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Arborist Assessment Memo

Prepared For:

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Vancouver Board of Parks and Recreation
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Site Address:

Stanley Park, Vancouver

December 5, 2024

Prepared By:

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Contents

Introduction

Davey Resource Group (DRG) was retained by the Vancouver Board of Parks and Recreation to prepare a memo assessing the condition of tree stands within certain areas of the southwest portion of Stanley Park.

Over a period between 2019 and 2023, the Western hemlock looper moth (*Lambdina fiscellaria)* infestation has impacted much of the Lower Mainland and has led to extensive defoliation caused by the feeding of the looper moth larvae on Western hemlock, and to lesser extent Douglas fir and Western Red cedar within Stanley Park.

Several reports and studies have been prepared discussing the impact of the looper moth outbreak on the Park, along with the associated risk to public safety and wildfire hazards. A mitigation plan, including a timeline, was developed and is currently being implemented. The Project Area, that is within the southwestern portion of the park, is scheduled for treatment in Quarter 4, 2025.

DRG was asked to conduct a Level 1[1] walk through of the Project Area and provide an opinion on whether the current schedule for mitigation within the Project Area is suitable or needs to be accelerated. "Generally, it is a good idea to inspect trees with known structural weaknesses and or high-value targets after major storms…"[1]

Current weather events, such as the 'bomb cyclone' have impacted the stability of the dead trees. The Project Area contains sections that experience heavy pedestrian and vehicle use during the summer months. To mitigate public hazards prior to the summer of 2025, work needs to be conducted prior to bird nesting season March 1 – August 15.

Trees not affected by the looper moth infestation, such as Big Leaf maple or Red alder were not assessed, unless they were considered to be imminently failing. Imminently failing trees were brought to staff attention immediately outside this report.

Additionally, DRG was asked to comment on the large, failed Douglas fir tree by Malkin Bowl, which is discussed at the end of the report.

Limitations of the Assignment

This report is based on a visual assessment, from the ground only. No core or tissue samples were taken; no root crown excavations were performed. This report provides no undertakings regarding the future condition or behaviour of the trees reviewed in it. Tree hazards and conditions do change over time, and the evaluation period for this report is valid for the day on which it was performed only. Recommendations are to serve only as a guideline for the care, retention, and protection of the tree(s), and are made according to commonly accepted arboricultural practises, and do not guarantee the survival and/or safety of the specimen(s). No responsibility is assumed for any legal matters because of this report. The consultant shall not be required to give testimony or attend court by any reason of this report unless subsequent contractual arrangements are made, including payment of additional fees for such services. Loss or alteration of any part of this report invalidates the entire report. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without verbal or written consent of the consultant. No part of this report shall be conveyed by anyone to the public by any means without prior written consent of the consultant.

Methods

The Project Area was defined as forested lands adjacent to:

- The seawall, from the gate by Siwash Rock to Second Beach – 30m above the seawall
- Park Drive, from the Picnic Area to Second Beach – for 75m (2 tree lengths) each side of the roadway
- North Lagoon Dr – for 75m each side of the roadway
- Thompson Trail – from Rawlings Trail to Bridle Path
- Bridle Path from Rawlings Trail to Lake Trail
- Meadow Trail from Thompson Trail to Hollow Tree.

A Level 1 walkthrough assessment was conducted of the project area. A Level 1 assessment is defined as a Limited Visual Assessment of a population of trees conducted from a specific perspective and to identify specific conditions (ISA Tree Risk Assessment Manual 2nd Edition[1]). A thorough assessment of individual trees or inventory was *not* requested.

For the purpose of this report, the Project Area was divided into 10 zones.

1	Seawall – Siwash Rock to Third Beach Parking Lot
2	Seawall – Third Beach Parking Lot to Second Beach Pool
3	Park Drive – West side – Picnic Area to Ferguson Point Tea house
4	Park Drive – East side - Picnic Area to Ferguson Point Tea house
5	Park Drive – West Side – Ferguson Point Tea house to North Lagoon Drive Intersection
6	Park Drive – East Side – Ferguson Point Tea house to North Lagoon Drive Intersection
7	North Lagoon Drive
8	Thompson Trail – Rawlings Trail to Bridle Path
9	Bridle Path – Rawlings Trail to Lake Trail
10	Meadow Trail – Thompson Trail to Hollow Tree

Targets for the project include:

- Pedestrian/cyclist and occupants of the Seawall within the Subject area
- Pedestrian/cyclists and occupants of defined trails and sidewalks within the Subject area
- Vehicles and Occupants using or parked on Park Drive and North Lagoon Dr
- The Occupancy Rate was defined as Frequent

Observations

- The site was inspected on November 4 & 5, 2024, by ISA Certified Arborist and Tree Risk Assessor Peter Rennie RPF, and ISA Certified Arborist and Tree Risk Assessor Kimberly Dahl.
- The weather conditions were 5°c and overcast.
- The stands within each zone are variable both in terms of species composition and terms of the status of the dead hemlock within the stand.
- Zone 1
    - Area has full impact of prevailing wind
    - Dead hemlock with fungal conk identified
    - Dead Douglas fir and Western Red cedar show no indicators of premature failure
- Zone 2
    - Full impact of prevailing wind
    - Small amount of dead hemlock identified
- Zone 3
    - Impact of prevailing wind
- Zone 4
    - Two distinct timber types – section by Picnic area younger regeneration after 2006 storm
    - Timber type with larger stems has hemlock with noted defects including visible fungal conks, sloughing bark and woodpecker activity.
- Zone 5
    - Impact of prevailing wind
    - Visible conks
    - Woodpecker activity
- Zone 6
    - Larger hemlock with sloughing bark
    - Woodpecker activity
- Zone 7
    - Significant amount of windthrow caused by wetter soil conditions at west end of North Lagoon Dr
    - Further east, area has been treated and there are lesser amounts of dead hemlock
    - The hemlock in this area has a greater amount of dwarf mistletoe in the canopy.
- Zone 8
    - Protected from prevailing winds within a closed stand

    - Large diameter dead hemlock
    - A lot of the dead hemlock are growing on nurse stumps and nurse logs that are disintegrating
- Zone 9
    - Protected from prevailing winds within a closed stand
    - Woodpecker activity
- Zone 10
    - Protected from prevailing winds within a closed stand
    - Fungal conks observed on stems

Discussion

The trees observed by this review are dead with no expectation of recovery. We are providing an opinion on the likelihood of trees failing prior to their scheduled mitigation period. Two approaches for mitigation are possible within the Project Area and timeframe. One approach would be to follow the plan as originally developed for this area, and just move the timetable forward one year. The second approach would be to retain the original timetable, assess individual trees and remove those that have an imminent or probable likelihood of failure.

The second approach will have a less dramatic effect on the landscape since fewer trees would be removed in a single operation, however overall operating efficiency would drop, increasing the cost significantly.

The predominant failures identified within the stands were stem snaps although whole tree windthrow was also observed. As with many forests, the stands reviewed were not homogenous and the stability of dead trees within each stand was not homogenous.

Observed indicators that were considered when recommending accelerated mitigation:

- Visible fungal conks – conks are the fruiting body of internal decay fungi within the tree. The fungi decompose one of the two primary components of the wood in the tree, cellulose or lignin (depending on species of fungi) thus removing the strength and/or flexibility of the tree.
- Woodpecker activity – insect feeding or cavity creation leading to weakening of stem and increased likelihood of stem snap at that location.
- Trees growing on nurse logs or stumps. As the nurse log/stump decomposes and disintegrates, the tree now sits elevated on the root platform. These above ground roots are more likely to break in prolonged storms as they begin to fail as the tree sways over a longer period of time.
- Previous failures – windfalls can cause more damage within the stand as there is more energy in the falling tree than when the tree snaps mid-stem
- Soil conditions – poorly drained versus well drained soil – Poorly drained saturated soils have less holding capacity and can lead to an increase incidence of windfall.
- Dwarf mistletoe – this parasitic plant can lead to the formation of “witches brooms”, overheavy swelling on the branch. When these branches fail, they usually fall straight down. The concern is witches brooms that overhang a trail or road. Witches brooms on trees off the trail or road are not of a concern.
- Closed canopy – There is inter-tree crown dampening in a closed canopy as the crowns support each other in wind events, reducing sway and stress on the stem of the tree.

Conclusion

In every zone, trees likely to fail in the short term were identified. The following outlines our opinion on the whether the treatments for stands within each zone should be accelerated:

Zone	Recommendation
1	Accelerate treatment timeline.
2	Retain existing timeline. Conduct assessment on individual trees.
3	Accelerate treatment timeline for a patch within the centre of the zone. Conduct assessment on individual trees for remainder of zone.

4	Accelerate treatment timeline for most of Zone. Smaller timber type at the north end by the Picnic area can utilize the existing timeline.
5	Retain existing timeline. Fewer dead trees. Conduct assessment on individual trees.
6	Accelerated treatment timeline.
7	Accelerate treatment timeline on west end of the Zone. The area is poorly drained and has saturated soils with significant existing windfall.
8	Retain existing timeline. Area is within closed canopy and protected from storm winds. Conduct assessment of individual trees.
9	Retain existing timeline. Area is within closed canopy and protected from storm winds. Conduct assessment of individual trees.
10	Retain existing timeline. Area is within closed canopy and protected from storm winds. Conduct assessment of individual trees.

Failed Douglas fir – Malkin Bowl

This large tree, approximately 275cm in diameter, failed during the recent 'bomb cyclone' storm. The tree had significant internal decay with a collar of approximately 10 cm of solid wood. It fell in a southerly direction and is now bridging across the pathway and it is approximately 5ft above the pathway. The log is still attached to the stump on the south side.

The log is sitting against a standing spruce tree and a concrete monument on the west side, and several large diameter branches (20+cm diameter) on the east side are acting as a brace preventing the log from rotating. A 40cm diameter branch is driven in the ground about ½ way along the log, supporting the centre of the log.

The stump splintered when the tree failed and has several jagged pieces of wood around the rim of the retained stump. Two potential hazards were identified:

- The log shifting or collapsing while people were standing around or underneath the log.
- People climbing on the log or stump and falling.

We offer the following suggestions to ensure public safety until the log can be removed.

- Trim the splinters on the stump
- Install concrete lock blocks under the log at the stump end to support the log if it were to shift and drop
- Restrict access to the stump using snow fencing, and provide signage on fencing indicating DO NOT ENTER

Appendix 1 – Overview Map

Areas Assessed – Scale as Noted

Appendix 2 – Photos - Large Douglas fir – Malkin Bowl

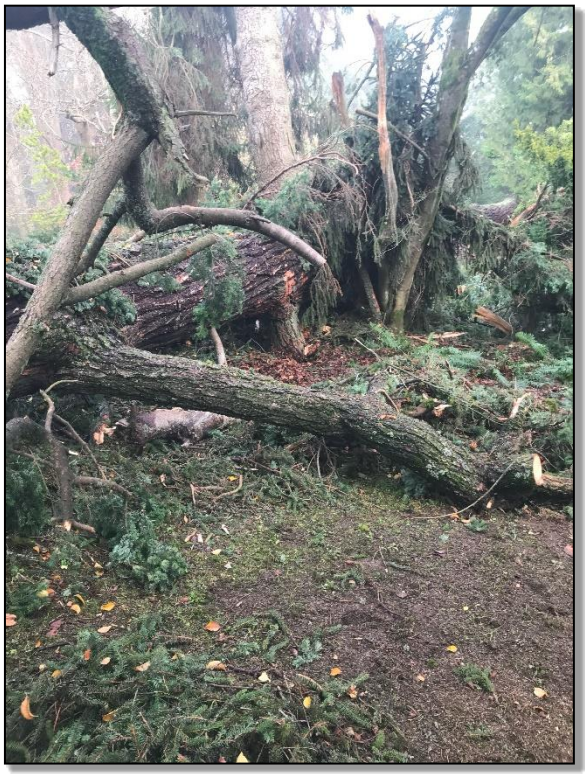
Douglas fir over pathway

Splintered stump – holding wood

(Arrows in above photos indicate the suggested location of temporary support lock blocks)

Shattered stump from north side

Top end of stem wedged against monument



Top of stem – Large limb providing brace to prevent rotation

DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886

December 5, 2024

Tina Fernandes
Urban Forestry
City of Vancouver

Re: Tree Risk Overview Assessment for select target areas in Stanley Park

Introduction

The City of Vancouver requested that Diamond Head Consulting Ltd conduct a Level 1 tree risk assessment of specific trails and roads on the west side of Stanley Park. This assessment aims to provide park managers with an estimate of the density of hazardous trees, which will help inform resource allocation and timing for risk mitigation efforts. The assessment areas, as designated by the City of Vancouver, are illustrated in Figure 1.

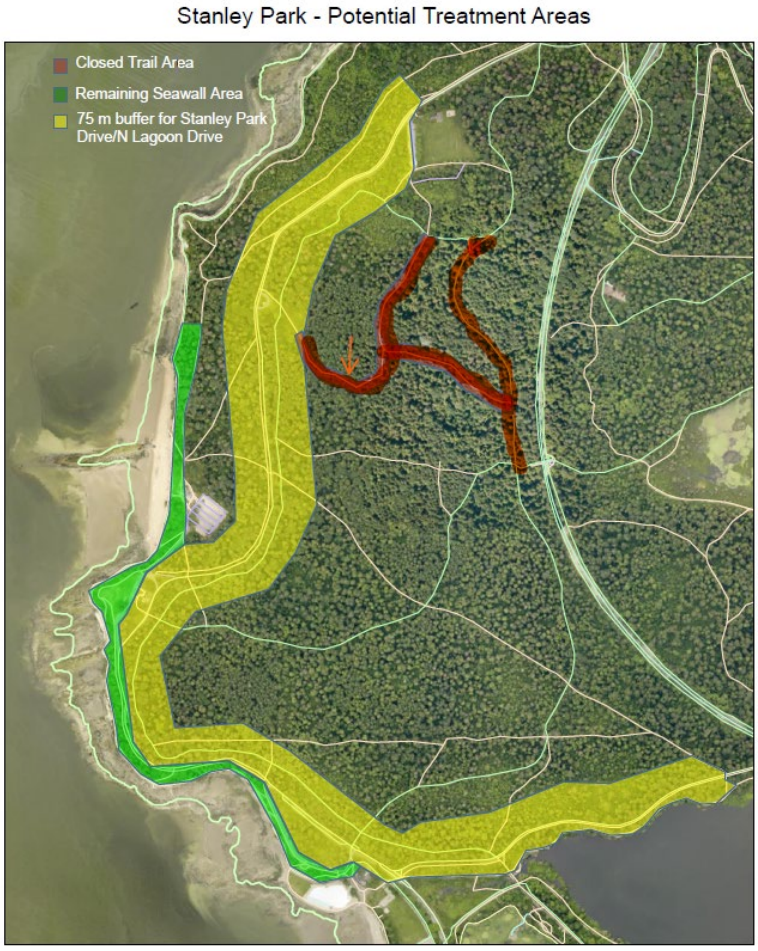


Figure 1 Assessment areas provided by the City of Vancouver include the areas coloured in red, yellow and green.

Tree Risk Assessment Methods

The level 1 risk assessment was conducted using the methods outlined in the ISA Tree Risk Assessment Manual[1]. This methodology evaluates risk based on three key factors: the likelihood of tree failure, the potential impact of such failure, and the severity of the consequences if a failure occurs. The matrices for likelihood of failure and risk ratings used to categorize tree risk are illustrated in Figure 2. These matrices are used in the International Society of Arboriculture Tree Risk Assessment methods.

The Level 1 limited visual assessment we conducted involved a quick reconnaissance of the trees from the selected trails and roads. Trees were viewed only from one side with the intention of identifying trees that met the specified tree risk threshold. The assessment covered a broad area and was completed in one day (December 4, 2024). Individual trees were not inventoried or described. We only recorded the number of trees that met the risk threshold, by tree species. This provides the city with a high-level overview of the trees currently posing a risk to park visitors.

The work was conducted by two registered professional foresters who are experienced tree risk assessors. Both are certified in the International Society of Arboriculture's Tree Risk Assessment Qualification (TRAQ) as well as in BC Parks' Wildlife Danger Tree Assessment systems. They have extensive experience working in various settings across the Lower Mainland, including private, municipal, and park environments.

Time frame

The assessment of the 'Likelihood of Failure' is based on a one-year period under typical weather conditions. However, this time frame does not guarantee the accuracy of the risk assessment. It is important to note that the evaluated likelihood of failure does not account for extreme events or weather conditions that exceed the average for the assessed area.

Occupancy Rates and Likelihood of Impact.

The occupancy rate of a given area is a critical factor in determining the likelihood of a failure striking a target and causing damage or injury. We assume that trails are *occasionally* occupied, the Seawall, roads, beaches, and picnic areas are *frequently* occupied, and buildings and built-up areas are *constantly* occupied. Tables 1 and 2 are informed by the ISA TRAQ manual and provide guidance on the relationship between the occupancy rate of a site and the likelihood that a failing tree will strike or impact a person.

[1] Dunster, J.A., Smiley, E.T., Matheny, N. and Lilly, S. (2017). Tree Risk Assessment Manual, second edition. *International Society of Arboriculture*. Champaign, Illinois.

Table 1: Occupancy rate guidelines

Occupancy rate	Definition from the Tree Risk Assessment Manual
Constant	"… a target is present at nearly all times, 24 hours a day, 7 days a week".
Frequent	"…the target zone is occupied for a large portion of a day or week"
Occasional	"…site that is occupied by people or other targets infrequently or irregularly."
Rare	"…sites that are not commonly used by people or other mobile/movable targets."

Table 2. Likelihood of impact guidelines. The chance of tree failure impacting a target during a specified time frame is determined by considering occupancy rates, location within target zone, protection factors, and direction of fall.

Likelihood of impact	Definition from the Tree Risk Assessment Manual
High	The failed tree or tree part is likely to impact the target."…constant target, no protection factors and direction of fall is toward target."
Medium	There is a slight chance that the failed tree or tree parts will impact the target."…occasionally used area with no protection factors and no predictable direction of fall; a frequently used area that is partially protected; a constant target that is well protected from the assessed tree."
Low	The failure tree of a tree part could impact the target but is not expected to do so. "…frequently used area when the direction of fall may or may not be toward the target."
Very Low:	The chance of the failed tree or tree part impacting the specified target is remote."…the target is outside the anticipated target zone" "…people in an occasionally used area with protection from being struck."

Consequences of failure/impact

The consequences of a tree or tree part failing and striking a target considered the tree or tree part size, the fall distance and potential energy, and protection factors.

Tree Risk Thresholds

For this assessment, only trees that pose a moderate or high risk according to TRAQ standards were included. This encompasses trees that are expected to fail within the next year and could potentially fall onto roads or trails. Trees categorized as moderate risk but with only minor consequences if they were to fail were excluded. Specifically, the trees included in this assessment are those that are:

- Expected to fail within one year (*probable* likelihood of failure) or;
- Actively failing or very unstable (*imminent* likelihood of failure) and;
- Likely to strike the identified trails or roads. We assume these trails and roads are occasionally or frequently occupied by people. This can translate to a *low* to *medium* likelihood of striking a the targets of concern with are people and vehicles. and;
- Carrying enough potential energy to injure or kill a person or to damage a vehicle. (*significant* or *severe* consequences).

Matrix 1: Likelihood

Likelihood of Failure	Likelihood of Impacting Target			
	Very Low	**Low**	**Medium**	**High**
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2: Risk Rating

Likelihood of Failure and Impact	Consequences of Failure			
	Negligible	**Minor**	**Significant**	**Severe**
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Figure 2 – Tree risk matrices for likelihood of failure and risk ratings used to categorize tree risk. These matrices are used in the International Society of Arboriculture Tree Risk Assessment methods. The inventoried trees meet the criteria of the highlighted cells.

Significant changes to the occupancy rate of a site will change the risk posed by trees. Trees should be reassessed for risk if the occupancy rate changes, for example, to accommodate special events or building projects where workers may be exposed to trees.

Findings

Table 3 summarizes the number of trees identified along each target segment, categorized by species. It also includes the average tree density counted for every 100 meter section of the target. The location of each target segment is illustrated in Figure 3.

Table 3 Summary of tree risks identified along each target area.

Segment	Segment Length	Count of trees that exceed the specified risk threshold by species						Sum of Trees in segment	Density of trees per 100m of target length
		Bitter Cherry	Red Alder	Hemlock western	Douglas Fir	Bigleaf Maple	Western Redcedar		
Thompson North	266	0	0	15	0	0	0	15	5.6
Meadow Trail	277	0	0	10	0	0	0	10	3.6
Thompson East	312	0	0	4	0	0	1	5	1.6
Bridle South	274	0	0	0	0	0	0	0	0.0
Bridle North	253	0	0	6	1	0	0	7	2.8
Stanley Park North	314	0	0	0	0	2	0	2	0.6
Stanley Park Drive West	2070	1	5	42	1	7	1	57	2.8
Stanley Park Drive South	775	0	0	11	0	1	0	12	1.5
Rawlings Trail	2120	1	8	41	0	2	0	52	2.5
Seawall West	1683	0	1	12	0	4	0	17	1.0
Third Beach Parking Lot	287	0	0	8	0	0	0	8	2.8
Total	8631	2	14	149	2	16	2	185	

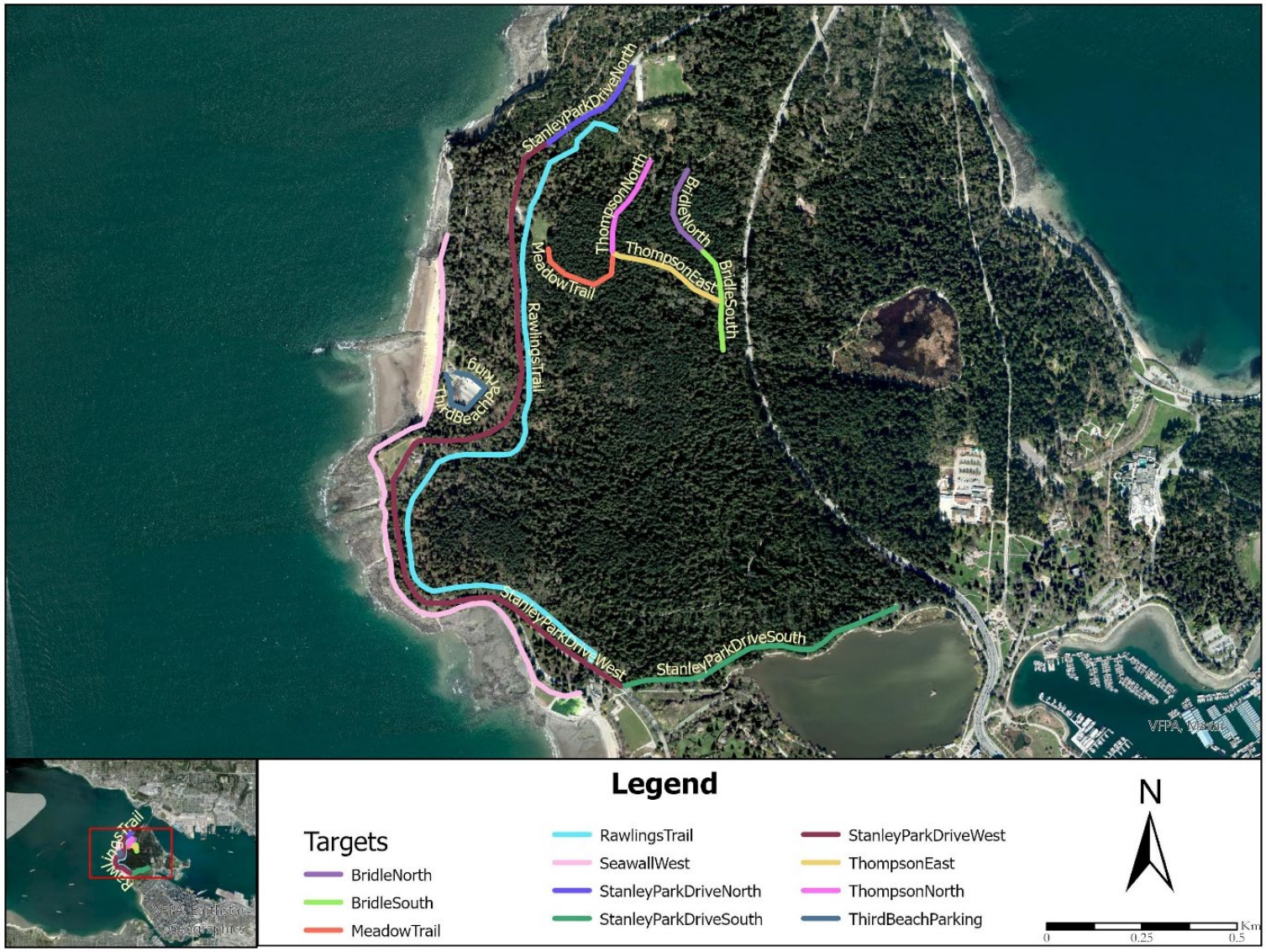


Figure 3 The targets that were assessed include the trail, road, and seawall segments highlighted in the colors above. Each of these segments corresponds to the trail names in Table 3.

Conclusion

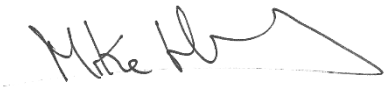
The density of trees that meet the specified tree risk threshold varies across the study area. The forests with a high concentration of Western Hemlock trees, which have been affected by the Hemlock Looper outbreak, pose the greatest risk. These trees are in various stages of decline. We have identified trees that exceed the specified risk threshold and recommend that they be treated as soon as possible. Additionally, there are other trees that are either dying or have recently died. Many of these are western hemlock trees that show clear signs of decay. The likelihood of these hemlock trees failing will increase over time as decay progresses. While these other trees do not currently meet the specified risk threshold, we expect them to do so within the next two years.

A detailed, tree-by-tree assessment is necessary to properly identify, document, and mitigate hazardous trees. We recommend that the City of Vancouver establish the occupancy rates for each assessment area, adopt a risk threshold for treating hazardous trees, and carry out a more comprehensive risk assessment.

Please feel free to reach out if you have any questions regarding the material discussed in this memo.

Sincerely,

Project Staff:



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December 9th, 2024

Tina Fernandes
Project Manager II, Urban Forestry
Mobile: 604-307-0451

City of Vancouver
2099 Beach Avenue
Vancouver, BC

Re: Stanley Park ISA Level 1 Assessment - Arborist Memorandum

At the request of Urban Forestry for the City of Vancouver, Chartwell Resource Group Ltd. (Chartwell) performed a third-party Level 1 Limited Visual Assessment in Stanley Park as per the International Society of Arboriculture (ISA) standards on December 6th, 2024. ISA Certified Arborists and Tree Risk Assessment Qualified (TRAQ) Chartwell employees who performed the assessment were Ryan Turner, RPF and Jordan Snyder, RFT.

The assessment included the 3 *High Use Areas* identified on a marked up aerial map (Appendix 1) and Malkin Bowl Large Fd Failure Map (Appendix 2) provided by Tina Fernandes. The 3 areas included the *Closed Trail Areas of Thompson/Rawlings/Meadow/Lake Trails and Bridal Path, including Malkin Bowl - Large Douglas Fir Failure*, the *Remaining Seawall Area*, and a *75m buffer for Stanley Park Drive/N Lagoon Drive*. The assessment involved walking trails, sidewalks, and portions of the seawall to observe tree and forest conditions. This memorandum serves as the professional opinion deliverable based on the observations and noted risk levels associated with the 3 identified areas shown in Appendices 1 and 2.

Observed during the Level 1 Limited Visual Assessment were 3 forested areas of varying species composition and density. Hemlock Looper damage was evident and significant in the areas assessed. The dead standing Western Hemlock (Hw) trees has resulted in an elevated level of risk of tree failure in these areas. Additionally, the 3 areas assessed are very high use areas of the park, heavily frequented by vehicles, walkers, cyclists, and runners. While every tree and forest inherently exhibits an expected level of risk, the recent observed increase Hw tree mortality in these areas of Stanley Park has elevated this level of risk.

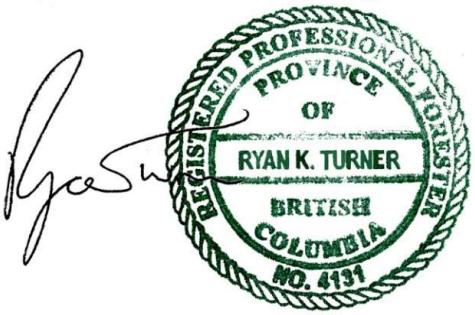
It was observed that the dead and declining Hw trees are in varying stages of decay, ranging from recently dead with fine twigs and grey/brown needles attached, to having been dead for multiple years with no fine twigs or needles and missing branches and sloughing bark. The dead trees appear to be losing structural integrity rather quickly, evidenced by large broken branches and whole tree failures at varying heights along their stems. Several tree failures were noted during the assessment, both across the trails and roads and located in the adjacent forested areas. Recent tree failures have been cleaned away from trails, while others are still blocking

trail access. A significant portion of the assessed areas have a high component of dead Hw trees and other areas observed had a low dead Hw tree component; however, the dead Hw trees that exist throughout the areas assessed appear to be progressing quickly through the stages of structural decline and as a result are increasing the hazard to the surrounding roads and trails. For these reasons it is recommended that the dead and dying trees within 1 to 1.5 tree lengths of the associated trails and roads be felled to mitigate this imminent and probable likelihood of tree failures in the short term.

ISA Level 1 assessment observations were made at Malkin Bowl pertaining to the large Douglas-fir tree failure. While this tree has failed and is laying horizontal to the ground, it does appear to be held up off the ground by one of its larger branches. If the tree is not going to be removed in the short term, the area around the entire tree should be fenced off to keep the public away as it does pose an increased level of risk in its current elevated state. If the plan is to retain the tree in the longer term, the tree should be pruned of its branches so it is lying in a stable position on the ground. The stem could be removed from the site by cutting it into smaller manageable pieces; however, due to the large diameter of the stem, mechanical equipment will likely be required for removal.

Yours Truly,
Chartwell Resource Group Ltd.

Arborist Memorandum prepared by:

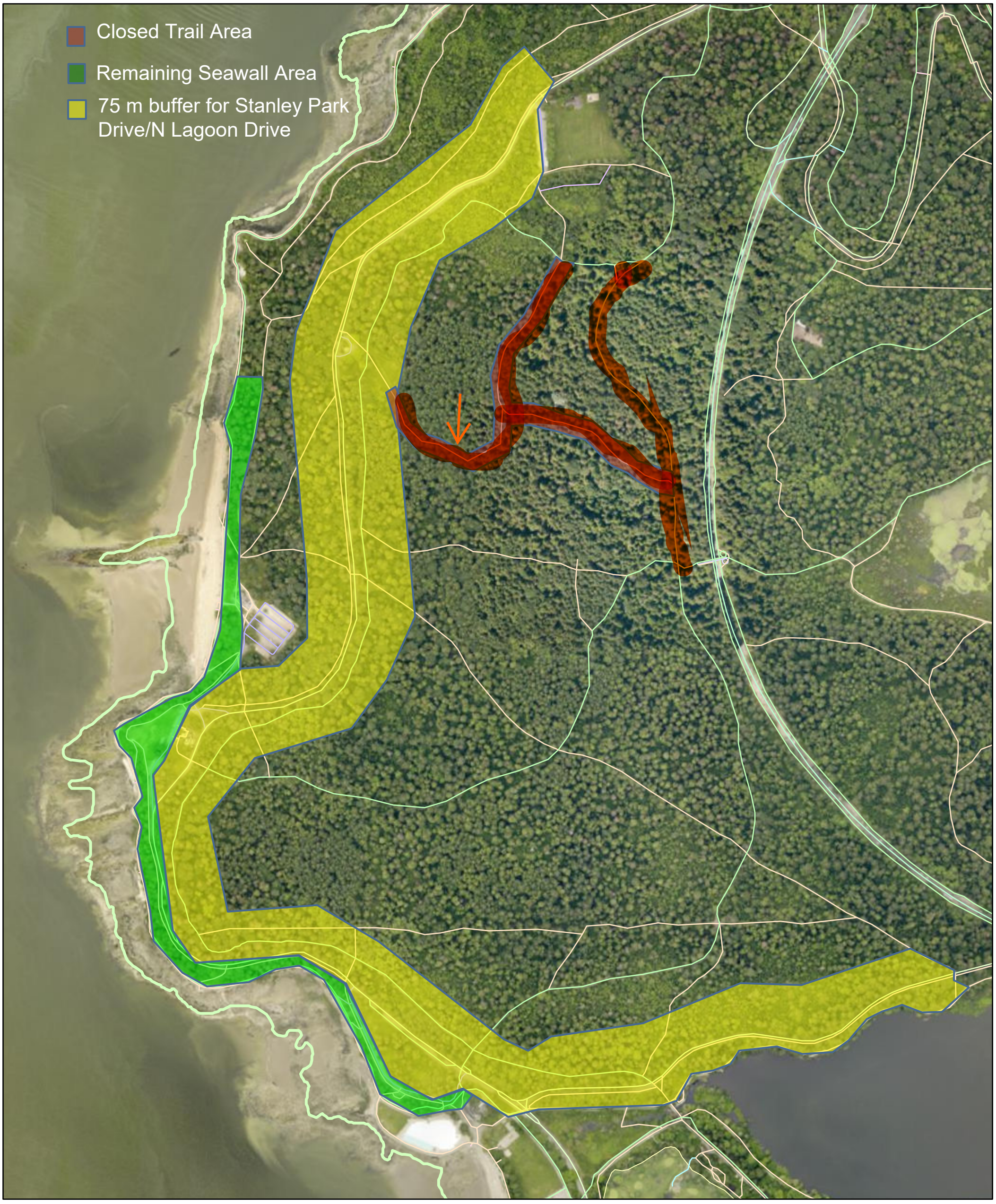


Ryan Turner, RPF
ISA Certified Arborist / Tree Risk Assessment Qualified

Reviewed by:

Jordan Snyder, RFT
ISA Certified Arborist / Tree Risk Assessment Qualified

Stanley Park - Potential Treatment Areas



1:9,028

0 365 730 1,460 ft

0 112.5 225 450 m

City of Vancouver

UF Department
City of Vancouver |

Malkin Bowl - Large Douglas Fir Failure

11/29/2024, 10:52:57 AM

1:1,128

0 30 60 120 ft

0 10 20 40 m

City of Vancouver

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