SHORELINE RESTORATION PLAN

An Element of the Shoreline Master Program

City of Tacoma, Washington

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Shoreline Restoration Plan

The City of Tacoma's *Shoreline Restoration Plan* is an element of the City's *Shoreline Master Program* and was developed in compliance with the Washington State Shoreline Management Act and Washington State Growth Management Act.

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1.0 OVERVIEW OF SHORELINE RESTORATION GOALS

Tacoma's shoreline restoration goals and objectives are aimed at restoring identified degraded areas. The following overarching goals will guide restoration efforts along the Tacoma shoreline:

- Improve shoreline water quality;
- Re-establish and restore natural shoreline processes, restore degraded and lost habitat, and wildlife corridors;
- Improve connectivity of the shoreline environments to one another and to adjacent habitat corridors that support priority species and species of local significance; and
- Promote shoreline stewardship.

2.0 INTRODUCTION

The Shoreline Restoration Plan is designed to meet the requirements for restoration planning outlined in the Department of Ecology Guidelines; WAC 173-26-201(2)(f) or, Guidelines, as well as the goals and aspirations of the people of the City of Tacoma. A restoration plan is not a regulatory document or a set of regulatory requirements. The Guidelines, however, point to restoration planning as a guide for improving shoreline ecological function at a city-wide scale.

Figure 1 A beach restoration project was part of the development of Chinese Reconciliation Park along Ruston Way. The Project includes beach stabilization and restoration (addition of fish friendly substrate) as well as off shore restoration. The benefits include wave attenuation and reconnection of the shoreline and water, and enhanced nearshore marine habitat.

The Shoreline Master Program should include restoration goals and policies, and regulations that facilitate implementation of restoration projects. The purpose of Tacoma's Shoreline Restoration Plan is to identify restoration goals and objectives, identify existing programs, plans and policies that contribute to shoreline restoration, to prioritize degraded areas with potential for ecological restoration, and provide a strategy for implementation of this plan. Additionally, this document is intended as a basis for partnership

between the City of Tacoma, and its citizens, businesses, property owners, and non-governmental organizations.

The Shoreline Restoration Plan describes and relies heavily on the significant past and ongoing shoreline analyses and restoration programs in the city of Tacoma. This plan also builds on the assessment of shoreline functions and opportunity areas that was compiled in the Tacoma Shoreline Inventory and Characterization (July 2007).

Project proponents seeking mitigation sites can consider potential opportunities identified in this Shoreline Restoration Plan. Other conservation and restoration groups or agencies with restoration funding could also use the identified goals, policies and opportunities to guide their actions.

Specifically, this Shoreline Restoration Plan includes:

- A discussion of the purpose and regulatory background of this Shoreline Restoration Plan and the definition of restoration in the context of shoreline planning (Section 3.0);
- Proposed shoreline restoration goals and objectives (Section 4.0).
- Restoration opportunities and prioritization criteria (Section 5.0);
- A summary of existing restoration plans, programs and policies (Section 6.0); and
- A discussion about how this Shoreline Restoration Plan will be implemented, including funding and partnerships, timelines and benchmarks, strategies for measuring effectiveness and adaptive management (Section 7.0).

3.0 PURPOSE AND INTENDED USE OF THE SHORELINE RESTORATION PLAN

The governing principles of the Guidelines (WAC 173-26-186) clarify that restoration of shoreline ecological functions is accomplished through the following

- Goals and policies for restoring ecologically impaired shorelines;
- Meaningful understanding of the current shoreline ecological conditions;
- Regulations and mitigation standards that ensure that permitted developments do not cause a net loss of ecological functions;
- Regulations that ensure developments exempt from permitting do not result in net loss of ecological functions when evaluated in the aggregate;
- Regulations and programs that fairly allocate the burden of mitigating cumulative impacts among development opportunities; and

- Incentives or voluntary measures designed to restore and protect ecological functions.

Restoration planning relies on voluntary mechanisms (rather than regulatory provisions), economic incentives and varied funding sources that can contribute to the improvement of ecological functions. The Guidelines do not state that local programs should or could require individual permit applicants to restore past damages to an ecosystem as a condition of a permit for new development. However, this Shoreline Restoration Plan can be used to guide compensatory mitigation projects to shoreline areas where they may have the most effect. The City and project proponents may use Shoreline Restoration Plan information to prioritize the types and locations for restoration and mitigation actions. Other conservation and restoration groups or agencies, such as those identified in this plan, could also use the identified goals, objectives and opportunities to guide their actions.

3.1 Regulatory Background

Shorelines are a major feature in the City of Tacoma, providing both a valuable setting for land use and recreation and performing important ecological functions. The Shoreline Management Act (SMA or the Act; RCW 90.58) is charged with balancing how shorelines should be developed, protected, and restored. The Act has three broad policies or mandates; it strives to: 1) encourage water-dependent uses, 2) protect shoreline natural resources, and 3) promote public access. Restoration planning is an important component of the environmental protection policy of the Act. This Shoreline Restoration Plan supplements the City of Tacoma's Shoreline Master Program (TSMP).

Tacoma's Shoreline Master Program (TSMP) is being updated to comply with the Shoreline Management Act (SMA) requirements (RCW 90.58), and the state's SMP Guidelines (Washington Administrative Code [WAC] 173-26, Part III), which went into effect in 2003. The SMP Guidelines require that local governments develop SMP goals that promote "restoration" of impaired shoreline ecological functions and a "real and meaningful" strategy to implement restoration objectives. Local governments are also encouraged to contribute to restoration by planning for and supporting restoration of shoreline functions through the SMP and other regulatory and non-regulatory programs. The City's Shoreline Inventory and Characterization (ESA Adolfson, July 2007) describes how natural shoreline processes have been modified and identifies the restoration potential and opportunities within each shoreline reach. This Shoreline Restoration Plan builds on that analysis. See Section 3.0 for a discussion of how this plan meets the State's 2003 Guidelines.

Table 1 summarizes the key elements for shoreline restoration planning required by the Guidelines, and identifies which section of this Shoreline Restoration Plan addresses each element.

Table 1. WAC Requirements and Tacoma's Shoreline Restoration Plan

Key elements for the shoreline restoration planning process WAC 173-26-201(2)(f)	Location in Tacoma Shoreline Master Program and Supporting Information
Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration.	Shoreline Inventory and Characterization, Section 8.0
Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions.	Shoreline Restoration Plan, Section 4.3 and TSMP section 3.5
Identify existing and ongoing projects and programs that are currently being implemented which are designed to contribute to local restoration goals (such as capital improvement programs (CIPs) and watershed planning efforts (WRIA habitat/recovery plans).	Shoreline Restoration Plan, Section 6.0
Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.	Shoreline Restoration Plan, Section 7.0
Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals (e.g., monitoring of restoration project sites).	Shoreline Restoration Plan, Section 7.0
Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs.	Shoreline Restoration Plan, Sections 5.0 and 7.0

3.2 Defining Restoration

The state has directed local governments to develop SMP provisions "…to achieve overall improvements in shoreline ecological functions over time when compared to the status upon adoption of the master program." This overarching goal is accomplished primarily through two distinct objectives:

Protection of existing shoreline functions through regulations and mitigation requirements to ensure "no net loss" of ecological functions from baseline environmental conditions; and Restoration of shoreline ecological functions that have been impaired from past development practices or alterations.

This distinction is illustrated in Figure 1 below.

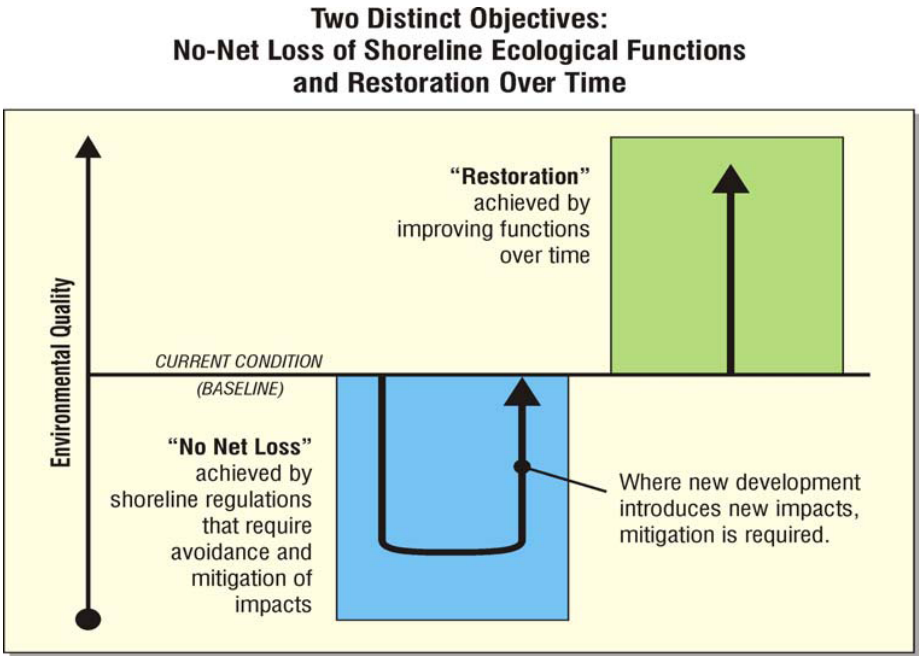


Figure 2 Mitigation versus Restoration in Shoreline Master Programs (Source: Department of Ecology)

The concept of no net loss of shoreline ecological function is embedded in the Act and in the goals, policies and governing principles of shoreline Guidelines and other federal and state environmental protections (e.g., the Clean Water Act). Washington's general policy goals for shorelines of the state include the "protection and restoration of ecological functions of shoreline natural resources." This goal derives from the Act, which states, "permitted uses in the shoreline shall be designed and conducted in a manner that minimizes insofar as practical, any resultant damage to the ecology and environment of the shoreline area."

There are numerous definitions for "restoration" in scientific and regulatory publications. Specific elements of these definitions often differ, but the core element of repairing damage to an existing, degraded ecosystem remains consistent. In the SMP context, the WAC defines "restoration" or "ecological restoration" as:

> "*…the reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions"* (WAC 173-26-020(27)).

Using the WAC definition of restoration with regard to state shorelines, it is clear the effort should be focused on specific shoreline areas where natural shoreline functions have been modified or degraded. The emphasis in the WAC is to achieve overall improvement in existing shoreline processes or functions, where functions are impaired. Therefore, the goal is not to restore the shoreline to historically natural conditions, but rather to improve on existing, degraded conditions. In this context, restoration can be broadly implemented through a

combination of programmatic measures (such as surface water management or public education) and site-specific projects (such as riparian plantings or habitat creation).

The Guidelines focus on an understanding and analysis of ecosystem-wide processes, or landscape scale processes that form and maintain shoreline ecological functions. The challenges with implementing restoration in highly urbanized settings have been characterized by Borde et al (2004), below. Shoreline restoration in Tacoma presents similar challenges and benefits.

> More than 50% of the U.S. Population lives on the coast, with a higher growth rate in coastal counties than in the country as a whole. The result of this development has been the loss of a high percentage of coastal habitats that were once present in urban areas. Restoration in highly urbanized settings represents perhaps the most critical and challenging situation to use the principles of landscape ecology for choosing a restoration site. While the challenges of urban restoration are many, the importance of habitat restoration in these settings is monumental from an ecological and societal perspective. The ecological importance of projects in urban areas can be disproportional to the size of the project because of the lack of ecological habitat in the surrounding areas. In other words, urban restoration can be more important, even in small areas, than in other rural restoration.
>
> Restoration in urban areas presents the following challenges:
>
> - Multiple inputs watershed-wide that are outside of a restoration site;
> - Limited sites available for restoration;
> - Limited reference sites;
> - Confounding factors, such as poor water quality, chemical contamination, and altered hydrology;
> - Fragmented habitat;
> - Competition for remaining potential restoration sites by development parties;
> - High costs due to land acquisition expenses and the amount of work required to reverse habitat modifications;
> - Differing needs for coastal resources (e.g., economic, cultural, social, recreational, environmental);
> - Differing values of local citizens and government decision-makers; and
> - Unintended potential impacts on neighboring properties that could be affected by expanded buffers.
>
> However, these challenges are often offset by the following benefits:

- The restored habitat provides pockets of habitat where otherwise there would be none;
- Restored habitat can provide a connectivity to adjacent, more functional habitats;
- Additional natural landscapes for urban residents;
- A heightened public awareness of coastal ecosystems;
- Educational opportunities;
- Public involvement in the restoration process of highly visible projects, resulting in community project stewardship; and
- Pre-identified restoration sites can "organize" efforts including manpower, staff time and funding to further other SMA restoration goals.

4.0 SHORELINE RESTORATION PLAN GOALS AND OBJECTIVES

This section discusses existing shoreline restoration goals in the Tacoma Comprehensive Plan (2007) and Open Space Habitat and Recreation Plan (2008), and proposes additional goals and policies considering issues identified in the Shoreline Inventory and Characterization (2007).

4.1 Comprehensive Plan

The general goal in the Environmental Policy Element of the City of Tacoma's Comprehensive Plan (last amended 6/30/2009) is to "ensure conservation, protection, enhancement and proper management of natural resources and shoreline, while providing for a balanced pattern of development and the needs of the citizens of the City of Tacoma." There is a strong environmental policy basis in the Comprehensive Plan for the restoration of shoreline resources.

4.2 Open Space Habitat and Recreation Plan

The City of Tacoma, Green Tacoma Partnership and the Metropolitan Park District developed an Open Space Habitat and Recreation Plan in 2008. This plan and action program includes strategies for open space acquisition, management and restoration as well as city-wide green strategies. The Open Space Habitat Plan was developed to meet goals seven, nine and ten of the Washington State Growth Management Act (GMA). Goal #7 directs the City to develop regulations and "process permits in a timely and fair manner" by providing mitigation sites to further restoration goals with mitigation on-site is not an option. Goal #9 encourages cities and counties to retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water and develop parks and recreation facilities. Goal #10 encourages cities and counties to protect the environment and enhance Washington's high quality of life, including air and water quality, and the availability of water.

4.3 Shoreline Restoration Goals and Objectives.

Tacoma's restoration goals and objectives must be consistent with WAC Guidelines (described in Section 3.1). As such, goals are to be aimed at restoring identified degraded areas and impaired ecological functions. The City's primary goal is to achieve an overall net gain in shoreline ecological function through the Shoreline Master Program, including restoration planning and implementation, policies and development regulations. As discussed in Section 1 of this Plan,

Figure 3 This public area along Ruston Way is planted with street trees and non-native ornamental shrubs; all set back from the shoreline. Replacing this landscaping with native vegetation (trees and shrubs) would preserve and maintain the existing use of the area and would add ecological value. Native shoreline vegetation would improve habitat by adding a source of woody debris, detrital inputs, and nearshore shade. These elements provide food and refuge for juvenile and adult fish and are key components of a well functioning natural shoreline.

restoration actions are meant to achieve the following four priorities for restoration citywide:

1. Improve shoreline water quality
2. Re-establish and restore natural shoreline processes, restore degraded and lost habitat, and wildlife corridors
3. Improve connectivity of the shoreline environments to one another and to adjacent habitat corridors that support priority species and species of local significance
4. Promote shoreline stewardship

The following restoration goals and objectives specifically address the altered shoreline processes and functions identified in the Shoreline Inventory and Characterization (ESA Adolfson, 2007 – summarized in Appendix B). Objectives identify specific measurable actions that can be taken to achieve the stated goals. For example, to meet the goal of improving water quality, an objective might be to remove creosote pilings.

4.3.1 Hydrology

Goal: Improve wave energy attenuation within the City's nearshore.

Objective: Restore estuarine and freshwater wetlands.

Objective: Encourage removal of bulkheads and use of soft armoring.

Goal: Increase the area over which the fresh to salt water transition occurs.

Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.

Goal: Reconnect the Puyallup River and Hylebos Creek channels to the floodplain, and generally increase flood storage along the Puyallup River and within natural floodplains that do not detrimentally impact previously developed areas.

Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.

Objective: Partner with watershed entities and Pierce County to improve flood storage along the Puyallup River.

Goal: Increase summer flows in the Puyallup River and Hylebos Creek.

Objective: Partner with regional and upstream entities to address minimum instream flows in the Puyallup River and Hylebos Creek.

Goal: Improve hydrological functions in the fresh to salt water transition area.

Objective: Restore estuarine and freshwater wetlands.

Objective: Connect freshwater seeps and wetlands to the shoreline.

Goal: Maintain the important water storage function of Wapato Lake.

Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.

4.3.2 Sediment Generation and Transport

Goal: Improve sediment delivery to support nearshore processes.

Objective: Reconnect feeder bluff functions.

Objective: Encourage natural sediment delivery to the nearshore and remove blockages on streams (i.e. culverts).

4.3.3 Water Quality

Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants.

Objective: Restore estuarine and freshwater wetlands.

Goal: Remove and avoid pollutant discharges (including turbidity) to the shoreline and state waters.

Objective: Prevent further loss of wetland area.

Objective: Restore estuarine and freshwater wetlands.

Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.

Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.

Objective: Require water quality BMPs in urban and industrial areas.

Objective: Implement stormwater quality measures in the Hylebos Creek Basin Plan.

Figure 4 The image above shows a collection of creosote-treated pilings south of the Sperry Dock along Schuster Parkway. Removal of these pilings would improve water quality by removing a contaminant source. For decades marine piles were coated with creosote, a preservative that protected the wood from wood-boring organisms. Approximately 300 chemicals have been identified in coal-tar creosote, many of which have been found to be potentially toxic to fish, other marine organisms and humans.

Goal: Restore the water quality of Wapato Lake.

Objective: Restore wetlands.

Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.

4.3.4 Habitat

Goal: Improve aquatic habitat conditions.

Objective: Restore and protect salt marsh habitat.

Objective: Remove fish passage barriers.

Objective: Restore eelgrass habitat where degraded.

Goal: Preserve and restore existing shoreline forests, and reconnect forests and the nearshore.

Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.

Goal: Establish native riparian vegetation communities along the shoreline.

Objective: Plant native vegetation along Puyallup River levees whenever possible as consistent with levee management standards.

Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.

Objective: Re-establish native riparian plant and forest communities around Wapato Lake.

Goal: Establish long term sources of large woody debris (LWD) to support shoreline habitat.

Objective: Reintroduce woody debris along the Puyallup River through plantings behind the levees and wood placement as consistent with levee management standards.

Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.

Objective: Re-establish native riparian plant and forest communities around Wapato Lake while preventing conflicts with recreational uses.

Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands.

Objective: Preserve existing and establish new habitat corridors around Wapato Lake.

5.0 RESTORATION OPPORTUNITIES

This section describes restoration opportunities within each shoreline district and criteria for use in prioritizing specific projects over time.

5.1 Opportunities

Restoration opportunities were identified based on the findings of the Shoreline Inventory and Characterization (2007).

Table 2 identifies specific restoration actions associated with the types and levels of shoreline alterations and the potential for restoration within each shoreline district. Further, the specific goals and objectives that Tacoma aims to achieve are associated with each action. Potential metrics for measuring the success of and monitoring restoration actions are suggested. Table 2 is not meant to be an exhaustive list of restoration actions and does not prohibit other meaningful objectives from being pursued.

As the City implements restoration actions, sea level rise and its potential effect on shoreline habitat will be considered (ESA Adolfson, 2007 – summarized in Appendix B). The size, elevation and overall resiliency of restoration projects will need to be planned according to expected changes in sea level.

Map 1 in Appendix A shows restoration opportunities conceptually as they occur across Tacoma's shoreline.

Table 2. Ecological Processes, Restoration Goals and Objectives, and Associated Actions

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-1A and B Western Slope South					
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**Moderate**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area
Habitat: Maintenance of typical native plant community	**High**	**Moderate**	Goal: Preserve and restore existing shoreline vegetation. Objective: Restore and protect marine riparian vegetation, where possible. Objective: Restore eelgrass habitat where degraded	Restore shoreline vegetation and salt water connections Replant eelgrass where degraded	Lineal feet of vegetated shoreline Square feet of restored eelgrass habitat
S-2 Western Slope Central					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district

[1] *See Shoreline Inventory and Characterization, Section 8.0, for a discussion of the level of alteration of shoreline ecological processes and functions.*

[2] *See Appendix 3 to this Plan for a summary of the criteria used to rate restoration potential. See Shoreline Inventory and Characterization, Section 8.0, for further discussion.*

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs have been reconnected Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Remove creosote contaminated logs, pilings and debris.	Use LID and water quality improvement measures in and adjacent to shoreline. Remove creosote contaminated pilings and debris.	Water quality sampling/indicators. Decrease in total impervious area. Number of pilings and contaminated logs removed.
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Limit wetland fill in or adjacent to shoreline districts.	Total area of wetland.

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Maintenance of typical native plant community	**Moderate**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Improve aquatic habitat conditions. Objective: Restore and protect salt marsh habitat.	Restore salt marsh and tidal wetlands	Acres of wetland restored within the shoreline district
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of native habitat enhanced within the shoreline district.
S-3 Western Slope North					
Hydrology: Attenuation of wave energy	**High**	**Low**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of hard bulkhead removed and replaced with new soft-shore armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs have been reconnected Feet of feeder bluff along shoreline

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of riparian vegetation. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline vegetation and nearshore habitats and enhance existing vegetation. Objective: Remove or improve overwater structures.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Lineal feet of shoreline vegetation or acres of forest enhanced within the shoreline district Square feet of overwater coverage (opaque). Lineal feet of unmodified shoreline/bluff
S-4 and S-5 Point Defiance					
Hydrology: Attenuation of wave energy	**High**	**High**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs have been reconnected Feet of feeder bluff along shoreline
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area and increase shoreline vegetation	Use LID and water quality improvement measures in and adjacent to shoreline. Limit wetland fill in or adjacent to shoreline districts.	Water quality sampling/indicators Decrease in total impervious area Lineal feet of shoreline vegetation.
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests. Objective: Restore eelgrass habitat where degraded	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of native habitat enhanced within the shoreline district.

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-6 Ruston Way					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands. Objective: Encourage removal of bulkheads and use of soft armoring.	Restore historic wetlands and/or enhance existing wetlands Replace existing bulkheads with soft shoreline armoring	Acres of restored wetland within the shoreline district Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs are reconnected Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area. Objective: Increase native shoreline vegetation	Use LID and water quality improvement measures in and adjacent to shoreline. Enhance shoreline vegetation Limit wetland fill in or adjacent to shoreline districts. Avoid loss of vegetation along shoreline	Water quality sampling/indicators Decrease in total impervious area Acres of restored wetland Lineal feet of shoreline vegetation
Habitat: Source and delivery of LWD	**High**	**Low**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests and shoreline vegetation. Objective: Restore eelgrass habitat where degraded	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees. Daylight culverted portions of streams and drainages, where possible.	Number of connections between upland forest and nearshore. Acres of forest habitat enhanced within the shoreline district Lineal feet of shoreline vegetation.

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-6/7 Schuster Parkway Transition and S-7 Schuster Parkway					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs are reconnected Feet of feeder bluff along shoreline
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area.	Use LID and water quality improvement measures in and adjacent to shoreline. Limit wetland fill in or adjacent to shoreline districts. Enhance shoreline vegetation where possible.	Water quality sampling/indicators Decrease in total impervious area Water quality sampling/indicators Lineal feet of shoreline vegetation
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-8 Thea Foss Waterway					
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, creosote contaminated logs, pilings and debris. Objective: Remove or cap contaminated sediments to ensure no discharge.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed or amount of contaminated sediments capped.
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area and enhance shoreline vegetation.	Use LID and water quality improvement measures in and adjacent to shoreline. Limit wetland fill in or adjacent to shoreline districts.	Water quality sampling/indicators Decrease in total impervious area Total area of wetland. Lineal feet of shoreline vegetation.
S-9 Puyallup River					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Increase the area over which the fresh to salt water transition occurs. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Hydrology: Fresh to Salt Water Transition	Area of fresh to salt water transition

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Channel and floodplain connection	**High**	**Low**	Goal: Reconnect the Puyallup River channels to the floodplain and generally increase flood storage. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Restore historic wetlands and/or enhance existing wetlands Set back levees	Acres of restored wetland within the shoreline district Acres of floodplain expansion
Hydrology: Summer low flows	**High**	**Moderate**	Goal: Increase summer flows in the Puyallup River. Objective: Partner with regional and upstream entities to address minimum instream flows in the Puyallup River.	Continue coordination with regional entities including Pierce County.	Acres of restored floodplain watershed-wide.
Hydrology: Flood flow retention	**Moderate**	**Low**	Goal: Reconnect the Puyallup River channels to the floodplain and generally increase flood storage. Objective: Partner with watershed entities and Pierce County to improve flood storage along the Puyallup River.	Continue coordination with regional entities including Pierce County.	Acres of restored floodplain watershed-wide.
Water Quality: Water contact time with soil	**High**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Encourage the restoration of estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district Decrease in total impervious area

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Restore estuarine and freshwater wetlands.	Use LID and water quality improvement measures in and adjacent to shoreline. Restore historic wetlands and/or enhance existing wetlands	Water quality sampling/indicators Decrease in total impervious area Total acres of wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove creosote contaminated logs, pilings and debris.	Remove creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed.
Habitat: Maintenance of typical native plant community	**High**	**Low**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Plant native vegetation along Puyallup River levees whenever possible as consistent with levee management standards. Objective: Plant native vegetation behind the Puyallup River levees whenever possible as consistent with levee management standards.	Restore native shoreline vegetation and wetland connections.	Acres of habitat enhanced within the shoreline district

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Reintroduce LWD along the Puyallup River through plantings behind the levee and wood placement as consistent with levee management standards.	Remove structural barriers between shoreline vegetation and river Remove fish passage barriers. Enhance existing shoreline vegetation with native plants and trees.	Acres of habitat enhanced within the shoreline district Number of fish passage barriers removed.
S-10 Port Industrial					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Connect freshwater seeps and wetlands to the shoreline.	Excavate and revegetate connections between seeps/wetlands and shorelines	Number of connections Acres of wetland connection
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of enhanced/restored wetland within the shoreline district
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of enhanced/restored wetland within the shoreline district

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area.	Use LID and water quality improvement measures in and adjacent to shoreline. Do not allow wetland fill in or adjacent to shoreline districts.	Water quality sampling/indicators Total acres of wetland
Habitat: Maintenance of typical native plant community	**Moderate**	**Low**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Improve aquatic habitat conditions. Objective: Restore and protect salt marsh habitat. Objective: Restore eelgrass habitat where degraded	Restore salt marsh and tidal wetlands	Acres of wetland restored within the shoreline district

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing shoreline vegetation with native plants and trees.	Number of connections between upland forest and nearshore. Area of forest enhanced or lineal feet of shoreline vegetation.
S-11 Marine View Drive					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Connect freshwater seeps and wetlands to the shoreline.	Excavate and revegetate connections between seeps/wetlands and shorelines	Number of connections Acres of wetland connection
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs are reconnected Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Number of parcels where bluffs are reconnected Feet of feeder bluff along shoreline

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, creosote contaminated logs, pilings and debris. Objective: Remove or cap contaminated sediments to ensure no discharge.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed or amount of contaminated sediments capped.
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques. Objective: Prevent further loss of wetland area.	Use LID and water quality improvement measures in and adjacent to shoreline. Do not allow wetland fill in or adjacent to shoreline districts.	Water quality sampling/indicators Decrease in total impervious area Total acres of wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests. Objective: Restore eelgrass habitat where degraded	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest habitat enhanced.
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, creosote contaminated logs, pilings and debris. Objective: Remove or cap contaminated sediments to ensure no discharge.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed or amount of contaminated sediments capped.
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	Total acres of wetland
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-12 – Hylebos Creek					
Hydrology: Fresh to Salt Water Transition	**High**	**Moderate**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district
Hydrology: Channel and floodplain connection	**High**	**Moderate**	Objective: Reconnect Hylebos Creek channels to the floodplain. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Restore historic wetlands and/or enhance existing wetlands Setback levees	Acres of restored wetland within the shoreline district Acres of floodplain expansion

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Upland sediment generation	**Moderate**	**Moderate**	Goal: Reduce sediment loading in Hylebos Creek. Objective: Require water quality BMPs in urban and industrial areas. Objective: Implement stormwater quality measures in the Hylebos Creek Basin Plan.	Use water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Water contact time with soil	**High**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Restore estuarine and freshwater wetlands.	Restore historic wetlands and/or enhance existing wetlands	Acres of restored wetland within the shoreline district
Habitat: Maintenance of typical plant community	**Moderate**	**High**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.	Establish native plants and trees along creek.	Number of trees and plants surviving 2 years after planting Acres planted

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.	Establish native plants and trees along creek.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat Barriers to fish passage	**Moderate**	**Moderate**	Goal: Improve aquatic habitat conditions. Objective: Remove fish passage barriers.	Remove barriers between shoreline and upstream habitat	Number of barriers removed Fish population in upstream habitat Miles of newly accessible habitat
S-14 Wapato Lake					
Hydrology: Water storage	**Moderate**	**Moderate**	Goal: Maintain the important water storage function of Wapato Lake. Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.	Prepare and implement basin plan to manage Wapato Lake hydrology.	Plan completed
Sediment Generation and Transport: Sediment Sink	**Low**	**Moderate**	Goal: Reduce sediment loading in Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Restore wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area
Habitat: Maintenance of native plant community	**High**	**High**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plants and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plants and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Connection between upland and aquatic habitats	**Moderate**	**Low**	Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands. Objective: Preserve existing and establish new habitat corridors around Wapato Lake.	Remove barriers between Wapato Lake and upland habitat	Number of corridors created Barriers removed Acres of habitat corridor
Hydrology: Water storage	**Moderate**	**Moderate**	Goal: Maintain the important water storage function of Wapato Lake. Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.	Prepare and implement basin plan to manage Wapato Lake hydrology.	Plan completed

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment Sink	**Low**	**Moderate**	Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators Decrease in total impervious area
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Restore wetlands.	Restore existing wetlands	Acres of restored wetland within the shoreline district
Habitat: Maintenance of native plant community	**High**	**Moderate**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plants and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plant s and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Connection between upland and aquatic habitats	**Moderate**	**Low**	Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands. Objective: Preserve existing and establish new habitat corridors around Wapato Lake.	Remove barriers between Wapato Lake and upland habitat	Number of corridors created Barriers removed Acres of habitat corridor

5.2 Criteria for Prioritizing Restoration Projects

The State's 2003 Guidelines do not include specific criteria for local jurisdictions to use in prioritizing restoration actions. Ecology has encouraged jurisdictions to use Stanley et al (2005) as a guide in prioritizing actions. In general, Stanley et al (2005) proposes that ecological processes and functions be evaluated at the reach and watershed scale. Functions should be protected where there is low alteration and enhanced in the urban environment where there is high alteration at the reach and watershed scale. Where there is low alteration of a reach within the context of a highly altered watershed (such as S-4, Point Defiance in the lower Chambers-Clover Watershed), Stanley et al (2005) recommends that the focus be on the restoration of broad ecological processes.

Collaborating with adjacent jurisdictions to restore ecological processes operating at the landscape level will help to protect existing functions and set the stage for reach- or site-specific actions. It is generally accepted that controlling factors or ecological processes must be restored to provide the basis for ecological functions. Once processes are intact, restoration of functions can be successful in the long term (Thom et al. 2005). High level guidance on appropriate shoreline enhancement actions from the Commencement Bay Aquatic Ecosystem Assessment (2000) can help guide restoration decisions. See Appendix C for further discussion of the foundation for restoration priorities in this Plan.

The following criteria will be used to prioritize restoration actions and fill the needs identified in Table 2 and Map 1 (in Appendix A).

If a project's priority was identified in previous plans/programs, that ranking is incorporated into this Shoreline Restoration Plan. If a project was not previously ranked and as new projects are proposed, the following criteria can be applied to determine their level of priority. A project may be rated as a low, medium or high priority once it is reviewed according to these criteria. The criteria are not listed in order of importance or priority.

<u>Screening criteria:</u>

- Site can be made available for restoration; sites do not have substantial structures or pavement.
- Site has limited potential for contamination/recontamination.

<u>Prioritization criteria:</u>

- The project meets the goals and objectives for shoreline restoration.
- The project is directly associated with a moderate or high restoration potential/opportunity, according to the Shoreline Inventory and Characterization.
- The project is sustainable and there is a high likelihood of success given the status of ecological processes and functions and larger watershed controls (such as sea level rise associated with climate change, or erosion associated with river/creek flows affected by land uses in the greater watershed).

- The project would increase functional connectivity or link existing habitats.
- The project is cost-effective. For example, enhancement of existing habitat is more cost-effective than creating new habitat (enhancement generally requires less engineering, less earth-moving, less cost).
- Size of area to be protected or restored; greater than 2 acres is preferred.
- Ownership and management does not present access challenges.
- Adjacent land uses are compatible with the site to be protected or restored.
- There is public support for the project.

6.0 EXISTING RESTORATION EFFORTS

Much effort has been dedicated to protecting natural areas and restoring Tacoma's shoreline. Although the Shoreline Inventory and Characterization demonstrated that there is currently a significant degree of alteration to ecological processes, it also illustrated that there are many areas of opportunity for improvement. This section provides an overview of organizations, plans, programs and policies that currently address shoreline restoration. The efforts of both public and private organizations are included. Appendix A, Map 2, show existing restoration sites associated with the existing efforts described in this section.

6.1 Local

Shoreline Master Program (1976) The City of Tacoma first adopted its SMP in 1976 as an element of the City's long-range comprehensive Land Use Management Plan (Comprehensive Plan, see below). The SMP is organized into two major parts. Part I is the Shoreline Plan, providing long-range goals and policies adopted by resolution. Part II establishes shoreline districts, shoreline environment designations, use regulations, and permitting procedures to govern development and other activities in the City's shorelines. The environment designations are to be based on biological and physical capabilities and limitations of the shoreline, existing and planned development patterns, and a community's vision or objectives for its future development. The City's SMP establishes three environment designations: Natural, Conservancy, and Urban. The City's SMP further establishes 14 distinct shoreline districts. Each district has shoreline environment designations, management policies, and use regulations applicable to properties in that district. The Shoreline Master Program is currently implemented by the City of Tacoma Building and Land Use Services (BLUS) division.

Comprehensive Plan (1993) The City of Tacoma's Comprehensive Plan is the official statement adopted by the City that establishes the long-range vision for the city. The Comprehensive Plan anticipates change for the coming 20 years and establishes direction for the future physical growth, development, and improvement of the city. The plan also fulfills the City's responsibilities to manage growth as mandated by the GMA. There are five primary elements mandated by the GMA: land use, transportation, housing, capital facilities, and utilities. These five general elements were initially adopted in 1993. The Shoreline Master Program was

amended and included as a general element of the Plan in 1996. Comprehensive Plan goals for the shoreline include conservation, protection, enhancement, and proper management of natural resources and shorelines, while providing for a balanced pattern of development and the needs of its citizens. Goals, objectives and policies relevant to shoreline restoration are included in the Shoreline Land Use Element, Open Space Habitat and Recreation Element (see discussion below), and Parks and Recreation Element.

Open Space Habitat and Recreation Plan (Comprehensive Plan Amendment; 2008) The City of Tacoma has been planning for and purchasing open space since the early 1970's. Since then, the City and its partnering agencies have acquired hundreds of acres of natural open space areas within the city. However, many areas which are appropriate to remain as open space are still unprotected and declining in habitat quality due to invasive species. Recent studies have shown that without a concerted restoration effort, the City's natural areas will lose significant forested canopy and biodiversity within the next 20 years.

Figure 5 This one-acre restoration project, along the Blair Waterway, was developed by the Port of Tacoma. The Port turned a portion of a former Rhone-Poulenc fertilizer plant into a salt marsh and mudflat habitat like those once common along Commencement Bay. Lying between Washington United Terminals and U.S. Oil, this public habitat area now provides food and refuge for young salmon before they enter Puget Sound. Filled with grasses, pussy willows and other native plants and trees, this habitat attracts small mammals and many types of birds.

In response, the City of Tacoma, Green Tacoma Partnership and the Metropolitan Park District developed an Open Space Habitat and Recreation Plan. This plan and action program includes strategies for open space acquisition, management and restoration as well as city-wide green strategies. The Plan provides an integrated vision for Tacoma's habitat and recreation lands and facilities. The plan sets forth goals, policies, and implementation plans for Tacoma municipal open spaces and natural areas. The Open Space Habitat Plan was developed to meet goals nine and ten of the GMA. Goal Nine encourages cities and counties to retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water and develop parks and recreation facilities. Goal Ten encourages cities and counties to protect the environment and enhance Washington's high quality of life, including air and water quality, and the availability of water.

In developing the Plan, the environmental quality and land use of Tacoma's open spaces and natural areas were analyzed; Natural Corridors and wetland mitigation sites within the identified Natural Corridors were identified; agency and community capacity to manage and restore natural areas were assessed; and recommendations for the restoration and management of Tacoma's

open spaces were developed. This analysis, the Plan and associated maps serve as the basis of information for development of an Open Space Program. The Natural Corridors include public and acquired private lands to provide a city-wide open space management approach. Corridors include the City's significant critical areas, their connection to each other and bordering critical areas within the same watershed. Corridors identify interrupted connections between critical areas, as well as open spaces that support ecological functions. A goal of the Plan is to provide a balance between natural area protection, urban public recreation opportunities and aesthetics.

The Open Space Habitat and Recreation Plan was prepared as an element of the Comprehensive Plan. The Plan is being implemented by the City in cooperation with the Green Tacoma Partnership (see below). The Open Space Habitat and Recreation Plan has a complimentary implementation program under development which will include a programmatic approach to permitting through Habitat Management Plans and mitigation sites identified in advance that are connected to upland natural corridors.

City of Tacoma Land Use Regulatory Code The key regulatory mechanism that implements the Comprehensive Plan is the Land Use Regulatory Code. This code contains the development regulations that govern the manner by which land is used, developed, or redeveloped. This code is found in Title 13 of the Tacoma Municipal Code (TMC) and includes regulations for platting, zoning, shorelines, and critical areas (see critical areas discussion below). The zoning ordinance regulates land use by specifying which uses are appropriate within zoning districts, including the shoreline district. The Land Use Code is implemented by the Tacoma Building and Land Use Services (BLUS) division.

City of Tacoma Critical Areas Regulations The City of Tacoma's critical area regulations Critical Areas Preservation Ordnance (CAPO) were recently updated and are codified in the TMC 13.11. Although critical areas in shoreline jurisdiction are to be identified and designated under the GMA, they must also be protected under SMA. According to Engrossed Senate Bill 1651 passed in 2010, once the Town updates its SMP critical areas within shoreline jurisdiction are protected under the SMA and are no longer subject to the procedural and substantive requirements of the GMA. The SMP must protect those critical areas such that there is "no net loss of shoreline ecological functions necessary to sustain shoreline natural resources" as defined by the SMP Guidelines.

Critical areas include wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas (including rivers, streams and marine shorelines), geologically hazardous areas, and frequently flooded areas (WAC 173.26.201(3)(c)(ii)). In further describing the approach for critical areas, the Guidelines describe standards for "critical saltwater" and "critical freshwater" habitats (WAC 173.26.221(2)(c)). Critical saltwater habitats include kelp beds, eelgrass beds, spawning and holding areas for forage fish, subsistence, commercial, and recreational shellfish beds, mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association.

Under the CAPO, buffers on Type S rivers and streams (shorelines of the state) are 150 feet in width from the ordinary high water mark. Minimum marine buffers are 50, 115 or 200 feet in width, depending on location. Tacoma's critical areas regulations are implemented by the Tacoma BLUS division.

Green Tacoma Partnership The Green Tacoma Partnership is a public-private partnership between the City of Tacoma, Metro Parks Tacoma, Tacoma Public Utilities, Cascade Land Conservancy, Tahoma Audubon Society, and the citizens of Tacoma. The Green Tacoma Partnerships' goal is to develop and foster community capacity and support the implementation of the Open Space Habitat Plan. The Green Tacoma Partnership uses the Open Space Program to identify priority projects, allocate project funding, and foster political and community support.

Green Ribbon Task Force Members of the City Council approved a resolution in April 2006 that affirmed the City's efforts to reduce greenhouse gases and curb global warming in accordance with the Kyoto Protocols. A Green Ribbon Climate Action Task Force was established to refine reduction goals and develop specific community and government greenhouse gas reduction measures. The Task Force was appointed by the Tacoma City Council and represents a diverse set of interests and community groups including government agencies, environmental groups, business and trade groups, higher education and the health community. Tacoma's Climate Action Plan recommendations were submitted by the Task Force to the City Council in July 2008. In October 2008, the City Council adopted a resolution creating an Office of Sustainability and the Sustainable Tacoma Commission on Climate Change. The purpose of these entities is to officially begin implementing the Climate Action Plan. The City Council appointed 11 members to the Sustainable Tacoma Commission in April 2009. The commission has had regular meetings since that time.

Tacoma's Climate Action Plan establishes carbon reduction goals for the City and community and offers more than 40 new strategies to achieve those goals. Strategies identified for action include adopting and funding the Open Space Habitat and Recreation Plan (see discussion of that plan in this section).

Commencement Bay Aquatic Ecosystem Assessment – Ecosystem-Scale Restoration for Juvenile Salmon Recovery (2000) This report provides an ecological assessment of the potential contribution of restoration and mitigation to salmon recovery in the Commencement Bay watershed that should be considered under CERCLA clean-up and compensation for contaminated sediments in Commencement Bay. Organized around broad landscape and ecosystem processes, the report identifies criteria that can guide selection of restoration sites and actions in Commencement Bay to benefit juvenile salmon. A list of priority projects and their rankings is provided.

Commencement Bay Natural Resource Restoration Plan (1997) The City of Tacoma has an active and well-established history in nearshore and intertidal restoration, particularly in Commencement Bay. Restoration in the nearshore marine environment of Commencement Bay has occurred over the past 15 to 20 years through the remediation efforts under the Commencement Bay Natural Resource Damage Assessment (CB/NRDA) program. These efforts are part of the implementation of the Commencement Bay Conceptual Restoration Plan (June 1997), which details the restoration components outlined in the preferred alternative – the Integrated Approach – as described in the programmatic Environmental Impact Statement (EIS) prepared for the Commencement Bay cleanup plan.

Restoration options for Commencement Bay cleanup are outlined in detail in Volume II - Restoration Options, Commencement Bay Cumulative Impact Study (see discussion below). The

Integrated Approach outlined in the EIS includes the implementation of a combination of restoration projects that are designed to maximize the benefits to the damaged natural resources in Commencement Bay, and meet the goals and objectives of the Commencement Bay Natural Resource Trustees. Additional detail on restoration activities is included in the Shoreline Inventory and Characterization, particularly in Sections 4 (Nearshore Marine Shoreline Planning Area) and 8 (Assessment of Shoreline Functions and Opportunity Areas).

The CB/NRDA restoration plan focuses on the 25 square miles of Commencement Bay as its primary restoration area, including the mouths of Hylebos Creek, Wapato Creek and the Puyallup River. Identified as the primary area where natural resources have been damaged by past releases of hazardous substances, this area is where remediation efforts are focused and ongoing.

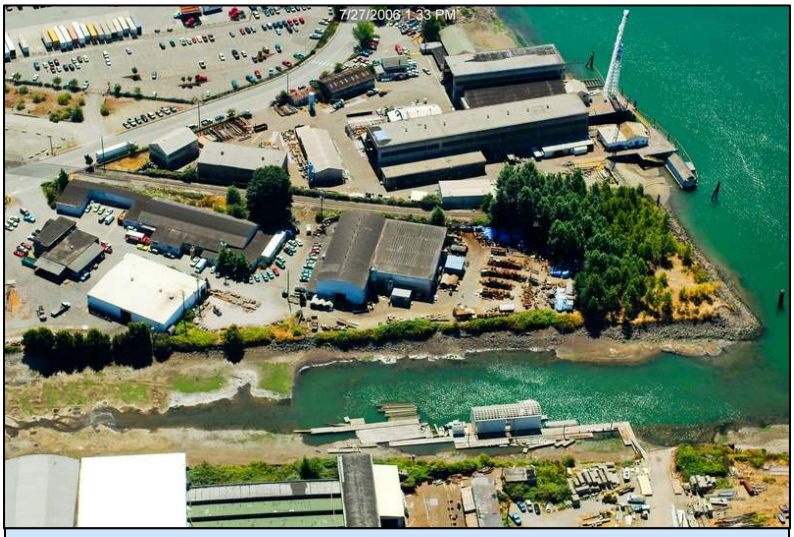


Figure 6 Under a plan accepted by the EPA, the Wheeler-Osgood and Thea Foss Waterways were cleaned. Approximately 425,000 cubic yards of contaminated sediments were dredged from the waterways and placed behind a containment berm in the nearby St. Paul Waterway. As part of the cleanup project, habitat restoration sites were constructed. In addition, wherever possible shorelines were enhanced to make them habitat friendly, including four areas along the Thea Foss Waterway. The Wheeler Osgood remains a potential site for further restoration. As shown in this image, native vegetation is lacking. Native plants along the shoreline would improve habitat functions.

The NRDA Trustees evaluated a number of potential restoration sites in conjunction with the potentially responsible cleanup parties, environmental groups and the public. Broad-based action groups such as Citizens for a Healthy Bay and the Commencement Bay Cleanup Action Committee, along with the City of Tacoma and other partners, have developed visions for the Commencement Bay restoration framework and activities. Site screening and selection criteria were developed through this process and over 100 potential restoration sites were evaluated. SMP restoration activities proposed within the Commencement Bay area should be conducted in coordination with the CB/NRDA restoration plan. As a means of integrating restoration efforts, any project consistent with the CB/NRDA restoration plan are considered consistent with this SMP restoration plan.

The four main objectives of the CB/NRDA restoration plan are:

- Provide a functioning and sustainable ecosystem where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain in habitat function beyond existing conditions;

- Integrate restoration strategies to increase the likelihood of success;
- Coordinate restoration efforts with other planning and regulatory activities to maximize habitat restoration; and
- Involve the public in restoration planning and implementation.

Six specific habitat areas were selected as the areas of focus for the CB/NRDA restoration plan. These habitat areas are all within the City of Tacoma's shoreline jurisdiction and include the following:

- Puyallup River wetlands and riparian corridor;
- Heads of waterways and river delta;
- The Hylebos Waterway;
- The eastern shoreline of Commencement Bay;
- The western shoreline of Commencement Bay; and
- Hylebos and Wapato Creeks wetlands and riparian corridors.

Commencement Bay Cumulative Impact Study – Vol. II Restoration Options (1993) The Commencement Bay Restoration Options Project involves federal, state, local and tribal efforts to assess cumulative impacts on habitats and resources of Commencement Bay and the Puyallup River estuary, and to identify options to restore, replace or rehabilitate habitats and resources. This comprehensive plan for the area is used to guide restoration and mitigation actions undertaken through the Superfund cleanup effort, navigational dredging operations, the Puyallup Settlement and port development.

Restoration planning in this project emphasized an ecosystem approach and public participation in identifying specialized habitats and their loss over time and technically feasible and cost-effective recovery methods. The list of restoration goals and sites is used by state and federal natural resource trustee agencies, the Puyallup and Muckleshoot Indian Tribes, the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, the Port of Tacoma and the City.

Citizens for a Healthy Bay (2004) Citizens for a Healthy Bay was formed to provide a community voice in the Superfund clean-up process. This report provides an overview of the status of CERCLA clean-up efforts since they were initiated in 1981. Progress at each Superfund site in the Bay is evaluated. The organization undertakes stewardship projects and monitors their success. The Citizens for a Healthy Bay also work to restore habitat with the goal to restore 610 acres of Commencement Bay critical marine habitat to its original functions and values. The organization has restored 260 acres since 1994. The 5 current restorations sites are:

1. Middle Waterway (Simpson side)
2. Mowitch Estuary

3. Squally Beach
4. Skookum Wuldge
5. Yowkwala

Puget Creek Restoration Society The Puget Creek Restoration Society protects, enhances, and restores the Puget Creek Watershed and other streams, wetlands, and green spaces in South Puget Sound. The Society involves the community in restoration and stewardship, research and monitoring, education and advocacy. Puget Creek/Gulch is a 66-acre natural area in Tacoma's North End and one of only three salmon-bearing streams within the city limits.

Titlow Beach Marine Preserve The Metropolitan Park District of Tacoma established Titlow Beach Marine Preserve in March 1994. The Preserve includes all waters and tidal and submerged lands in the area between the southernmost point of the Tacoma Outboard Association leasehold and the old ferry dock at the foot of the 6th Avenue extension, and between the mean high water line and the outer harbor line. The purpose of the Preserve is to:

- Preserve tidelands, beach and the bank;
- Prohibit harvesting of all life forms with the exception of recreational salmon fish subject to State regulations;
- Ensure enhancement projects do not have adverse effects on the natural environment;
- Provide education on the importance of the marine environment; and
- Coordinate education between the Titlow Marine Preserve, Interpretive Center and Education Link.

The Park Board management goals for the Preserve include maintaining and protecting the physical attributes of the park, and enhancing visitors' enjoyment of the park.

Titlow Park Master Plan (2010) Metropolitan Park District of Tacoma developed a master plan for adding park amenities and enhancing natural features at Titlow Park in January 2010. The master plan includes the following habitat enhancements which are generally located within the shoreline area :

- Restore and lengthen perennial stream that drains into the upper lagoon to improve stream health.
- Deepen the bottom of the existing lagoon so its bottom provides standing water on the lowest tides and is connected under the railroad to tidal influences for fish passage. The connection to Tacoma Narrows would be through a free-flowing channel running under a new railway bridge. Reshape and revegetate the edges of the lagoon. Rebuild the connection between the upper and lower lagoons by

replacing the tidal weir with a new outfall and pedestrian bridge, and bank/vegetation restoration.

- Consider the environmental trade-offs from removing existing off-shore piling. Take the cultural/historic perspective and nest boxes and dive sites into account.
- Remove the existing "barge" at North Beach and restore natural beach.
- Work with environmental agencies to explore ways to rebuild the beach profile from pier to Kay's House, restoring natural functions consistent with lagoon enhancement.
- Establish a beach re-construction and beach feeding program on the water side of the railroad berm. Significant regulatory obstacles preclude this from being accomplished in the near future.

A restoration study is being conducted by the South Puget Sound Salmon Enhancement Group and the People for Puget Sound on the Titlow Park shoreline and estuary lagoon for the purpose of improving habitat for juvenile salmon and other species. The study is being carried out in 2010.

Wapato Park Master Plan (2005) The Metropolitan Park District of Tacoma developed a master plan for Wapato Park in September 2005. The master plan includes lake enhancements to improve water quality. The enhancements proposed include:

- Installation of an aerating fountain and bubblers throughout the lake.
- Reconstruction, as needed, and maintenance of the sediment trap system at the Ainsworth Avenue outfall.
- Establishment of a vegetative edge along the north and west sides of the lake to control soil erosion, introduction of rooted aquatic vegetation to increase nutrient removal, and addition of taller wetland plants for increasing shade along the water's edge.

Figure 7 Conceptual drawing of Wapato Park from the Wapato Park Master Plan

- Installation of docks and platforms at the water's edge to control access and reduce erosion of the shoreline.

- Installation of rock outcroppings at strategic locations around the lake to provide additional locations for public access, armoring of the shoreline, and protection for planting of sedges and other rooted aquatic vegetation.

- Increasing the amount of water entering the lake to provide water movement and exchange. Because of limited natural flow of ground water, pumping in fresh water from the Green River conduit at the north end of the lake may be necessary.

- Control of the waterfowl population with a first step of adopting enforceable measures to stop the public from feeding the ducks and geese.

- Work with Ecology and the City of Tacoma Environmental Services to develop a lake management plan. A first step in this process is the development of a base-line water quality measurement program.

6.2 Regional

Salmon Habitat and Protection Strategy – WRIA 10 (Puyallup Watershed) and WRIA 12 (Chambers/Clover Watershed) (2005) The Salmon Habitat Protection and Restoration Strategy for the Puyallup and Chambers/Clover watersheds was developed in response to the listing of Chinook salmon as threatened under the Endangered Species Act. Pierce County, the lead entity for recovery planning in these watersheds, coordinated citizen and technical advisory groups to identify habitat conditions, prioritize habitat areas and near and long-term actions, and provide policy recommendations. The policy recommended for the Puyallup Watershed was to continue the role of hatchery production, but a reform of hatchery management policies. Chambers Creek habitat was identified as important for Chinook spawning and rearing. The policy recommended for Chambers/Clover Watershed was to allow wild Chinook to spawn naturally upstream.

The Strategy supports efforts that protect and restore intertidal and shallow subtidal habitat throughout Commencement Bay. General protection and restoration measures (listed below) and general priorities for shoreline reaches are, though no specific projects are identified.

- Reduce and minimize shoreline armoring wherever feasible and unnecessary to support water-dependant uses.

- Control point and non-point sources of contamination.

- Restore, enhance, or protect viable habitat that provides connective corridors between riverine and estuarine habitats and between estuarine and open water.

- Allow LWD to remain in the shoreline to provide structure for refuge.

- Limit additional bulkheads; promote development of natural shorelines and habitats.

- Include the use of shoreline setbacks for new construction and promote shoreline vegetation buffers.

- Maintain public access to the shoreline.
- Conserve or restore stream mouths.
- Protect and restore intertidal and shallow subtidal habitat throughout Commencement Bay to provide rearing habitat for salmonids.

The Shoreline Inventory and Characterization synthesizes restoration opportunities on Tacoma's shorelines based to some extent on the WRIA 10 and 12 Limiting Factors Reports.

Lower Puyallup Watershed Action Plan (1995) Pierce County coordinated the Lower Puyallup Watershed Management Committee in developing and action plan to address declining water quality and habitat degradation in the river. The Lower Puyallup Watershed Action Plan is based on information developed as part of the Lower Puyallup Watershed Phase 1 Report on nonpoint water pollution issues, goals and objectives. Water quality concerns associated with agriculture, boats and marinas, forest practices, on-site sewage disposal, stormwater and erosion and other sources were evaluated and a list of action items was prepared. Implementation responsibility, a funding source, time frame and potential benefits of each action were identified. An implementation budget and monitoring program were included in the plan as well.

South Puget Sound Salmon Enhancement Group The South Puget Sound Salmon Enhancement Group protects and restores South Puget Sound salmon populations and aquatic habitat through scientifically informed projects, community education, and volunteer involvement. The group works in cooperation with landowners and other organizations to help plan, fund, carry out, and monitor fishery enhancement and habitat restoration projects. Over 100 projects have been completed since the group formed in 1990.

The Washington State Legislature formed salmon enhancement groups in 1990 as a means of directly involving communities, citizen volunteers, and landowners in salmon recovery. Enhancement groups are funded by surcharges on sport and commercial fishing licenses and the sale of eggs and carcasses from state hatcheries.

Puget Sound Nearshore Project The Puget Sound Nearshore Project (PSNP) (also referred to as the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)) is a large-scale, multi-agency initiative to address habitat restoration needs in the Puget Sound basin. Nearshore Project goals are to identify significant ecosystem problems, evaluate potential solutions, and restore and preserve critical nearshore habitat. PSNP represents a partnership between the U.S. Army Corps of Engineers (Corps); local, state and federal government organizations; Indian tribes; industries and environmental organizations.

A General Investigation Reconnaissance Study (2000) conducted by the U.S. Army Corps of Engineers identified a direct link between healthy nearshore habitat and the physical condition of the shoreline. The study identified several actions that would be central in restoring nearshore processes to a more natural state:

- Providing marshes, mudflats, and beaches with essential sand and gravel materials;

- Removing, moving and modifying artificial structures (bulkheads, rip rap, dikes, tide gates, etc.);
- Using alternative measures to protect shorelines from erosion and flooding; and
- Restoring estuaries and nearshore habitat such as eelgrass beds and kelp beds.

PSNP also provides outreach and guidance materials related to nearshore ecosystem restoration principals, concepts, and methods of implementation.

Puget Sound Salmon Recovery Plan Shared Strategy for Puget Sound (Shared Strategy) is a collaborative effort between local stakeholders and regional leaders to protect and restore salmon runs across Puget Sound that was initiated as a result of Endangered Species Act (ESA) listings of salmonid species in the Puget Sound region. Shared Strategy engaged local citizens, tribes, technical experts and policy makers to build a practical, cost-effective recovery plan endorsed by the people living and working in the watersheds of Puget Sound.

In June 2005, Shared Strategy presented its regional plan for Puget Sound Chinook to the National Oceanic and Atmospheric Administration (NOAA) for approval. The NOAA Northwest Region then prepared a supplement that clarified and expanded on ESA recovery requirements. Following public comment on the proposed plan, NOAA finalized these two documents on January 19, 2007. Together the Shared Strategy plan and NOAA supplement comprise a final recovery plan for Puget Sound completing for the first time ever in the history of the Endangered Species Act a recovery plan developed and endorsed by the community.

Cascade Land Conservancy The Cascade Land Conservancy (CLC) seeks to conserve urban and rural natural spaces within the Central Puget Sound region, including areas throughout King and Pierce Counties. Priority natural areas include lands along streams, rivers, other areas in the cascade foothills, and estuary areas. The CLC conservation strategies have included securing lands through purchase and donation, conservation easements, and ownership agreements. CLC is participating in conservation efforts in Tacoma, such as the Green Tacoma Partnership (described in this section).

Puyallup River Watershed Council Formed in 1995, the Puyallup River Watershed Council is an action group made of citizens, local governments, businesses, elected officials, and environmental agency representatives who support strategies to preserve, protect, and improve the Puyallup River watershed. The Council provides opportunities for collaboration and cooperation between the public and watershed stakeholders, establishes outreach programs to encourage citizens to make a difference in their communities, and creates and submits grant proposals for watershed improvement projects. The Puyallup River Watershed Council received the Washington State Environmental Excellence Award in 2002 for creating a unique public forum to benefit the watershed.

Figure 8 The Port of Tacoma cleaned up a former city landfill to create the off-channel wetland shown above. Located along the Puyallup River just south of Lincoln Avenue, the site was named Gog-le-hi-te wetlands by the Puyallup Tribe to mean "where the land and waters meet."

The wetlands support a healthy ecosystem with thousands of plants, more than 100 types of birds and a variety of mammals, fish, reptiles and amphibians. The restored wetland is particularly significant because of its importance to salmon and the scarcity of such, once common, landscape features along the lower Puyallup River.

Pierce County Lower Puyallup River Feasibility Study Pierce County is currently developing a feasibility study to investigate measures to address the potential for levee failure and/or flooding in the Lower Puyallup basin. This work was prompted by the recent significant revisions to the FEMA floodplain as the levees do not provide sufficient freeboard, and have therefore been de-certified. This study will investigate options to reduce the potential for flooding and improve habitat within the Lower Puyallup River. *The Lower Puyallup River Flood Protection Investigation Without-Project Analysis* was developed in June 2009. According to the report, prior to the identification of appropriate flood-protection projects, the physical and social conditions with no new flood-protection measures in place should be studied. The "without-project" analysis is a first step in the process of finding ways to reduce the size of the recently mapped floodplain. The report evaluated flood-related conditions along the river as they are today and will be in 50 years if no new flood-protection project is undertaken.

6.3 State and Federal

Puget Sound Partnership The Puget Sound Partnership was formed in December 2005 by the Governor to focus attention on the overall needs and health of Puget Sound. The Partnership is a community effort of citizens, governments, tribes, scientists and businesses working together to restore and protect Puget Sound.

Puget Sound Partnership is drafting a 2020 Action Agenda that prioritizes cleanup and improvement projects, coordinates federal, state, local, tribal and private resources, and ensures interagency cooperation. Decisions within the Action Agenda are to be based on science, focus on actions that have the biggest impact, and hold people and organizations accountable for results. The Action Agenda will be completed in December 2008.

The Puget Sound Action Team, created by legislature in 1996 as the state's partnership for Puget Sound, became part of the Puget Sound Partnership in 2005.

Salmon Recovery Funding Board In 1999, the Washington State Legislature created the Salmon Recovery Funding Board (SRFB). The Board provides grant funds to protect or restore salmon habitat and assist with related activities. It works closely with local watershed groups (known as lead entities). Composed of five citizens appointed by the Governor and five state agency directors, the Board brings together the experiences and viewpoints of citizens and the major state natural resource agencies.

The Board administers annual grant programs and supports feasibility assessments for future projects and other recovery activities. Eligible applicants include municipal subdivisions (cities, towns, counties, and special districts such as port, conservation, utility, parks and recreation, and schools), tribal governments, state agencies, nonprofit organizations, regional fisheries enhancement groups, and private landowners. SRFB has helped finance over 900 projects.

7.0 IMPLEMENTING THE SHORELINE RESTORATION PLAN

7.1 Implementation Actions

Restoration Demonstration Project

A small demonstration restoration project that includes a variety of techniques could be completed by the City as an example for private landowners, or the City could identify a set demonstration projects and actively solicit entities to implement one or more of them. Additionally, the City could work with existing programs such as the South Puget Sound Salmon Enhancement Group, to leverage funding and efforts where available to implement demonstration projects.

Environmental Education and Volunteer Coordination

The City should create a shoreline restoration initiative the Department of Public Works, Surface Water Management, Education and Involvement Program. Through such an initiative, the City could accomplish restoration projects together with community volunteers. Volunteers could be

provided with shoreline stewardship training, and recruited for project implementation and monitoring. General shoreline stewardship education could be provided through the program. The City would provide equipment and expertise; new staffing and funding may be necessary to implement the initiative.

Regional Coordination

The City should continue to take an active role in the Puget Sound Nearshore Project, Puget Sound Partnership and Commencement Bay restoration efforts and pool resources with regional entities to achieve as much restoration as possible. The City should also look for new opportunities for involvement in regional restoration planning and implementation.

Resource Directory

The City could develop a resource list for property owners that want to be involved in voluntary restoration activities. This resource list could include native plant nurseries, contacts, and other educational information needed by private property owners who desire to restore shoreline habitat within their ownership.

Development Opportunities

When shoreline development occurs, the City should look for opportunities to conduct or encourage restoration in addition

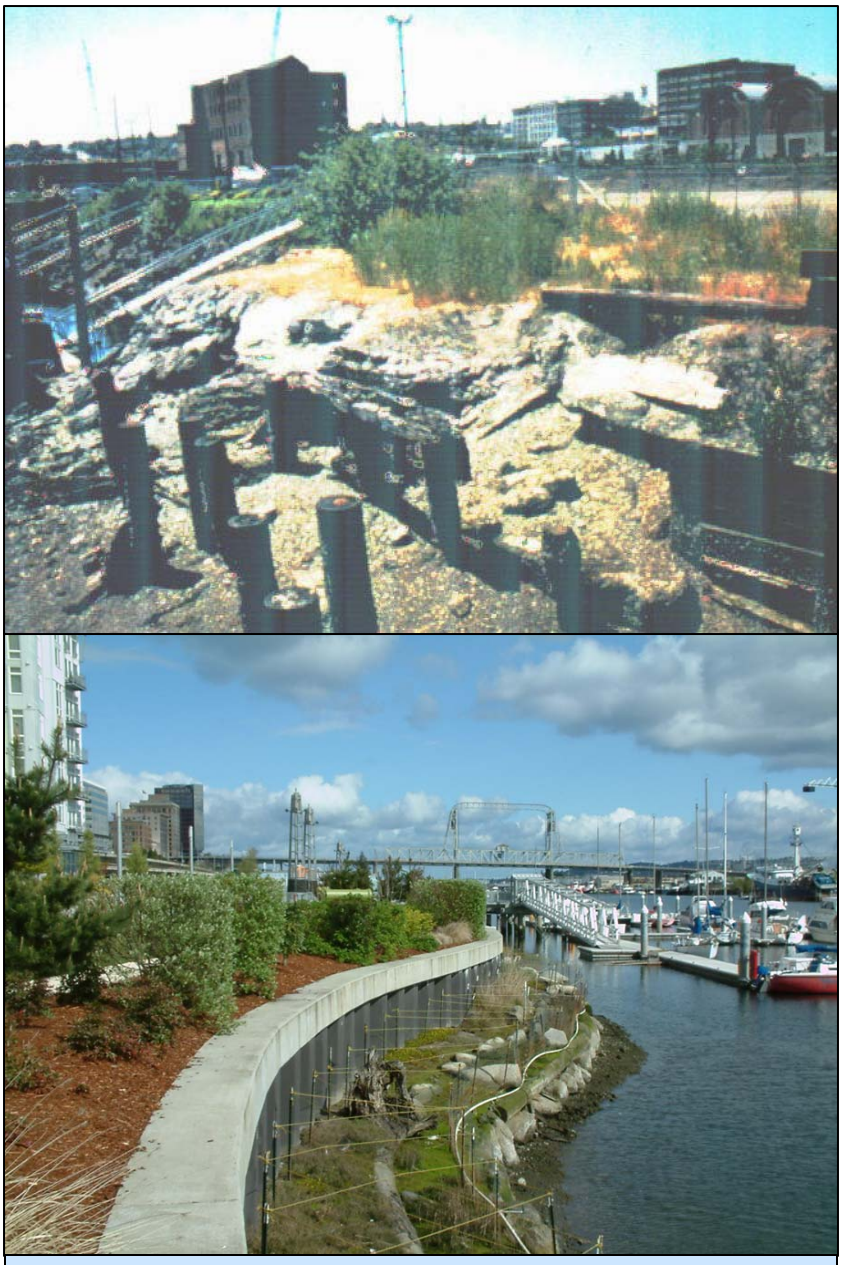


Figure 9 The top image shows a portion of the Thea Foss Waterway in 1998, before restoration activities. The bottom image shows the Thea Foss Waterway today. As shown, creosote pilings have been removed, a seawall was constructed to support the Thea Foss Esplanade and restoration plantings have been established between the wall and the water. This design provides an alternative to traditional shoreline armoring built directly at the shore. The shoreline vegetation between the bulkhead and water provide wave attenuation as well as overhanging native vegetation.

to minimum mitigation requirements. Development may present opportunities for restoration that would not otherwise occur and may not be available in the future. When on-site mitigation opportunities are limited due to site constraints or limited potential ecological gains, the City could direct mitigation to priority off-site restoration needs.

Shoreline Habitat Fee-in-lieu Prospectus

The City is currently considering a fee in-lieu (FIL) program for mitigating shoreline habitat impacts. This FIL program would allow an applicant to pay fees "in-lieu" of providing on-site mitigation for upland shoreline habitat. The fees would be used to mitigate for shoreline habitat, including wetlands, at an off-site location within the same Shoreline District. The FIL program is in prospectus form at this time and has been designed to provide mitigation that meets the requirements of the shoreline regulations. The prospectus FIL program is included as Appendix D. Restoration actions that go above and beyond the mitigation requirements in the shoreline regulations could be incorporated into the FIL program on a voluntary basis.

7.2 Timelines and Benchmarks

In the context of the SMP update, restoration planning is a long-term effort. As stated earlier, the SMP guidelines include the general goal that local master programs “include planning elements that, when implemented, serve to improve the overall condition of habitat and resources within the shoreline area” (WAC 173-26-201(c)). As a long-range policy plan, it is difficult to establish meaningful timelines and measurable benchmarks in the SMP by which to evaluate the effectiveness of restoration planning or actions. Establishing timelines is further complicated by the fact that shoreline restoration is almost entirely dependent on grant funding, which is unpredictable at best. Nonetheless, the legislature has provided an overall timeframe for future amendments to the SMP. In 2003, Substitute Senate Bill 6012 amended the Shoreline Management Act (RCW 90.58.080) to establish an amendment schedule for all jurisdictions in the state. Once Tacoma adopts its updated shoreline management plan, the City is required to review, and amend, if necessary, it’s SMP once every seven years (RCW 90.58.080(4)). During this review period, the City should document progress toward achieving shoreline restoration goals. The review could include:

- Re-evaluating adopted restoration goals, objectives, and policies;
- Summarizing both planning efforts (including application for and securing grant funds) and on-the-ground actions undertaken in the interim to meet those goals; and
- Revising the SMP restoration planning element to reflect changes in priorities or objectives.

Specific timelines for identified reach and site- specific restoration actions should be developed according to the general priorities described herein, and emphasis should be given to areas with the greatest restoration potential.

7.3 Funding and Partnership Opportunities

Capital Facilities Program

The City should include shoreline restoration as a new section of the 6-year Capital Facilities Program. This would ensure that shoreline restoration projects are considered during the City's budget process.

Development Incentives

The City could provide development incentives for restoration, such as waiving some or all permit fees when shoreline restoration is included in a project and when restoration is voluntary (not required for mitigation). An incentive program could serve to encourage developers to try to be more imaginative or innovative in their development designs.

Stewardship Certification and Tax Incentives

The Shore Stewards program sets up guidelines for shoreline residents to preserve and enhance the shoreline environment. With a verification component, Shore Stewards could provide certification and tracking. This could be implemented as a Shoreline Tax Incentives when someone participates in the WDFW backyard sanctuary program. Since the City recognizes that there are important opportunities to improve shoreline ecological conditions and functions through non-regulatory volunteer actions, it might examine the potential for property tax breaks for shoreline property owners who are actively manage their property for habitat protection or enhancement. The City could participate in the open space tax program pursuant to Chapter 84.43 RCW to provide such benefits to landowners.

A related tax incentive program is the current use assessment. The City of Tacoma can grant current use assessments to incent private landowners to maintain ecologically important areas in an undeveloped condition. Current use assessments are allowed under the State's 1970 Open Space Taxation Act. This act allows property owners to have their open space valued at its current use (i.e. undeveloped) rather that at their highest and best use. Lands eligible for current use classification would include areas identified by this program as important to the maintenance of natural shoreline functions. The program is voluntary, and property owners may remove their property from the program at any time, paying back taxes and a penalty if they do so within 10 years of entering the program.

The City and Pierce County jointly review Current Use Assessment applications within the City. In conducting a review of an application, the City considers its goal of conserving lands that are valuable for the natural, recreational, aesthetic and/or other open space benefits they provide to the public. The City's Comprehensive Plan and Current Use Assessment regulations contained in Tacoma Municipal Code (TMC) Chapter 13.08 guide the City's review. Additionally, the City considers the County's findings as determined through use of a point system called the Public Benefit Rating System (PBRS), contained in Pierce County Code 2.114.060. The PBRS is used by the County to determine how much public benefit is derived from the subject open space site, and therefore how much of a tax reduction to grant.

City and Other Grants

The restoration plan will be implemented via existing city programs. Metro Parks maintains a 6-year comprehensive capital projects list to implement recommendations in the Metro Parks Strategic Plan; this capital program includes restoration as part of larger projects as well as stand alone projects. Most funding resources for these projects are limited in scope and can only be used to fund specific types of projects or improvements. Metro Parks continues to investigate all available funding options, including maintaining and expanding general fund support, aggressively seeking grants, partnerships and donations, and being prepared to act as opportunities arise. Other funding sources for Metro Parks include bond proceeds, the State Recreation and Conservation Office, the State legislature (through special capital allocations), federal grants, State and local grants, and private partnerships. Via its service contract with Metro Parks, the City of Tacoma will continue to contribute funds to Metro Park's capital program.

Funding approaches to implement the Shoreline Restoration Plan will take into consideration and be consistent with the funding strategies outlined in the Open Space Habitat and Recreation Plan. These strategies include identifying and pursuing new funding sources and strategies, utilizing City funds to leverage other public, private and non-profit funding sources whenever feasible; and partnering with other local agencies (Pierce County, Port of Tacoma, Tacoma-Pierce County Health Department, Tacoma Public Utilities, Tacoma Housing Authority) and educational institutions.

Other small City grants that may be used to implement the Restoration plan include the City's Make a Splash Environmental Grant and Neighborhood Innovative Grant programs. The make a splash grant program awards up to $50,000 a year in environmental grants to help educate residents and protect and restore our surface water resources. Grants may be up to $4,000 and are open to anyone considering a project within Tacoma city limits. Projects may be educational and should focus on preventing stormwater pollution and protecting or restoring clean surface water. Neighborhood Innovative Grants are derived from Community Development Block Grant (CDBG) funds set aside for to provide matching funds primarily to grassroots neighborhood organizations within the eight Neighborhood Council areas. The grants are meant to assist and support in developing and implementing small-scale neighborhood self-help physical improvement projects that could include beautification activities or cleanups.

In addition to these funding sources, the City will continue to pursue partnership opportunities and grant funds to implement restoration actions and priorities. Table 3 identifies additional funding opportunities.

Table 3. Funding Opportunities

Grant Name	Allocating Entity	Grant Size	Web Site
Acorn Foundation	Acorn Foundation	$5,000 - 12,000	http://www.commoncounsel.org/Acorn%20Foundation
Aquatic Lands Enhancement Account (ALEA)	Washington Recreation and Conservation Office	$10,000 – $500,000	http://www.rco.wa.gov/rcfb/grants/alea.shtml
Audubon Washington			http://wa.audubon.org/
Various programs	U.S. Army Corps of Engineers	varies	http://www.usace.army.mil/
Various programs	National Fish and Wildlife Foundation	varies	http://www.nfwf.org/AM/Template.cfm?Section=Browse_All_Programs
Bullitt Foundation	Bullitt Foundation	varies	http://www.bullitt.org/
Coastal Grant Program	U.S. Fish & Wildlife Service	$5,000 - 50,000	http://www.fws.gov/coastal/
Community-Based Restoration Program	National Oceanic and Atmospheric Administration	$1,000 to 500,000	http://www.nmfs.noaa.gov/habitat/restoration/funding_opportunities/funding_nwr.html
Endangered Species Program	U.S. Fish & Wildlife Service	$1,000 - 14,000	http://www.fws.gov/endangered/grants/index.html
Doris Duke Charitable Foundation	Doris Duke Charitable Foundation	Multi-year grants that range from $125,000 - 3.5 million	http://www.ddcf.org/environment
FishAmerica Grant Program	FishAmerica Foundation	varies	http://www.fishamerica.org/grants/
Various	Environmental Protection Agency	varies	http://www.epa.gov/epahome/grants.htm
Forest Legacy Program	U.S. Forest Service, Washington Department of Natural Resources	varies	http://www.dnr.wa.gov/BusinessPermits/Topics/ConservationTransactions/Pages/forest_legacy.aspx

Grant Name	Allocating Entity	Grant Size	Web Site
Conservation Grants	U.S. Fish and Wildlife Service Coastal Program	varies	http://www.fws.gov/birdhabitat/Grants/NAWCA/Small/index.shtm http://www.fws.gov/midwest/Fisheries/library/CelebratingHabitat05/The%20National%20Coastal%20Wetlands%20Conservation%20Grant%20Program_2-1.pdf
Water quality grants	Environmental Protection Agency, Washington State Department of Ecology	varies	http://www.ecy.wa.gov/biblio/0810013.html
Planning/Technical Assistance Program	Bureau of Reclamation	Technical assistance	http://www.usbr.gov/pmts/tech_services/manage/index.html
Wetland Restoration Programs	Washington State Department of Ecology	varies	http://www.ecy.wa.gov/programs/sea/wetlands/stewardship/celcp.html http://www.ecy.wa.gov/programs/sea/wetlands/stewardship/nwcgp.html
Regional Fisheries Enhancement Groups	Washington State Department of Fish and Wildlife	$10,000 - 40,000	http://wdfw.wa.gov/volunter/index.htm
Salmon Recovery Funding Board	Washington State Recreation and Conservation Office	varies	http://www.rco.wa.gov/
Transportation Environmental Research Program (TERP)	Federal Highway Administration	$20,000 - $50,000	http://www.fhwa.dot.gov/terp/
Various programs	Washington Department of Transportation	varies	http://www.wsdot.wa.gov/environment/

7.4 Conservation Easements

Conservation easements are a mechanism by which restoration sites can be protected and managed by City staff. Conservation easements are a legal agreement between a landowner and a land trust or government agency that restricts development in erosion-prone and habitat areas like shorelines. Unlike land acquisition, easements do not limit other land uses and still enable the property to remain in private ownership. Conservation easements can be placed on the entire property or just along the property's shoreline. An easement can be written to prohibit development or designed to restrict the size or density of structures (e.g., only allow small,

portable structures near the shore). Easements can also be used to prevent shoreline hardening or specify which types of shoreline stabilization can be used. Finally, easements can prohibit the removal or cutting of natural vegetation within the shoreline buffer and/or restrict any other land use or activity that may either contribute to erosion or impair natural shoreline processes.

Easements are typically placed on property in perpetuity and passed on to the new land owner. Some easements, however, can be written to expire after a certain period of time such as 25 or 50 years. Most easements are placed on individual properties although easements can also be placed on larger waterfront subdivisions or coordinated at a regional scale so that all property owners within a drift cell, shoreline reach or embayment have the same easement on their land. Easements can be donated or sold. Land owners that choose to donate a conservation easement often receive a federal property tax break for placing the easement on their property.

Due to the voluntary nature of erosion control easements, they are often more appealing than other more regulatory approaches to control shoreline erosion and protect shoreline resources. Landowners have the flexibility to choose how restrictive they would like the easement to be. However, for that reason, easements are often not as effective as other, more regulatory approaches such as establishing setback lines, using zoning overlays or regulating development in the shoreline. Therefore easements are typically used in combination with regulations and a strong education and public outreach campaign.

7.5 Adaptive Management and Monitoring

This Shoreline Restoration Plan is based on a synthesis of existing plans, programs and policies and the analysis completed in the Tacoma Shoreline Inventory and Characterization. This plan does not constitute an exhaustive review of restoration opportunities and projects, but will guide the City's restoration efforts. As part of its Shoreline Master Program updates (required at least every seven years; WAC), the City will review project monitoring information and shoreline conditions, and reevaluate restoration goals, priorities and opportunities. The City will seek partnerships with existing local, regional and federal groups working in Tacoma to adaptively manage the shoreline.

The SMP guidelines for restoration planning state that local programs should "…appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals" (WAC 173-26-201(2)(f)). Monitoring of the progress of any restoration plan is an important step in documenting progress and managing change in the shoreline environment.

Under the Shoreline Management Act, the SMP must result in "no net loss" of shoreline ecological resources. If reviews demonstrate that this standard has not been met, the City will be required to take corrective actions. The goal for restoration is to achieve a net improvement of shoreline resources. The cumulative effect of restoration over the time between reviews will be evaluated, along with an assessment of impacts of development that is not fully mitigated to determine effectiveness at achieving a net improvement to shoreline ecological resources.

To conduct a valid reassessment of the shoreline conditions, it is necessary to monitor, record and maintain key environmental metrics to allow a comparison with baseline conditions. The City will track information using the City's GIS and permit system as activities occur

(development, conservation, restoration, and mitigation) and compare it to baseline data collected as part of the Shoreline Inventory and Characterization (ESA Adolfson, 2007 – summarized in Appendix B). Indicators collected to date include:

1. Bulkheading
2. Riparian Corridor
3. Intertidal Vegetation
4. Docks and Overwater Structures
5. Large Woody Debris
6. Streets and Roads
7. Water Quality

In addition to the indicators presented and described above, the Washington State Department of Ecology has recently developed guidance on identifying no net loss indicators for use in shoreline Master programs. As the Shoreline Master Program and this restoration plan are implemented, the City may find that currently used indicators are inadequate or that data is lacking. The following is a list of additional indicators that could be used by the City and the functions tracked. These are derived from Ecology's guidance:

1. Acres of permanently protected area – Water Quality/Habitat
2. Shellfish closures - Water Quality
3. Floodplain area (Puyallup) - Water Quality/Habitat
4. Percent cover of invasive species - Habitat
5. Impervious surface area – Water Quality
6. Wetland acreage - Water Quality/Habitat
7. Area of sea grasses - Habitat
8. Wildlife presence (bald eagle & osprey nests and roosts & great blue heron rookeries) - Habitat
9. Unarmored feeder bluffs

8.0 REFERENCES

Beamer, Eric, Aundrea McBride, Rich Henderson and Karen Wolf. 2003. The Importance of Non-Natal Pocket Estuaries in Skagit Bay to Wild Chinook Salmon: An Emerging Priority for Restoration. May 2003.

Borde et al, 2004. Borde, A.B., L.K. O'Rourke, R.M. Thom, G.W. Williams, H.L. Diefenderfer. National Review of Innovative and Successful Coastal Habitat and Restoration. Prepared for National Oceanic and Atmospheric Administration Coastal Services Center. 2004.

Metro Parks Tacoma. 2005. Wapato Park Master Plan. Prepared in September 2005.

ESA Adolfson, 2007. Tacoma Shoreline Inventory and Characterization. July 2007.

Stanley et al, 2005. Stanley, S., J. Brown, and S. Grigsby. Protecting aquatic ecosystems: A guide for Puget Sound Planners to understand watershed processes. Washington State Department of Ecology. Publication #05-06-027. 2005.

Thom et al, 2005. Thom R.M., G.W. Williams and H.L. Diefenderfer. Balancing the Need to Develop Coastal Areas with the Desire for an Ecologically Functioning Coastal Environment: Is Net Ecosystem Improvement Possible? *Restoration Ecology, 13, pp 193-203*. 2005.

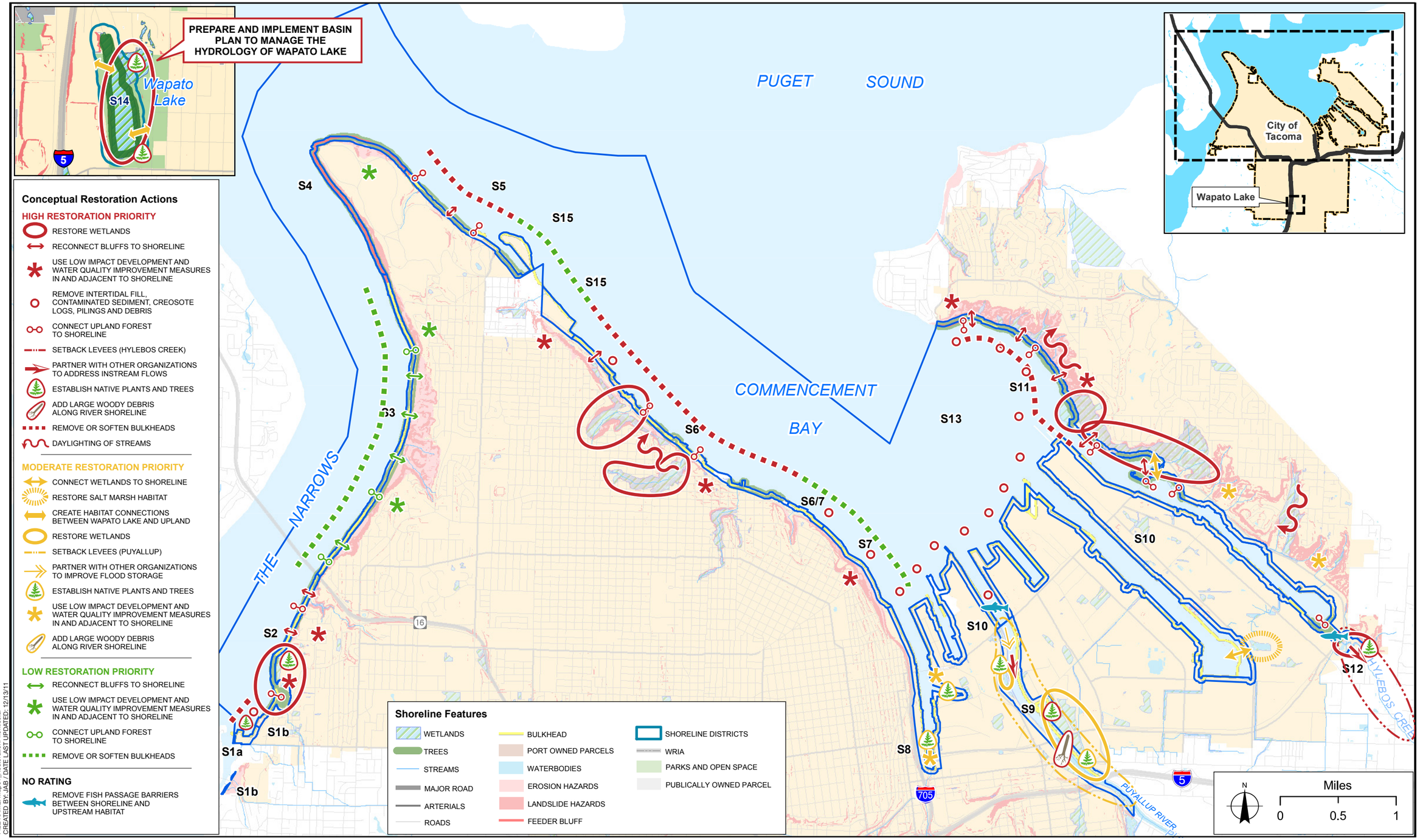
Washington State Department of Ecology, 2004. Restoration Planning and the 2003 Shoreline Management Guidelines. July 2004.

City of Tacoma. 2008. Open Space Habitat and Recreation Plan. December 2008.

APPENDIX A. Shoreline Restoration Plan Maps

Map 1. Conceptual Restoration Opportunities

Map 2. Existing Restoration Sites



Map data are the property of the sources listed below. Inaccuracies may exist, and ESA Adolfson implies no warranties or guarantees regarding any aspect of data depiction.
SOURCE: Beckwith Consulting, 2001; City of Tacoma GIS, 2006; ESA Adolfson, 2008; Geo Engineers, 2004; King County, 2005; Pierce County, 2005-2008; Port of Tacoma, 2008; TFD, TED, 2008; Wayne Clifford, 2005.

Tacoma Shoreline Master Program Update . 209536

Map 1
Conceptual Restoration Priorities
Tacoma, Washington

Restoration Sites (Existing & Potential)
Shoreline District, Site No. and Name

S6, Ruston Way
- 2, Fish Ladder to Creek
- 3, Old Tacoma/Ruston Shoreline
- 4, Dickman Mill
- 5, National Guard Property
- 6, Chinese Reconciliation Park

S7, Schuster Parkway
- 7, Tahoma Salt Marsh

S8, Thea Foss Waterway
- 8, Thea's Park
- 9, 1147 Dock St. (cc Heating)
- 10, Concrete Lot
- 11, Esplanade Riparian Area
- 12, Head of Thea Foss Waterway
- 13, Berg Scaffolding Pocket Beach
- 14, Johnny's Dock Pocket Beach
- 15, Wheeler-Osgood Waterway
- 16, D Street Petroleum
- 17, Thea Foss-Middle Peninsula

S9, Puyallup River
- 29, Puyallup River Side Channel
- 30, Swan Creek
- 31, Banks of Puyallup River
- 32, Gog-le-hi-te Wetland (Port of Tacoma)
- 33, Puyallup River Dike Wetland

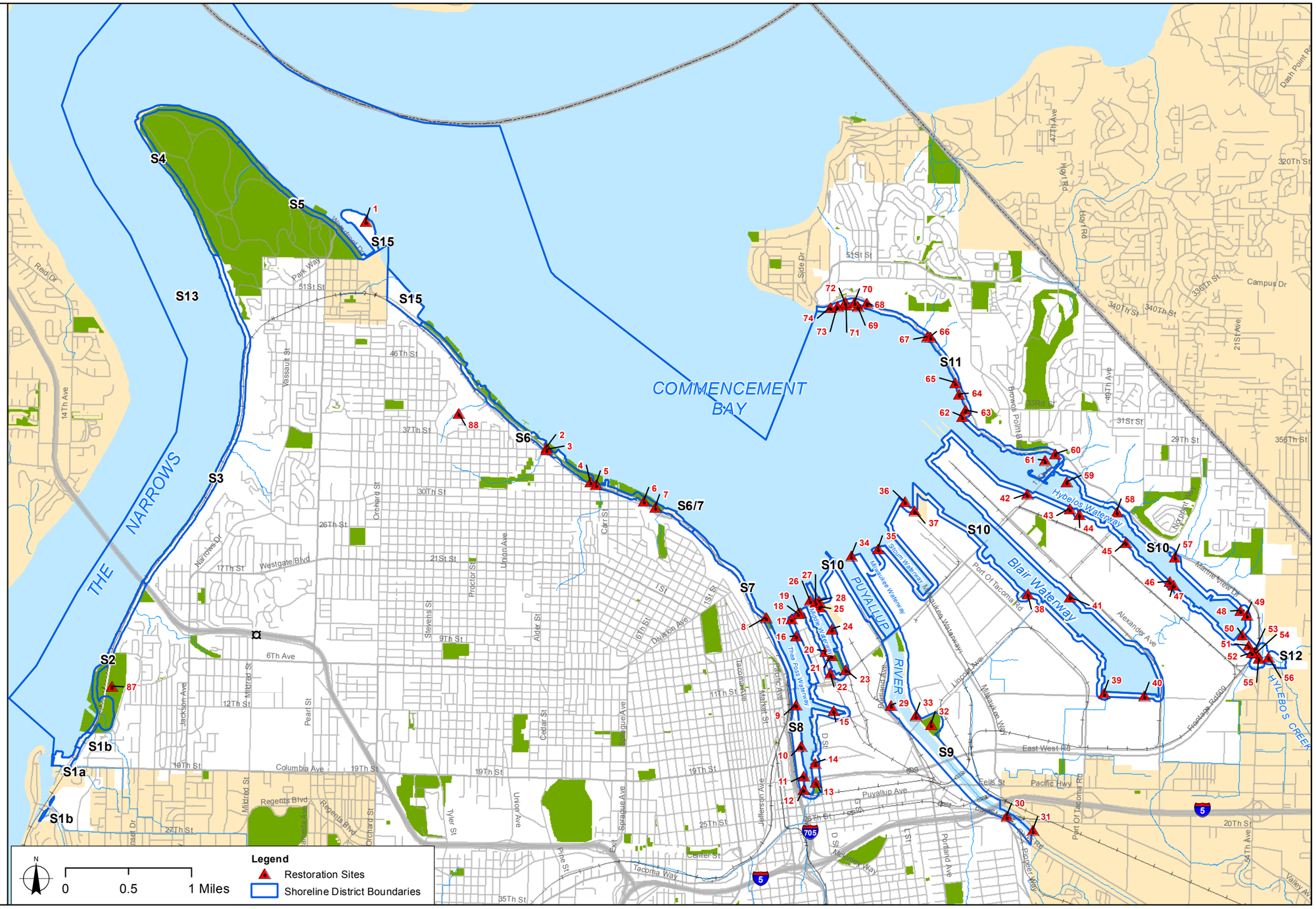
S10, Port Industrial
- 18, DNR OVRA Triangle Restoration
- 19, Olympic View (with Tidelands)
- 20, Middle Waterway Action Comm.
- 21, Middle Waterway Mudflats (City)
- 22, Middle Waterway
- 23, Middle Waterway Shore Restoration
- 24, Middle Waterway Tideflat
- 25, Middle WAterway Shore
- 26, St. Paul Cap
- 27, St. Paul Middle Peninsula
- 28, North Beach Habitat
- 34, Neo Delta Augmentation
- 35, Sitcum-Milwaukee Peninsula
- 36, Slip 5 Mitigation Site
- 37, Slip 1 (Port of Tacoma)
- 38, Blair Waterway Shore
- 39, Plum Creek Timber Shore
- 40, Mouth of Wapato Creek
- 41, Blair Waterway Pond
- 42, Hybelos/11th St
- 43, Taylor Way Properties
- 44, American Construction
- 45, Murray Pacific
- 46, Atofina
- 47, Dunlop
- 48, J&G Marina
- 49, Upper Hybelos Turning Basin
- 57, Schnitzer Steel
- 58, Cascade Pole
- 59, Hybelos Waterway Log Storage Mudflat

S11, Marine View Drive
- 60, Squally Beach
- 61, Hybelos Mudflat
- 62, Outer Hybelos Waterway (Puyallup Tribe of Indians)
- 63, East Commencement Bay Mudflat
- 64, DNR Aquatic Lands South
- 65, Skookum Wuldge
- 66, Marine View Drive Beaches
- 67, DNR Aquatic Lands Middle
- 68, Tyee Marina Beach
- 69, Yowkwala
- 70, WDNR Settlement Sites
- 71, DNT Aquatic Lands North
- 72, WDNR Settlement Sites
- 73, WDNR Settlement Sites
- 74, Bluff Beach

S12, Hybelos Creek
- 50, Mouth of Hybelos Creek
- 51, SR-509
- 52, Louisiana Pacific
- 53, Mowitch
- 54, Hybelos Marsh Alternate Site
- 55, Gider Assiciates Property
- 56, Mattich/Evanich Propoerty

S15, Point Ruston/Slag Peninsula
- 1, Asarco Beach

Restoration Sites Outside Shoreline Districts
- 87, Titlow Lagoon/Titlow Park
- 88, Mason Gulch



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Map data are the property of the sources listed below. Inaccuracies may exist, and ESA Adolfson implies no warranties or guarantees regarding any aspect of data depiction.
SOURCE: City of Tacoma GIS, 2009; King County, 2005; Pierce County, 2005-2008.

Tacoma Shoreline Master Program Update . 209536

Map 2
Restoration Sites (Existing & Potential)
Tacoma, Washington

APPENDIX B. ASSESSMENT OF SHORELINE FUNCTIONS

The Shoreline Inventory and Characterization (2007) provided a comprehensive assessment of ecosystem functions along Tacoma's shoreline. Information from the Inventory on watershed context, shoreline modifications, habitat and species, land use and altered ecosystem processes is summarized below, along with information from newly available technical analyses. Further discussion and references can be found in the Shoreline Inventory and Characterization.

Watershed Context and Shoreline Modifications

The City of Tacoma includes portions of two Water Resource Inventory Areas (WRIAs), the Puyallup River Watershed (WRIA 10) and the Chambers/Clover Creek Watershed (WRIA 12). Much of the marine nearshore areas of Commencement Bay are included in WRIA 10.The nearshore areas of the Tacoma Narrows and a portion of Commencement Bay to just east of Puget Creek in the Ruston Way area are included in WRIA 12. The Puyallup River is the largest watercourse draining WRIA 10, with Swan Creek being the largest tributary stream to the Puyallup River within the city. Hylebos Creek, also located within WRIA 10, is an independent tributary that drains to Commencement Bay within the city. Several other small independent tributaries to Commencement Bay drain WRIA 10, including Wapato Creek and other drainage features (gulches) draining the slopes along the northern plateau above Marine View Drive. Chambers Creek is the largest stream draining WRIA 12; however, this stream lays outside the city limits to the south. Flett Creek is the largest tributary within the city draining to the Chambers Creek basin.

The Puyallup River is a shoreline of statewide significance (WAC 173-18-310) that travels approximately 54 miles from its headwaters on the southwest slopes of Mount Rainier to its mouth at Commencement Bay. The entire Puyallup River basin covers 1,065 square miles and consists of 728 rivers and streams, with the largest tributaries being the White and Carbon Rivers (Kerwin, 1999). The Puyallup River is fed primarily by the Tahoma and Puyallup Glaciers on the southwest slope of Mount Rainier. The Carbon River originates from the Carbon Glacier located on the north slope of Mount Rainier, and the White River is fed primarily by the Emmons Glacier on the northeast slopes of Mount Rainer.

The City of Tacoma lies between River Miles (RM) 0.0 and 2.8 on the Puyallup River in the Lower-Puyallup River basin (Map 2). The city and its urban growth area occupy approximately 27.1 square miles, or 2.5 percent of the land area included in WRIA 10. The portion of the Puyallup River within the city and its Urban Growth Area is approximately 5.2 percent of the total length of the river.

Hylebos Creek enters the Hylebos Waterway in Tacoma and drains to Commencement Bay. Hylebos Creek drains approximately 18,300 acres, and contains 25 miles of stream, 11 named lakes, and 250 acres of wetlands (Kerwin, 1999). There are two major tributaries to Hylebos Creek, referred to as the West and East Forks. The headwaters of the West Fork of the Hylebos are located in the City of Federal Way near South 320th Street (Pierce County, 2005). The East Fork originates in King County near North Lake and Lake Killarney in the Federal Way potential annexation area. The confluence of the two forks lies east of Interstate-5 within the City of Milton. From the confluence of these forks in Milton downstream, the Hylebos Creek itself is

considered a shoreline of the state due to its mean annual flow of greater than 20 cfs (Kresch, 1998). Approximately one-half mile of the Hylebos Creek lies within the City of Tacoma, from about USGS River Mile (RM) 0.00 to RM 0.51.

The south and southeastern portions of the City are located within WRIA 12, which drains an area of approximately 179.5 square miles. The City occupies approximately 43.7 square miles, or 24.3 percent of the land area included in WRIA 12. In addition, WRIA 12 contains many small independent drainages including Crystal Creek, Narrows Creek, Crystal Springs, and 16 smaller drainages (gulches) that drain the western plateau either toward the Tacoma Narrows (west) or toward Commencement Bay (north). The 34-acre Wapato Lake is also located within WRIA 12 and the City of Tacoma. Wapato Lake is made up of three hydrologically connected waterbodies. The northernmost waterbody is essentially an open-water wetland complex. The upper waterbody opens up into a larger, middle waterbody, with wetlands surrounding the fringe. The lower waterbody constitutes the main lake area and contains the majority of development, which is primarily restricted to Wapato Park and its amenities. A stormwater bypass exists at the southwestern end of the middle waterbody. This bypass routes the stormwater flows around the main lake to Ward's Lake and then to the Flett Holding Basins. A dike was constructed in 1981 when the lake was dredged and "restored." The dike was designed to keep sediments in the stormwater from entering the wetlands and the main lake area.

See the Shoreline Use Analysis for specific discussion of existing shoreline modifications.

Habitat and Species

A number of fish and wildlife species use the shorelines in Tacoma for habitat. Critical fish and wildlife habitat conservation areas are those areas identified as being of critical importance to the maintenance of fish and wildlife species, and if altered may reduce the likelihood that the species will survive and reproduce. Species listed under the federal Endangered Species Act that have critical habitat in Tacoma include Chinook salmon and bull trout. The killer whale and Steller sea lion are not documented as occurring in Commencement Bay, but have the potential to occur and have been sighted within this area. Other federal species of concern or State-listed species include the peregrine falcon, purple martin, coho salmon, steelhead, cutthroat trout, and the western pond turtle.

In addition to the above listed species, the State Priority Habitats and Species maps include chum salmon, pink salmon, sockeye salmon, bald eagle, seabird nesting colonies, waterfowl concentrations and harbor seal/California sea lion haul-out sites. Priority habitats shown on the map include riparian areas, urban natural open spaces, wetlands, cliffs and bluffs, estuarine zones and lagoons. See Section 3.1 of the Shoreline Inventory and Characterization for further information on habitat and species in Tacoma.

Land Use

Tacoma is the second largest urban center in the Puget lowlands. Its land uses and cover are similar to other highly urbanized city centers. In general, there have been three key phases of changing land use between 1800 and the present.

Prior to the mid-1800s, the area around Tacoma was characterized by both a significant delta system where the Puyallup River meets Commencement Bay, and dense forestlands on the floodplain and surrounding uplands (Kerwin, 1999, Collins et al., 2003). As populations in western Washington grew, timber harvesting throughout the watershed and establishment of agriculture on floodplains represented the first phase of land use changes. Filling of tidelands within Commencement Bay began as early as 1877 with the initial installation of railroad beds (U.S. Army Corps of Engineers et al, 1993; Kerwin, 1999; Simenstad, 2000).

The presence of a deepwater embayment (Commencement Bay) resulted in the early establishment of a port that influenced the development of the City. A significant channel change occurred in 1906 when the White River moved south to entirely flow into the Puyallup River. This alteration initiated a series of projects intended to manage the size, location, and behavior of the Puyallup River and its tributaries (King County, 1988). Between 1908 and 1917, significant relocation, armoring, and diking of the Puyallup River was completed. Much of the work was completed under the auspices of the Inter-County River Improvement District, which was formed as an organization to share costs between King and Pierce Counties to address river issues surrounding the White River's movement into the Puyallup basin (King County, 1988).

River projects continued through the 1970s, resulting in the channelization and construction of levees along significant portions of the lower Puyallup River. Once the system of channels and levees was completed, river management shifted to the removal of in-channel sediments to preserve the flood-carrying capacity of the system. In the late 1980s, dredging was restricted, and in the late 1990s, further restrictions were imposed following the listing of salmonid species as threatened under the Endangered Species Act (ESA). The carrying capacity of the lower Puyallup River has generally decreased as sediments deposited in the White, Carbon and Puyallup River deltas now build up within the leveed channels (USGS, 1990; Kerwin, 1999). Today, much of the upper watershed of the Puyallup River is in forest land uses, either within the Mt. Rainier National Park, Mt. Baker-Snoqualmie National Forest, or privately held timber operations (Kerwin, 1999). Agricultural land uses dominate the floodplains of the middle and upper portions of the watershed (Kerwin, 1999, Collins and Sheikh, 2005). Urban land uses also exist in the middle and upper portions of the watershed, including the cities of Puyallup, Auburn, Orting, Federal Way, Fife, Sumner, Buckley, Enumclaw and Milton. Urban land uses are typically located on either alluvial valley or on the relatively level surrounding uplands. The City of Tacoma also includes substantial industrial and commercial land uses along the Interstate 5 corridor extending west through the Port of Tacoma. At the end of World War II, the urban population within the cities in the Puyallup watershed increased substantially (Washington Office of Financial Management Historical Data).

See the Shoreline Use Analysis for specific discussion of existing land uses and future demand.

Altered Ecosystem Processes

Sections 3.0 and 4.0 of the Shoreline Inventory and Characterization discuss the status of watershed process controls and shoreline ecosystem processes in detail.

Climate Change

Climate change is a consideration in shoreline management in that it is expected to affect water temperatures, flows and the sea level over time. King County's Shoreline Inventory and Characterization (2007) discussed the potential effects on Puget Sound shorelines and fresh water shorelines; relevant excerpts from that discussion follow:

> Casola et al. (2005) summarized the information presented at a conference in 2005 to address predicted effects of climate change on Washington's hydropower, water supplies, forests, fish populations, and agriculture (see http://dnr.metrokc.gov/dnrp/climate-change/conference-2005-results/plenarysession/background.htm).
>
> The Intergovernmental Panel on Climate Change (IPCC 2007) predicts that global surface air temperature could increase by 2.5 to 10.4 ºF (about 1 to 6 °C), and global sea level could rise from 8 to 18 inches between 2000 and 2100, depending on both the rate of natural changes and the response of the climate system to greenhouse gas emissions both now and into the future. However, the IPCC models do not take polar ice cap melting into account. Rahmstorf (2007) uses another method of estimation and derives a predicted range of sea level increase of 21 to 55 inches by 2100. Neither of these methods take into account the effects of local earth movements into account, and these processes could also impact the relative sea level in the Puget Sound region. Temperature In the Pacific Northwest, Casola et al. (2005) noted that, "The average temperature in the Pacific Northwest (PNW) increased approximately 1.5°F (0.8°C) over the last century; snowpack has been declining over the last 80 years, especially at lower elevations; the onset of snow melt and peak streamflows in snow-fed rivers has moved earlier in the year; and many species of plants are blooming earlier in the year." They also noted that "although direct observations are not available, hydrologic models indicate that spring soil moisture has also been increasing."
>
> In the future, Casola et al. (2005) expect increases in air temperature across all seasons for the Pacific Northwest. Using global climate models, they project that by the year 2020 temperatures will likely increase between 2.5 to 3.7°F (about 1 to 2°C), and by 2040 the increase will be between 3.1 and 5.3°F (about 1.5 to 3°C). At the same time, water temperatures are also expected to increase.
>
> Increases in both water and air temperature will have impacts on many species, but for shorelines in particular, warmer water temperatures will be of major importance. Casola et al. (2005) note that fish will have to respond to changes in habitat caused by responses of vegetation, streamflow, temperature patterns and oxygen to climate change. In some cases, these changes may occur faster or be more extreme than some species can accommodate. For example, although Casola et al. (2005) do not explicitly predict the fate of particular species, it is reasonable to expect that some more temperatures-sensitive species, such as sockeye salmon, may have more difficulty adapting than others, such as coho and Chinook.
>
> Marine plant species, such as eel grass and bull kelp, appear to have a narrow range of water temperature tolerance and extensive stands may also suffer as a result of the projected changes (Snover et al. 2005). Effects on aquatic plants could have a cascading effect of

habitat change, affecting other species that might not have narrow temperature tolerances but do have an important dependence on those plant stands for food, nesting sites, or refuge.

Warmer water temperatures may change seasonal variation in planktonic community structure in both marine and freshwater systems. Longer periods of warm temperatures in shallow waters will likely favor certain groups, including: (1) bluegreen cyanobacteria, some of which make toxic substances that harm pets and people; (2) dinoflagellates, some of which cause red tides, causing toxic accumulations in shellfish; and (3) chlorophyte algae, some of which form large filamentous masses that cover rocks and structures, as well as wash up on shoreline to cover beaches and cause nuisances.

Implications for precipitation and runoff are more difficult to predict, due to uncertainty over the interplay among many factors affecting precipitation. However, the majority of models indicate that an increase in cool season precipitation (October to March) will include a greater portion of the precipitation as rain rather than snow, which will result in reduced residual spring snowpack and earlier snowmelt. Casola et al. (2005) predict that stream flow, stormwater runoff, and water temperature patterns will likely be affected by changes in both air temperature and precipitation.

For marine coastal areas, Rahmstorf (2007) predicts a global sea level rise of 2 to 4.5 ft, while the IPCC is conservative, forecasting a rise of 0.7 to 1.5 ft., but does not include polar ice melt. Casola et al. (2005) report that sea level could rise almost 3 feet by the year 2100 in south Puget Sound (Tacoma), taking into account the net subsidence in crustal elevations in the Puget Sound region, although it is not clear if subsidence should be estimated as a continuous rate (Petersen, in prep). Rising relative sea level is a response to a series of complicated processes that are in turn impacted by factors affecting other parameters on a global as well as local scale, such as temperature, wind patterns, oceanic currents, and precipitation.

Increased sea elevations will make development and infrastructure in low-lying areas more susceptible to flooding due to high tides and storms. Waves will encroach further onto low-lying beaches and cause greater beach erosion and threatening or damaging low-lying structures. At the same time steep slopes may receive increased moisture, due to predicted changes in precipitation patterns, potentially resulting in an increase in landslides that deliver more material to the marine shoreline, but which may cause property destruction and threaten human safety.

Where shorelines are currently armored, a slightly higher sea level may have minimal impacts. Significant rise might begin to allow overtopping of armoring with storms and very high tides. Shoreline reaches, known as transport zones, are composed of mostly stable bluffs and gentle sloping shorelines. A significant rise in sea level will likely cause these areas to become active feeder bluffs, perhaps endangering residences currently considered safe. A rise in sea level also will likely cause current feeder bluffs to become more active and increase erosion rates.

Marshes, estuarine areas, and tributary mouths could experience changes in shape due to changes in accretion and erosion patterns, potential loss of eel grass beds and changes in

plant communities associated with the estuarine and marsh areas, and increased erosion in drainage channels upstream of deltas.

A related impact of sea level rise would be to change the location and amount of land coming under shoreline jurisdiction over time, since a 2-foot vertical rise of the sea can mean a much more substantial incursion inland. This could cause flooding of some beach front properties.

Changes in sea level could affect the Puyallup River's flow regime, river height, and salinity, which have implications for existing habitat quality and the design and ultimate effectiveness of restoration projects.

APPENDIX C. SOURCES OF CRITERIA FOR PRIORITIZING RESTORATION PROJECTS

Several existing sources of shoreline restoration prioritization criteria, including the Shoreline Inventory and Characterization (2007), the Commencement Bay Natural Resources Restoration Plan (1997), and the Commencement Bay Aquatic Ecosystem Assessment (2000), were relied upon in this Plan. These criteria, summarized below, were used to inform the criteria ultimately developed to prioritize projects in this Shoreline Restoration Plan.

First, in the assessment of shoreline functions and opportunity areas in the Shoreline Inventory and Characterization (Section 8.0), best professional judgment using a general set of criteria was used to rank restoration potential/opportunities as low, moderate or high. Factors considered in that ranking included: the number of goals that could be achieved by pursuing a restoration opportunity, likelihood of success given the level of ecological alteration, and whether the project was identified as a priority in other restoration planning efforts.

In the Commencement Bay Natural Resources Restoration Plan (1997), required criteria were used to screen out projects that do not attain a minimum level of land availability, source control, or adequately address injured natural resources. The overall goal of the plan was to clean up toxic sites along the Bay. Required criteria were:

- Site is or can be made available for restoration. In general, available sites are those that may not contain substantial structures or pavement.
- Source control is or will be sufficient. In general, source control is sufficient if an environmental audit or similar report demonstrates that the site has limited potential for recontamination.
- Restoration of the site will provide functional benefits to injured natural resources. Site restoration efforts may include restoration and preservation of habitat or enhancement of physical or biological conditions.

Then, preferred criteria were used to rank suitable restoration sites, as follows.

HIGH IMPORTANCE:

- Functional connectivity (to other shoreline areas and upland corridors)
- Location in existing critical habitat areas (for key species)
- Separation from sources of contamination or opportunity to remediate contaminated areas
- Cost-effectiveness or grant applicability
- Sustainability

MEDIUM IMPORTANCE:

- Size of restored habitat

- Ownership and management
- Land use compatibility
- Water quantity and flow (as related to erosion potential) – rivers and streams only

LESSER IMPORTANCE:

- Public access or view of site

The Commencement Bay Aquatic Ecosystem Assessment (2000) includes restoration criteria for juvenile salmon habitat landscapes, given their dependence on landscape features and processes in the delta and Commencement Bay. The overall goal of the assessment was to aid salmon recovery. The following criteria guided analysis and priority setting for restoration opportunities:

- Restore and enhance inter-habitat mosaics and linkages that accommodate refugia, feeding and physiological requirements.
- Promote landscape structure and elements that result in diverse, productive primary- and secondary-producer populations that support juvenile salmon growth and survival.
- Take advantage of existing and restorable geomorphic structure that promotes the extent (opportunity, access) and utility (realized function) of habitat use.
- Preserve and augment fundamental estuarine processes that naturally build and maintain juvenile salmon habitats.
- Plan restoration and remediation that optimally addresses salmon life-history diversity to compensate for climatic variation, energy regimes, and disturbance.

The 2000 Assessment also generally identifies appropriate actions for enhancement of juvenile salmon rearing along five segments of the delta and Bay shoreline.

Tacoma's critical areas mitigation sequencing requirements can also be considered in developing prioritization criteria. TMC 13.11.900.M defines mitigation as:

> Avoiding, minimizing, or compensating for adverse critical areas impacts. Mitigation, in the following sequential order of preference, is:
>
> a. Avoiding the impact altogether by not taking a certain action or parts of an action.
>
> b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps such as project redesign, relocation, or timing, to avoid or reduce impacts.
>
> c. Rectifying the impact to wetlands by repairing, rehabilitation, or restoring the affected environment to the conditions existing at the time of the initiation of the project
>
> d. Minimizing or eliminating the hazard by restoring or stabilizing the hazard area through engineered or other methods.

e. Reducing or eliminating the impact or hazard over time by preservation and maintenance operations during the life of the action.

f. Compensating for the impact to wetlands by replacing, enhancing, or providing substitute resources or environments.

g. Monitoring the hazard or other required mitigation and taking remedial action when necessary. Mitigation for individual actions may include a combination of the above measures.

APPENDIX D. Fee in-lieu Program

Appendix D

Shoreline Habitat Fee-in-Lieu Prospectus

PREPARED BY: ESA

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1.0 INTRODUCTION

As part of its comprehensive update of the Shoreline Master Program (SMP), the City of Tacoma Community and Economic Development Department is considering establishment of a shoreline mitigation program to allow for off-site mitigation of development impacts to shoreline riparian areas. This report was prepared to specifically address the city's need to explore off-site shoreline mitigation and the feasibility of a fee in-lieu (FIL) program for shoreline habitat.

In 2003, the Department of Ecology (DOE) issued guidelines to assist local governments in meeting the State requirement to conduct a comprehensive review of the City's SMP. The guidelines outline procedural steps and substantive requirements that must be met. The SMP must assure "no net loss" of shoreline ecological functions while providing for appropriate uses within shoreline areas. Tacoma's update to its Shoreline Master Program is a comprehensive update of its existing program requiring the City to re-evaluate all shoreline policies, designations and regulations. An inventory of existing conditions was conducted based upon scientific and technical information. The Tacoma SMP will amend goals, policies and development regulations for all shoreline areas including Commencement Bay and its waterways, the Hylebos Creek, the Puyallup River, Tacoma Narrows and Wapato Lake.

Currently, the Draft Tacoma SMP (TSMP) is in development. The Planning Commission will be overseeing the update of the program and is expected to make a recommendation to the City Council in late 2010. This project is closely coordinated with the Thea Foss Waterway Comprehensive Review, the Critical Areas Preservation Ordinance update, and the Open Space Habitat Management and Plan efforts.

The intent of this technical report is to explore options and alternatives to on-site mitigation for impacts to shoreline functions during development. The information in this report has been prepared to support the shoreline regulations and provide a mechanism for a potential fee in-lieu program for shoreline mitigation.

2.0 OVERVIEW

The Shoreline Management Act (SMA) provides a broad policy framework for protecting the natural resources and ecology of the shoreline environment. The SMP Guidelines adopted in 2003 by Ecology establish the standard of *no net loss* of shoreline ecological functions. The Washington State Administrative Code (WAC) 173-26-186 directs that master programs must "include policies and regulations designed to achieve *no net* loss of those ecological functions."

The *no net loss* standard set by the WAC is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development within the shoreline jurisdiction. Information related to this standard is provided on the Ecology web page in Chapter 4 of the new SMP Handbook. Chapter 4 of the Handbook is titled No Net Loss of Shoreline Ecological Functions and was last updated on December 16, 2009. Ecology staff are currently developing a list of potential indicators of *no net loss* in order to quantify parameters affecting shoreline functions. The list of indicators includes quantities such as length of shoreline armoring, acreage of riparian vegetation, acres of permanently protected area, etc.

The City of Tacoma seeks to assess the feasibility of a shoreline mitigation program that assists the City and applicant appropriately mitigate for shoreline impacts and achieve the regulatory requirements of *no net loss* during permit compliance.

In addition to mitigation, the State has directed local governments to develop SMP provisions "…to achieve overall improvements in shoreline ecological functions over time when compared to the status upon adoption of the master program." This overarching goal is accomplished by protection of existing shoreline functions through regulations, and through restoration of ecological functions, including mitigation.

The City of Tacoma has developed the following restoration goals in the Draft Shoreline Restoration Plan (2010a) in order to achieve net gain in shoreline habitat function:

- improve shoreline water quality;
- re-establish and restore natural shoreline processes;
- restore degraded and lost habitat; and
- improve connectivity of shoreline environments.

The Draft Restoration Plan further identifies restoration opportunities for the specific Shoreline Districts (S1 through S-15). Many of these opportunities involve reconnection of bluffs, wetlands, or upland forest to the shoreline. However, the space or location to capitalize on these restoration goals is limited by the existing development of the shoreline. Restoration opportunities, some associated with shoreline habitat, were identified during the development of the Tacoma Open Space Habitat and Recreation Element in the City Comprehensive Plan.

Provision for off-site mitigation would increase mitigation opportunities, and a fee in-lieu program would allow further flexibility and increased success in mitigating shoreline impacts.

A fee-in-lieu program involves the preservation, enhancement, or restoration of habitat and/or aquatic resources through funds paid to a sponsor to satisfy compensatory mitigation requirements; the responsibility for providing and maintaining mitigation is transferred to the program sponsor.

Shoreline habitat fee-in-lieu mitigation occurs when the applicant proposes an activity that impacts shoreline habitat, and on-site mitigation is precluded for reasons of site development or physical constraints. The applicant provides funds to the sponsor instead of completing project-specific mitigation. These funds would then be contributed to off-site mitigation projects.

3.0 LITERATURE SEARCH

Fee in-lieu (or in-lieu fee) programs have been developed for land use application in density transfer, wetlands impacts, and shoreline armoring.

In these programs, the regulating agency allows the permittee to substitute on-site mitigation of impacts through provision of a fee. The agency then applies the fee to mitigation of the impact.

Several examples that provide insight to a shoreline habitat fee in-lieu program are discussed below.

3.1 Federal 404 Mitigation and Fee-in-Lieu Guidance

Discussion of fee in-lieu mitigation for wetland impacts under Section 404 of the Clean Water Act was initiated in the 1990 Memorandum of Agreement between the Corps of Engineers (Corps) and the Environmental Protection Agency (EPA). The program was further defined in 1995, and in 2000, the Corps, EPA, United States Fish and Wildlife Service (USFWS), and the National Oceanic and Atmospheric Association (NOAA) provided additional guidance for fee in-lieu arrangements for mitigation. Fees-in-lieu are described as appropriate for 404 individual and general permits established under the mitigation banking guidance, but as a rule, are to be limited to instances where on-site mitigation is not available or practicable. The fees are to be transferred to the local natural resource management agency for implementation of mitigation. In-kind and in-watershed projects are preferred. The natural resource agency accepting the fees is encouraged to provide information on the identified restoration projects, the implementation schedule, and financial, legal, and technical mechanisms to ensure long-term success.

On April 10, 2008, the Department of the Army (Army) and U.S. Environmental Protection Agency (EPA) published a final rule for compensatory mitigation authorized by Corps permits issued under §404 of the Clean Water Act (33 U.S.C. 1344) and/or §§9 or 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401, 403). Federal-related fee in-lieu programs are distinguished from mitigation banks and other forms of compensatory mitigation by having all of the following six elements:

- Fee in-lieu program instrument
- Review by interagency review team
- Geographic service area(s)
- Compensation planning framework
- Fee in-lieu program account
- Allocation of advance credits

The Environmental Law Institute has published: In Lieu Fee Mitigation: Model Instrument Language and Resources (December 2009) which provides detailed information and sample language on the Federal Section 404 and Section 10 fee-in-lieu process for wetland mitigation.

3.2 Washington State Department of Ecology

The Washington State Department of Ecology (Ecology) is working with the Corps and EPA in the development of a FIL program in Washington State for wetlands mitigation. The guidelines are similar to those described above under the federal program (Ecology, Corps, & EPA, March 2006).

3.3 Puget Sound Partnership

The Puget Sound Partnership (PSP) is establishing a pilot FIL program for compensatory mitigation; Thurston and Pierce Counties were chosen as the locations for the two pilot projects, and is accepting applications for those two programs through April 27, 2010 (PSP, January 2010).

3.4 King County Mitigation Reserves Program

King County is in the process of establishing a Fee In-Lieu Program for wetland and buffer impacts, as part of revisions to the King County Mitigation Reserves Program, established in 2005 (KCNRP, June 2009). The program will allow payment of a fee in-lieu of mitigation for wetlands impacts that cannot be mitigated on site. The fee is based upon a function-based debit and credit system that is in development (Murphy, Personal Communication. 2010.) Marine and estuarine wetlands will be included in the program, and the program will include shoreline buffer mitigation, if Ecology has a role in permitting (Murphy, Personal Communication. 2010). King County has proposed locations, termed "roster sites" in different watersheds where fees would be applied. The program is intended to be certified by the Corps and EPA, so that the fee-in-lieu mitigation will satisfy Section 404 and Section 10 permitting as well as county permits.

3.5 City of Seattle Shoreline Alternative Mitigation Plan

The draft City of Seattle Shoreline Alternative Mitigation Plan (SAMP) (May 2006) identifies a fee-in-lieu program to shoreline impacts to Lake Union and Lake Washington. The plan supports the use of shorelines in these areas for water-dependent uses, while providing mitigation for shoreline impacts that is predictable and effective to achieve no net loss. The framework for assessing impacts is viewed through the lens of impact to Chinook salmon habitat, which also provides habitat for other organisms. The SAMP bases it's evaluation of impacts on an On-Site Habitat Unit Equivalency. Habitat Suitability Index (HIS) curves quantify the changes in habitat quantity and quality as part of Habitat Evaluation Procedures (HEP) (Raleigh et. al, 1986). HIS values are typically multiplied by the area they represent to derive a set of weighted habitat areas that can be compared across alternatives (R2, 2006). The concept is that maintaining a comparable balance in habitat before and after project completion, resulting in no adverse impact to Chinook habitat. Use of fee-in-lieu is limited to projects with water-dependent uses (Seattle Municipal Code 23.60.944). Applicants will be required to provide 1.3:1 mitigation credits for off-site mitigation. (Seattle, 2006); this may be modified to higher ratios such as 2:1 (R2, 2006) based solely on a policy decision, not on scientific data, which is lacking. Fees will include the cost of mitigation design, establishment, maintenance, and contingency. The SAMP has identified potential restoration sites, which will be protected by conservation easements.

3.6 Fee In-lieu Programs in Other States

3.6.1 In-Lieu Fee Beach Sand Mitigation Program

An example fee in-lieu program is currently being used in San Diego County, California. This program allows fees to be transferred to offset impacts to beaches and beach sand habitat (California Coastal Commission, 1997).

Section 30235 of the California Coastal Act requires the Coastal Commission to approve seawalls, revetments, cliff retaining walls and other such construction that alters natural shoreline processes to protect existing structures, public beaches and coastal development in danger from erosion. Approved development is designed to eliminate or mitigate the adverse impacts on shoreline sand supply. In addition to avoidance and minimization, the mitigation definition includes: "Compensating for the impact by replacing or providing substitute resources or environments."

The FIL process in San Diego County has been used to mitigate for armoring of bluff and shoreline habitats, and mitigate for the loss of beach area and the loss of sand denied to the beach cell over the life of the structure. The fee is derived based upon the volume of sand lost, multiplied by the cost of transporting and depositing the sand on the beach in the project vicinity based upon site-specific conditions. The program developed a formula to quantify impacts and calculate fees. The review of a number of permitted projects also includes descriptions of alternatives to fee-in-lieu determined on a case-by-case basis, including, for example, design modifications, or provision of lateral access to the beach.

3.6.2 Virginia Aquatic Resources Trust Fund In-Lieu Fee Program

The Virginia Aquatic Resources Trust Fund In-Lieu Fee Program, established in 1995 and expanded in 2003, provides in-lieu fee mitigation for impacts to waters of the US and the state, including wetlands, streams, and associated buffers. Project-specific credits are determined based upon standard ratios for wetlands, and through the Unified Stream Methodology for streams, and include the expected costs for restoration, establishment, adaptive management, and preservation (VAR, 2003). In-lieu fee sites are designated by "Service Areas" associated with different watersheds. The Nature Conservancy manages the program with oversight from the Virginia Department of Environmental Quality and the Corps.

3.6.3 Virginia Marine Resources Commission Tidal Wetland Mitigation Bank

The Virginia Marine Resources Commission Tidal Wetland Mitigation Bank, established in 1998 and updated in November 2005, provides off-site mitigation for impacts to tidal wetlands. Although the Bank specifically excludes in-lieu fee arrangements, it states that they are some times appropriate, and are permitted on a case-by-case basis. This document includes a function-specific credit calculation methodology for assigning credits to tidal wetlands for the purpose of the bank.

4.0 PROGRAM CONCEPTS

The City of Tacoma has identified restoration goals and actions and potential restoration sites in the Draft Shoreline Restoration Plan (ESA Adolfson, September 2010a). This plan provides a description of existing plans and programs in the City of Tacoma that have identified needs for restoration, including those within the shoreline.

Ecological processes and functions of shoreline areas are identified as:

- Hydrology: Attenuation of wave energy; fresh to salt water transition, channel and floodplain connection, summer low-flow attenuation. Flood-flow retention,

- Sediment Generation and Transport: sediment delivery from coastal bluffs;

- Water quality: water contact-time with the soil; long-term storage of excess nutrients, pathogens, and toxins

- Habitat: maintenance of native plant community; source and delivery of large woody debris (LWD); removal of fish-blockages.

Each shoreline area contains identified restoration opportunities and locations (conceptual). Restoration actions include:

- Reconnection of bluffs to the shoreline
- Restoration of wetlands
- Provision of large woody debris (LWD)
- Removal of contaminated soils and trash
- Implementing Low Impact Development (LID) and water quality improvement measures
- Replace existing bulkheads with soft shoreline armoring
- Removal of structural barriers between feeder-bluffs and shoreline
- Removal of invasive plant species and enhancement of native vegetation
- Setting back levees (Hylebos Creek and Puyallup River)
- Removal of barriers between Lake Wapato and upland habitat

In many circumstances, potential impacts cannot be mitigated on site, due to the level of existing development, and/or the functionality of a small mitigation project in the context of the site.

The City of Tacoma could establish a fee in-lieu program for shoreline habitat impacts that cannot be mitigated on-site. The program could be modeled upon wetland fee in-lieu programs, where impacts are assessed based upon functional criteria and fees based upon those impacts are paid to the City for the performance of mitigation off site.

The program would have the following elements:

- Development of a fee in-lieu program instrument – the guidelines for the program including valuation and a vehicle for fee collection;
- Establishment of a review team which would review proposals on a case-by-case basis and monitor the performance of mitigation sites;
- Assignment of geographic service area, such as the Shoreline Districts identified in the Draft Shoreline Master Program (ESA Adolfson, 2010b) and potential restoration sites identified in the Draft Restoration Plan (ESA Adolfson, 2010a);

- Identification of performance standards; and
- Development of a fee in-lieu program account.

4.1 Program Instrument

The program instrument typically contains the following elements:

Objectives. The objective(s) of the program need to be clearly stated such as: to provide for off-site mitigation for shoreline habitat impacts when on-site compensation is not possible or practical. The fees will be applied to restoration projects identified in the *Shoreline Restoration Plan* (2010a) and located within the same Shoreline District when possible. The fee would be applied to in-kind mitigation when possible. For example, if the proposed impact is related to shoreline armoring, affecting wildlife habitat area, and sediment availability for transport, then mitigation could include both habitat connection and sediment delivery elements.

Need and Technical Feasibility. This section would describe the need for the program and the feasibility of the implementation. Need would be based upon a record of un-mitigated past shoreline impacts due to lack of on-site opportunity. Feasibility would be based upon the existence of opportunities for off-site mitigation and the ability of the City to manage the program.

Establishment and Operation. The program instrument would need to describe, in legal terms, how the fee in-lieu program will be established and operated, and describe the reporting protocols.

Proposed Service Area. The instrument will describe the proposed service area, in this case, the City of Tacoma regulated shoreline. Several mitigation site locations or "roster sites" could be identified based upon the Shoreline District where the impact occurs.

Ownership arrangements and long- term management strategy. The instrument would need to describe who would have ownership of the sites and how the sites would be maintained. The management strategy would need to describe both the financial management and the site-maintenance provided to ensure long-term success of the project. (Note: the City of Seattle specifies that the City would have an access agreement for the sites, though some would remain private). The City may decide that all mitigation would take place at city-owned properties.

Compensation planning framework. The instrument would include a description of the method for determining project-specific credits and fees. The method would be function-based where possible and will equal or exceed an area-based determination. Valuation of wetland impacts would be based upon ratios in the Critical Areas Preservation Ordinance; valuation of other impacts would need to be developed. A workshop on analysis of the City of Seattle Shoreline Alternative Mitigation Plan (documented by R2 Resources, 2006) resolved that there were linear measures of function (e.g. length of shoreline armoring) and areal measures (e.g. area of over-water coverage). These measures would be assessed separately when determining credits.

Areal measures can be valued based upon a 1:1 ratio (simplest) or a larger ratio, that is based upon general findings that mitigation is not always successful, so ratios should be greater than 1:1. Based

upon a review of scientific literature for riparian areas and strategies for management, a standard ratio of 2:1 mitigation is recommended to offset the temporal loss of function and loss of shoreline habitat area (National Research Council, 2003). Impact to wetlands, streams, and their specific buffers can be mitigated at ratios prescribed in the Critical Areas Code (TMC 13.11.350). Upland shoreline habitat loss, however, is hard to quantify, as the character and shape of the habitat, in addition to its acreage, influences its current use by wildlife and effect on water quality. For example, a long, narrow strip of forest extending from the shoreline to the bluff provides shoreline access to many more different species (e.g. urban-adapted) than a short, wide swath of forest would provide (perhaps providing habitat for interior forest species). Quantifying habitat in this case might require selecting a species on which to base habitat analysis, in the way that the City of Seattle has selected Chinook salmon for their Shoreline Alteration Mitigation Plan (2006). Applicants could apply the City of Seattle Shoreline Alternative Mitigation Plan (Seattle, May 2006) method as an alternative to a 2:1 standard replacement ratio. The Seattle method assigns habitat units per square foot to habitat lost: for example grass is valued at 0.27 habitat units per square foot while mature shrubs are valued at 2.77 habitat units per square foot, etc. According to the Seattle method, these habitat units are typically replaced on the receiving site at a 1.3:1 ratio.

Linear impacts related to infrastructure can be mitigated on a 1:1 ratio – one foot of armoring removed for every foot of new armoring proposed for example. Higher ratios would be based upon a policy decision to deter new bank-hardening, absent current scientific data availability.

Description of program account. The instrument will include a description of the financial accounting for the program.

4.2 Review Team

The City could convene a technical review team (TRT) to implement the program. Their duties would include implementing the valuation of impacts and mitigation described in the Instrument. The review team could include only City staff, or include staff from other agencies such as WDFW, Corp, Tacoma Green Partnership, or EPA members.

4.3 Geographic Service Areas

The Draft Tacoma Shoreline Master Program (ESA Adolfson, 2010b) includes the designation of 15 shoreline districts within the city. The FIL program would require that the mitigation for project impacts occur within the same shoreline district as the impact. If no site is available in that specific district, the mitigation site should be within one of five larger shoreline areas that encompasses the impact location. These areas would correspond approximately to 1) the Narrows; 2) Ruston Way; 3) Puyallup River; 4) the Port of Tacoma; and 5) Marine View Drive.

Restoration opportunities have been described for each shoreline district in the Draft *Shoreline Restoration Plan* (2010a), which identified restoration potential based upon information in the Shoreline Inventory and Characterization (2007), the Commencement Bay Natural Resource Restoration Plan (2007), and the Commencement Bay Aquatic Ecosystem Assessment (2000). Sites with high importance for restoration included:

- Functional connectivity;

- Location in existing critical area;
- Separation from sources of contamination;
- Cost-effectiveness; and
- Sustainability.

The Open Space and Recreation Element of the Tacoma Comprehensive Plan includes identification of habitat areas and proposed corridors, some of which are located in the City's shoreline jurisdiction (see Figure 2 of that document). During development of that plan, an inventory of open space included identification of potential sites for restoration based solely upon ecological characteristics, including presence of the target community (e.g. native conifer forest), extent of invasive plant species present, and presence of priority habitats and species. Thirty nine (39) sites were identified, several of which lie on or adjacent to the shoreline. These may provide initial sites for restoration funded by a fee-in-lieu program. Further in-depth analysis will be necessary to determine feasibility. The sites located on or adjacent to the shoreline include the following:

- Wapato Lake: Wapato Park includes lake, wetland, and upland habitats. The Shoreline Restoration Plan (2010a) has identified the restoration of wetlands associated with Wapato Lake as a beneficial action, improving water quality, mitigation flood flows, and providing wildlife habitat. The hydrology of these wetlands has been altered over time through dredging and filling; invasive plant species are present, and are dominant in some areas, and opportunities to improve habitat are many. This area was identified as a high restoration potential in the Draft Shoreline Restoration Plan (20010a).

- Puget Creek: This stream flows down a steep ravine, within Puget Park, although not all of the riparian corridor is publically-owned. Elements of forest habitat remain, but invasive plant species and erosion due to stormwater runoff have degraded habitat. This stream flows beneath roads and railway tracks prior to entering Commencement Bay and Puget Sound. An active community group supports restoration activities at this site. Improving the habitat quality and connections between upland forest, riparian habitat, and marine shoreline would prove valuable to wildlife. This area was identified as a moderate restoration potential in the Shoreline Restoration Plan (2010a).

- Marine View Drive: Bluffs fronting Marine View Drive on the northwest shore of Commencement Bay are substantially intact, due to gradient and slope instability. However, the bluffs have been separated from the shoreline by the roadway and the industrial development of the port/shoreline. Small areas of shoreline (e.g. Squally Beach) have been restored and re-connected to riparian habitat, although Marine View Drive itself impedes connection to the bluff sediments if not to wildlife that can cross the roadway (e.g. birds and small- to medium-sized mammals.) This area was identified as a moderate restoration potential in the Shoreline Restoration Plan (2010a).

4.4 Performance Standards

Performance standards would be developed based upon the habitat functions identified in the valuation process. As in wetlands mitigation projects, a time period would be defined for

mitigation projects to meet their specific goals. The time periods would be variable. For example, removal of shoreline armoring as mitigation for replacement of project shoreline armoring would be accomplished in a short time-frame, equal to the proposed project time-line. In contrast, establishment of a tidal wetland or of a forested connection to bluff areas would take years to mature. Performance standards would be tied to the specific function that was being impacted and replaced.

4.5 Fee-In-Lieu Program Account

A fee-in-lieu program account would be established to house funds collected through the program. The fees would be sufficient to establish mitigation projects and to provide for maintenance and monitoring in the future. The account would track funds accepted from permittees separately from those accepted from other entities and for other purposes (i.e., fees arising out of an enforcement action, "such as supplemental environmental projects," donations, and grants) (Corps and EPA, 2000). The King County Mitigation Reserve Program Prospectus states that King County will have such an account, and in addition to tracking the fees/credits by project, will also track projects by aquatic resource and jurisdictional authority (e.g. Corps).

The Tacoma Municipal Code does not specifically provide for a fee-in-lieu program for mitigation. Minor revisions to the CAPO would be required for use of the program when project impacts are unavoidable and mitigation cannot be provided on site.

4.6 Example Fee-In-Lieu Scenarios

For the purpose of illustration, two examples of projects that might need off-site mitigation for approval of a Shoreline Permit are described below. Note that these examples are purely theoretical and in-depth analysis would be necessary to determine both the amount of impact to habitat function and the amount and type of appropriate mitigation. Graphics representing these example scenarios are included as Figures 1 and 2.

Example 1: Commercial Marina expansion along the Narrows. This commercial landowner would like to expand the marina parking lot to a grass area. Riparian habitat impacts would be determined on an areal basis as described under above. The receiving site (mitigation area) would be within the Geographic Service Area, in this case the Western Slope South Shoreline District, which could be in Titlow Park. Riparian vegetation could be enhanced through plantings of native grass, shrub and tree species and habitat improvements above the tide line in an area that is currently mowed grass edged with logs. Funds assessed for the project impact would be deposited into the fee-in-lieu program account, described above, and would be assigned to a particular location, and to on-going maintenance for attainment of the established Performance Standards.

Example 2: Redevelopment on East Foss Waterway. This landowner would like to redevelop an existing developed site within the shoreline district. "Riparian" habitat impacts would be determined on an areal basis, as described above.

The receiving site (mitigation area) within the Geographic Service Area, in this case the Port Industrial Shoreline District (S-10), could be at the Go-Le-Hi-Ti restoration site. Habitat

restoration activities have been identified for this site and are on-going. Funds assessed for the project impact would be deposited into the Fee-in-Lieu Program Account, described above, and would be assigned to a particular portion of the riparian habitat restoration and the associated on-going maintenance of the restoration in order to meet the established Performance Standards.

Figure 1. Commercial Marina Parking Expansion along the Narrows

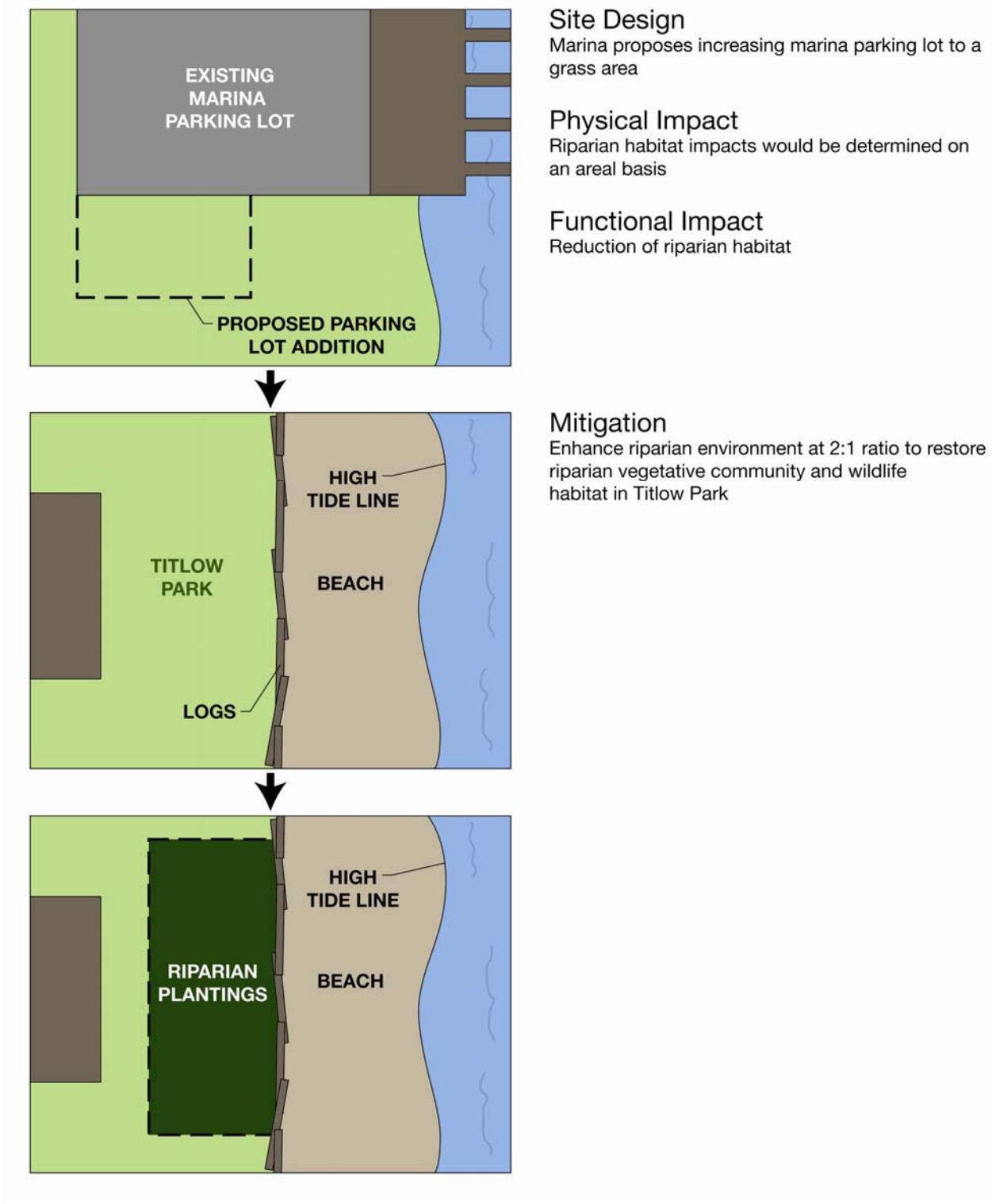
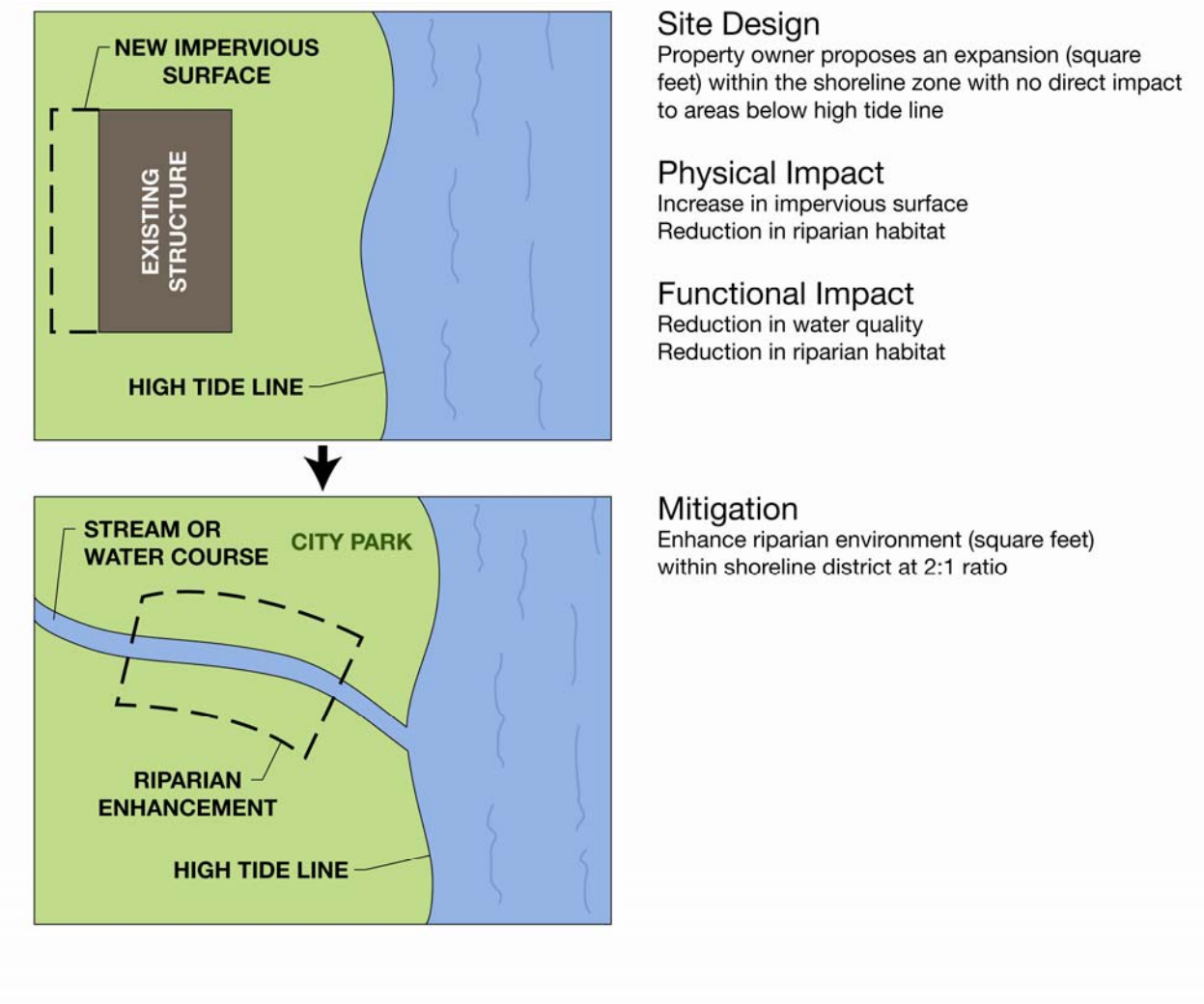


Figure 2. Redevelopment in Shoreline Riparian Area (No in-water work)



4.7 Restoration Cost Estimates

The costs for performing restoration activities vary widely depending on the necessity for clearing and grading, the amount of vegetation removal or replanting, and the incorporation of habitat features such as dunes, snags, large woody debris, etc.

The following is a rough cost estimate of some restoration elements and actions. Estimated costs for restoration are based upon the King County Bond Quantity Worksheet and the RS Means Guide (2009). These costs are provided for planning purposes only and specific costs would need to be developed based upon a specific site in the City of Tacoma.

Table 1. Estimated Costs for Restoration of Shoreline Habitat

Restoration Element	Cost per Square Foot	Cost per Acre	Notes
Grading	$8 – 10	$348,500 – 435,600	Fine grading, with grader
Clearing (Mechanical)	-	$9,000 – 10,000	
Clearing (Hand Clearing Only)	$2 – 4	$87,000 – 174,000	
Upland Planting (Purchase, Installation & Establishment)	$3 - 7	$130,000 – 305,000	Highly variable; 1-5 gallon-plants
Upland Inter-planting (native elements remain)	$2 – 4	$87,000 – 174,000	Depends upon spacing
Beach Nourishment	$1 – 2	$43,500 – 87,000	Variable depending upon site
Dune Creation	$2 – 3	$87,000 – 130,000	Assumes dune height about 6 feet
Large Woody Debris (purchase and install)	-	-	$550 – 750 per piece
Snag (purchase and Installation)	-	-	$400 – 500 per piece

4.8 Conservation Easements

Following establishment of the receiving sites on City-owned properties, these areas would be protected from future development activities through conservation easements. Conservation easements are a legal agreement between a landowner and a land trust or government agency that restricts development in erosion-prone or habitat areas like shorelines. Unlike land acquisition, easements do not limit other land uses. An easement can be written to prohibit the future development of the receiving site and prohibit the removal or cutting of native vegetation. Easements are typically held in perpetuity and therefore offer future protection of the receiving area for the City's fee in-lieu program.

The City then would become the formal steward for the conservation easement areas and provide long-term maintenance and monitoring of these shoreline habitat areas. This concept is similar to the establishment of protective covenants as required for wetlands, streams and their buffers during site development.

5.0 NEXT STEPS

Based upon this review, the next steps for the establishment of a Shoreline Habitat Fee-in-Lieu Program in Tacoma would be to develop detailed habitat enhancement plans and planting plans for two or three targeted receiving sites. Once detailed plans are developed, implementation and actual construction costs can be accurately calculated for each site. Fees held in-lieu could then be applied by the City to specific phases of the habitat enhancement work based upon actual designs and planning documents for each site.

REFERENCES

California Coastal Commission. 1997. Report on In-Lieu Fee Beach Sand Mitigation Program: San Diego County. January 2007.

City of Seattle Department of Planning and Development. Shoreline Alternative Mitigation Plan: Preliminary Plan. May 2006.

City of Tacoma. 2008. City of Tacoma Comprehensive Plan. Open Space and Habitat and Recreation Element.

Corps et al. (Department of the Army, Department of the Interior, National Oceanic and Atmospheric Administration, and U.S. Environmental Protection Agency). 2000. *Federal Guidelines on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act*.

Ecology (Washington State Department of Ecology)

Environmental Law Institute. 2009. *In-Lieu Fee Mitigation: Model Instrument Language and Resources*. December 2009.

ESA Adolfson. 2007. Memorandum to Parametrix: Tacoma Open Space Habitat Project – Inventory Findings. October 5, 2007.

ESA Adolfson. 2007. Shoreline inventory and Characterization Report. Prepared for the City of Tacoma. December, 2007.

ESA Adolfson. 2010a. Draft Shoreline Restoration Plan. Prepared for the City of Tacoma. September 2010.

ESA Adolfson. 2010b. Draft City of Tacoma Shoreline Master Program. September, 2010.

King County Department of Natural Resources and Parks. 2009. *Prospectus for King County Mitigation Reserves Program*. June 11, 2009.

National Research Council (NRC). 2003. *Riparian Areas – Functions and Strategies for Management.* National Academy Press. Washington, DC. 425 pp.

Puget Sound Partnership.

Virginia Aquatic Resources Trust Fund (VAR). 2003 *Virginia Aquatic Resources Trust Fund In-Lieu Fee Program Instrument*.

VMRC (Virginia Marine Resource Commission) 2005. *Guidelines for the Establishment, Use and Operation of Tidal Wetland Mitigation Banks in Virginia*. 1989 revised 2005.

Washington Administrative Code Chapter 173-7000. Wetland Mitigation Banks.

Personal Communications

Glowacki, Margaret (City of Seattle). Telephone Conversation with Catherine Conolly (ESA Adolfson) on April 7, 2010. Seattle, Washington.

Murphy, Michael (King County). Telephone Conversation with Catherine Conolly (ESA Adolfson) on March 10, 2010. Seattle, Washington.