Lewis Park
Vegetation Management Plan
July 2010 DRAFT

Prepared for:
Friends of Lewis Park

Natural Systems Design

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Section 1: Overview

1.1 Site location and context

Lewis Park is a natural area located on North Beacon Hill. The park was donated to the City of Seattle in the early 1900's and had been left unattended from that time until a group of neighbors began to restore the area in early 2007. Lewis Park is located on the east slope of Beacon Hill's northern terminus directly east of 15th Ave South (a portion of which is also known as Golf Drive South), across the street from the Pacific Medical Center building. The Park stretches along a 0.23-mile (1,200 feet) northwest-southeast axis between South Charles Street on the north boundary to the undeveloped Judkins Street right-of-way at the southern boundary. It is comprised of four discreet parcels of land owned by the City of Seattle Department of Parks and Recreation (Seattle Parks) totaling 3.4 acres in addition to adjacent rights-of-way that bring the total area under park management to 5.1 acres.

The parcels are contiguous with one another and are linked by undeveloped rights-of-way property that is not owned by Seattle Parks. Rights-of-way adjacent to Park property on both sides are fully included in Park management actions; those that are bordered by Park property on only one side are managed by Parks to the right-of-way centerline. For the purposes of this document, references to the Park hereafter will assume inclusion of these adjacent rights-of-way as described.

Lewis Park is zoned Residential, Multifamily, Lowrise 1 (L1). It is surrounded to the south and east by Residential, Multifamily, Lowrise 2 (L2) and to the west by both Residential, Multifamily, Lowrise 3 (L3) and Commercial 1 (C1).

Lewis Park is in close proximity to a number of other natural areas/greenspaces: Dr. Jose Rizal Park and the East Duwamish Greenbelts to the northwest, Cheasty Greenspace to the south, and the I-90 greenbelt linking to Lake Washington to the east.

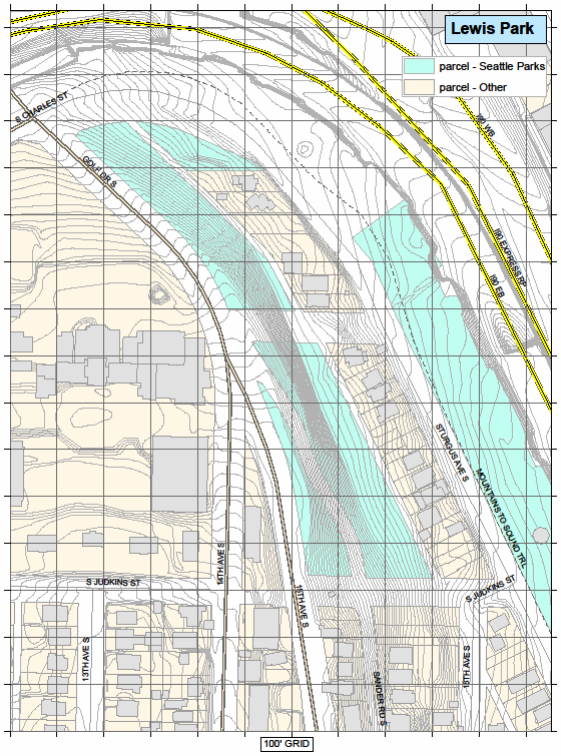

Figure 1 Lewis Park

1.2 Park description

The 5.1 acres comprising Lewis Park are characterized by a maturing upland deciduous forest consisting mainly of bigleaf maple (*Acer macrophyllum*), with some red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera*) in moister areas. A few individual western flowering dogwoods *(Cornus nutallii)* were also observed. Non-native Mazzard cherry trees (*Prunus avium*) are present in most of the park, both in the canopy as mature trees and more abundantly as saplings and suckers in the understory/shrub layer. The understory is also invaded to varying degrees by the typical suite of non-native species found in Seattle's urban forests: English ivy (*Hedera helix*), laurel (*Prunus laurocerasus*), English holly (*Ilex aquifolium*), and Himalayan blackberry *(Rubus procerus*). Common native understory dominants found in the Park include: hazelnut (*Corylus cornuta*), osoberry (*Oemlaria cerasiformis*), and low Oregon grape (*Mahonia nervosa*).

Lewis Park is a narrow greenbelt – its width ranging from 100 feet to 200 feet. The park includes an adjacent 'hook' of land known as 'the triangle,' which extends east from the northern part of the park across the alley/right-of-way and is bordered by Sturgis Ave S. to the east and the adjacent private property parcel to the south. The Park has a dominant east slope aspect, with slope steepness ranging from 20-90% (Figure 2). Approximately 1.7 acres of the park are slopes of 40% or greater. The Park is long and thin, generally from 100-200' in width, with 3,080 ft. (0.58 mile) of perimeter or edge adjacent to developed land.

Lewis Park has no official trails (Parks constructed and sanctioned), but is criss-crossed by several social trails, at least two of which lead to encampments. Seattle Public Utilities (SPU) has recently cleared an access route into the park from the southeast corner of the park up hill to a utility vault located on the Saunders Street ROW. The route is gravel surfaced and 20' wide.

Section 2: Goals and Objectives

2.1 Overall Green Space Goals

A number of existing documents outline the broad goals for managing Seattle's public parks. In addition there are adopted Park policies and guidelines for the management of natural areas under Parks ownership, such as Lewis Park. A brief summary of the most relevant goals, policies and guidelines from these documents is provided below.

2.1.1 Green Seattle Partnership – 20 Year Strategic Plan (2006)

The Green Seattle Partnership (GSP) is a public/private partnership between the City of Seattle and the Cascade Land Conservancy dedicated to promoting a livable city by re-establishing and maintaining healthy urban forests. Formed in 2004 by a Memorandum of Agreement between the City of Seattle and the Cascade Land Conservancy, the Green Seattle Partnership is a one-time, 20-year investment in the restoration of Seattle's forests. Seattle Parks and Recreation, Seattle Office of Sustainability and Environment, and Seattle Public Utilities are the three key City departments serving in the Green Seattle Partnership. The GSP's goal is to restore and maintain 2,500 acres of urban forest parklands by 2025. The 20-Year Strategic Plan (GSP, 2006) describes the process by which this goal will be achieved.

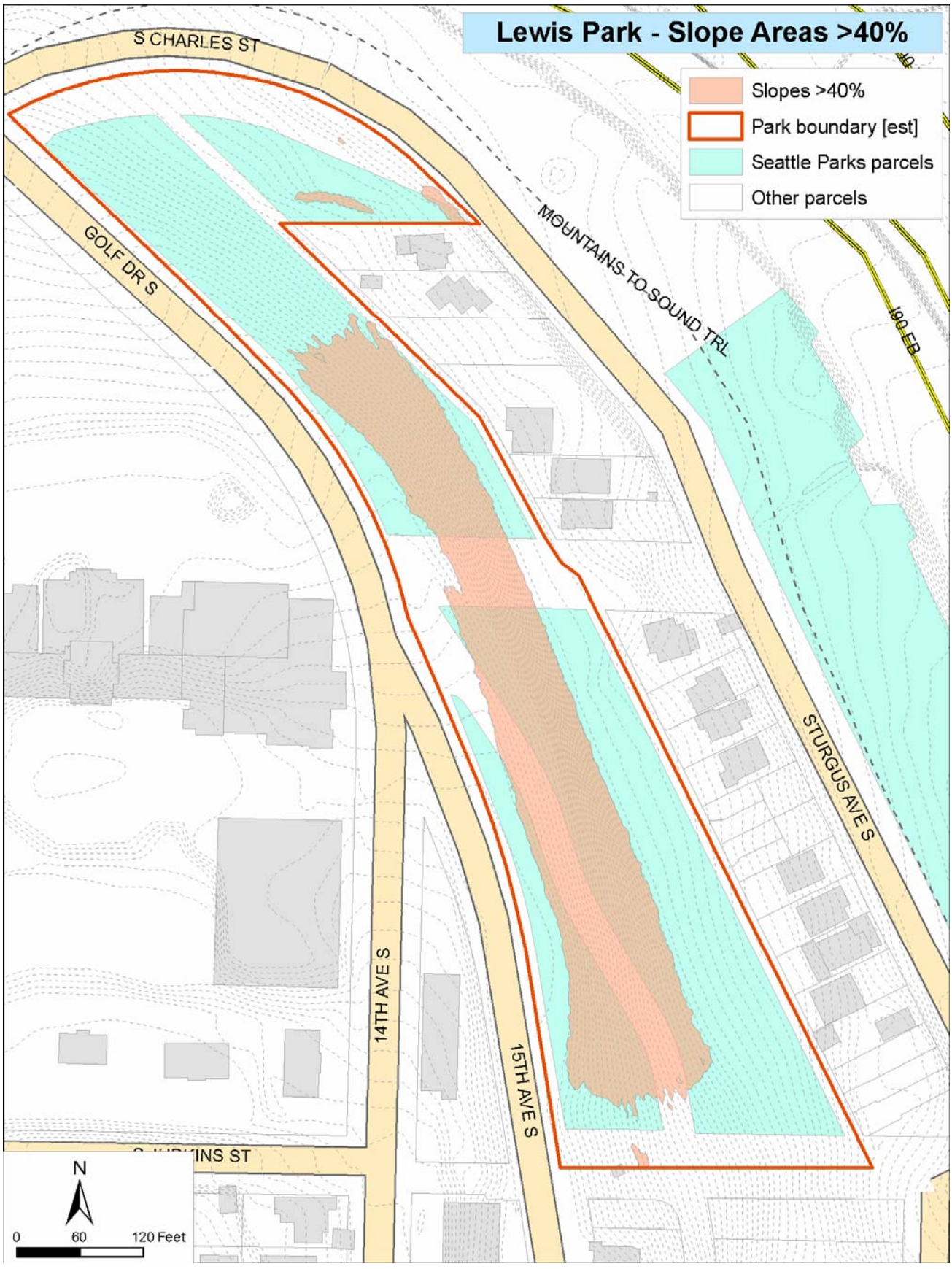

Figure 2 Steep Slope Areas, Lewis Park

2.1.2 Urban Wildlife and Habitat Management Plan (1994)

The UWHMP, developed by the Seattle Parks Department, provides a general "framework and guidelines for integrating natural and human systems in Seattle's parks and open spaces" (1994). Seven broad goals are presented in this document, which apply to the vegetation management in Lewis Park.

- Continue and increase wildlife habitat protection and enhancement efforts
- Protect and enhance wildlife populations
- Develop and maintain a wildlife resource inventory
- Provide environmental education, using wildlife resources
- Promote volunteer involvement in wildlife and habitat protection and enhancement
- Promote internal education and consistency in Department actions
- Promote interdepartmental and interagency cooperation to protect wildlife

More specific objectives are expressed in the UWHMP that refer to protection of wildlife corridors and sensitive habitats such as riparian and wetland areas, promoting native plant communities, controlling invasive plants, maintaining species diversity, using parks and greenspaces for educational purposes, promoting volunteer stewardship of wildlife resources, and integrating street tree programs with parks and greenspaces to promote wildlife habitat.

2.1.3 Seattle Parks COMPLAN (2000)

The COMPLAN is a comprehensive plan first put together by Seattle Parks Department in 1993 to guide policy and decision-making for parks and recreation facilities. The 2000 COMPLAN is an update to the original 1993 plan and reflects the intent to use the COMPLAN as a 'living document' to be adapted as needed. Goals and policy directions in the COMPLAN particularly relevant to the Lewis Park VMP are paraphrased and listed below. Greenspaces are defined in the COMPLAN as *"Areas designated for preservation because of their natural or ecological qualities, and their potential to contribute to an interconnected open space system".*

With respect to General Park Management and Environmental Stewardship:

- Conserve and enhance wildlife habitat, watershed areas, and wetlands
- Manage forests for the benefit of present and future generations by implementing reforestation and forest community restoration projects.
- Maintain the living park inventory of plants and trees, focusing on reforestation, enhancement and restoration of native plant communities, plant replacement, and control of nuisance plants.

With respect to Urban Habitat:

- Outline reforestation plans in selected parks and undertake reforestation and vegetation management to restore native plant communities. Use volunteers where appropriate and institute park stewardship committees to provide long-term care of restoration sites.
- Update the UWHCP.
- Incorporate habitat restoration or enhancement measures in maintenance activities as well as capital projects.
- Improve and increase the inventory of natural areas by reclaiming, restoring, and enhancing greenspaces, creeks, and wetlands.

With respect to Maintenance:

- Develop open space maintenance strategies
- Clarify measurable objectives for maintenance of open spaces and parks

- Tree management and maintenance will include considerations of tree health, long-term reforestation needs, historical context, and tree impacts such as public safety, views, aesthetics, street or sidewalk damage, and maintenance requirements.

With respect to Safety:

- Work toward long-term solutions for security problems

2.1.4 Seattle Parks Tree Management, Maintenance, Pruning, and/or Removal Policy & Procedure (2001)

The purpose of the Parks Department Tree Policy is stated as

> *"to maintain, preserve, and enhance the urban forest within parks . . . to increase overall tree canopy, tree health, tree longevity . . . and to ensure that parks trees are managed in a manner that is consistent with other departmental and municipal policies"*

The Tree Policy describes in detail the circumstances under which tree and other vegetation removals may occur on Parks property, and how trees and other vegetation are to be replaced. Among the criteria used to consider a tree or vegetation removal are: hazard trees, or those that are dead, dying, or diseased; trees or vegetation that create visibility problems (e.g. along roadways); trees or vegetation that compromise public safety; trees that are crowded/over-planted; trees that can be removed to create light gaps, snags or other habitat features.

The Tree Policy also details the required components of a Vegetation Management Plan, which is required if proposed vegetation removal exceeds clearing thresholds also defined in the Tree Policy. Vegetation Management Plans must include specific elements defined in the policy such as, vegetation replacement plan, specifications for invasive control, and a maintenance plan.

2.2 Lewis Park VMP Goals and Objectives

Goal 1: Improve overall forest health

Objectives:

1.a. Control invasives
1.b. Reduce human impacts to vegetation (encampments, social trails)
1.c. Increase native species richness in the tree, shrub and ground layers
1.d. Develop plan to remove and replace hazard trees along eastern boundary

Goal 2: Create and sustain over time a mixed deciduous/coniferous forest

Objectives:

2.a. Increase conifer density throughout the Park
2.b. Create canopy openings to allow diversity of conifer species to be planted
2.c. Increase species diversity of deciduous trees in the greenspace

Goal 3: Improve wildlife habitat quality

Objectives:

3.a. Increase snag density
3.b. Increase quantity of down wood
3.c. Increase native plant species richness and structural complexity of forest
3.d. Protect and improve interior habitat
3.e. Fortify park edges to promote resistance to invasive plant species

Goal 4: Improve aesthetic qualities, public perception, and stewardship of the Park

- 4.a. Create cohesive plant palette for Park edges
- 4.b. Develop plan to remove and replace hazard trees along eastern boundary
- 4.c. Create and maintain view corridors into Park interior
- 4.d. Maintain designated view corridors of the Pacific Medical Building from offsite per historic landmark stipulations
- 4.e. Reduce human impacts that suggest illicit uses of the Park (encampments, social trails)

Section 3: Plan Context

3.1 History of Park

The present day Lewis Park originated from a 1.4 acre parcel which was transferred to the City of Seattle by W.H. Lewis in 1911. The park was subsequently named in his honor. The transfer apparently was payment to the City by Lewis for "dirt removed from Beacon Place"(Sherwood History Files).

3.2 Citizen Activity and Concerns

In 2005, neighbors and city agencies embarked on an effort to reclaim the natural area by removing trash and drawing attention to the park. Efforts continued in 2006 with the objective of improving site safety. Volunteers improved sight-lines by removing dense holly and laurel shrubs and building debris jams across social trails that had been primarily used for illegal activities.

In 2007 volunteers generated 657 person hours clearing Himalayan blackberry, cherry laurel, and holly, planting hundreds of native trees, shrubs and groundcovers; and continuing to remove trash. In May of 2007 the group began hosting weekly volunteer work parties, and in June 2009 the Friends of Lewis Park (FOLP) was officially formed.

With the support of the Seattle Parks Department, Lewis Park became a Green Seattle Partnership (GSP) restoration site in 2009, and preliminary restoration plans were developed for portions of the Park which included GSP and Parks resources supporting community volunteer efforts.

In spring of 2010, Natural Systems Design was hired to develop a vegetation management plan for the park. A geotech report and hazard tree evaluation for the east and north slopes of the park were also completed in the spring of 2010 by Terra Associates and Stonehedge Tree Experts respectively. These reports can be found in the Appendices of this VMP.

3.4 Vegetation-related Uses

There are two primary human uses of the park: passive recreation and illicit uses. Passive enjoyment of the forest setting is had by those who live adjacent to the park and those who pass through or past it on foot, by bicycle, or in vehicles. Wildlife viewing and enjoyment of the aesthetic benefits of the forest are probably the main elements of this passive use. Several adjacent landowners have noted that the forest provides a sound buffer from vehicular noise generated on 15th Ave S. In addition, there are some illicit human uses that compromise the aesthetic qualities and health of the forest – chiefly, dumping of garbage and yard waste, encampments, and a myriad of social trails that bisect the forest. Another detrimental effect of these particular uses is the toll taken on the community perception of safety and positive qualities of this forested area in the midst of their neighborhood.

3.5 Related Projects

The following parks, greenspaces, and other public areas include projects that are related to work being undertaken in Lewis Park: Dr. Jose Rizal Park, East Duwamish Greenbelts, Cheasty Greenspace, Pacific Medical Center Building Historic Designation and Landmark status (designated view corridors from off site of the building).

Section 4: Existing Conditions

4.1 Geology, Soils, Slope Stability, and Erosion

The geotech report (Terra Associates, 2010) included in the Appendices of this VMP is summarized briefly here. Overall the slopes do not exhibit signs of deep-seated instability or the potential for large scale slides or mass-wasting. Park soils are a mixture of sandy silts and topsoil/fill mixture. Some shallow and localized seepage and wet areas were observed, particularly at the base of the slopes at the south end of the Park, but there were no springs or groundwater seepage noted on the slopes. Soil movement and erosion observed on site were limited to surficial soil disturbances, shallow slope creep, and normal surface erosion due to the effects of surface water movement across the site. The report includes specific suggestions to protect the site during and immediately after restoration activities, but concludes that site restoration work is unlikely to increase erosion or destabilize the slopes. Key suggestions include: ensuring that bare slopes are minimized by using heavy mulches or other erosion control methods (jute fabric, brush layering, or wattles); phasing invasive removal so that groundcover is not removed all at once from slope areas; replacement planting to re-establish vegetation in areas cleared of invasives.

Slopes of 40% or greater comprise approximately 1.7 acres, or one third, of the park. These areas are not appropriate for volunteers to perform management tasks and will require contractor involvement.

4.2 General Forest Character and Conditions

Lewis Park is dominated by second- and third-growth deciduous-dominated forest that was logged presumably through the late 1800s and early 1900s. The general condition of this area indicates that it has received no large-scale forest management over the years (e.g., extensive replanting or thinning), and that the regrowth of the forest has been strongly influenced by the urban setting. As the Seattle area has undergone rapid and extensive urban development since settlement and logging, regrowth of the urban forest of which Lewis Park is a part has been shaped by factors that include:

- fragmentation into small forest blocks;
- development that has resulted in restricting much of the remaining forest remnants to slide-prone slopes;
- disturbance along forest edges for construction of roads, housing, commercial buildings, etc.;
- invasion of non-native plants progressing from the disturbed edges into forest interiors; and
- tree clearing for utility corridors and accompanying invasion of non-native plants.

As forest fragmentation increased due to spreading urban development in the area, the amount of forest edge has increased. All forest edges differ in typical ways from the forest interior: there is increased potential for windthrow, more open tree canopy, decreased shading, decreased moisture in soil and microclimate, and encroachment by non-native plants. Forest edges in urban areas tend to have an even greater extent of disturbance, the effects of which are seen further into the forest interior than in more rural areas.

Types of urban-related disturbances may include selective tree clearing, planting or encroachment of non-native species from landscaped areas, encroachment of invasive weeds from disturbed areas, networks of social paths, predation of wildlife by domestic pets, piping creeks underground or diverting flows thus eliminating or decreasing riparian corridors, and increased storm water flows resulting in slides of steep slopes. This higher level of disturbance, when combined with the extensive fragmentation and smaller forest blocks of urban areas, results in the degraded condition of the forest edge extending further into the forest and greatly reducing the effective forest interior. In Lewis Park, for example, invasive plant species are not just limited to disturbed forest edges, but occur and even dominate the understory throughout most of the park. The urban nature of the park is reflected in the following description of the forest condition in the area.

Lewis Park is comprised of primarily forested areas that are dominated exclusively by deciduous species. Some areas at the north end of the Park were recently cleared of invasive shrubs and newly installed tree species are under 5 feet high. Vegetation Zones were defined for this project using existing vegetation data mapped by the Seattle Urban Nature Project (SUNP, 2000) that was ground-truthed in the field and checked against information gathered during the course of developing this VMP. SUNP assessments were made by qualitative visual estimates made using a dichotomous key to determine vegetation type during a site walk-through. Vegetation classes used are consistent with those used by the Washington State Gap Analysis Project and the Interagency Committee for Outdoor Recreation, as well as the Seattle Parks UWHMP and SUNP. Lewis Park consists of three Vegetation Zones based on vegetation type: These are defined below in Table 1.

Table 1. Vegetation Types in Lewis Park (per SUNP vegetation community definitions)

Vegetation Type	Definition	Area within park
Deciduous Forest 10-20"	• 10-15" diameter at breast height (dbh) • 16-20" diameter at breast height (dbh) scattered throughout at low density • Trees greater than 30 ft in height • Dominated by big-leaf maple • Some red alder and black cottonwood	3.5 acres
Recently Planted w/ Open Canopy	• Greater than 25% shrub cover • Less than 10% tree cover	0.6 acres
Edges	• Dense shrub layer (eastern edge), or • Newly planted trees, shrubs, and groundcovers (western edge)	1.0 acres

4.4.1 Deciduous Forest 10-20"

Even-aged deciduous forest covers the majority of the park. This type is almost entirely dominated by bigleaf maple with individual red alders and black cottonwood typically occurring in areas of moister soils. There is virtually no coniferous component to the forest.

Understory plants reflect the high degree of shading. English ivy is the most frequently occurring invasive in the ground layer, while several areas of the park are dominated by mature English holly and cherry laurel. Native shrub cover was observed to be moderate to high in two areas of the park. The remainder of the park understory is as follows: interior dominated by holly and cherry laurel; the southeastern edge with numerous upland invasive species; areas at the north end of the park that were formerly dominated by blackberry that has recently been removed; the Norman Street ROW where shrubs are virtually absent.

Invasive cover in the forest is high. English ivy is the most commonly occurring species in the park and also has the highest percent cover. For frequency of occurrence, ivy is followed by English holly, cherry laurel, Himalayan blackberry, and clematis (*Clematis vitalba*). Other notable invasive species that are present but are not particularly problematic at this time in terms of percent cover include bindweed (*Convolvulus arvensis*), and Scot's broom (*Cytisis scoparius*).

Native groundlayer species are very limited due to the abundance of ivy in the groundlayer throughout the Park.

The most common plant associations observed in the deciduous forest are shown in Table 2

Table 2. Common Plant Associations in Deciduous Forest in Lewis Park

Plant Associations	
Bigleaf maple/Osoberry	Bigleaf maple/Hazelnut/Ivy
Bigleaf maple/Ivy/Osoberry	Bigleaf maple/Hazelnut/Holly/Cherry laurel/Ivy
Bigleaf maple/Ivy	Bigleaf maple/Holly/Cherry laurel

The only observed tree saplings, indicating forest regeneration, were non-native Mazzard cherry, which was observed frequently throughout the park. No native tree regeneration was observed.

4.4.2 Recently Planted w/Open Canopy

The northeast end of the Park, in the area known as the Triangle, is characterized by both a lack of tree canopy and a newly installed planting. The area was formerly dominated by Himalayan blackberry. Tree, shrub, and large ground layer species are from 1' to 5' in height planted at 3-4' spacing. The site is mulched with wood chip mulch.

4.4.3 Edge

Canopy edges are of two dominant types based on location. The southeast edge of the park is bordered by an alley and receives ample direct morning sunlight. Where light penetrates into the park, a diverse mix of native shrubs and non-native shrubs and groundcovers thrive. In addition to direct rainfall, this community receives moisture through sporadic groundwater seeps. Canopy cover, almost wholly provided by big-leaf maple, is approximately 50%.

The other edge community borders 15th Ave S/Golf Drive and receives a small amount of direct afternoon sunlight. Canopy cover, provided by bigleaf maple, is high. The area was dominated by invasive shrub species, primarily blackberry, but through the work of volunteers and Parks staff, has mostly been cleared of invasive species and replanted with trees, shrubs and large groundcovers. A stand of Mazzard cherry trees still exists. Wood chip mulch has been applied to all planting areas. This western edge is drier and has fewer mature shrubs compared to the southeastern edge.

4.6 Human Impacts

Human impacts are evident throughout the park. Direct impacts to vegetation are caused primarily by one or more of the following:

- encampments where people have established long-term camps

- social trails weaving throughout the park
- the utility access road
- historic and ongoing disturbance of vegetation along park edges due to development (homes, roads, sidewalks)

Three encampments were observed at the time of the vegetation survey in April 2010, but no systematic inventory of camps was undertaken. Encampment locations may change over time, as it is likely that encampments are abandoned and then re-established in different locations. The social trails found in the park appear to be associated with the encampment locations. The trails are generally narrow and the entrances to them are somewhat obscure. Dumped refuse was not observed in the park, however, this is likely due to the repeated efforts of community volunteers and city officials to collect and remove refuse. It is unclear if dumping persists and if so, to what degree.

Section 5: Findings – Qualitative Descriptions of Management Areas

5.1 Data Collection Methods

Information collected for the vegetation management plan was done using a qualitative methodology. This method was chosen primarily for cost-effectiveness, and also because it was determined that quantitative data was not necessary to develop the management strategies that will be implemented at this site. Long-term detailed monitoring is also not anticipated at the site at this time, so detailed and costly baseline data was not desired.

The vegetation was surveyed on foot during the growing season (April 2010) with topographic maps and aerial photographs. The perimeter was walked followed by numerous transects bisecting the park. Patches of forest that could not be seen from the perimeter, social trails, and SPU's access right-of -way were investigated; however, not all ground within the project area was actually walked.

Relatively homogeneous vegetation stands were identified and described by noting all dominant and subdominant species in all layers; cover estimates were made by ocular estimate. Some additional species were noted but were neither dominant nor subdominant. The completed vegetation surveys are not comprehensive and are intended to characterize plant communities, understand their basic components, and identify invasive problems and overall forest health issues.

Each vegetation community/management area was given a unique identifier as it was encountered, observed, and described in the field. Community boundaries were later grouped and characterized as distinct in the field.

Plant species throughout the document are referred to by common name; the first time they appear in the document a scientific name is included.

5.2 Overall Findings

Seven unique management areas were identified and described. The table below provides a summary of the main characteristics of the areas. A map of the management areas follows.

Table 3. Plant Communities and Management Areas (Areas) in Lewis Park

Code	Name	Description	Area (acres)
A	The Triangle-Recently Planted w/ Open Canopy	Recent multi-strata planting in former H. blackberry dominated area. Canopy not yet established	0.6
B	North End/Newly Planted Understory	Recent multi-strata planting beneath maple dominated canopy. Extensive invasive removal.	0.6
C	Mature Native Shrub Community	Osoberry dominated shrub layer.	0.2
D	Absent Shrub Layer	Ivy dominates ground layer.	0.6
E	Mixed Mature Shrub Community	Dense but distinct patches of invasive shrubs surrounded by less dense mature native shrubs	1.1
F	Mature Invasive Shrub Community	Dense mature invasive shrub community	0.9
G	Edge	Southeastern and western types. Southeastern type dominated by low-growing invasive shrubs and groundcovers. Western type mostly replanted with multi-strata natives.	1.0
		total acreage	5.1

Canopy Species:
Bigleaf maple dominates the canopy of all Management Areas (Areas). Red alder and black cottonwood are also present but their presence is minor. A non-native cherry tree species, Mazzard cherry, is present as an immature tree, semi-mature tree and in sucker-form where trees have been cut and herbicide was not applied. Three western flowering dogwood trees were observed in Area E. Canopy cover throughout the park, but excluding The Triangle, is ~90%, with parts of the edge community accounting for most of the canopy gaps. Conifers are virtually absent. Over 95% of maples are even-aged and less than 15"dbh, with approximately 5% of the individuals in the 15-20"dbh range.

Shrub Species:
Dominant shrubs in the Park are holly, laurel, hazelnut, and osoberry. Other species found with some abundance are Himalayan blackberry, and red elderberry as well as red osier dogwood (*Cornus sericea*) and salmonberry (*Rubus spectabilis*) in moister pockets at the toe of the slope at the southern end of the Park.

Shrub layer species composition and density vary tremendously within Lewis Park and it is primarily these differences that define the vegetation zones within the park. In general, as one travels from north to south, the shrub layer becomes denser and more invasive. Invasive shrub species English holly and cherry laurel dominate the southern quarter of the park as well as large patches in Area E. These two species in Area F provide over 90% cover. Recent restoration work in Areas A, B, and C have removed these species.

Native shrub cover was observed to be moderate in two areas of the park, Area C and the northern part of Area E, with osoberry and hazelnut the two dominant species. Mature red elderberry (*Sambucus racemosa*), salmonberry, thimbleberry (*Rubus parviflorus*), snowberry (*Symphoricarpos albus*), and red-twig dogwood also exist on site.

Groundcover Species:
Ivy dominates the ground layer throughout the park, except in areas where it has recently been removed (Area A, -B, and -G's western portion). In two communities (D & E) ivy has climbed into ~ 25% of the trees. In Area F, ivy exists in 75% of the trees and has overtaken the tree crown in 25% of the Area's trees.

Native ground layer species are limited to sword fern (*Polystichum munitum*), lady fern (*Athyrium filix-femina*), and bracken fern (*Pteridium aquilinum*), areas of saxifrages, Pacific waterleaf (*Hydrophyllum tenuipes*), false Solomon's seal

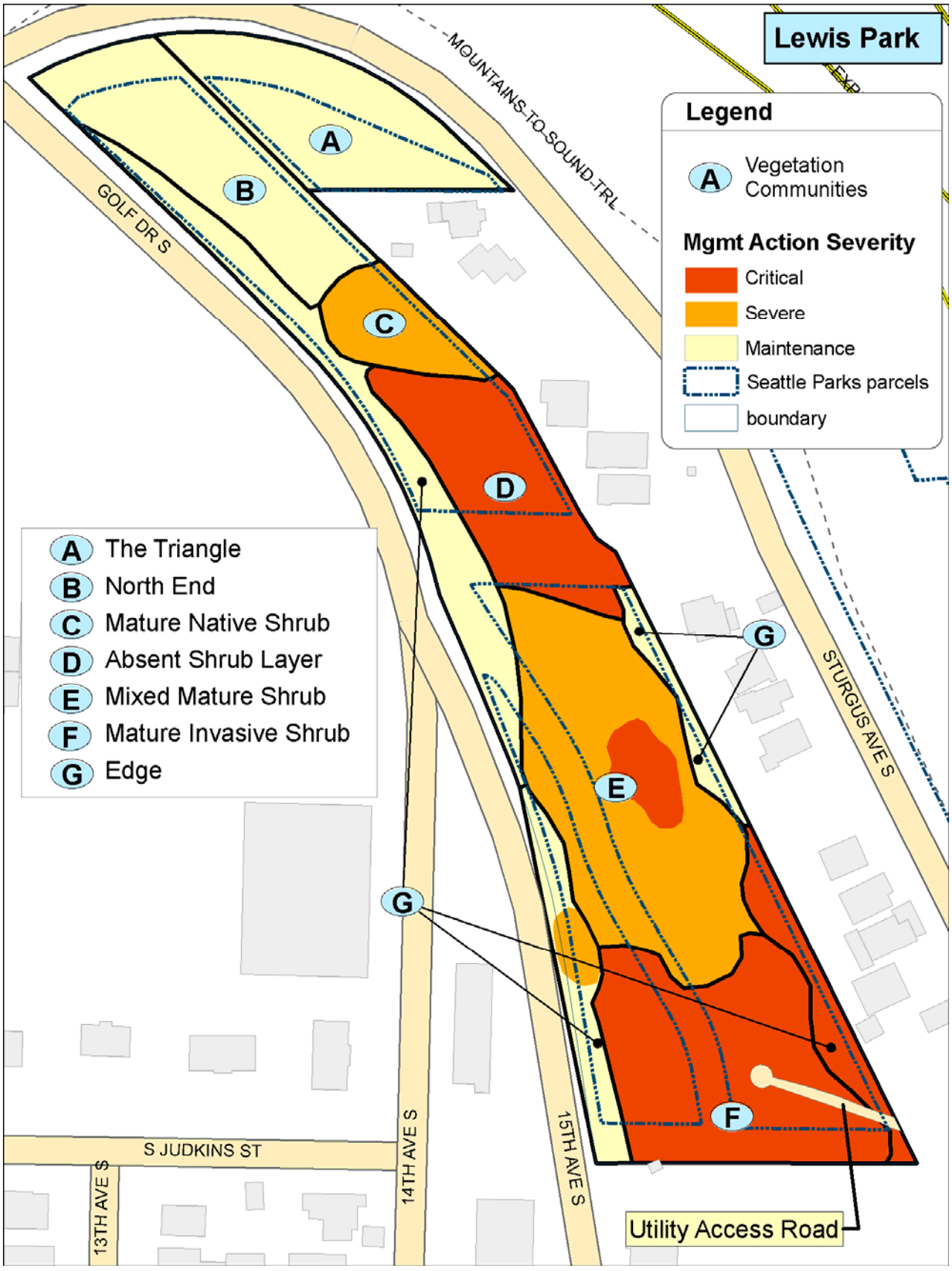

Figure 3 Map of Management Areas, Lewis Park

(*Smilacina racemosa*), tall Oregon grape (*Mahonia aquifolium*), low Oregon grape (*Mahonia nervosa*), cleavers (*Gallium aparine*), fringecup (*Tellima grandiflora*), and miner's lettuce (*Montia sp.*). Area E has the largest number and largest assemblages of native groundcover species.

5.4 The Triangle: Area A

Area A (the Triangle) is in middle stages of restoration. The canopy is currently open. This Area consists of large groundcovers, shrubs and tree transplants. Transplants are 3-4"on center. The planted area has been mulched with wood chips.

5.5 The North End/Newly Planted Understory: Area B

In Area B (the North End) the mature shrub layer is currently sparse although some (~5% cover) native mature osoberry do exist. Other tree, shrub, and groundcover species exist but are newly transplanted and have yet to achieve functional shrub size. Few to no invasive shrubs are present. The shrub layer was recently (2006) dominated by blackberry and holly but blackberry has been grubbed and holly has been cut and painted by Parks crews. Blackberry regrowth was observed. Non-native cherry trees also were present and have been cut. Some cherry suckering was observed. English ivy is absent.

5.6 Mature Native Shrub Community: Area C

In Area C a remnant native mature shrub community is dominated by a prolific osoberry population (approx. 50% cover) with hazelnut (5% cover) as a subdominant shrub. Holly and laurel were present prior to 2006 but have been removed. English ivy covers 100% of the ground in this Area. Other species maintain a presence however (holly 10% cover, sword fern 5% cover, low Oregon grape 5% cover).

5.7 Absent Shrub Layer: Area D

In Area D the shrub layer is nearly absent with a mix of native and non-native shrub species providing < 2% aerial cover. Shrubs present are osoberry, red elderberry, snowberry, and holly. English ivy dominates the site. It covers 100% of the ground and is present in ~25% of the trees. Additional groundcovers present are sword fern, low Oregon grape, and bracken fern.

5.8 Mature Mixed Shrub Community: Area E

Area E is the most diverse Area in the park in terms of structure and existing plant species. As with the other sites (not including the Triangle), Area E's bigleaf maple canopy provides approximately 90% cover. Beneath the canopy are dense patches of invasive shrubs (English holly and cherry laurel) and assemblages of beaked hazelnut, osoberry, and red elderberry. Beaked hazelnut provides approximately 50% cover. English ivy covers approximately 25% of the ground layer and has climbed into approximately 80% of the maples. However, intact patches of low Oregon grape exist, as do sword and bracken fern, Pacific waterleaf, stinging nettle (*Urtica dioicus*), and cleavers. Low Oregon grape provides approximately 20% cover.

5.9 Mature Invasive Shrub Community: Area F

Besides bigleaf maple, the dominant vegetation in Area F is invasive. There is approximately 90% aerial coverage by invasives in the shrub layer: holly (~40%) and laurel (~50%). Holly and laurel in this Area reach >30' in height. English ivy is present in ~75% of the trees and has reached the crown in ~25% of trees. Ivy covers

~50% of the ground. Clematis is also present in trees. Natives that manage to exist in Area F are osoberry (~4% cover), hazelnut (~1% cover), sword fern (~2% cover), and fringecup (~2% cover). The few native shrubs present are confined to edges.

5.10 Edge Community: Area G

Much of the western edge is currently planted as a continuation of Area B. The eastern edge of the park is bordered by an alley and, adjacent to parts of Areas E and D, directly by private property. From Area E southward, morning sunlight penetrates into the park creating ideal growth conditions for shrubs, vines and groundcovers. The alley and property boundaries, and edges in general, also provide physical pathways for invasive entry. Because the eastern edge is at or near the toe of the slope, soils in some pockets tend to be moist and in places quite wet. Seeps were observed in several locations. Increased light penetration with higher soil moisture levels have allowed for a mix of native and non-native species to flourish, exhibiting increased levels of plant diversity, but still dominated by non-native species. In this Area, native species include salmonberry, thimbleberry, red elderberry, hazelnut, red osier dogwood, fringecup, bracken fern, sword fern, horsetail (*Equisetum arvense*), and non-native species Himalayan blackberry, Scots broom, laurel, holly, ivy, thistle (*Cirsium sp.*), and clematis. The edge influence extends ~50'into the interior of Areas E and F.

Section 6: Vegetation Management Recommendations

6.1 Prescriptions by Management Area

6.1.1 The Triangle: Area A

- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch). It is expected that invasive removal will be required twice per year, once in late spring, once in early fall.
- Evaluate planted areas for consistency with plant palettes, species groupings, and planting density recommended in this VMP. Relocate, remove, and/or add plants as appropriate.
- Perform GSP project monitoring.

6.1.2 The North End/Newly Planted Understory: Area B

- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch). It is expected that invasive removal will be required twice per year, once in late spring, once in early fall.
- Evaluate planted areas for consistency with plant palettes, species groupings, and planting density recommended in this VMP. Relocate, remove, and/or add plants as appropriate.
- Perform GSP project monitoring.

6.1.3 Mature Native Shrub Community: Area C

- Remove invasives, primarily English ivy in the ground layer, but also re-sprouting English holly. Temporary erosion control technologies should be installed after removal. Possible techniques on slopes include the use of coir fabric, coir logs, straw wattles.
- Replant with native trees, shrubs and groundcovers; and wood-chip mulch should be applied and maintained at a depth of 4-6".

- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch).
- Monitor for re-growth of blackberry, holly and laurel.
- Perform GSP project monitoring.

6.1.4 Absent Shrub Layer Management Area: Area D

- Remove invasives, starting with ivy in the trees followed by ground layer ivy and any invasive shrubs that may be present.
- Create multi-year schedule for ground ivy removal due to slope steepness. An example would be to begin ivy removal across the top half of the slope, leaving ivy in place across the lower half of the slope to help control and contain surface soil erosion. Treatment of the upper half of the slope would follow standard replanting protocol: re-plant, install temporary erosion control measures, mulch, irrigate, monitor, and maintain. Once plants within the upper half of the slope become established (three to five years), work could commence along the lower slope.
- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch).
- Monitor for re-growth of any invasives.
- Perform GSP project monitoring.

6.1.5 Mature Mixed Shrub Community: Area E

- Remove invasives, starting with ivy in the trees, followed by ground ivy and patches of holly and laurel. Because this Area is a mix of non-native invasive and native species and exists on a steep slope, the removal of invasive species will need to be done with care and sensitivity and also will need to be done with multi-year phasing. Personnel should be trained in plant identification, low impact movements across the slope, and on how to minimize root disturbances to native ground covers and shrubs. Access into and through the site should be made via focused temporary routes. These routes should be located where the potential for erosion is lowest. Upon exiting the site, personnel should install temporary erosion control measures and mask the route entrances. Routes will be needed for subsequent monitoring and maintenance.
- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch).
- Monitor for re-growth of any invasives.
- Perform GSP project monitoring.

6.1.6 Mature Invasive Shrub Community: Area F

- Remove ivy and clematis in the trees,
- Remove dense invasive shrub layer of laurel and holly. Chip stems and spread onsite.
- Replant with native trees, shrubs and groundcovers; and apply and maintain wood-chip mulch at a depth of 4-6".
- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch).
- Monitor for re-growth of invasives primarily ivy, clematis, laurel, and holly.
- Perform GSP project monitoring.

6.1.7 Edge Management Area: Area G

Eastern Edge

- Remove hazard trees and snag or leave wood as downed wood onsite.
- Remove invasives - primarily blackberry, ground ivy, Scot's broom, and clematis.
- Replant primarily with shrubs to establish a dense shrub community or thicket that can provide a strong front to reinvasion and apply and maintain wood-chip mulch at a depth of 4-6". Species should be adapted to sun/partial shade.
- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch).
- Monitor for re-growth of invasives primarily blackberry.
- Perform GSP project monitoring.

Western Edge

- Maintain newly installed plantings per plant establishment guidelines from DPR and GSP documents (irrigation, weed control, mulch). It is expected that invasive removal will be required twice per year, once in late spring, once in early fall.
- Evaluate planted areas for consistency with plant palettes, species groupings, and planting density recommended in this VMP. Relocate, remove, and/or add plants as appropriate.
- Remove invasives – starting with stand of Mazzard cherry, followed by ground ivy and other invasive shrubs.
- Replant with trees, shrubs, and groundcovers and apply and maintain wood-chip mulch at a depth of 4-6". Species should be adapted to shade/partial sun.
- Monitor for re-growth of invasives primarily blackberry.
- Perform GSP project monitoring.

Section 7: Vegetation Management & Maintenance Practices

All of the Management and Maintenance Practices for restoration work per Parks and GSP standards are described in detail in Parks documents (City of Seattle Parks and Recreation, 2008 and GSP, 2009). Practices described include: amending soils; creating canopy gaps, snags, and coarse woody debris; mulching; planting; pruning; removing plants; three year establishment care; watering; weeding and invasive control. GSP documents (GSP, 2009) also provide detailed guidance on restoration practices and organization of volunteer crews.

Section 8: Plan Implementation

8.1 Implementation Priorities

The most pressing needs at Lewis Park are the removal and control of invasive species. As invasives are removed, they can be replaced with desirable native species that over time will achieve the long-term goals set forth in the VMP. Invasive removal needs vary by area within the Park, as do planting needs. The following is a list of prioritized and specific actions that describe how to accomplish the objectives established for each of the four main goals.

The highest priority actions are designated as such with these criteria in mind:

- highest ecological need
- highest public safety need
- easiest to accomplish with obvious positive benefit to the Park

Lower priority actions are those that are identified as:

- less ecologically critical
- less pressing as far as safety for the public as well as adjacent private property owners
- more challenging and/or expensive to complete for less overall benefit

Table 3 Prioritization of Implementation Actions for Lewis Park

Priority	Task/Action	Objective Satisfied	Location	Expertise Needed
HIGH	Task 1: Remove crown ivy and clematis from trees	1a, 1b, 3d, 4e	E, F	volunteers and contractor (on slopes exceeding 40%)
	Task 2: Remove laurel and holly	1a, 1b, 3d, 4e	E, F	volunteers and contractors (on slopes exceeding 40% and for herbicide treatments of cut stumps)
	Task 3: Snag or remove hazard trees from eastern Park edge (per arborist report)	1b, 1d, 3a, 4b, 4e	G	contractor
	Task 4: Plant trees and shrubs in groups/patches as invasive removal is done	1c, 2a, 2c, 3c, 3d, 3e, 4a, 4c	C, D, E, F, G	volunteers and contractors (on slopes exceeding 40%)
	Task 5: Evaluate existing new planting areas for coherence with native species palettes	1c, 2a, 3c, 4a	A, B, G	volunteers
	Task 6: Maintain all existing and new planting areas until establishment is apparent	1c, 2a, 2c, 3c, 3d, 3e	all areas	volunteers and contractor (on slopes exceeding 40%)
MEDIUM	Task 7: Remove ground ivy	1a, 3d	C, D, E, F, G	volunteers and contractor (on slopes exceeding 40%)
	Task 8: Remove invasive cherry trees	1a, 3d	E, F	volunteers and contractors (on slopes exceeding 40% and for herbicide treatments of cut stumps)
	Task 9: Snag or drop any hazardous or invasive trees to increase snags and LWD in Park	3a, 3b	all areas	contractor
	Task 10: Establish dense native shrub community along eastern edge	1a, 1b, 1c, 3e, 4a, 4c, 4e	G	volunteers
LOW	Task 11: Add LWD by bringing in logs from offsite	3b	all areas	volunteers and/or contractor
	Task 12: Create canopy gaps by selectively dropping or snagging maple trees to enable limited planting of Douglas fir	2a, 2b, 3a, 3b, 3c	C, D, E, F, G	contractor with Parks input on tree selections

8.2 Implementation Strategies

Task 1: Remove crown ivy and clematis from trees

Ivy and clematis in the crowns of trees in the Park directly threaten the vitality of the canopy. This problem is most prevalent in Areas E and F. Protocol for removal is standard for GSP and can be found in the Forest Stewards Handbook as well as Seattle Parks Natural Area BMPs.

Task 2: Remove laurel and holly

Laurel and holly are pervasive and abundant in Areas E and F. Removals should follow standard Parks and GSP protocol and should include cut stump herbicide treatments. All material can be chipped and spread on site if removals are not done during fruiting season.

Task 3: Snag or remove hazard trees from eastern Park edge (per Stonehedge, 2010)

A total of five trees are recommended for snagging or removal. Two additional trees that are part of a clump of one of the removals may also require removal. All trees are bigleaf maple except for one cherry. All trees are in Areas D, E, or G along the eastern Park edge and have been identified as hazardous. Please refer to arborist report (Stonehedge, 2010) in Appendices for details. Any trees that are to be removed that cannot be snagged should be left as down woody debris in the Park and branches can be chipped and spread on site.

Task 4: Plant trees and shrubs in groups/patches as invasive removal is done

Planting in the Park should be done per standard GSP and Parks protocols as far as timing, plant sizes, and establishment care. Particular care should be taken to implement erosion control measures in all planting areas due to the prevalence of slopes in the Park and the concerns about erosion risk in areas newly cleared of invasives. Plants should be grouped in communities or associations with like species with consideration for the gradation of dominance within a plant community. For example: when planting a grouping of hemlock and cedar trees beneath the maple canopy, the typical shrubs associated with these species should also be installed as a cluster around the trees. However, the shrubs should not occur in equal numbers of each species. In this example, vine maple would typically be a dominant shrub (approx. 25-40% cover), with hazelnut, red elderberry, red huckleberry, and salmonberry if moist occurring at about 5% cover for each species. Plant quantities of each should reflect these proportions to truly approach a naturalistic planting. The groundlayer species would be dominated by sword fern at approximately 50% cover, with salal and low Oregon grape at 5-10% cover.

The majority of planting in the Park will reflect the requirements of an eastern and northern aspect slope under existing canopy. It is assumed that the forest will be slowly converting from a deciduous bigleaf maple forest to a mixed deciduous/coniferous forest. Dominant tree species will likely be bigleaf maple, western hemlock, and cedar with some pockets of Douglas fir, black cottonwood (declining as it dies and is not replaced), and red alder (also declining). Some areas of the Park will be planted as shrub thickets, and there will be some opportunities to plant open forest type plant communities. The following are the most typical associations and suggested species composition for Lewis Park. All tree planting must adhere to limitations on view corridor maintenance as described by historic preservation and landmark designation documents relevant to the Pacific Medical Center Building (Note: specific view corridor descriptions are pending).

Table 4 Plant Associations and Proportions for Planting at Lewis Park

Plant Association	Current Conditions			
Hemlock/Cedar/Vine maple/Sword fern	**This plant association would be indicated in areas with existing bigleaf maple canopy. The result would be a combined mixed deciduous/coniferous canopy**			
	Common Name	**Scientific Name**	**Approx. Proportion by % Cover**	**Plant spacing (avg.)**
Trees (canopy)	western hemlock	*Tsuga heterophylla*	10-20%	8-15'
	western red cedar	*Thuja plicata*	10-20%	8-15'
Trees (subcanopy)	Pacific dogwood	*Cornus nuttalli*	2-5%	8-10'
	cascara	*Rhamnus purshiana*	2-5%	6-8'
Shrubs	vine maple	*Acer circinatum*	20-35%	4-8'
	snowberry	*Symphoricarpos albus*	10-15%	3-4'
	hazelnut	*Cornus cornuta*	10-15%	6-8'
	oceanspray	*Holodiscus discolor*	5-10%	6-8'
	osoberry	*Oemlaria cerasiformis*	5-10%	4-6'
Groundcover	sword fern	*Polystichum munitum*	40-55%	3-4'
	salal	*Gaultheria shallon*	<5%	1-2'
	low Oregon grape	*Mahonia nervosa*	5-10%	1-2'
Plant Association	**Current Conditions**			
Douglas fir/Snowberry/Sword fern	**This plant association would be appropriate in gap areas where there are pockets of sunlight sufficient to establish Douglas fir as a canopy tree. It would also be appropriate along outer edges such as in Areas A and B and the southern portions of Area F.**			
	Common Name	**Scientific Name**	**Approx. Proportion by % Cover**	**Plant spacing (avg.)**
Trees (canopy)	Douglas fir	*Pseudotsuga menziesii*	70-85%	8-12'
	grand fir	*Abies grandis*	5-10%	8-12'
	Pacific madrone	*Arbutus menziesii*	<5%	6-8'
Shrubs	snowberry	*Symphoricarpos albus*	20-30%	3-4'
	hazelnut	*Cornus cornuta*	10-15%	6-8'
	oceanspray	*Holodiscus discolor*	10-15%	6-8'
	osoberry	*Oemlaria cerasiformis*	<5%	4-6'
Groundcover	sword fern	*Polystichum munitum*	40-55%	3-4'
	salal	*Gaultheria shallon*	<5%	1-2'
	low Oregon grape	*Mahonia nervosa*	5-10%	1-2'
Plant Association	**Current Conditions**			
Snowberry/Nootka Rose thicket	**This plant association would be indicated along currently invaded edges with sun exposure. This would be a shrub community with the possibility of scattered and sparsely distributed trees set back from Park edges. Planting would be very dense.**			

	Common Name	Scientific Name	Approx. Proportion by % Cover	Plant spacing (avg.)
Trees (canopy)	Douglas fir	*Pseudotsuga menziesii*	individuals	10-20'
	grand fir	*Abies grandis*	individuals	10-20'
Shrubs	snowberry	*Symphoricarpos albus*	30-40%	2-3'
	Nootka rose	*Rosa nutkana*	30-40%	2-3'
	hazelnut	*Cornus cornuta*	10-15%	4-6'
	oceanspray	*Holodiscus discolor*	10-15%	4-6'
	thimbleberry	*Rubus parviflorus*	5-10%	2-3'
	red flowering currant	*Ribes sanguineum*	<5%	4-6'
	red osier dogwood*	*Cornus sericea*	10-20%	4-6'
	salmonberry*	*Rubus spectabilis*	20-30%	3-4'
	Sitka or Scouler willow*	*Salix sitchensis or Salix scouleriana*	10-20%	4-6'
* this species can be planted in moist pockets where seeps occur to replace the more upland species in this list				

Task 5: Evaluate existing new planting areas for coherence with native species palettes

Existing planted areas include species that are not native or may not be typical within the context of the site. Additionally individual plants may not be grouped with like species and in some cases could benefit from being relocated to create larger single or two-species clusters that are more typical of natural plant distribution patterns. Existing planting areas in Areas A, B, and G (west) should be evaluated to make sure that they meet VMP standards and achieve stated goals.

Task 6: Maintain all existing and new planting areas until establishment is apparent

Current new planting areas in Areas A, B, and G (west) should continue to be maintained with summer irrigation, wood chip mulch, and weed control as needed per GSP and Parks standards. All additional planting areas shall not be initiated without resources to provide establishment care. The geo-tech report done by Terra Associates (2010) suggests that for erosion control purposes all restoration activities that involve removal of vegetation should include placement of wood chip mulch or other erosion control material to stabilize slopes until plant establishment and permanent long-term erosion control is achieved. Irrigation is recommended to be done by hand for each individual plant rather than an automated unmonitored system to avoid adverse effects of broadcast watering onto steep slopes.

Task 7: Remove ground ivy

Ground ivy is particularly extensive throughout Areas D, E, and F. Currently it does provide protection for the surface soils in these areas, especially where there are few other plants except for canopy trees as in Area D (the Absent Shrub Layer) where there is virtually no vegetation but bigleaf maple canopy over ground ivy. Thus in steep areas removal should be incremental, and should be done in non-adjacent areas so as not to disturb an entire slope at one time. Terra Associates also suggests trying to perform vegetation removal on dry weather days. Timing removals for the summer low rainfall season will minimize damage to the slopes and upper soil layer, as well as reduce trampling and erosion during and immediately after work is done.

Task 8: Remove invasive cherry trees

Invasive Mazzard cherry trees occur throughout the Park, in even-aged stands and also as individual trees. These should be removed when possible along with other invasive shrub removal work. Trees less than 20' in height can be removed using the same methodology as for other invasive shrub species (laurel, holly); trees in excess of 20' height will be tree removals and stumps will also likely require herbicide treatment to prevent suckering. Trunks can be left as woody debris, branches can be chipped on site and spread.

Task 9: Snag or drop any hazardous or invasive trees to increase snags and LWD in Park

Any invasive or hazard trees that are removed can either be snagged at a safe height or left on the ground to increase snag and LWD density in the Park. This improves habitat quality as well as supporting beneficial decaying processes in the soil.

Task 10: Establish dense native shrub community along eastern edge

The eastern edge of the Park (part of Area G) offers an opportunity to establish a dense native shrub community with areas of trees set back from the right-of-way. Currently there is a mixture of invasive species (Himalayan blackberry, thistle, bindweed) and native species (salmonberry, thimbleberry, red osier dogwood) as well as some identified hazardous trees within the mixture of bigleaf maple, alder, and cherry. This disturbed edge is also always open to invasion by undesirable non-native species.

Planting here should focus on dense spacing of thicket-forming species: thimbleberry, Nootka rose (*Rosa nutkana*), snowberry, hazelnut, redflowering currant (*Ribes sanguineum*), with red osier dogwood and salmonberry in areas of moister soil or seeps. The disturbed edge extends an average of 50' westward into the forest – a newly established native shrub thicket could vary in width anywhere from 25-60'+ as microsite indicates. Management of large trees directly along the edge and within 50'of the right-of-way may continue to be challenging due to the sloughing toe of the slope and the presence of homes. For this reason, planting of large trees species within 25'+ of the eastern Park boundary may not be advisable.

Task 11: Add LWD by bringing in logs from offsite

Large wood can be imported as desired and installed in Park interior. Wood can also be used as part of slope stabilization, and/or to create planting pockets particularly for plant groupings such as hemlock/red huckleberry/salal that prefer richer soils with rotting wood. Installed wood should be dug into a shallow trench to ensure good soil contact with the log and also to ensure that wood remains in place.

Task 12: Create canopy gaps by selectively dropping or snagging maple trees to enable limited planting of Douglas fir

Removing some bigleaf maple in selected locations would open up the canopy enough to establish some pockets of Douglas fir plantings. This would expand the potential conifer composition of the forest to include a species which would not colonize under shade as hemlock and cedar do. Douglas fir can also be planted in areas that currently have openings such as the outer edges of Areas A and B as well as the eastern side of Area G. Any conifers planted along edges should be set back from the Park edge by at least 20'.

8.3 Implementation Timeline

Below is a suggested implementation timeline based on the prioritized actions and estimates of how long it will take to accomplish these tasks. It is expected that the basic plan has a 20 year implementation timeline, but that ongoing maintenance will extend beyond the 20 year period.

Table 5 Suggested Timeline for Task Implementation, Lewis Park

Years	Tasks to Work On	Tasks Completed
Years 1-2	1, 3, 5, 6	1, 3, 5
Years 2-5	2, 4, 6, 7, 8, 9, 10, 11	8
Years 5-10	2, 4, 6, 7, 9, 11, 12	2, 7
Years 10-20	4, 6, 9, 11, 12	11, 12
ongoing past Year 20	4, 6, 9	

Section 9: Monitoring

Project monitoring is to be done per GSP protocol. Monitoring procedures are already well-documented elsewhere and are not repeated in this VMP.

Section 10: References and Appendices

References

City of Seattle Department of Parks and Recreation, ***Best Management Practices for Natural Areas***, 2008 (in press).
City of Seattle Department of Parks and Recreation, ***Cheasty Greenspace Vegetation Management Plan***, 2003.

City of Seattle Department of Parks and Recreation, ***Sherwood History Files,*** undated.

City of Seattle Department of Parks and Recreation, ***Tree Management, Maintenance, Pruning and/or Removal - #060-P 5.6.1***, 2001

City of Seattle Department of Parks and Recreation., ***Urban Wildlife and Habitat Management Plan***, 2004.

Green Seattle Partnership, ***20 Year Strategic Plan***, 2006.

Green Seattle Partnership, ***Forest Stewards Field Guide Final Draft***, 2009.

Stonehedge Tree Experts Inc., ***Lewis Park Tree Risk Assessment***, 2010.

Terra Associates, Inc, ***Geologically Hazardous Areas Review – Lewis Forest Park Restoration***, 2010.

Appendices

Terra Associates, Inc. - Geologically Hazardous Areas Review – Lewis Forest Park Restoration

Stonehedge Tree Experts, Inc. – Tree Risk Assessment Report

Public Information Process and Citizen Comment

Existing Plant Species

Terra Associates, Inc. - Geologically Hazardous Areas Review – Lewis Forest Park Restoration

(first 6 pages of report + maps – please refer to complete report for soil logs)

TERRA ASSOCIATES, Inc.

Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

January 21, 2010
Project No. T-6389

Ms. Diane Dunbar
Friends of Lewis Park
c/o NBHC
3211 Beacon Avenue South, Suite #14
Seattle, Washington 98114

Subject: Geologically Hazardous Areas Review
Lewis Forest Park Restoration
Golf Drive South
Seattle, Washington

Dear Ms. Dunbar:

As requested, we have conducted a review of geologically hazardous areas for the Lewis Forest Park site. The location of the site is shown on the attached Figure 1. Our scope of work included a visual site reconnaissance, on-site exploration, and review of all available geologic documentation. Our study addresses geologic hazards as described in the City of Seattle Municipal Code. It also includes analysis of slope stability along three profiles on the existing slope. The results of these analyses are used to address potential erosion, steep slope, and landslide hazards as they relate to restoration of the park.

SITE CONDITIONS

The site is a predominantly east-facing hillside with a narrow plateau along its western margin. The topographic information provided to us indicates the slope is approximately 50 to 80 feet high, with inclinations ranging between about 20 and 90 percent. The site is bordered to the west by Golf Drive South and 15th Avenue South, to the north by South Charles Street, and to the east and south by residential lots. At the toe of the slope exists a partially graded and gravel surfaced alleyway that provides access to the southern and northern most down-slope residences.

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Ms. Diane Dunbar
January 21, 2010

The northern quarter of the property has been reworked. This portion of the site is gently to moderately sloping. We observed two areas of fill or graded soil. One area observed consists of a circular berm creating a small interior depression. The second area, located at the transition to the steeper untouched southern three quarters of the site, ramps up to the south to a level pad separating upper and lower portions of the slope. Trees appear to have been thinned and the area stripped of nearly all previously existing undergrowth. Older growth Alder and Maple trees are scattered throughout the northern quarter with new plantings consisting of coniferous trees, bushes, shrubs and groundcover (hemlock, cedar, spruce, snow berry, rose, salal, and fern). Bark covered walking trails lined with tree limbs meander throughout this portion of the site. A semi-flexible, approximately one-inch diameter tightline pipe has been placed from the northern end of the site to a small water storage container, near the intersection of Golf Drive South, 15th Avenue South, and 14th Avenue South. Water spickets are attached at regular intervals.

The southern three quarters of the property varies in inclination and vegetation throughout. In general, vegetation consists of a thick to moderate growth of Maples with thick underbrush and groundcover. Underbrush consists mostly of holly, salal, Oregon grape, and wax myrtle. Groundcover consists almost entirely of ivy with scattered fern. We observed a small stand of Birch trees in the upper plateau portion of the slope near the southwest corner of the site. Blackberry and nettles were observed in the flatter lower portions of the slope toward the slopes toe. We observed the existing utility easements to be nearly void of shrubs or bushes. Based on City of Seattle Sewer cards, these utilities were installed in the mid 1920s. We also observed garbage, and occasional concrete debris littered throughout the southern three-quarters of the site.

We did not observe indications of deep-seated instability; however, portions of the slope have been subjected to shallow erosion, creep, and localized sloughing. These conditions are generally limited to the forest litter and relatively loose surficial soils mantling the underlying competent soils, and are commonly associated with natural weathering occurrences on steep slopes. All of the erosional features we observed on the steep slope appear to be a result of surface water runoff and shallow interflow from areas above the slope crest, and flatter areas above the toe of the slope.

GEOLOGIC CONDITIONS

On December 10, 2009, we visited the site to perform a reconnaissance of the slope. On December 17, 2009, we revisited to perform our subsurface exploration. We excavated 4 test pits to depths ranging from about 8 feet to 8.5 feet and 6 hand augers to a maximum depth of 4 feet below the existing ground surface. Test pits were excavated at the top of the slope, along the flatter western margin of the site. In general, we observed loose to medium dense sand and silty sand. Test Pit TP-3 found uncontrolled fill, consisting of organics, ash, and charred bits, to a depth of 2 feet grading down slope to 3 feet below existing surface grade. Hand augers found topsoil and topsoil fill from three inches to two feet in thickness overlaying silty sand and silt. Silt is exposed in the cut face at the toe of the slope along the alleyway on the southern end of the site.

Ms. Diane Dunbar
January 21, 2010

The native soils are generally moist below a depth of about three feet. We observed wet soils to a depth of about 4.5 feet in Test Pit TP-1. Soils in and around the area of TP-1 were wet enough that vibration during excavation was felt under foot. We did not observe indications of significant groundwater seepage on the slope; however, we observed the exposed silt soils at the southern half of the toe of the steep slope were wet, and sloughing in places. The wet conditions at this location appear to be from surface runoff from areas above, and possibly from seasonal perched groundwater following roots and emerging out the face of the cut toe of the slope.

The *Geologic Map of Seattle – a Progress Report, Seattle, Washington* by K.G. Troost, D.B. Booth, A.P. Wisher, and S.A. Shimel, 2005, maps the soils at the site as Advanced Outwash (Qva) resulting from mass wastage in the northern and majority of the site becoming landslide deposits in the southern margin. Lawton Clay (Qvlc) is the mapped geology at and beyond the toe of the slope. It is possible that due to their density and consistent grain size that the surficial sands were potentially deposited as a result of past landsliding however, the soils were void of organic and granular debris normally included in landslide debris.

Detailed descriptions of the subsurface conditions encountered in the test pits and hand augers are presented on the attached Test Pit and Hand Auger Logs in Appendix A. The approximate locations of the test pits and hand augers are shown on the attached Figure 2.

GEOLOGICALLY HAZARDOUS AREAS

Section 20.09.020 (A)(1) of the City of Seattle Municipal Code (SMC) defines geologically hazardous areas as liquefaction-prone areas, landslide-prone areas (including steep slope areas), peat settlement-prone areas, seismic hazard areas, and volcanic hazard areas.

Liquefaction-Prone Areas

Section 20.09.020 (A)(2) of the SMC defines liquefaction-prone areas as those areas "underlain by cohesionless soils of low density, usually in association with a shallow groundwater table, that loose substantial strength during earthquakes".

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in pore water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction; thus, eliminating the soil's strength.

The soils we observed at the site consist of fine loose to medium dense sand becoming medium dense silty sand terminating in medium stiff silt. Due to the lack of subsurface groundwater within the fine grained sands and the cohesive nature of the underlying silt, it is our opinion that there is a minimal risk for soil liquefaction to occur at the site.

Ms. Diane Dunbar
January 21, 2010

Landslide-Prone Areas

Section 25.09.020 (A)(3)(a) of the SMC, defines landslide-prone areas as, "…known landslide areas identified by documented history, or areas that have shown significant movement during the last ten thousand years or are underlain by mass wastage debris deposited during this period; or potential-landslide areas….". Potential-landslide areas include but are not limited to the following:

(b.)(1) "Those areas that are described as potential slide areas in "Seattle Landslide Study" (Shannon & Wilson, 2000 and 2003)."

(b.)(2) "Areas with indications of past landslide activity, such as landslide headscarps and sidescarps, hummocky terrain, areas with geologic conditions that can promote earth movement, and areas with signs of potential landsliding, such as springs, groundwater seepage, and bowed or backtilted trees."

"(b.)(5) "Slopes with an incline of 40 percent or more within a vertical elevation change of at least 10 feet."

The South Seattle Vicinity Map, Figure C-8 of the *Seattle Landslide Study* shows the site to be less than 100 feet south and west of the nearest recorded landslides. According to this study, the northern extent of the site is located within a landslide prone area with the entire site identified as having landslide potential.

During our site visit, we did not observe on-site indications of deep-seated instability, springs, or groundwater seepage on the steep slopes. As discussed, we observed relatively shallow erosional features and localized shallow sloughing or creep at isolated locations. Due to its geologic mapping, local landslide study, presence of shallow ground movement features, and slope inclinations, the site would be considered a landslide prone area pursuant to Items 1, 2, and 5.

Steep Slope Areas

Section 20.09.020 (A) (4) of the SMC defines steep slope areas as those areas with slopes inclined at 40 percent or greater with in a vertical elevation change of at least 10 feet. The southern two thirds of the site is inclined at gradients generally greater than 40 percent and; therefore, meets requirements as stated in the SMC as a Steep Slope.

Stability Analysis

We performed our stability analyses using the computer program WINSTABL. The soil parameters used are shown on the attached analysis plots and output text in Appendix B. These parameters are based on field and laboratory data, and our past experience with similar soils. Analyses of the slope were performed along three section lines identified on the attached Figure 3 as Section A-A' through Section C-C'. Our analyses of these sections considered both static and pseudostatic (seismic) conditions for the existing slopes. A horizontal acceleration of 0.20g was used in the pseudostatic analysis to simulate slope performance under earthquake loading.

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January 21, 2010

The lowest safety factors for each condition are presented in the following table:

Section Analyzed	Minimum Safety Factors	
	Static	Pseudostatic
Section A-A'	1.57	1.13
Section B-B'	1.76	1.30
Section C-C'	2.16	1.32

The results of the stability analyses indicate that acceptable factors of safety against global or deep-seated landslides occurring on the property are present under current conditions.

Peat Settlement-Prone Areas

Section 20.09.020 (A)(5) of the SMC defines peat settlement-prone areas as those areas as delineated on Maps A1 through A26 of the Peat Settlement-prone Area Boundaries Maps. Based on review of the 2007 Peat Settlement-prone Area Boundaries Map A-14, the site is not located within a peat settlement-prone area.

Seismic Hazard Areas

Section 20.09.020 (A)(6) of the SMC defines seismic hazard areas as liquefaction-prone areas and also include but are not limited to the following:

(a.) "Areas of the City subject to ground shaking from seismic hazards that are addressed by the Building Code (SMC Title 22)."

(b.) The Seattle Fault zone as delineated in Troost et al., 2005, the geologic map of Seattle, a progress report, U.S. Geological Survey, Open-file report 2005-1252 or as the Director determines is more accurately mapped by the U.S. Geological Survey, as set our in a Directors Rule."

The January 2007 Director's Report and Recommendation titled "Amendments to the Geologic Hazards Areas Designation of the Environmentally Critical Areas Regulations" states that the Seattle Fault Zone is to be considered a geologic hazard area. Based on review of the 2007 Seattle Fault Zone map by the Department of Planning and Development (DPD) for the City of Seattle, the site lies within the Seattle Fault Zone. Per, Exhibit A to the Geologic Hazard Areas Designation Ordinance, this fault is said to be a "5 to 7 km-wide east-west trending zone of south-dipping thrust faults, north-dipping backthrusts, and folds. This fault is an active fault, inferred to have been active during the Holocene epoch in the last 10,000 years". No historic earthquakes (within the last 150 years) have been caused by or associated with deformation or surface rupture along a fault or fold in Washington State.

Based on the soil and groundwater conditions we observed in our on-site explorations, and the results of our stability analysis, it is our opinion that the risk for severe damage resulting from seismically induced landslides, earth adjustments, and settlement is low.

Ms. Diane Dunbar
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Volcanic Hazard Areas

Section 20.09.020 (A) (7) of the SMC defines volcanic hazard areas as, "...areas subject to inundation by lahars or related flooding resulting from volcanic activity to Mount Rainer, as delineated by the U.S. Geological Survey in Hoblitt, et al., 1998, Volcano Hazards from Mount Rainer, Washington, Revised 1998: U.S. Geological Survey Open-File Report 98-428, or as the Director determines are more accurately mapped by the U.S. Geological Survey, as set out in a Director's Rule".

The January 2007 Director's Report and Recommendation titled *Amendments to the Geologic Hazards Areas Designation of the Environmentally Critical Areas Regulations* states that the "based on the best available science review, lahars represent a known or suspected risk to Seattle...". Per, the Department of Planning and Developments Exhibit A to the Geologic Hazard Areas Designation Ordinance, dated January 31, 2007, "Mount Rainer represents the only active volcano that may pose a hazard to the City of Seattle from lahar activity". The report indicates that the City of Seattle will most likely be subject to secondary or "post-lahar sedimentation" impacts from a Case II lahar rather than direct damage. According to *Plate II of the Open-File Report* contained in the *Volcano Hazards from Mount Rainier, Washington* by Hoblitt et al., the site is within an area that is estimated to have an "annual probability of the deposition of 1 centimeter" of 0.1 to 0.02 percent.

Due to the unknown and unpredictable nature of a volcanic eruption and the relatively minor secondary effects posed to the site, it is our opinion that the volcanic hazard at the site is low.

Erosion Hazard Areas

Due to existing erosion features, and classification as a landslide and steep slope hazard, it is our opinion that the site would also classify as an Erosion Hazard Area. We observed several areas of past and ongoing surficial erosion at the toe, along foot trails within the slope, and occasionally near the top of the slope. One area in particular has been improved using wooded terraces. This area is inclined at approximately 80 to 90 percent with no groundcover vegetation. Maple leaves are scattered across the surface. Wood limbs have been staked in place creating approximately eight terraces. Slight, but ongoing erosion of the surface organics and sandy topsoil is visible. Analysis using the Universal Soil Loss Equation indicates that under current conditions erosion results in the transport of approximately 2.5 tons of soil from the site per year of which approximately 30 percent is from the restored northern quarter of the site. The equation indicates that maintaining 75 percent or greater tree canopy and 70 percent or greater forest litter with managed undergrowth will aid in maintaining soil erosion losses to current levels.

In our opinion, proper implementation and maintenance of Best Management Practices (BMPs) for erosion and sediment control will adequately mitigate the erosion potential at the site. Restoration activity on the site involving removal of existing vegetation cover and possibly minor grading will need to consider implementing appropriate temporary erosion control measures to mitigate erosion in the short-term while the newly planted native vegetation establishes.

DISCUSSION

Based on the results of our analysis of current site conditions, we conclude the property is stable with respect to mass movement of soil due to a deep-seated slope failure. Soil movement we observed was typically shallow slope creep and surface erosion involving only the near-surface soil horizon. In our opinion, site activities associated with restoration of native vegetation with minimal grading will not impact this current stability.

Ms. Diane Dunbar
January 21, 2010

The existing forest litter and thick growth of ivy significantly reduces soil erosion. The old growth Maple trees at the site contribute to a majority of the forest litter. Their large leaves and wide reaching branches provide much needed rain droplet dampening lowering the slopes potential for soil loss. Based on our observation of the already restored northern quarter, we anticipate that remaining park native plant restoration will involve disturbance of the forest litter and removal of evasive species such as the existing ivy. Trees and underbrush will also be thinned allowing for planting of new evergreen trees and underbrush native to the northwest. In our opinion, this restoration would adequately protect the shallow soil horizon and maintain soil losses at their current level once established. However as noted above until firmly established, additional temporary ground cover elements may need to be implemented to reduce erosion in the short-term.

Restoration efforts should take place in small, inconsecutive areas so as not to disturb the entire slope at one time. New plantings should be allowed to firmly establish themselves, providing permanent erosion control, prior to beginning secondary portions. We recommend that clearing of evasive groundcover, underbrush, and thinning of larger trees be limited to dry weather days. Individual new plantings may be installed if soils are stabilized immediately after. Every effort must be made to limit the exposure of bare soils on the slope.

Depending on the final restoration plans, erosion measures such as terraces, wattling, contour brush-layering, and placement of jute or woven fabrics may be used. An interceptor drain in the flatter area along the toe of the slope may also be recommended. We recommend that no permanent, unmonitored, watering system be installed. Watering should be done by hand and should be limited to each individual planting. Motorized equipment traversing the slope during restoration should also be limited with most of the restoration work completed by hand labor when practical.

Terra Associates, Inc. looks forward to reviewing the proposed restoration plans once available. At that time, we will provide additional geotechnical recommendations for implementation. We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

Jessica M. [illegible], E.I.T.
Staff Geotechnical Engineer

1-21-10

Theodore J. Schepper, P.E.
Principal

Encl: Figure 1 – Vicinity Map
Figure 2 – Exploration Location Plan
Figure 3 – Cross Sections & Soils Map
Figure 4 – Geologic Hazard Areas Map
Appendix A – Unified Soils Classification System
Test Pit & Hand Auger Logs
Sieve Analyses
Appendix B – WINSTABL Output Data

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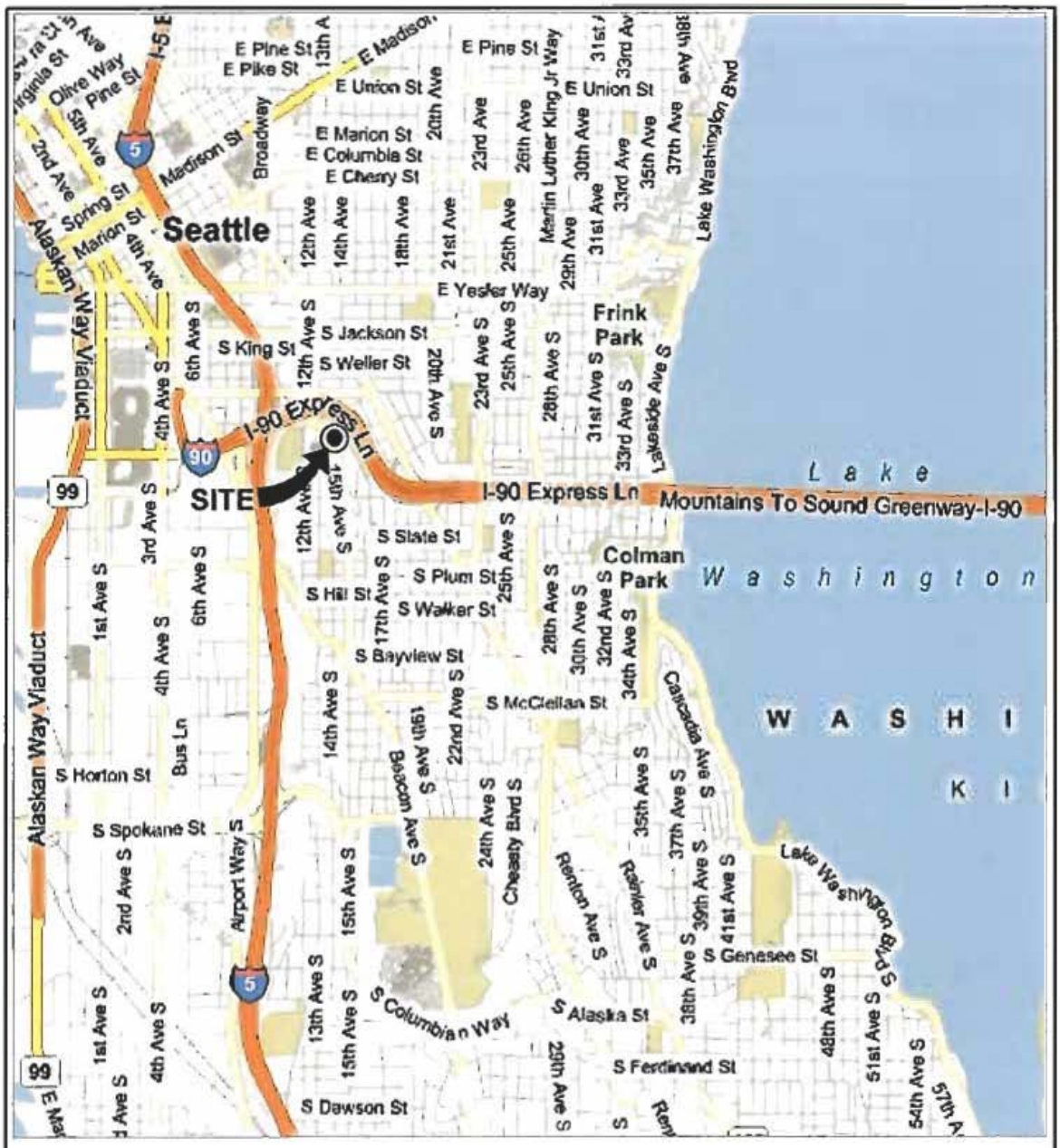
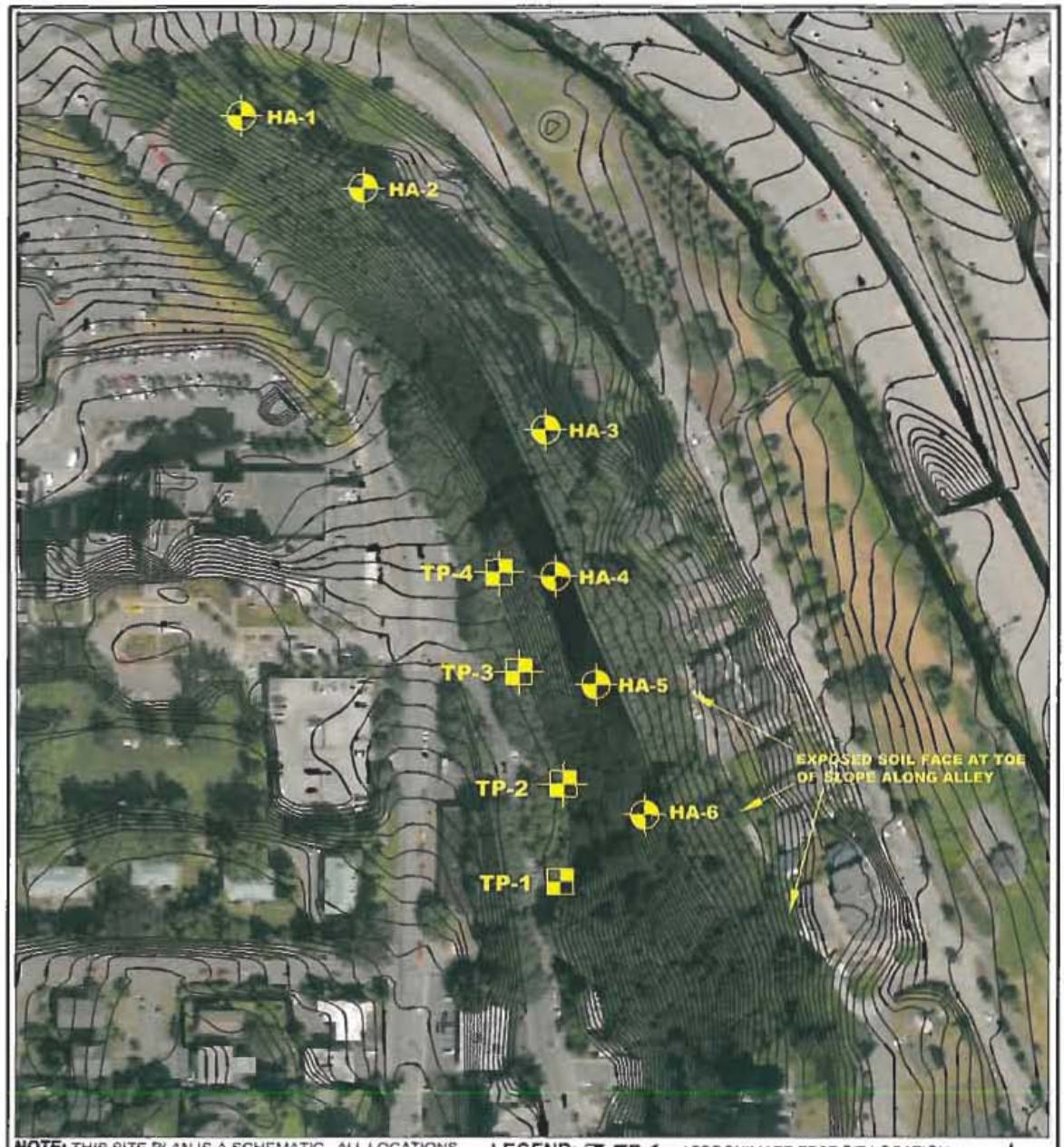
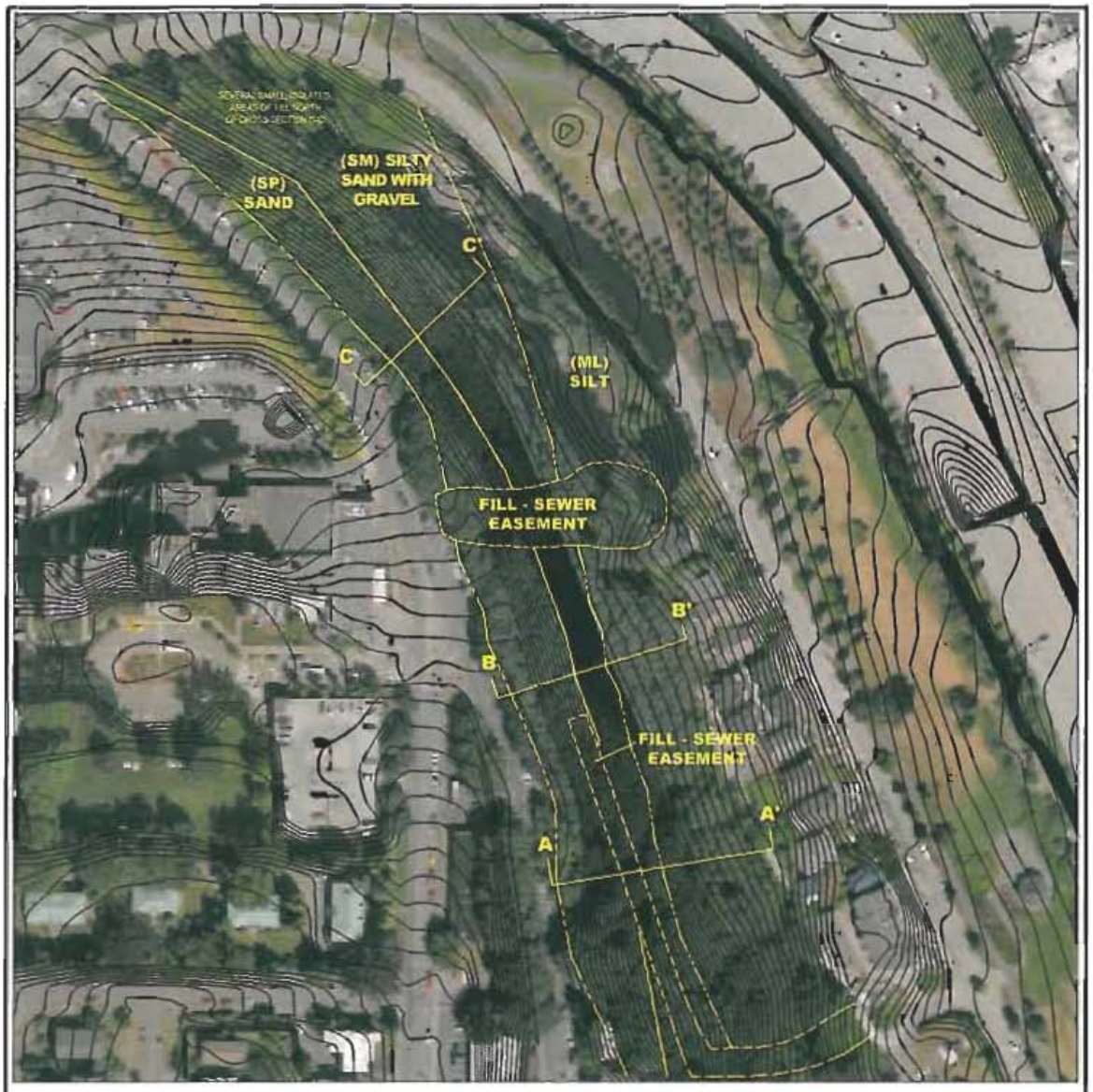


Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences

VICINITY MAP
LEWIS FOREST PARK RESTORATION
SEATTLE, WASHINGTON

Proj. No.T-6389	Date JAN 2010	Figure 1

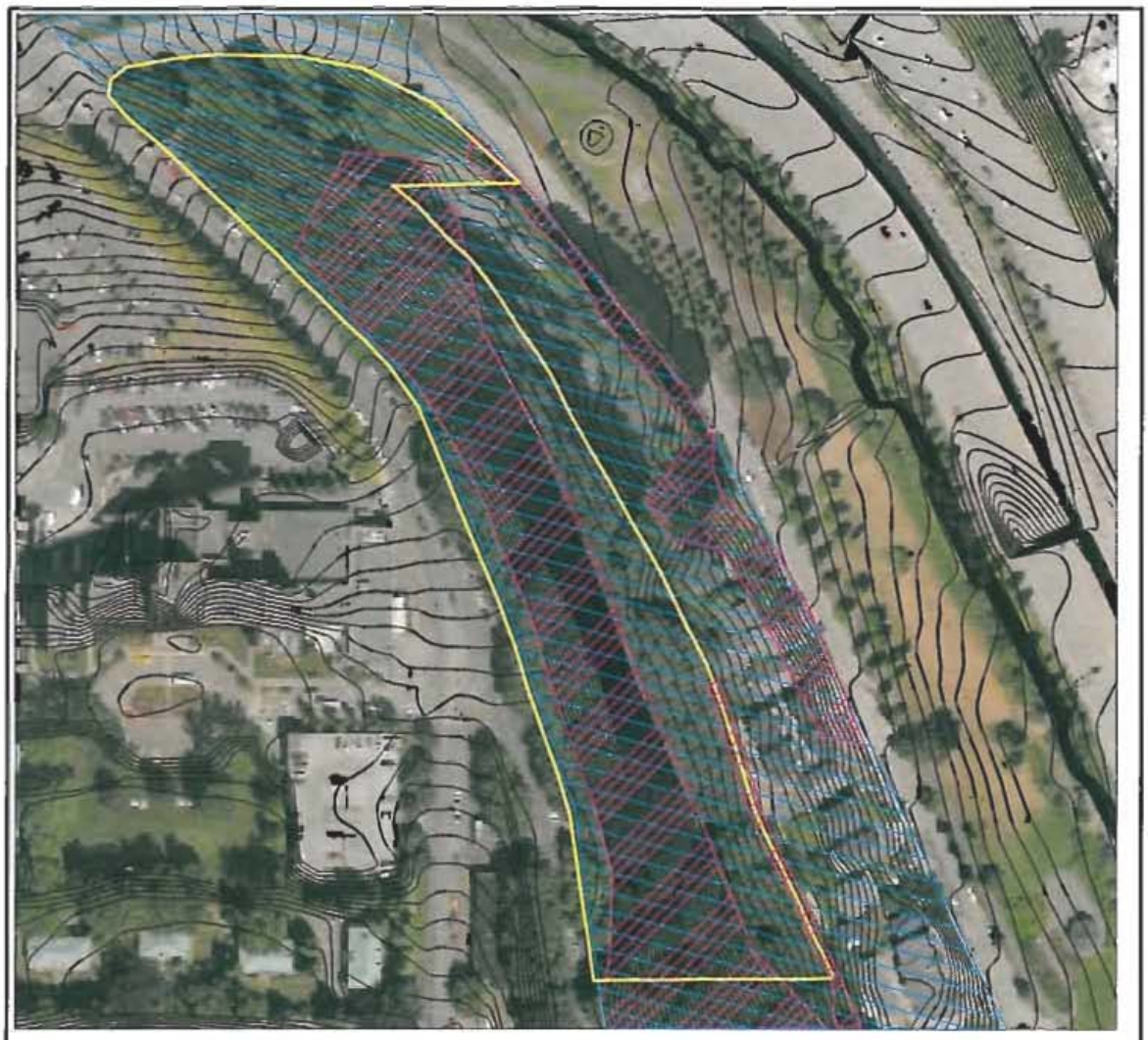

HA-1
HA-2
HA-3
TP-4
HA-4
TP-3
HA-5
EXPOSED SOIL FACE AT TOE OF SLOPE ALONG ALLEY
TP-2
HA-6
TP-1
NOTE: THIS SITE PLAN IS A SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY.
LEGEND: TP-1 APPROXIMATE TEST PIT LOCATION
HA-1 APPROXIMATE HAND AUGER LOCATION
REFERENCE: SITE PLAN IS OVERLAY OF LIDAR CONTOURS, PROVIDED BY THE FRIENDS OF LEWIS FOREST PARK, ON AERIAL MAP FROM KING COUNTY iMAP ACCESSED ON DECEMBER 14, 2009
NOT TO SCALE
Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences
EXPLORATION LOCATION PLAN
LEWIS FOREST PARK RESTORATION
SEATTLE, WASHINGTON
Proj. No.T-6389
Date JAN 2010
Figure 2



NOTE:
SOIL MAP IS APPROXIMATE. ELEVATIONS AND LOCATIONS ARE BASED ON DOCUMENT REVIEW, SITE OBSERVATIONS AND SHALLOW EXPLORATIONS. FILL LOCATIONS ARE APPROXIMATE, BASED ON SITE OBSERVATIONS AND CITY OF SEATTLE SEWER CARDS ON LINE. IT IS INTENDED FOR REFRENCE ONLY.

NOT TO SCALE

Terra Associates, Inc. Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences	CROSS-SECTIONS & SOILS MAP LEWIS FOREST PARK RESTORATION SEATTLE, WASHINGTON	
	Proj. No.T-6389	Date JAN 2010	Figure 3



LEGEND:

APPROXIMATE STEEP SLOPE HAZARD AREAS

APPROXIMATE LANDSLIDE HAZARD AREA

APPROXIMATE PROPERTY BOUNDARY

NOTES:

1. AS A RESULT OF LANDSLIDE AND STEEP SLOPE HAZARDS, IT IS OUR OPINION THAT THE ENTIRE SITE WOULD ALSO BE CLASSIFIED AS AN EROSION HAZARD AREA.
2. THIS MAP IS A SCHEMATIC AND FOR REFRENCE ONLY. ALL HAZARD AREAS ARE APPROXIMATE AND BASED ON SITE OBSERVATIONS AND THE PROVIDED LIDAR CONTOUR MAP.

N

NOT TO SCALE

Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences

GEOLOGIC HAZARD AREAS
LEWIS FOREST PARK RESTORATION
SEATTLE, WASHINGTON

Proj. No.T-6389	Date JAN 2010	Figure 4

Stonehedge Tree Experts, Inc. – Tree Risk Assessment Report

Stonehedge Tree Experts, Inc.

4000 SW Myrtle St. Seattle, WA 98136
Tel: 206.937.7428 Fax: 206.937.4939
Email: info@Stonehedgetree.com

6/2/2010

Lana Krisman
Seattle Parks and Urban Forestry
206. 684.7566
206.310.2936

Re: Lewis Park Tree Risk Assessment

Dear Lana,

During the week of June 9, 2010 I had the pleasure of inspecting the trees along the northern and eastern side of Lewis Park for hazard potential. The following report will document the risk factors and help prioritize the risk reduction activities needed to maintain the park and homes from future in a safe condition.

Lewis Park is situated on the north-eastern edge of Beacon Hill, bordered on the west by Golf Drive S and on the east by homes situated above Sturgus Ave S. The Park consists predominately of an even age stand of Big Leaf Maple (Acer macrophylum) with a few Cottonwood, Alder and Mazzard Cheery trees. The hillside slopes down to the east ending at an old alley easement that does not go through from the north to south. Just below the alley easement there are homes with back yards backing up the Park. The northern end of the park has had work crews remove invasive species and replant native shrubs. As one walks further south the park gets thick with holly, blackberrys, ivy and homeless camps.

The trees generally are in good shape. Most of the edge trees have heavier canopies on the eastern side stretching for light toward the neighboring properties. These trees are in the lee of the prevailing wind being protected by the forest above. I did not see wind damage as a big problem in this forest though there was one large open grown tree in the center of the park which had recently lost one half the tree due to an included co-dominate stem failure . Other structural problems were observed related to included stems and weak attachments typical of the Maple species. There were a few trees with large open cavities, some having 30% and greater hollows or decayed wood. Hypoxylon and Armillaria; two wood rotting fungi were found in the root-crown area of some trees. I have noted that further investigation is needed on some to determine the extent of the wood decay.

There were approximately 25 trees that had obvious defects that could lead to potential problems. These trees have been identified with a numbered aluminum tag, located by GPS, and visually assessed for defects and hazard potential. This information has been tabulated into a Tree Risk Assessment Form.

Tree Risk Assessment work is based upon the ability to observe and analyze the external parts of the tree – typically the trunk, visible roots, canopy, foliage, lean, crown architecture, and site history. This is called the Visual Tree Assessment process. This guides the assessor through a systematic and defined process to rank several factors, and sum these rankings to give a sense of overall risk levels. The typical factors ranked are:

- Size of the component part that might fail
- Probability of failure
- Probability of a target being hit in the event of failure
- Damage/harm likely to result to the target

These attributes are given a numerical value to help establish a ranking of which trees are the most hazardous (extreme risk) and require immediate attention. I have used a 12 point rating system; 3 to 5 points = Low risk, 6-8 points =Moderate risk, 9-11 points = High risk, and 12 points = Extreme Risk. The point system will give a way of prioritizing the tree work needed.

Thank you for the opportunity to help manage the urban forest. If there is anything I have not covered please do not hesitate to contact me.

Respectfully yours,

Mark Harman Certified Arborist and Certified Tree Risk Assessor
Stonehedge Tree Experts, Inc.

Attachments:

Tree Risk Assessment Forms
Lewis Park GIS Map with Tree Numbers
Tree Assessment Forms

Assumptions & Limiting Conditions

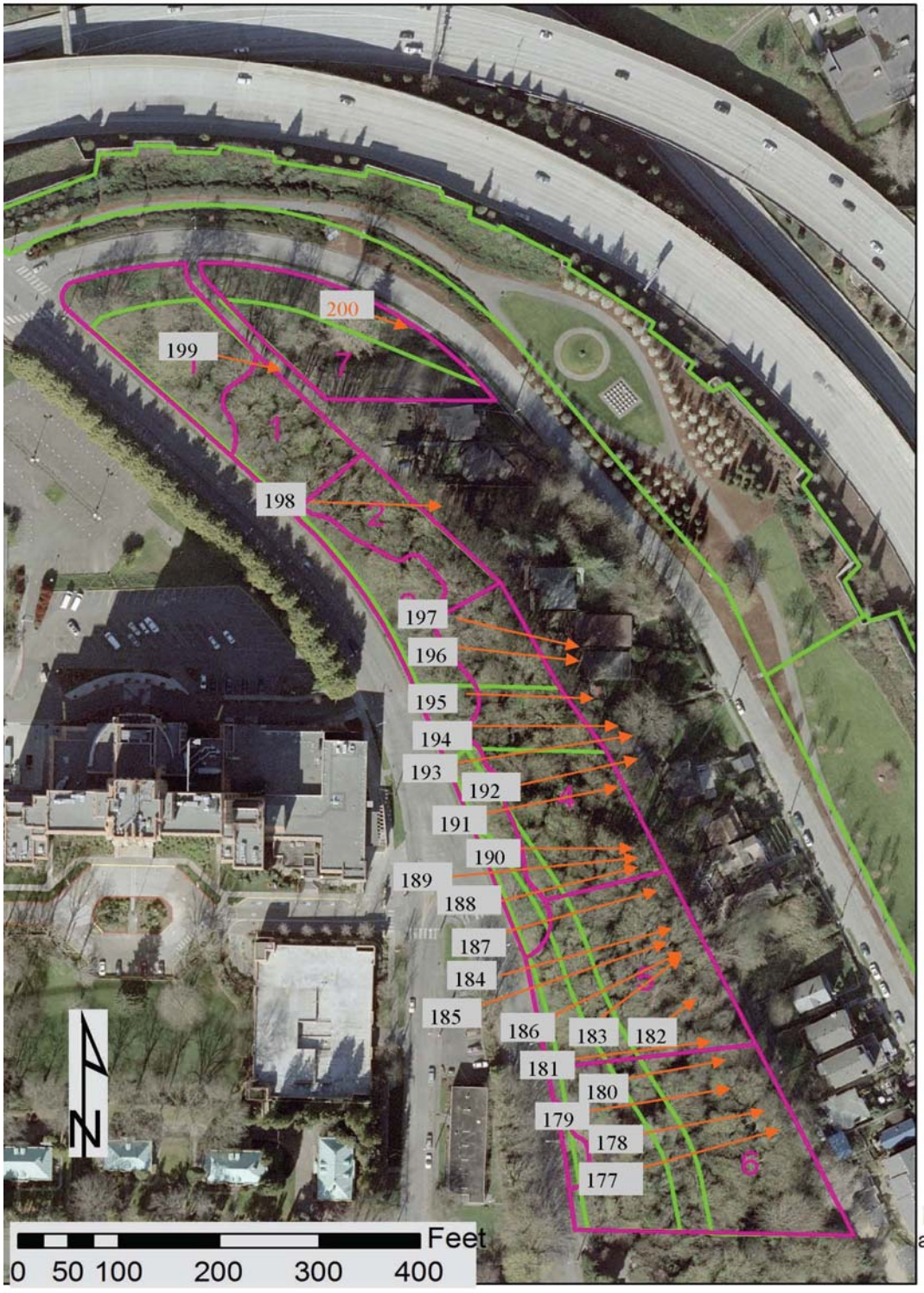
Unless otherwise agreed, information contained in this report covers only the items examined and reflects the condition of those items at the time of inspection; and the inspection is limited to visual examination of accessible items without dissection, excavation, probing, climbing or coring. Consultant makes no warranty or guarantee, express or implied, that the problems or deficiencies of the plans or property in question may not arise in the future.

Stonehedge Tree Experts, Inc. Mark Harman www.stonehedgetree.com
4000 SW Myrtle St. Seattle, WA 98136 Certified Arborist Phone 206.937.7428 Fax 209.937.4939
Lewis Park Risk Assessment

GREEN SEATTLE PARTNERSHIP

City of Seattle

Lewis Park



1) North
2) Central North
3) Central West
4) Central
5) Central South
6) South
7) The Triangle

#1B

TREE RISK ASSESSMENT FORM

TREE #	COMMENTS
#197	HAS ORANGE PAINT ON TRUNK
#195	DECAY IN STEM – DISEASE CENTER W/ HYPOXYLON
#194	REMOVE IVY / CLIMB TO INSPECT FOR STEM INCLUSION – IF IINCLUDED UNWEIGHT EAST STEM BY REMOVING LIMBS
#193	HYPOXYLON ON ROOT SYSTEM – WOULD FALL IN VACANT LOT

#1

TREE RISK ASSESSMENT FORM LOCATION: Lewis Park DATE: 06/07/10 ASSESSOR NAME: Mark Harman CTRA 508#

TREE #	SPECIES	DBH	LOCATION Details	DEFECTS Description	PROBABILITY OF FAILURE 1-5 points	SIZE OF PART 1-3 points	TARGET RATING 1-4 points	OTHER FACTORS	OVERALL RISK RATING 3-12 points	TREATMENT RECOMMENDED	ACTION COMPLETED Date & Initial
200	Alder	27/27/27	47°35.646N 122°18.929W	DEAD TOPS	4	2	1		7	Remove DEAD TOPS	
199	Maple	25	" .634N .921W	INCLUDED STEMS	3	2	1		6	MONITOR	
198	Maple	15"	" .629N .911W	Hollow Stem W/CAVITY	2	2	1		5	MONITOR	
197	Maple	20	" .597N .865W	LARGE CAVITY	4	3	4	WOULD HIT HOUSE	11	SNAG/ Remove	
196	Maple	19/30	" .594N .865W	INCLUDED STEM	2	2	4	COULD HIT HOUSE	8	SHORTEN STEM	
195	Maple	16	" .592N .862W	STEM/Root DECAY	1	2	3		6	MONITOR FOR DECAY	
194	Maple	40	" .589N .863W	POSSIBLE STEM INCLUSION	2	3	4	WOULD HIT HOUSE	9	INSPECT Further	
193	Maple	28	" .586N .860W	ROOT DECAY	2	3	1		6	MONITOR	
192	Maple	30	" .576N .850W	DECLINING 10" STEM	2	2	3		7	MONITOR	
191	Maple	42	" .574N .850W	16" CO-DOMINATE STEM	4	2	1		7	SNAG TOP	
190	Maple	10	" .564N .837W	DECLINING TREE	4	2	2		6	SNAG TREE	
189	Maple	24/30	" .556N .840W	Hypoxylon on Root/Crown	1	2	4	DISEASE center		INSPECT Further	
188	Maple	30/12/16	" .560N .836W	ROOT ROT DEAD STEM	4	3	3		10	Remove CLUMP	
187	Maple	28	" .558N .830W	Root ROT	2	3	3		8	MONITOR	

ISA PACIFIC NORTHWEST CHAPTER

#2B

TREE RISK ASSESSMENT FORM

TREE #	COMMENTS
184, 185, 186	REMOVING #185 WILL HAVE an IMPACT ON the REMAINING TREES MAY WANT TO SNAG OR REMOVE THEM ALL
182	DECAY <u>NOT</u> IN Plane of LEAN - investigate to Determine extent of DECAY - Lots of Armillarea

ISA PACIFIC NORTHWEST CHAPTER

The Overall Risk Rating and Action Thresholds

Risk Rating	*Risk Category*	*Interpretation and Implications*
3	Low 1	Insignificant - no concern at all.
4	Low 2	Insignificant - very minor issues.
5	Low 3	Insignificant - minor issues not of concern for many years yet.
6	Moderate 1	Some issues but nothing that is likely to cause any problems for another 10 years or more.
7	Moderate 2	Well defined issues - retain and monitor. Not expected to be a problem for at least another 5 - 10 years.
8	Moderate 3	Well defined issues - retain and monitor. Not expected to be a problem for at least another 1 - 5 years.
9	High 1	The assessed issues have now become very clear. The tree can still reasonably be retained as it is not likely to fall apart right away, but it must now be monitored annually. At this stage it may be reasonable for the risk manager/owner to hold public education sessions to inform people of the issues and prepare them for the reality that part or the entire tree has to be removed.
10	High 2	The assessed issues have now become very clear. The probability of failure is now getting serious, or the target rating and/or site context have changed such that mitigation measures should now be on a schedule with a clearly defined timeline for action. There may still be time to inform the public of the work being planned, but there is not enough time to protracted discussion about whether or not there are alternative options available.
11	High 3	The tree, or a part of it has reached a stage where it could fail at any time. **Action to mitigate the risk is required within weeks rather than months.** By this stage there is not time to hold public meetings to discuss the issue. Risk reduction is a clearly defined issue and although the owner may wish to inform the public of the planned work, he/she should get on with it to avoid clearly foreseeable liabilities.
12	Extreme	This tree, or a part of it, is in the process of failing. **Immediate action is required.** All other, less significant tree work should be suspended, and roads or work areas should be closed off, until the risk issues have been mitigated. This might be as simple as removing the critical part, drastically reducing overall tree height, or taking the tree down and cordoning off the area until final clean up, or complete removal can be accomplished. The immediate action required is to ensure that the clearly identified risk of harm is eliminated. For areas hit by severe storms, where many extreme risk trees can occur, drastic pruning and/or partial tree removals, followed by barriers to contain traffic, would be an acceptable first stage of risk reduction. There is no time to inform people or worry about public concerns. Clearly defined safety issues preclude further discussion.

The Table shown above outlines the interpretation and implications of the risk ratings and associated risk categories. This table is provided to inform the reader about these risk categories so that they can better understand any risk abatement recommendations made in the risk assessment report.

Public Information Process and Citizen Comment

Existing Plant Species