Salmon Beach
Activities and Monitoring Report
2020/2021

Prepared by City of Tacoma

Passive Open Space Program

Permit #LU18-0004
#CAPO10-0001

Contents

1. 0 Introduction

Salmon Beach is a 3.8 acre passive open space area under City of Tacoma (City) Environmental Services Department ownership and management. It is located between Point Defiance Park and the Tacoma Narrows Bridge in Tacoma, WA (Exhibits 1 & 2). The City-owned property lies adjacent to private residences to the east; a parking lot used by Salmon Beach residents to the west; a paved access road (Salmon Beach Road) to the north; and vegetated sloped areas to the south (Figure 1).

The Salmon Beach Landscape Management Plan (LMP) was developed in collaboration between the City's Environmental Services Department, KPG, Grette Associates, GeoDesign and public input obtained through public meetings. Over 90% of slopes at Salmon Beach are >25%, therefore habitat restoration and slope stabilization activities are subject to a critical areas permit. The LMP was permitted in 2017, and its purpose is to provide management direction based on best available science, comply with current regulations and permitted code, replace the 1995 Parkside View Management Plan, and provide a transparent process for stewardship of the project area. A detailed planting and restoration plan (hereafter referred to as "Work Plan") was created in 2018 based on specifications from Appendix G of the LMP.

This report provides an overview of the activities performed at Salmon Beach during 2020/2021, including those from the Work Plan. Relevant performance standards outlined in the LMP will be addressed, and monitoring results from 2020/2021 will be summarized and used to make recommendations concerning future activities. The 2020/2021 activity and monitoring year began on October 1st, 2020 and ended September 30th, 2021.

1. 1 Salmon Beach Background Information

The upland portions of the Salmon Beach open space historically contained what is known as North Pacific Dry Douglas Fir Forest and Woodland (WDNR 2015). Late seral stands of this forest type contain an overstory canopy dominated by Douglas fir, with codominant madrone and grand fir. Vegetation conditions vary throughout the area in terms of species composition and stand health. Prior to restoration, the upper elevations consisted largely of invasive species, such as Himalayan blackberry, while the lower elevations contain mostly native species. The understory shrub layer is dense in most areas, and predominantly native in the lower elevations.

As Tacoma settled, established, and urbanized, the once natural state of Salmon Beach slope was altered by development. The top of the ridge was developed into single-family homes in the early 1980's. In subsequent years, trees on the mid-to-upper reaches of the slope were pruned to maintain views from the homes to the Tacoma Narrows. The neighborhood, called Parkside, commissioned the Parkside View Management Plan (PVMP) in 1995. The report's stated purpose was to provide for, "existing views through selective pruning and tree removal".

Although the PVMP cites the American National Standards Institute Tree Care Industry Association (ANSI

A300), “Tree, Shrub and Other Woody Plant Management” as the technical guide for pruning trees in the open space, observations show that many trees, including madrone, Douglas fir and bigleaf maple have been topped or coppiced in order to limit tree growth from extending into the views of the Parkside residents. A January 2017 memorandum produced by Tree Solutions, an arboriculture consultant firm that provided observations of the slope area, noted that most trees that had been topped over the course of the last twenty years had not spurred new, lower growth, but had instead led to tree health decline and mortality.

Most of the native trees within the Salmon Beach open space exhibit some degree of limbing or topping. Many exhibit a multi-stemmed growth habit or dense canopy structure typical of being topped or indiscriminately limbed. This damage, along with pathogens, weakened the trees and reduced their lifespan, altering the natural health, growth pattern and succession of the forest. As trees died prematurely, areas of the canopy opened up which allowed non-native and invasive vegetation to colonize, thus reducing the ability of the slope to naturally manage rainfall and stormwater runoff.

Himalayan blackberry was the most commonly occurring invasive species within the open space, and dominated the upper slopes prior to restoration. The thick and aggressive growth of Himalayan blackberry on the upper slopes prevented the establishment of native species, and in many locations, this species was infiltrating to adjacent areas with predominantly native understory. Scotch broom was found sparsely throughout the space in open canopy areas, as were aggregations of English holly, morning glory and English Ivy. These primarily occurred in the upper elevations of Salmon Beach next to private residential properties. While much of the upper section of the slope has been treated for these invasive species, they still exist in other areas of the site.

In the City’s Forested Land Assessment Tool (FLAT) assessment, the Salmon Beach open space ranked a “3”, meaning it has high levels of invasives but also high ecological value in its tree composition. It is important to maintain this high ecological value as the LMP is implemented. Although mature native trees are present in the area, forest health is considered poor to moderate with regards to its structure, species diversity, and ability to provide for stormwater benefit, forest sustainability and slope stability. Identified issues associated with forest health include: invasive species, tree disease, lack of native species diversity, lack of evergreen species, poor tree rejuvenation, and low or threatened soil binding root mass in select areas.

Salmon Beach is classified as an "Erosion Hazard Area" and a "Landslide Hazard Area" based on the classification criteria in the City of Tacoma Title 13 Land Use Regulatory Code (City Tacoma, 2017). The Salmon Beach open space is uphill from a steeper section of slope above the Salmon Beach community, where numerous residential houses are present along the toe of the slope, adjacent to the shoreline. While the slopes within the open space currently appear stable, they are still classified as susceptible to landslide events. These types of slopes are often subject to episodic shallow debris flows, which are difficult to predict. The general surrounding area has experienced recent surficial slides along with deep rotational slides associated with seismic activity (1949). Proper vegetation planting and management within the Salmon Beach open space can help create varied depths of soil binding root mass, which will

help decrease erosion and increase slope stability for the entire slope by controlling soil moisture content and runoff. The establishment of a mature forest dominated by native conifers will benefit slope stability as deep-rooted conifers can generally resist slope creep and provide a deep rooting network to bind soils.

1. 2 Management Unit Descriptions

There are seven Management Units (MUs) at Salmon Beach that span the site consecutively (1-7) from North to South (Figure 1). Over 90% of the open space has slopes greater than 25%, and the majority of that area includes slopes greater than 40% (Figures 1 & 2).

All MUs have areas of invasive species, however they are most dense in the eastern half and upper elevations (>180 ft, Figure 3) of MUs 1-5, and completely dominated MU1 prior to restoration. These areas coincide with those that had the most tree topping and removals. Management Units 3 and 4 have areas of healthy native vegetation cover near the lower elevations of the slope consisting of bigleaf maple *(Acer macrophyllum),* madrone *(Arbutus menziesii)* and Douglas fir *(Pseudotsuga menziesii).* Management Units 6 and 7 also have a healthier tree cover and fewer invasive species. Areas with more native vegetation cover still have significant numbers of dead and dying trees.

2. 0 Management Unit Activities

2.1 Management Considerations

The following management considerations were taken into account when developing the LMP. These are based on existing conditions and the overall goal of a healthy target ecosystem. Multiple management goals may be applicable to the same location within the Salmon Beach open space.

1. **Achieve a Sustainable Target Ecosystem:** This element should be applied throughout the entire open space area in order to ensure long-term success and improvement of habitat and ecosystem functions.

2. **Geologic Hazard Mitigation:** This element is the main priority within areas classified as steep slopes (over 25% slope per TMC 13.11), which includes approximately 90% of the open space, and will be considered the top priority in areas where slopes occur above or below roadway, and utility and residential infrastructure.

3. **Maximize Stormwater Benefits:** Stormwater benefits include managing both the amount of precipitation that reaches the soil surface and runs off, and the quality of stormwater runoff that reaches Puget Sound, by establishing quality vegetative cover.

4. **Improve Wildlife Habitat:** The open space is part of a long wildlife habitat corridor stretching from Point Defiance to the Tacoma Narrows Bridge, and is home to a variety of birds, small mammals and even larger mammals including deer. A secondary benefit of improving the diversity of native vegetation and limiting invasive vegetation (as a part of other management goals) within this area is the improvement of habitat quality for existing and new species potentially migrating to the area.

5. **Protect Public Infrastructure and Public Safety:** Public safety includes controlling access onto steep hazardous slopes and reducing the likelihood of slope failure below existing roadways, utilities and private residences.

6. **Vegetation Modification Requests for Private View Management:** Allowing view enhancement will be a secondary management consideration after the other management elements (public safety, stormwater, slope stability, etc.) have been fully addressed to the extent of this LMP.

Typically, community stewardship would be a component of the LMP. However, due to limited access and steep slopes, volunteer opportunities will not be available.

2. 2 Restoration Overview

Restoration began on Salmon Beach in the spring of 2018, with herbicide treatment to Himalayan blackberry (*Rubus armeniacus*) in MU1. This area was planted with native species in December 2018 by Washington Conservation Corps (WCC) crews supervised by Passive Open Space staff. Management Units 2 and 3 were treated for invasive species during 2019 and 2020 and erosion control blanket and wattles were installed prior to planting in 2020. All areas have been swept for invasive species since the beginning or restoration.

3. 0 Methods

3. 1 Invasive Vegetation Removal

Monocultures of Himalayan blackberry (*R. armeniacus*) and other noxious weeds found in MU1 were sprayed with an herbicide mix of glyphosphate and triclopyr during the spring of 2018. Once the weeds died, they were brush-cut to the ground, and left in place to serve as mulch. Any regrowth was treated

again during the summer of 2018. Spot treatment of invasive weeds post-planting took place in May of 2019.

Monocultures of Himalayan blackberry (*R. armeniacus*) in MU2 and MU3 were treated with triclopyr herbicide in March and July of 2019. Invasive weeds, including Himalayan blackberry (*R. armeniacus*), old man's beard (*Clematis vitalba*), foxglove (*Digitalis purpurea*) and sow thistle (*Sonchus arvensis*) were removed using hand tools during the spring/summer of 2020.

3. 2 Best Management Practices (BMP's)

As mentioned in Section 3.1, dead blackberry canes were turned into mulch on site and used to prevent soil erosion in MU1. No other BMP's were used as no additional areas of erosion were observed. Coir erosion control fabric and straw wattles were used in MUs 2 and 3 after the removal of invasive species and prior to planting.

3. 3 Vegetation Installation

Plants were installed in MU1 per the Work Plan based on recommended plantings from the LMP (Appendix G, Section 2.1.1 Table 1 & Table 2A of this report). Contrary to the Work Plan, madrone (*Arbutus menziesii*) were not planted due to their high transplant mortality, and the known presence of pathogens on site. Trailing snowberry (*Symphoricarpos mollis*) and Kinnikinnick (*Arctostaphylos uva-ursi*) groundcovers were not installed. Trailing snowberry was not available from local nurseries, and Kinnikinnick was not anticipated to survive once the tree canopy began to develop. Native plants were installed by WCC crews during December of 2018 (Table 3). No additional infill planting has taken place.

Vegetation installed in MUs 2 and 3 were adapted from MU1 and included three additional evergreen tree species (Table 2B). Madrone *(A. menziesii*) were utilized after seeing success at other open space sites. Five new shrub species were added, one of which was evergreen, along with two species of evergreen groundcover. Plants were installed by WCC crews during December of 2020 (Table 3).

3.4 Work Performed Outside the LMP

Invasive species, including Himalayan blackberry (*R. armeniacus*) and St. John's wort (*Hypericum perforatum*) were treated with triclopyr herbicide in the flatter areas of MU5. Blackberry was also grubbed in this areas, and other species were removed by hand, including foxglove (*Digitalis purpurea*) and English ivy (*Hedera helix*).

Native plants were installed and included a mixture of native shrubs and groundcovers along with the evergreen Western white pine (*Pinus monticola*) tree (Table 2C).

3. 5 Monitoring Requirements from the Landscape Management Plan

According to the Salmon Beach LMP Appendix G, Section 4.2, "A monitoring plan will be implemented by the project proponent or project proponent's representative to document the progress and challenges of the plants and project area according to the objectives and performance standards for the management element(s) as defined in Section 4.1 of the Landscape Management Plan. Monitoring must be conducted by a Certified Horticulturalist, Restoration Ecologist, Professional Wetland Scientist, Certified Arborist, Landscape Architect or other qualified professional as approved by the City. Monitoring will also assist in identifying adaptive

management needs. Each planting area will be monitored for a minimum period of 5 growing seasons from the date of installation. The project will be specifically monitored for the survival of the planted material within the planting area, the aerial coverage of noxious or invasive weed species, soil erosion, vandalism, disease, survivability, human activity, and slope failure".

Monitoring of the restoration area shall include the following:

- Establishment of one 50-foot monitoring transect per quarter acre of planting area to monitor survival of plantings, percent cover of plantings, composition of the plant community, and noxious/invasive weed species coverage. Noxious weed cover shall also be qualitatively described, with recommendations for control activities.
- Percent survival shall be monitored using randomly selected but permanent sample plots located along the established permanent transect (2 sample plots per 50 foot transect). Sample plots shall consist of a 9-foot radius circle from a stationary point along transect.
- Photographs are to be collected from each transect end and each sample plot point to compare vegetation density and compositions from year to year.
- Observations of the project area for excessive erosion, slope instability, vandalism, disease, plant stress, human activity and debris, as well as general observations of the entire planting area and/or areas directly adjacent.

3. 5. 1 Monitoring Personnel

The development of monitoring methodologies and data collection were performed by City of Tacoma Passive Open Space staff, with assistance from WCC crew members.

3. 5. 2 Baseline Monitoring

Baseline monitoring, also referred to as Year 0 (Y0) monitoring, took place post-planting to establish baseline conditions for comparison with future monitoring years, Year 1 (Y1) through Year 5 (Y5). At Y0, plants were recorded to determine initial cover of planted and invasive species, along with the number of plants installed for survival estimates. Physical observations related to erosion and human activity were also recorded (Table 3).

3. 6 Monitoring Locations

3. 6. 1 Transect and Quadrat Establishment

In MU1, the total number of transects was selected based upon the acreage of the MU to equal one 50 ft transect per quarter acre. The maximum length of the MU was divided by 50 ft (transect length) to identify the total number of potential transect lengths. The length of the MU can be thought of as an "X" axis and the width of the slope (top of slope to bottom of slope) being thought of as a "Y" axis, with the entire grid sitting at an angle mimicking slope. Transects were numbered sequentially, and a random number generator was used to select the transect location along the length or "X" axis.

Each transect length along the x-axis needed to be randomly placed between the top and bottom of the MU along the y-axis. This was done by using the same methodology described above. The total width of the MU was determined and divided by 18 ft (diameter of the quadrat). The first possible location of the transect centerline along the y-axis was located 9 ft from the top of the slope, with each subsequent potential transect centerline location being placed 18 ft downslope. A random number generator was used to determine where the transect would be place along the y-axis.

Two 9 ft radius quadrat locations were established along the transect by selecting a quadrat center point at 10 ft and 40 ft for MU1.

3. 6. 2 Locating Transects and Quadrats in the Field

A four ft piece of metal rebar was pounded into the ground to mark the beginning and end of each transect. The top ~one ft of the rebar was spray-painted white or red in order to find the same locations in subsequent years. A tape measure was used to identify the center point for each quadrat along the transect where temporary rebar was installed during monitoring.

3. 6. 3 Total Number of Transects and Quadrats

The number of transects needed within MU1 was only one 50 ft transect as the area was less than a quarter acre at 0.16 acres or 7,090 sq ft (Figure 1). Management Units 2 and 3 were restored together, with the total restoration area being 0.18 acres or 7,817 sq ft, requiring only 1 transect. However, it has been observed by field staff that monitoring quadrats result in more damage than monitoring transects as they usually encompass multiple contours and require staff to move up and down the slope multiple times to see the entire quadrat. It was decided that quadrats would no longer be used for new monitoring at Salmon Beach, and the numbers of transects would be doubled. Thus, two transects were used to monitor MUs 2 and 3 collectively.

3. 7 Data Collection

Data collected in the quadrats and transects (Tables 4 & 5) was used to monitor plant survival, composition of the plant community, invasive species cover and visual changes in the plant community over time. Also, data was collected that would identify excessive erosion, slope instability, vandalism, and other human activities.

3. 7. 1 Estimation of Plant Cover in Transects

In order to collect data within a transect, a mark was made at 3 ft on a piece of rebar. The end of the rebar was held from the centerline of the transect outward. The centerline was identified by a tape measure that was laid on the ground between transect end points. Monitoring personnel walked the line, noting the beginning and end point (in feet and inches) along the tape measure for each native plant that touched the 3 ft rebar on either side of the centerline. Percent native plant cover was estimated by dividing the total length of the plant along the transect by the total length of the transect. Since more than one plant can occupy space both horizontally and vertically along a transect, it is possible for cover to be over 100%. The percent exposed soil, tree canopy cover and percent invasive species cover were estimated visually using a Daubenmire scale (Table 5).

3. 7. 2 Data Collection within Quadrats

To collect data within a quadrat, a rope was marked at 9 ft from the top of a loop. The loop was placed around the temporary rebar in the center of the quadrat, and a 9 ft radius circle (quadrat) was marked temporarily using stake flags. Data observations were made regarding native plant numbers, percent aerial cover, and other physical factors associated with the quadrat (Table 4).

Degree slope was measured on an iPhone using the Clinometer Application with a slope finder created by Peter Breitling (2016), then converted to percent slope. The phone was laid directly on the ground near the center of the quadrat and slope was read. These measurements were compared with slope measurements in ArcGIS for accuracy.

Installed vegetation was monitored in the quadrats shortly after planting to identify baseline or Year 0 (Y0) data for comparison with future monitoring years one through five (Y1-Y5).

4. 0 Results/Discussion

4. 1 General Observations

The MU1 monitoring area (Figure 1) was located in full sun having no tree canopy, and the soils were dry and sandy, with light compaction that was attributed to monitoring (Table 6A). Given the vast amount of blackberry mulch present prior to planting and the continued growth of installed plants, the percent of exposed soil was less in 2020/2021 compared with the previous year, going from 5%-25% exposed soil to 0%-5% exposed soil in MU1 quadrats.

Exposed soil was minimal in MUs 2 and 3 post-planting due to the installation of erosion control blanket over most of the restoration area. There was significant tearing of the erosion control blanket in MU3 as it had been stored for longer and had significant deer activity. Similar to MU1, soil compaction was light in this area from restoration activities.

4. 2 Plant Survival

4.2.1 Management Unit 1

Tall Oregon grape (*Mahonia aquifolium*) was the most successful plant installed in MU1, with nine of 11 plants surviving from Y0, or 69% survival (Table 7A). Nootka rose (*Rosa nutkana*) and Pacific wax myrtle (*Morella californica*) both had around 50% survival from Y0 to Y3. Grand fir *(Abies grandis)* and shore pine (*Pinus contorta*) had some survival from Y0 to Y3 and a Douglas fir (*Pseudotsuga menziesii*) volunteer tree showed up in the quadrat. No infill planting occurred during or prior to 2020/2021. All species had some damage from animal browse. Overall survival of planted shrubs and groundcovers was 47%, and 46% overall when trees were added to survival estimates.

4.2.2 Management Units 2 and 3

There were many plant species that had survival of 60% or more form Y0 to Y1 in MU2 (Table 7B). Those plants included salal (*Gaultheria shallon*), tall Oregon grape (*M. aquifolium*), snowberry (*Symphoricarpos albus*) and shore pine (*P. contorta*). Overall survival was 73%.

The MU3 transect got more sun than the MU2 transect and overall survival was slightly lower at 60% (Table 7C). Oceanspray (*Holodiscus discolor*), Pacific wax myrtle (*M. californica*), Nootka rose (*R. nutkana*), mock orange (*Philadelphus lewisii*) and shore pine (*P. contorta*) had 100% survival. Salal (*G. shallon*) had good survival at 75% and red flowering currant (*Ribes sanguineum*) had 60% survival.

4. 3 Plant Cover

4.3.1 Management Unit 1

Plant cover was estimated from the transect. Total Native Vegetation cover increased by 24% in MU1, due mostly to evergreen vegetation (Table 8A). Tall Oregon grape (*M. aquifolium*) nearly doubled in cover from 33% in Y2 to 62% in Y3, and grand fir (*A. grandis*) increased in cover from 15% to 20%. There was an 11% loss in Total Deciduous cover of 11%, mostly due to bald hip rose (*Rosa gymnocarpa*) mortality and loss of hairy honeysuckle (*Lonicera hispidula*), which was already established on site. Invasive species cover was minimal at <5% and there was <5% exposed soil in the transect.

4.3.2 Management Units 2 and 3

There was an 8% loss of Total Native Vegetation cover in MU2 (Table 8B). The only significant gain in cover seen with the deciduous vegetation occurred with beaked hazelnut (*Corylus cornuta*) that grew into the transect. There was a 12% increase in salal (*G. shallon*) cover from Y0 to Y1. In general, other species did not show dramatic increases or decreases in cover. There was a reduction in invasive species cover from 5%-25% to 0%-5%.

Similar to MU2, the MU3 transect has an overall decrease in Total Native Vegetation from 70% in Y0 to 53% in Y1 (Table 8C). All of the swordfern (*P. munitum*) died resulting in a 10% loss of cover. There were no other significant changes in vegetation cover, however there were minor decreases in cover for most species.

4. 4 Performance Measures/Goals

See Table 1.

The only performance standards that can be expected to be met at this time include the percentage of planted evergreen to deciduous trees, the number of planted shrub and groundcover species and their evergreen to deciduous ratios, along with Y3 survival for MU1.

According to the LMP, at least 2/3rds of the installed trees shall be evergreen. This requirement was met in MU1 and exceeded this standard in MUs 2 and 3 where all installed trees were evergreen (Table 9).

All MU's exceeded the minimum number of species of shrubs (3) and the minimum number of evergreen shrub species (1) required by the LMP (Table 9). There were five shrub species planted in MU1, two of which were evergreen, and there were nine shrub species planted in MUs 2 and 3, three of which were evergreen. Management Unit 1 did not have any surviving groundcovers in the transect, thus not meeting the two species minimum. However, there were two more shrub species installed than required in MU1. Management Units 2 and 3 both had two groundcover species installed that were both evergreen.

Survival in MU1 was meant to meet 80% at Y3, however it fell short of this standard at 47% survival (Table 9). Infill planting along with adaptive management strategies will need to be employed to ensure requirements are met in the future. Survival estimates are not required for MUs 2 and 3 at this time as they are in Y1 of monitoring and have not yet reached the Y3 benchmark.

4. 5 Adaptive Management/Recommendations

Plant survival data indicates that plants are underperforming in all MUs. However, plant cover increased 1.6 x in MU1 from Y0 to Y3, so while some plant mortality has occurred, those plants that are surviving appear to be growing well. Based on the 2020/2021 monitoring data, the following adaptive management strategies are recommended:

- Continue to monitor plants for browsing and cage trees as needed.
- Invasive species will continue to be monitored and prioritized for removal by WCC crews.
- Continue to add new plant species and climate adapted plants to diversify palette, such as the evergreen plants seaside juniper (*Juniperus maritima*) and buckbrush (*Ceanothus cuneatus*).

5. 0 Planned Activities 2020/2021

All management units will be monitored for invasive and noxious weeds and treated on a case-by-case basis.

6.0 References

1. City of Tacoma. 2017. Tacoma Municipal Code, Title 13 Land Use Regulatory Code, Revised May 2017, 582pp.
2. Salmon Beach Landscape Management Plan. 2017. City of Tacoma Environmental Services Department, KPG, Grette Associates, and GeoDesign.
3. WDNR (Washington State Department of Natural Resources). 2015. *Ecological Systems of Washington State-A Guide to Identification.* Washington State Department of Natural Resources, Natural Heritage Program.

Table 1. Salmon Beach Restoration Goals, Objectives and Standards

Goal	Objective	Standard	Progress
4.2.1 Create a self-sustaining, multi-layered canopy of native vegetation	Create a healthy evergreen-dominated, multi-layer canopy structure of native trees shrubs, and groundcover which provides rainwater interception, erosion control, and other stormwater benefits and improves slope stability.	• Two-thirds of the tree cover will consist of large evergreen trees; one-third will consist of small deciduous trees. • Large trees will be planted at 15'-0" on-center triangular spacing (for containerized stock; see Appendix G); small trees will be planted at 10'-0" on-center triangular spacing. • Mature tree canopy shall achieve and/or retain 50 percent aerial cover for Year 5 and beyond. Aerial coverage requirement of the mixed tree canopy may be modified based on existing aerial coverage in areas of healthy, native canopy. • A 100 percent soil-binding effective tree root zone shall be established and maintained for healthy mature trees; the effective root zone shall be calculated as 1-ft radius of lateral root extent for every inch of diameter at breast height (DBH) of the tree's trunk. DBH is measured at 4.5 feet above ground level.	• Two-thirds of all trees installed in MU1 during 2018 were evergreen and one-third were small, deciduous trees. All trees installed in MUs 2 & 3 during 2020 were evergreen. • Installed trees were spaced per the planting plan in the LMP Appendix G. • It will take several years for a tree canopy to develop. MU1 is currently in Y3 of restoration, and MUs 2 & 3 are in Y1. • It will take many years to establish a 100% soil binding root zone. MU1 is currently in Y3 of restoration, and MUs 2 & 3 are in Y1.
		• Shrub layer shall consist of at least three native species, and a minimum of one species shall be a native evergreen. • Groundcover layer will consist of at least two native species, and a minimum of one species shall be a native evergreen. • Mature shrub and groundcover layer shall achieve and retain 80 percent aerial cover for Year 5 and beyond. Aerial coverage requirement of the understory vegetation layer may be modified based on existing aerial coverage in areas of healthy, native understory. • Planted shrub and groundcover as a class will meet 80	• The shrub layer in MU1 was planted in 2018 with 5 native species, 2 of which were evergreen. 9 shrub species were planted in MUs 2 & 3, with 3 being evergreen. • No groundcover layer was planted in MU1, however 2 additional shrub species were planted. There were 2 groundcover species planted in MUs 2 & 3, and both were evergreen.

Goal	Objective	Standard	Progress
		percent survival by the end of the Establishment Period (Year 3) and 60 percent survival by end of the Monitoring Period (Year 5).	• Plant cover for MU1 was 25-50% for MU1 at Y3 and 5-25% for MUs 2 & 3 at Y1. • Survival for MU1 was 47% for Y3, and 72% for MU2 and 59% for MU3, both in Y1.
	Reduce percentage of invasive species to 15 percent of the aerial coverage of vegetation or less for all areas during and following active restoration.	• Cut and/or treat all invasive vegetation within each Work Area (as phased) and monitor and maintain to prevent significant populations of invasive species for a minimum period of five years. • Plant area where invasive vegetation was treated with new native vegetation as outlined in Objective 1.	• Invasive species in MU1 were treated with herbicide and cleared in 2018, and in MUs 2 & 3 during 2020. • Native vegetation was planted in all areas invasive vegetation was removed in MU1 during 2018 and MUs 2 & 3 during 2020. • Herbicide application and hand work were done to remove patches of invasive species in MUs 1, 2, 3 & 5. • Aerial cover of invasive species in 2020/2021 for all monitoring sites was <5%.
4.2.2 Provide erosion control and soil stabilization measures while vegetation establishes.	Implement soil stabilization and erosion control measures where applicable to allow the establishment of the target ecosystem, which will improve slope stability, decrease erosion and the associated risks with regards to public safety and infrastructure.	• Erosion control measures will be installed in accordance with the most current version of the City erosion control BMPs as provided in the City's Stormwater Management Manual (City Tacoma, 2016) where applicable within Work Areas (section 5.4). • Slopes 67 percent or greater over a distance of 15 ft in vertical height or greater shall be evaluated by a geotechnical consultant or an engineering geologist experienced in slope stability to evaluate for the impact of the planned work. This is recommended as slope	• Blackberry cane mulch was used across all areas of MU1 with slopes less than 50%. • Erosion control blanket and wattles were installed across MUs 2 & 3. • No work was done on slopes >67%.

Goal	Objective	Standard	Progress
		inclinations above 67% are typically in excess of the natural angle of repose of the loose unconsolidated material that is exposed during restoration activities.	
4.2.3 Enhance public safety using vegetation management	Vegetation along the top of the slope will be maintained in areas that act as a natural barrier to slope access.	• Plant a dense understory of mixed evergreen and deciduous shrubs and groundcovers to discourage access.	• Planting density for MU1 and MUs 2 & 3 followed instructions in the LMP. An informal path is used for work crews to access all MUs, therefore this area will remain open until such time it is no longer necessary for maintenance. There doesn't seem to be unwanted activity in the restoration areas.
	Maintain public safety through proactive tree management.	• Conduct Level 1 tree assessments annually along all "public" areas accessible by work crews or Salmon Beach residents or any future public accessible areas. • Prune or remove risk-prone trees and branches where they can impact public areas and infrastructure.	• A level 1 tree assessment was performed in 2020/2021 and no tree pruning or removals were required.
4.2.4 Provide a process for a private vegetation modification request on City property to enhance a private view	Provide a transparent process where private landowners may apply to conduct landscape management activities on City property within the Project Area that are in conformance with the intent, techniques and goals in this LMP.	• All management actions approved for private view management shall be conducted in accordance and compliance with the permitted LMP and all applicable regulations. • Tree pruning for the purpose of view enhancement shall not be conducted until the Work Area has met all other applicable goals, objectives, and standards for invasive removal and established native vegetation as outlined in Section 4.2.1. • Tree snagging or removal shall not be allowed	• None of these standards are applicable at this time.

Goal	Objective	Standard	Progress
		unless the tree meets the criteria for removal outlined in Section 5.6.2 and shall not be conducted until the management area has met all other applicable goals, objectives, and standards . No tree topping will be allowed under any circumstances. • Trees shall be pruned by or under the direct supervision of an ISA (International Society of Arboriculture) Certified Arborist, to current industry standards according to the most current versions of the American National Standard Institute (ANSI) Z133.1for safety of pruning operations, the ANSI A300 Standard Practices, and the Tree Pruning Guidelines of the International Society of Arboriculture (ISA). All cuttings from the pruned tree must be left onsite as outlined in Section 5.6.2. • No more than 25 percent of any one tree's crown may be removed in any pruning event and for a minimum of one year following. The tree's health, age and structure must be taken into account to determine the appropriate amount of pruning. No tree topping will be allowed under any circumstance. • If mitigation planting is required in order to satisfy the goals, objectives and standards of this management plan, pruning activities may not be allowed until the end of the 3-year plant establishment period and until the plant establishment minimums for the associated Work Area have been met (section 4.2.1).	

Table 2A. Planting Palette for Management Unit 1

Upper Slope - above elevation 180 ft Dry Soils, Sun				
Scientific Name	Common Name	Form	Mature Height (ft)	Percent of Plantings
Trees				
Abies grandis	Grand fir	Evergreen tree	100	20
Acer circinatum	Vine maple	Deciduous tree	20	10
Rhamnus purshiana	Cascara	Deciduous tree	30	25
Pinus contorta	Shore pine	Evergreen tree	40	45
Shrubs & Groundcovers				
Corylus comuta	Beaked hazelnut	Deciduous shrub	20	15
Holodiscus discolor	Oceanspray	Deciduous shrub	15	15
Morella califomica	Pacific wax-myrtle	Evergreen shrub	5	20
Mahonia aquifolium	Tall Oregon grape	Evergreen shrub	8	30
Rosa nutkana	Nootka rose	Deciduous shrub	10	20

Table 2B. Planting Palette for Management Units 2 and 3

Upper Slope - above elevation 180 ft Dry Soils, Sun				
Scientific Name	Common Name	Form	Mature Height (ft)	Percent of Plantings
Trees				
Abies grandis	Grand fir	Evergreen tree	100	19
Artubus menziesii	Pacific madrone	Evergreen tree	90	19
Pinus contorta	Shore pine	Evergreen tree	50	33
Pinus monticola	Western white pine	Evergreen tree	130	19
Pseudotsuga menziesii	Douglas fir	Evergreen tree	250	10
Shrubs & Groundcovers				
Gaultheria shallon	Salal	Evergreen groundcover	5	17
Holodiscus discolor	Oceanspray	Deciduous shrub	15	6
Morella califomica	Pacific wax-myrtle	Evergreen shrub	5	6
Mahonia aquifolium	Tall Oregon grape	Evergreen shrub	8	17
Oemlaria cerasiformis	Osoberry	Deciduous shrub	15	6
Philadelphus lewisii	Mock orange	Deciduous shrub	9	3
Polystichum munitum	Swordfern	Evergreen groundcover	3	10
Ribes sanguineum	Red flowering currant	Deciduous shrub	6	6
Rosa nutkana	Nootka rose	Deciduous shrub	10	6
Symphoricarpos albus	Snowberry	Deciduous shrub	5	6
Vaccinium ovatum	Evergreen huckleberry	Evergreen shrub	6	17

Table 2C. Planting Palette for Management Unit 5

Scientific Name	Common Name	Form	Mature Height (ft)	Percent of Plantings
Trees				
Pinus monticola	Western white pine	Evergreen tree	130	100
Shrubs & Groundcovers				
Corylus cornuta	Beaked hazelnut	Deciduous shrub	20	7
Gaultheria shallon	Salal	Evergreen groundcover	5	33
Holodiscus discolor	Oceanspray	Deciduous shrub	15	13
Polystichum munitum	Swordfern	Evergreen groundcover	3	20
Vaccinium ovatum	Evergreen huckleberry	Evergreen shrub	6	27

Table 3. Planting and Monitoring Schedule

MU	Planting Month and Year (Y0)	Baseline Monitoring (Y0) Month and Year if different than Planting Month	Monitoring Year 1 (Y1) Month and Year	Monitoring Year 2 (Y2) Month and Year	Monitoring Year 3 (Y3) Month and Year
1	12/2018	03/2019	09/2019	08/2020	08/2021
3	12/2020	02/2021	08/2021	Anticipated 08/2022	Anticipated 08/2023

Table 4. Data Collection in Quadrats

Variable	Measurement
Native plant name	Identified to species whenever possible
Number of each native plant	Individually counted
Estimated coverage for each native plant species (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Dominant invasive species (up to 5) and unusual invasive species	Identified to species whenever possible
Estimated coverage for all invasive species (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Slope	Percent
Aspect	Downhill cardinal direction
Dominant soil texture	Clay, silt, sand, gravel
Soil moisture (typical of summer months)	Dry, damp, saturated, standing water
Soil compaction	None, moderate, light, heavy
Estimated exposed soil (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Litter depth	<0.5 inches, 0.5-1.0 inches, >1.0 inches
Course woody debris > 5” in diameter	0%-5%, 5%-10%, >10%
Overstory canopy coverage (includes trees that are >2” diameter at breast height (DBH)) (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Evidence of erosion	Stable, erosion, slump, slide
Erosion control material (still intact) (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Type of erosion control material	None, coir, jute, straw coir, straw lined, straw wattles, etc.
General observations	Dumping, timber trespass, tree of concern, etc.
Phototags	Photos taken to incorporate entire quadrat

Table 5. Data Collection in Transects

Variable	Measurement
Native plant name	Identified to species whenever possible
Number of each native plant	Individually counted
Native plant species location and total length along transect (used to calculate coverage)	Feet and Inches
Dominant invasive species present (up to 5) and unusual invasive species	Identified to species whenever possible
Estimated foliar coverage of all invasive species (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Overstory canopy coverage (includes trees that are >2" diameter at breast height (DBH)) (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Tree basal stem cover (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Shrub plus groundcover foliar cover (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Grass cover (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Estimated exposed soil (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Erosion control material (still intact) (Daubenmire Scale)	0%-5%, 5%-25%, 25%-50%, 50%-75%, 75%-95%, 95%-100%
Type of erosion control material	None, coir, jute, straw coir, straw lined, straw wattles, etc.
General observations	Encampment, trail, debris, etc.
Phototags	Photos taken from beginning and end point of each transect

Table 6A. Landscape Observations for Management Unit 1

Transect/Quadrat	T1Q1				T1Q2			
Monitoring Year	Y0 (2018/2019)	Y1 (2018/2019)	Y2 (2019/2020)	Y3 (2020/2021)	Y0 (2018/2019)	Y1 (2018/2019)	Y2 (2019/2020)	Y3 (2020/2021)
Restoration Status	Cleared and Planted				Cleared and Planted			
Slope (%)	22				18			
Soil Texture	Sand				Sand			
Slope Stability	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Soil Compaction	None	None	None	Light	None	None	None	Light
Exposed Soil (%)	5-25	5-25	5-25	0-5	5-25	25-50	5-25	0-5
Erosion Control Best Management Practice(s)	Blackberry cane mulch				Blackberry cane mulch			

Table 6B. Landscape Observations for Management Units 2 and 3

Management Unit/Transect	MU2-T1		MU3-T1	
Monitoring Year	Y0 (2020/2021)	Y1 (2020/2021)	Y0 (2020/2021)	Y1 (2020/2021)
Restoration Status	Cleared and Planted		Cleared and Planted	
Slope (%)	65		65	
Soil Texture	Sandy Silt		Sandy Silt	
Slope Stability	Stable	Stable	Stable	Stable
Soil Compaction	Light	Light	Light	Light
Exposed Soil (%)	0-5	0-5	0-5	0-5
Erosion Control Best Management Practice(s)	Coir blanket and wattles		Coir blanket and wattles	
Erosion Control Materials Intact (%)	75-95	75-95	95-100	25-50

Table 7A. Plant Survival Rates Management Unit 1 Transect 1 Quadrats

Evergreen/ Deciduous	Growth Habit	Species Name	Common Name	Y0 # (2018/2019)	Y1 # (2018/2019)	Y2# (2019/2020)	Y3# (2020/2021)	Y0 to Y3* Survival (%)
Trees								
Evergreen	Tree	*Abies grandis*	Grand fir	2	2	1	1	
Deciduous	Tree	*Acer circinatum*	Vine maple	1	1	0		
Deciduous	Tree	*Rhamnus purshiana*	Cascara	2	1	0	0	
Evergreen	Tree	*Pinus contorta*	Shore pine	4	4	2	3	
Evergreen	Tree	*Pseudotsuga menziesii*	Douglas-fir	2	0	0	1	
Shrubs and Groundcovers								
Deciduous	Shrub	*Corylus cornuta*	Beaked hazelnut	1	1	0	0	
Deciduous	Shrub	*Holodiscus discolor*	Oceanspray	7	7	7	2	
Deciduous	Groundcover	*Lonicera hispidula*	Hairy honeysuckle	1	0	0	0	
Evergreen	Shrub	*Mahonia aquifolium*	Tall Oregon grape	13	11	11	9	
Evergreen	Shrub	*Morella californica*	Pacific wax myrtle	8	4	4	4	
Deciduous	Shrub	*Rosa gymnocarpa*^	Bald hip rose	1	1	3	0	
Deciduous	Shrub	*Rosa nutkana*	Nootka rose	14	9	13	6	
Total Native Shrubs and Groundcovers				45	33	38	21	47%
Total All Plants				56	41	41	26	46%

^ *Rosa gymnocarpa* was not part of the original plant palette however one was accidentally planted in Y0 instead of *Rosa nutkana*.

* Number of plants alive in Y3/number of plants alive in Y0.

Table 7B. Plant Survival Rates Management Unit 2 Transect 1

Evergreen/ Deciduous	Growth Habit	Species Name	Common Name	Y0 # (2020/2021)	Y1# (2020/2021)	Y0 to Y1* Survival (%)
Trees						
Evergreen	Tree	*Pinus contorta*	Shore pine	1	1	
Shrubs and Groundcovers						
Deciduous	Shrub	*Corylus cornuta*	Beaked hazelnut	0	1	
Deciduous	Groundcover	*Gaultheria shallon*	Salal	7	5	
Evergreen	Shrub	*Mahonia aquifolium*	Tall Oregon grape	10	6	
Deciduous	Shrub	*Philadelphus lewisii*	Mock orange	1	0	
Evergreen	Groundcover	*Polystichum munitum*	Swordfern	2	1	
Deciduous	Shrub	*Ribes sanguineum*	Red flowering currant	0	1	
Deciduous	Shrub	*Symphoricarpos albus*	Snowberry	2	2	
Evergreen	Shrub	*Vaccinium ovata*	Evergreen huckleberry	5	2	
Total Native Shrubs and Groundcovers				25	18	72%
Total All Plants				26	19	73%

* Number of plants alive in Y1/number of plants alive in Y0.

Table 7C. Plant Survival Rates Management Unit 3 Transect 1

Evergreen/ Deciduous	Growth Habit	Species Name	Common Name	Y0 # (2020/2021)	Y1# (2020/2021)	Y0 to Y1* Survival (%)
Trees						
Evergreen	Tree	*Pinus contorta*	Shore pine	1	1	
Shrubs and Groundcovers						
Deciduous	Groundcover	*Gaultheria shallon*	Salal	8	6	
Deciduous	Shrub	*Holodiscus discolor*	Oceanspray	5	5	
Evergreen	Shrub	*Mahonia aquifolium*	Tall Oregon grape	2	0	
Evergreen	Shrub	*Morella californica*	Pacific wax myrtle	5	5	
Deciduous	Shrub	*Oemlaria cerasiformis*	Osoberry	3	0	
Deciduous	Shrub	*Philadelphus lewisii*	Mock orange	1	1	
Evergreen	Groundcover	*Polystichum munitum*	Swordfern	4	0	
Deciduous	Shrub	*Ribes sanguineum*	Red flowering currant	5	3	
Deciduous	Shrub	*Rosa nutkana*	Nootka rose	1	1	
Deciduous	Shrub	*Symphoricarpos albus*	Snowberry	5	2	
Total Native Shrubs and Groundcovers				39	23	59%
Total All Plants				40	24	60%

* Number of plants alive in Y1/number of plants alive in Y0.

Table 8A. Estimated Cover by Plant Form in Management Unit 1 Transect 1

Plant Form	Cover Y0 (%) 2018/2019	Cover Y1 (%) 2018/2019	Cover Y2 (%) 2019/2020	Cover Y3 (%) 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover	0	5.0	5.2	1	
Deciduous Shrub	43.8	37.6	43.6	37	*Rosa nutkana*/Nootka rose
Deciduous Tree	3.6	2.2	0	0	
Deciduous Total	47.4	44.8	48.8	38	
Evergreen Groundcover	0	0	0	0	
Evergreen Shrub	28.6	29.2	44.6	69	*Mahonia aquifolium*/Tall Oregon grape
Evergreen Tree	15.0	19.4	30.8	41	*Abies grandis*/Grand fir *Pinus contorta*/Shore pine
Evergreen Total	43.6	48.6	75.4	110	
Total Native Vegetation	91.0	93.4	124.2	148	
Estimated Total Native Vegetation	5-25	5-25	25-50	25-50	
Tree Canopy	0-5	0-5	0-5	0-5	
Exposed Soil	5-25	5-25	0-5	0-5	
Invasive Species	0-5	0-5	0-5	0-5	

Table 8B. Estimated Cover by Plant Form in Management Unit 2 Transect 1

Plant Form	Cover Y0 (%) 2020/2021	Cover Y1 (%) 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover	0	0	
Deciduous Shrub	7	10	*Corylus cornuta*/Beaked hazelnut
Deciduous Tree	0	0	
Deciduous Total	7	10	
Evergreen Groundcover	39	46	*Gaultheria shallon*/Salal
Evergreen Shrub	46	27	*Mahonia aquifolium*/Tall oregon grape *Vaccinium ovatum*/Evergreen huckleberry
Evergreen Tree	2	2	
Evergreen Total	87	75	
Total Native Vegetation	93	85	
Estimated Total Native Vegetation	5-25	5-25	
Tree Canopy	50-75	50-75	
Exposed Soil	0-5	0-5	
Invasive Species	5-25	0-5	

Table 8C. Estimated Cover by Plant Form in Management Unit 3 Transect 1

Plant Form	Cover Y0 (%) 2020/2021	Cover Y1 (%) 2020/2021	Species with Significant Cover (2020/2021)
Deciduous Groundcover	0	0	
Deciduous Shrub	24	19	*Holodiscus discolor*/Oceanspray
Deciduous Tree	0	0	
Deciduous Total	24	19	
Evergreen Groundcover	24	14	*Gaultheria shallon*/Salal
Evergreen Shrub	16	17	*Morella californica/*Pacific wax myrtle
Evergreen Tree	2	3	
Evergreen Total	46	35	
Total Native Vegetation	70	53	
Estimated Total Native Vegetation	5-25	5-25	
Tree Canopy	0-5	0-5	
Exposed Soil	0-5	5-25	
Invasive Species	0-5	0-5	

Table 9. Landscape Management Plan Goals

Monitoring Year		Y3	Y1	Y1
Management Unit		1 *	2**	3**
Transect	LMP Goal	T1 (Q1+Q2)	T1	T1
Planted Evergreen Trees/All Planted Trees (%) for Trees <2" DBH**	67	67	100	100
Native Shrubs**	3 species/ 1 evergreen	5/2	9/3	9/3
Native Groundcovers**	2 species/ 1 evergreen	0/0	2/2	2/2
Mature Shrub and Ground-cover Aerial Cover (%)**	80% by Y5	25-50	5-25	5-25
Shrub + Groundcover Survival (%)**	80% @Y3 60% @ Y5	47	72	59

* Calculated from quadrats.

** Calculated from transects.

Exhibit 1. Salmon Bay Area Map

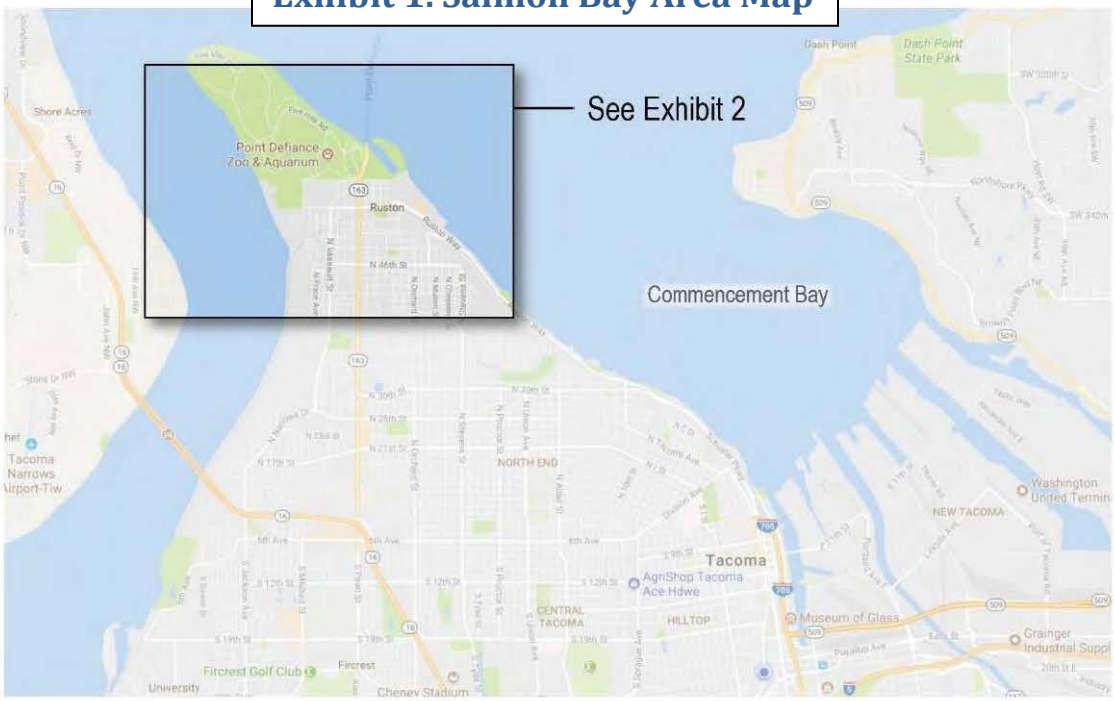

Exhibit 2. Salmon Bay Project Area

Figure 1. Salmon Beach Elevation

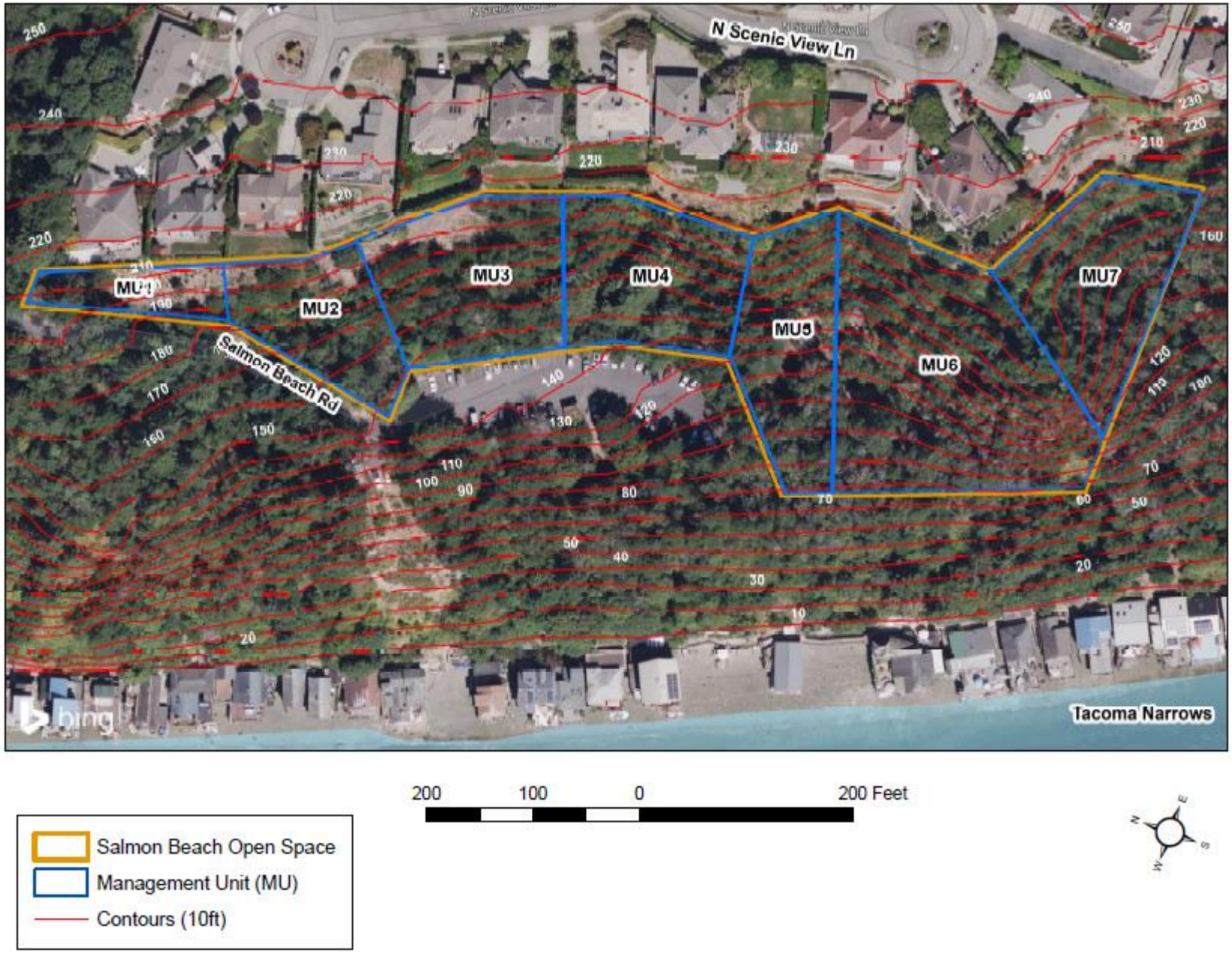

Figure 2. Salmon Beach Slope

Figure 3. Salmon Beach Monitoring Areas 2020/2021