF-BW1	MWTF-BW2	MWTF-BW3
Sample Type:	Water	Water	Water
Sample Date:	8/21/2006	8/21/2006	8/21/2006

Test	Result	Result	Result	Units
CONVENTIONAL				
Soil Salinity	2.0 U	2.0 U	2.0 U	0/00
FIELD				
Conductivity	1410	625	2560	uS/cm

Reviewed By:

Barbara Pemberton
August 30, 2006

Date

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City of Tacoma

Science and Engineering Division

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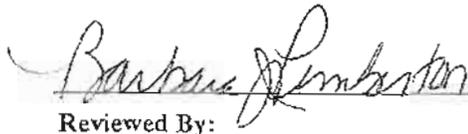
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
ENV-00042-03-10

Date: August 30, 2006

Lab#:	20060829321	20060829322	20060829323
Sample ID:	MWTF-BW4	MWTF-BW5	MWTF-BW6
Sample Type:	Water	Water	Water
Sample Date:	8/21/2006	8/21/2006	8/21/2006

Test	Result	Result	Result	Units
CONVENTIONAL				
Soil Salinity	2.0 U	2.0 U	14.7	0/00
FIELD				
Conductivity	26 U	26 U	22800	uS/cm



August 30, 2006

Reviewed By:

Date

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Project: Stormwater Investigation
ENV-00042-03-10
Date: August 30, 2006

Lab#:	20060829324	20060829325	20060829326	
Sample ID:	MWTF-BMC1	MWTF-BMC2	MWTF-BMC3	
Sample Type:	Water	Water	Water	
Sample Date:	8/21/2006	8/21/2006	8/21/2006	
Test	Result	Result	Result	Units
CONVENTIONAL				
Soil Salinity	27.3	12.3	22.3	0/00
FIELD				
Conducvity	38400	18600	31900	uS/cm

Bruce Pemberton August 30, 2006
 Reviewed By: _____ Date

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City of Tacoma
Environmental Services
Science and Engineering Division

Memorandum

TO: Mary Henley, Senior Engineer, Foss Construction Management
FROM: Christopher L. Getchell, Sr. Environmental Specialist
SUBJECT: Middle Waterway Sediment Salinity SAP ENV-00042-03-10
DATE: September 26, 2006

Attached are the data reports for the Middle Waterway Sediment Salinity samples collected September 18, 2006. These samples are associated with the sprinkler system placement on the Middle Waterway restoration sites.

The Science and Engineering Division Laboratory personnel collected and analyzed the samples for Soil Salinity and Conductivity.

All raw data concerning the analysis of these samples is stored in the Science and Engineering Division's archives and is immediately available.

If you have any questions concerning these results, call me at (253) 502-2130. Please note that the samples associated with this report will be discarded six months from the date of this report unless requested otherwise.

Christopher L. Getchell
Sr. Environmental Specialist

CLG:LAZ

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Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation
ENV-00042-03-10
Date: September 26, 2006

Lab#:	20060922080	20060922081	20060922082	
Sample ID:	MWTF-BW1	MWTF-BW2	MWTF-BW3	
Sample Type:	Water	Water	Water	
Sample Date:	9/18/2006	9/18/2006	9/18/2006	
Test	Result	Result	Result	Units
CONVENTIONAL				
Soil Salinity	11.6	7.80	27.9	0/00
FIELD				
Conductivity	16000	11600	37000	uS/cm

Lew A. Zgonalski

September 26, 2006

Reviewed By:

Date

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Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Stormwater Investigation

ENV-00042-03-10

Date: September 26, 2006

Lab#:	20060922086	20060922087	20060922088	
Sample ID:	MWTF-BMC1	MWTF-BMC2	MWTF-BMC3	
Sample Type:	Water	Water	Water	
Sample Date:	9/18/2006	9/18/2006	9/18/2006	
Test	Result	Result	Result	Units
CONVENTIONAL				
Soil Salinity	31.7	26.0	20.5	0/00
FIELD				
Conductivity	41500	34700	28000	uS/cm

Leri A. Zboralski

September 26, 2006

Reviewed By:

Date

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