Tree Protection Plan

August 31, 2022

Prepared for:
Laurie Yang
8456 SE 40th St
Mercer Island, WA 98040

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Background and History

I was called out by Laurie Yang on Aug 31, 2022 to prepare a tree protection plan regarding the trees located at 8456 SE 40th St, Mercer Island, WA. This property is going to be redeveloped, with the existing structure being demolished and a new structure with a larger footprint being constructed.

ASSIGNMENT

Provide a tree inventory and protection plan for all trees in preparation for construction.
•Visit the site to inventory and measure trees on the subject property which are within or adjacent to construction activity.
• General health and condition of the trees.
• Provide Tree Protection Zones (TPZ)
• Provide Critical Root Zones (CRZ)
• Provide TPZ, CRZ fencing requirements and instructions.
• Provide observations, facts, findings and recommendations in a professionally written report.

LIMITATIONS OF ASSIGNMENT

This report is limited to a Visual Assessment (VA) of the site and the trees. It is not a comprehensive risk assessment, structural assessment or health assessment. The report is limited to the scope of the assignment.

METHODOLOGY

To evaluate the trees, as well as to prepare this report, I drew upon my 8 years of experience in the field of arboriculture and my formal education. I followed the protocol of the International Society of Arboriculture (ISA) and I performed my assessment using and/or considering the following Best Management Practices:

ANSI A300 Part 2 – Soil Management a.) Modification b.) Fertilization & c.) Drainage.
ANSI A300 Part 5 – Managing Trees During Site Planning, Site Development, and Construction.
ANSI A300 Part 9 – Tree Risk Assessment (Second Edition).
ISA BMP's – Tree Inventories (Second Edition 2013)

Best Management Practices were developed to aid in the interpretation of professional standards and guide work practices based upon current science and technology. Using this process, I performed my assessment, which included looking at the overall health of the trees as well as the site conditions. This is a scientifically based process to look at the entire site, surrounding land and soil, as well as a general look at the trees themselves.

Testing and Analysis

The diameter of each tree was measured at four and a half feet above the ground, commonly referred to as diameter at breast height (DBH). For trees located on a slope, the 4.5 feet is measured from the average of the highest and lowest ground points or, on very steep slopes where this is not possible, the lowest practical point on the uphill side. Where a tree splits into several trunks close to ground level, the DBH for the tree is the square root of the sum of the DBH for each individual stem squared. When branches interfered with measurement of DBH, the measurement was taken at the narrowest point below four and a half feet above the ground. The DBH of each tree was determined using a DBH measuring tape and the height and dripline were determined using a rangefinder. I affixed a metal number tag to every tree that was on or adjacent to the project.

SITE

Parcel 502190-0790 is a 11,930 sq. ft. (.27-acre) site, Zoned R-8.4, proposed for a new residence. Using King County IMap w/ critical areas overlay, no environmentally sensitive area, or its buffer, was noted.

TREES

The significant onsite trees were tagged with numbers corresponding to the numbers listed in this report. Refer to Attachment 1, Site Images, for an orientation to the site and the approximate location of the trees. There were a total of 8 regulated trees and 5 unregulated treeson the property. According to the DPD Director's Rule 16-2008 there were two exceptional trees on the property, trees labeled 1199 and 1201. Exceptional trees will be marked with an * following their corresponding number. Two trees, labeled 1384 and 1385, would conflict with the proposed work and are proposed for removal. The two trees to be removed are both in poor health due to bronze birch borer damage and severe pruning. No adjacent trees will be affected by the removal of these trees.

- Tree #1201* has a TPZ that will likely interfere with construction activities. To the south of the tree, the TPZ will be reduced by 30%. This would reduce the TPZ from 43' to 30'. Any excavation done within the TPZ zones shall be done with hand tools and a consulting arborist on site.

- Tree #1199* has a TPZ that will likely interfere with the construction of the driveway. To the south of the tree, the TPZ will be reduced by 10% to match tree #1201's TPZ. This would reduce the TPZ on the south side of the tree from 33' to 30'. Any excavation done within the TPZ zones shall be done with hand tools and a consulting arborist on site.

To avoid any conflicts of interest, Eastside Tree Works will not be performing any tree removals associated with this construction project.

Impacts

By following the tree protection measures outlined in Attachment-4 and the installation of fencing prior to construction activity, the impacts to the trees onsite as well as those nearby should be minimal.

RZC 21.72.060 (A) (1) TREE RETENTION / RZC 21.72.080 (B) TREE REPLACEMENT

19.10.060 (A)(2) In all developments a minimum of 30% of all significant trees shall be retained over a rolling 5 year period.
19.10.070 Significant trees shall be replaced as followed:

- 1:1. for trees less than 10 inches in diameter.
- 1:2 for trees 10-24" in diameter.
- 1:3 for trees 24-36" in diameter.
- 1:6 for trees greater than 36" in diameter

	Total Trees	Hazard Non-Viable	Trees Retained	Significant Tree Removed	Replacement Ratio	Required Replanting
Less than 10”	0	0	0	0	1:1	0
10-24”	6	0	4	2	1:2	4
24-36”	1	0	1	0	1:3	0
+36”	1	0	1	0	1:6	0
	Viable Trees		**Retained**	**Percent**		**Total Replanting**
	8		6	6/8=75%		4

Replacement trees shall be primarily native species.
a. Two-and-one-half-inch caliper for deciduous trees.

Minimum size for replacement trees:
b. Six feet in height for evergreen trees.

Tree Retention: 6/8 = 75%.
2 significant trees are proposed to be removed.

Replacement trees required: 4

Landscape Plan to be provided by: Client

TREE PROTECTION ZONES (TPZ)

In order for trees to survive the stresses placed upon them in the construction process, tree protection must be planned in advance of equipment arrival on site. If tree protection is not planned integral with the design and layout of the project, the trees will suffer needlessly and possibly die. With proper preparation, often costing little or nothing extra to the project budget, trees can survive and thrive after construction. This is critical for tree survival because damage prevention is the single most effective treatment for trees on construction sites. Once trees are damaged, the treatment options available are limited.

General

1. The TPZ is the optimal protection zone set to preserve trees during construction. The TPZ radius generally is 8-Inches to 18-Inches of protection for every 1-Inch of DBH, based on the trees size, vigor and construction tolerances (ANSI A300 Part 5 BMP, Matheny, Clark, 1998).

2. The TPZ can usually safely be reduced by 20% as long as it does not impact the CRZ. Greater than 20% reductions may be possible, pending review, written permission, and direct oversight of the work, by the Consulting Arborist.

3. The trees to be saved, must be protected during construction by temporary 6' tall chain-link, or like fencing, located a minimum 5' beyond the edge of the trees farthest extending limbs on all sides (dripline). The individual tree protection zones (TPZ) are 5' past the drip lines of the tree(s), unless otherwise delineated by Eastside Tree Works. See Attachment 2 for tree specific TPZ and CRZ.

4. No irrigation lines, trenches, or other utilities shall be installed within the TPZ, without detailed written instructions and the oversight of the Consulting Arborist, to reduce the impacts to the tree roots, and construction related stressors. Cuts or fills should impact no more than 20% of a tree's root system. If topsoil is added to the root zone of a protected tree, the depth should not exceed 2 inches of a sandy loam or loamy fine sand topsoil and should not cover more than 20% of the root system.

5. If roots are encountered outside the TPZ during construction, they shall be cut cleanly with a saw (not ripped or torn) and covered immediately with moist soil. Noxious vegetation within the critical root zone should be removed by hand. If a proposed save tree must be impacting by grading or fills, then the tree should be re-evaluated by Eastside Tree Works to determine if the tree can be saved with mitigating measures, or if the tree should be removed.

CRITICAL ROOT ZONES (CRZ)

The CRZ is the area where the roots vital for the tree's survival are located, the CRZ is generally 1⁄2 of the TPZ. At no time or for any reason shall the roots within the CRZ be impacted. See Attachment 2 for tree specific TPZ and CRZ.

ROOT PROTECTION

1. Any roots encountered of 1" in diameter or greater, shall be cut with loppers, pruners, reciprocal saw or like device to provide a clean smooth cut. At no time, shall 1" or greater diameter roots be ripped or torn. Exposed roots shall be covered with wet burlap, or like item, to keep roots from drying out and shall be covered with soil as soon as reasonably possible.

2. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations. Protect root systems from damage due to removal of adjacent trees. SEE ATTACHMENT 3 For Complete Tree Protection

Instructions.

FENCING

1. 6’ tall chain link (or like fencing) shall be installed the TPZs prior to commencement of site clearing and shall remain in place for the duration of the project. When possible, it is preferred that trees be fenced as a group, rather than individuals. At no time shall any vehicle or equipment be allowed inside the TPZ/Fencing. No placing or stock-piling of any material of any kind shall be allowed inside the TPZ.

2. Removal of any vegetation within the TPZ shall be done by hand. Should any disturbance be required inside the TPZ to install utilities or any other needs during the construction period, they will require project specific instructions by the Consulting Arborist and approval by the city prior to undertaking any said activity in the TPZ.

Follow Up

After the completion of the construction project, trees should be inspected by a qualified arborist. Additionally trees should be monitored annually for three to five years. If it has been determined that construction has had a negative impact on the trees remedial steps should be taken to improve tree health. Those steps may include:

- Addition of mulch
- Watering
- Fertilization
- Removal and replacement of trees which are badly damaged or in an irreversible decline due to construction activities
- Development of a regular maintenance program to enhance tree health

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Replacement trees

According to Mercer Island any trees that are cut pursuant to a tree permit shall be replaced on the subject property as specified below. Mercer Island tree code requires a 1:1. for trees less than 10 inches in diameter, 1:2 for trees 10-24” in diameter, 1:3 for trees 24-36” in diameter, and 1:6 for trees greater than 36” in diameter. Based on my calculations 20 replacement trees will be required. Replacement trees shall be located in the following order of priority from most important to least important:

1. On-site replacement adjacent to or within critical areas;

2. On-site replacement outside of critical areas adjacent to other retained trees making up a grove or stand of trees;
3. On-site replacement outside of critical areas; and, Off-site in adjacent public right-of-way where explicitly authorized by the City.

Species – Replacement trees shall primarily be species native to the Pacific Northwest.

Size – All replacement trees shall be at least 6' tall for conifers and at least 1.5" diameter at the base for deciduous trees. Shrubs and bushes are not an acceptable replacement for trees.

Planting Guidelines

All tree planting work should be performed in accordance with the specifications set forth in the ANSI A300 (Part 6)-2012 Planting and Transplanting. Care should be taken to select good planting stock. Container grown, grow bag, and ball and burlap are all acceptable forms of planting stock. Trees should be inspected carefully for health and defects. Trees with defects such as girdling root(s), codominant leaders, or trees with roots that are severely container bound should be avoided. Be sure to pull back soil around the base of the tree and to open up burlap on ball and burlap trees to inspect for defects.

1. Identify the root flare. The trunk flare is where the trunk expands at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). Remove excess soil from the top of the root ball prior to planting if the root flare is not visible.
2. Dig a shallow, broad planting hole. Holes should be 2 to 3 times wider than the root ball, but only as deep as the root ball. Digging a broad planting pit breaks up the surrounding soil and provides newly emerging tree roots room to expand.

3. Remove the containers or cut away the wire basket. Inspect container tree root balls for circling roots. Straighten, cut, or remove them. Expose the root flare, if necessary.

4. Remove soil from the root ball taking care not to damage the roots. Inspect for girdling or circling roots and straighten or prune the roots to correct these defects.

5. Place the tree at the proper height. Take care to dig the hole to the proper depth — and no more. The majority of a tree's roots develop in the top 12 inches (30 cm) of soil. If the tree is planted too deeply, new roots will have difficulty developing because of a lack of oxygen. In poorly drained or heavy clay soils, trees can be planted with the base of the trunk flare 2 to 3 inches (5 to 7.5 cm) above grade. When placing the tree in the hole, lift it by the root ball, not the trunk.

6. Fill the planting hole with soil, lightly packing it in around the root ball.

7. Create a berm around the planting hole and soak the area inside the berm thoroughly with a hose.

8. Check the stability of the tree, if it is at risk of falling over, provide supplemental support, generally this consists of stakes connected to the tree with tree ties. The ties should be snug but not tight.

9. Place a two inch thick layer of wood chip mulch over the planting area.

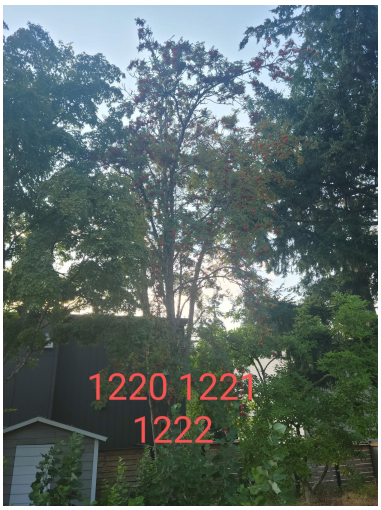
Attachment 1- On Site Trees

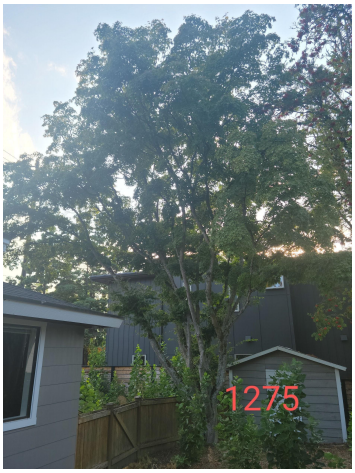
Tree #1199*, Redwood, *(Sequoia sempervirens*) The tree is perched on top of a small stone retaining wall at the northeast corner of the property. The tree has a DBH of 33” at a height of 95’ and a crown spread of approximately 20’. There is a small fence that is growing against the trunk at the root flare. This tree is part of a cluster of 3 Redwood trees.

Tree #1200, Redwood, *(Sequoia sempervirens*) The tree is located at the northeast corner of the property. The tree has a DBH of 12” at a height of 35’ and a crown spread of approximately 17’. This tree is growing subdominantly under 2 larger Redwood trees.

Tree #1201*, Redwood, *(Sequoia sempervirens*) This tree is located at the northeast corner of the property amongst a cluster of 3 Redwood trees. The tree has a DBH of 43” at a height of 100’ and a crown spread of approximately 19’. This tree is codominant with included bark. The bifurcation starts at approximately 6'. The tree has not created much reaction wood in reaction to this codominance.

Tree #1220, 1221 and 1222, Mountain ash, *(Sorbus americana)* The tree is located approximately 30' south of the northwestern corner of the property and approximately 12' from the west wall. The tree has a DBH of 10”, 9” and 7” at a height of 40’ and a crown spread of approximately 16’. Although there is one tag per stem, the stems should be treated as one tree. The three stems all originate at ground level. Excavation of the root flare would be needed to determine if there is included bark. The tree is sparse with some significant tip dieback.





Tree #1275, Japanese maple, *(Acer palmatum)* This tree is located approximately 15' west of the northwest corner of the house. The tree has a DBH of 11” at a height of 30’ and a

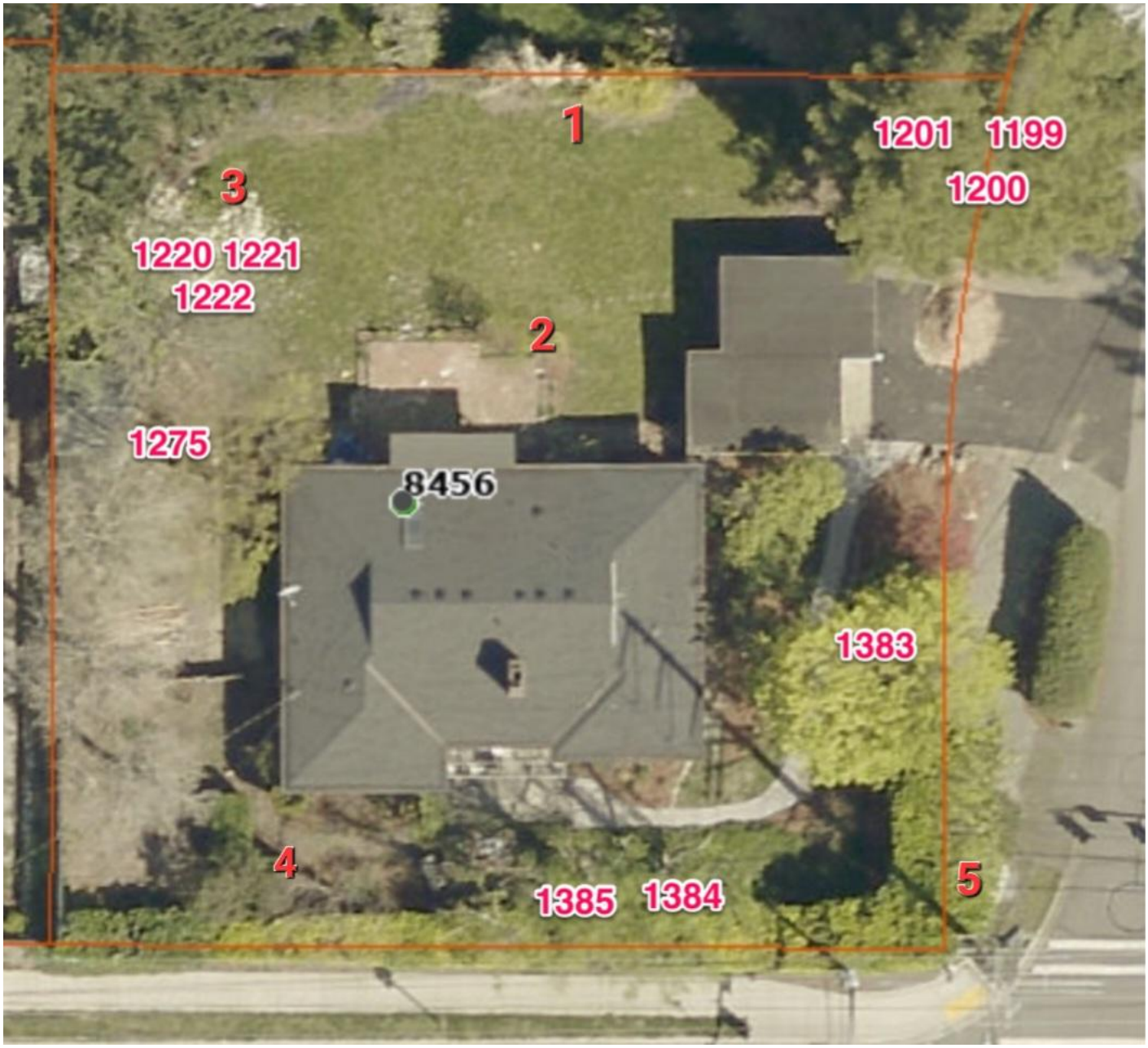
crown spread of approximately 22'. This tree has 3 stems originating from the ground level, all with included bark. Its canopy does overhang the roof.

Tree #1383, Japanese maple, *(Acer palmatum)* This tree is located approximately 25' east of the southeast corner of the house. The tree has a DBH of 10", 10" and 7" at a height of 20' and a crown spread of approximately 19'. Although the tree has several stems, bark inclusion is minimal and the tree is in very good health.

Tree #1384, Paper birch, *(Betula papyrifera)* This tree is located approximately 15' south of the southeast corner of the house. The tree has a DBH of 10" at a height of 20' and a crown spread of approximately 8'. This tree has been topped with sparse suckering growth and signs of severe decay. This tree is in poor health.

Tree #1385, Paper birch, *(Betula papyrifera)* This tree is located approximately 15' south of the front door at the south end of the house. The tree has a DBH of 15" at a height of 20' and a crown spread of approximately 15'. This tree has been topped with sparse suckering growth and signs of severe decay. The tree has large dead branches and branches with fruiting fungal bodies. This tree is in poor health.

Attachment 2 - Site Map



ATTACHMENT 3- TREE INVENTORY SUMMARY

Tree #	Species	Latin Name	DBH	Appr Ht	Health	Dripline Radius	TPZ Radius [ft]	CRZ Radius [ft]	Exceptional	Regulated	Retain
1199*	Redwood	*(Sequoia sempervirens)*	33"	95’	Very Good	20'	33	16.5	Yes	Yes	Yes
The tree is perched on top of a small stone retaining wall at the northeast corner of the property. There is a small fence that is growing against the trunk at the root flare. This tree is part of a cluster of 3 Redwood trees.											
1200	Redwood	*(Sequoia sempervirens)*	12"	35’	Good	17’	12	6	No	Yes	Yes
The tree is located at the northeast corner of the property. This tree is growing subdominantly under 2 larger Redwood trees.											
1201*	Redwood	*(Sequoia sempervirens)*	43"	100’	Very Good	19’	43	26.5	Yes	Yes	Yes
This tree is located at the northeast corner of the property amongst a cluster of 3 Redwood trees.											
1220, 1221 and 1222	Mountain ash	*(Sorbus americana)*	10”, 9”, and 7"	40’	Fair	16’	10	5	No	Yes	Yes
The tree is located approximately 30' south of the northwestern corner of the property and approximately 12' from the west wall											
1275	Japanese maple	*(Acer palmatum)*	11”	30’	Good	22’	11	5.5	No	Yes	Yes
This tree is located approximately 15' west of the northwest corner of the house.											
1383	Japanese maple	*(Acer palmatum)*	10”, 10”, and 7"	20’	Very Good	19’	10	5	No	Yes	Yes
This tree is located approximately 25' east of the southeast corner of the house.											
1384	Paper birch	*(Betula papyrifera)*	10"	20’	Poor	8’	10	5	No	Yes	No
This tree is located approximately 15' south of the southeast corner of the house.											
1385	Paper birch	*(Betula papyrifera*	15”	20’	Poor	15’	15	7.5	No	Yes	No

		)									
This tree is located approximately 15' south of the front door at the south end of the house.											
1	Big leaf maple	*(Acer macrophyllum)*	4”	15’	Good	6’	4’	2’	No	No	Yes
Located the middle of the property at the border.											
2	Black cottonwood	*(Populus trichocarpa)*	5”	15’	Fair	6.5’	5’	2.5	No	No	Yes
Located at the northeast corner of the back porch.											
3	Magnolia	*(Magnolia acuminata)*	5”	15’	Fair	12’	5’	2.5’	No	No	Yes
Located at the northeast corner of the property.											
4	Japanese Maple	*(Acer palmatum)*	5”	15’	Fair	11’	5’	2.5’	No	No	Yes
Located at the Southeast corner of the house.											
5	Big leaf maple	*(Acer macrophyllum)*	4”	20’	Fair	12’	10’	5’	No	No	Yes
Big leaf maple cluster with the largest trunks being approximately 4” DBH. Located at the Southeast corner of the property mostly in the right of way											

ATTACHMENT 4-TREE PROTECTION ZONES AND LAYOUT CONDITIONS

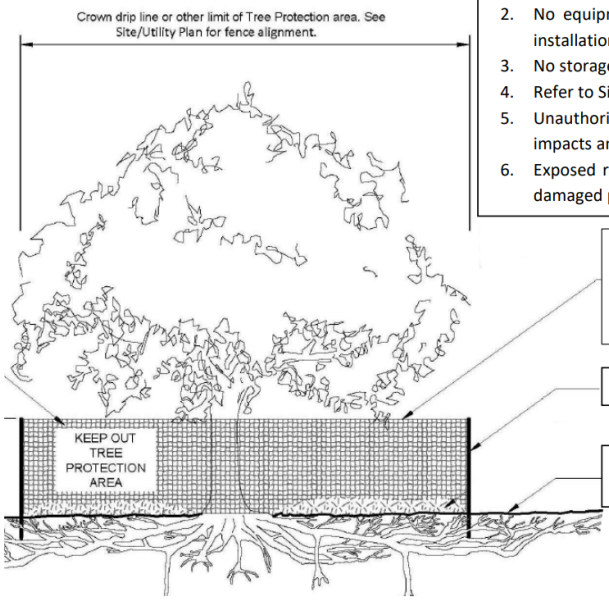
TREE PROTECTION AREA (TPZ)

KEEP OUT!

DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION AREA

Trees enclosed by this fence are protected and are subject to the conditions of the tree permit. Violation of tree conditions may lead to:

1. Correction Notices or Stop Work Orders until compliance is achieved
2. RE Inspection Fees
3. Arborist reports recommending mitigation



Notes

1. No pruning shall be preformed unless under the direction of an arborist
2. No equipment shall be stored or operated inside the protective fencing including during fence installation and removal
3. No storage of materials shall occur inside the protective fencing
4. Refer to Site/Utility Plan for allowable modifications to the tree protection area.
5. Unauthorized activities in tree protection area may require evaluation by private arborist to identify impacts and mitigation required
6. Exposed roots: For roots > 1" damaged during construction, make a clean straight cut to remove damaged portion and inform City Arborist

Tree protection fence: 4-6" chain link fence, solidly anchored into the ground, or if authorized High-density polyethylene fencing with 3.5" x 1.5" openings; color orange. Steel posts installed at 8' o.c.

2" x 6" steel posts or approved equal

Maintain existing grade with the tree protection fence unless otherwise indication on the plans

Waiver of Liability

There are many conditions affecting a tree's health and stability, which may be present and cannot be ascertained, such as, root rot, previous or unexposed construction damage, internal cracks, stem rot and more which may be hidden. Changes in circumstances and conditions can also cause a rapid deterioration of a tree's health and stability. Adverse weather conditions can dramatically affect the health and safety of a tree in a very short amount of time. While I have used every reasonable means to examine these trees, this evaluation represents my opinion of the tree health at this point in time. These findings do not guarantee future safety nor are they predictions of future events.

The tree evaluation consists of an external visual inspection of an individual tree's root flare, trunk, and canopy from the ground only unless otherwise specified. The inspection may also consist of taking trunk or root soundings for sound comparisons to aid the evaluator in determining the possible extent of decay within a tree. Soundings are only an aid to the evaluation process and do not replace the use of other more sophisticated diagnostic tools for determining the extent of decay within a tree.

As conditions change, it is the responsibility of the property owners to schedule additional site visits by the necessary professionals to ensure that the long-term success of the project is ensured. It is the responsibility of the property owner to obtain all required permits from city, county, state, or federal agencies. It is the responsibility of the property owner to comply with all applicable laws, regulations, and permit conditions. If there is a homeowners association, it is the responsibility of the property owner to comply with all Codes, Covenants, and Restrictions (CC&R's) that apply to tree pruning and tree removal.

This tree evaluation is to be used to inform and guide the client in the management of their trees. This in no way implies that the evaluator is responsible for performing recommended actions or using other methods or tools to further determine the extent of internal tree problems without written authorization from the client. Furthermore, the evaluator in no way holds that the opinions and recommendations are the only actions required to insure that the tree will not fail. A second may be sought if the client feels it's necessary. The client shall hold the evaluator harmless for any and all injuries or damages incurred if the tree examined fails for any reason or if the evaluator's recommendations are not followed or for acts of nature beyond the evaluator's reasonable expectations, such as severe winds, excessive rains, heavy snow loads, etc.

Should you have any questions or concerns, or if I may be of further assistance, please call. Sincerely,

Jordan Blonski
Certified Arborist PN-8610-A
Qualified Tree Risk Assessor (TRAQ)
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GLOSSARY

Terms Used in This Report, on the Tree Condition and Their Significance

In an effort to clearly present the information for each tree in a manner that facilitates the reader's ability to understand the conclusions I have drawn for each tree, I have collected the information in a report format. This report was developed by Jordan Blonski and it is based upon the Tree Risk Assessment in Urban Areas and the Urban/Rural Interface course manual and the Tree Risk Assessment Form, both sponsored by the International Society of Arboriculture, and the Hazard Tree Evaluation Form from the book, The Evaluation of Hazard Trees in Urban Areas, by Matheny and Clarke. The descriptions were left brief in the report in an effort to include as much pertinent information as possible, to make the report manageable, and to avoid boring the reader with infinite levels of detail. However, a review of these terms and descriptions will allow the reader to rapidly move through the report and understand the information.

1) **TREE LOCATION**—indicates what general area of the site the tree is on, or whether the tree is Off the Project property.

2) **TREE #**—the individual number of each tree.

3) **SPECIES**—this describes the species of each tree with both most readily accepted common name and the officially accepted scientific name.

4) **DBH**—Diameter-at-Breast-Height. This is the standard measurement of trees taken at 4.5 feet above the average ground level of the tree base.

I. Occasionally it is not practical to measure a tree at 4.5 feet above the ground. The most representative area of the trunk near 4.5 feet is then measured and noted on the spreadsheet. For instance, a tree that forks at 4.5 feet can have an unusually large swelling at that point. The measurement is taken below the swelling and noted as, '28.4" at 36"'.
II. Trees with multiple stems are listed as a "clump of x," with x being the number of trunks in the clump. Measurements may be given as an average of all the trunks, or individual measurements for each trunk may be listed.
III. Every effort is made to distinguish between a single tree with multiple stems and several trees growing close together at the bases.

5) **DRIP LINE**—the radius, the distance from the trunk to the furthest branch tips (sometimes the average of these measurements around the tree).

6) **% LCR**—Percentage of Live Crown Ratio: the relative proportion of green crown to overall tree height. This is an important indication of a tree's health. If a tree has a high percentage of Live Crown Ratio, it is likely producing enough photosynthetic activity to support the tree. If a tree has less than 30 to 40% LCR it can create a shortage of needed energy and can indicate poor health and vigor.

7) **SYMMETRY**—is the description of the form of the canopy. That is, the balance or overall shape of the canopy and crown. This is the place I list any major defects in the tree shape—does the tree have all its foliage on one side or in one unusual area.

Symmetry can be important if there are additional defects in the tree such as rot pockets, cracks, loose roots, weak crown etc. Symmetry is generally categorized as Generally Symmetrical, Minor Asymmetry or Major Asymmetry:

I. Gen. Sym.—Generally Symmetrical. The canopy/foliage is generally even on all sides with spacing of scaffold branches typical for the species, both vertically and radially.
II. Min. Asym.—Minor Asymmetry. The canopy/foliage has a slightly irregular shape with more weight on one side but appears to be no problem for the tree.
III. Maj. Asym.—Major Asymmetry. The canopy/foliage has a highly irregular shape for the species with the majority of the weight on one side of the tree. This can have a significant impact on the tree's stability, health and hazard potential—especially if other defects are noted such as cracks, rot, root defects.

8) **FOLIAGE/BRANCH**—describes the foliage of the tree in relation to a perfect specimen of that particular species. First the branch growth and foliage density is described, and then any signs or symptoms of stress and/or disease are noted. The condition of the foliage, or the branches and buds for deciduous trees in the dormant season, are important indications of a tree's health and vigor.

I. For Deciduous trees in the dormant season:
    - The structure of the tree is visible.
    - The quantity and quality of buds indicates health, and is described as good bud set, average bud set, or poor bud set. These are abbreviated in the spreadsheet as: gbs, abs, or pbs.
    - The amount of annual shoot elongation is visible and is another major indication of tree health and vigor. This is described as: a) Excellent, Good, Average, or Short Shoot Elongation. These are abbreviated in the spreadsheet as ESE, GSE, ASE, OR SSE. ii)
II. For evergreen trees year round and deciduous trees in leaf, the color and density of the foliage indicates if the tree is healthy or stressed, or if an insect infestation, a bacterial, fungal, or viral infection is present. Foliage is categorized on a scale from:
    - Dense—extremely thick foliage, an indication of healthy vigorous growth,
    - Good—thick foliage, thicker than average for the species,
    - Normal/Average—thick foliage, average for the species, an indication of healthy growth,
    - Thin or Thinning—needles and leaves becoming less dense so that sunlight readily passes through; an indication that the tree is under serious stress that could impact the long-term survivability and safety of the tree,
    - Sparse—few leaves or needles on the twigs, an indication that the tree is under extreme stress and could indicate the future death of the tree
    - Necrosis—the presence of dead twigs and branchlets. This is another significant indication of tree health. A few dead twigs and branches are reasonably typical in most trees of size. However, if there are dead twigs and branchlets all over a certain portion of the tree, or all over the tree, these are indications of stress or attack that can have an impact on the tree's long-term health.
    - Hangers—a term to describe a large branch or limb that has broken off but is still hanging up in the tree. These can be particularly dangerous in adverse weather conditions.

9) **CROWN CONDITION**—the crown is uppermost portion of the tree, generally considered the top 10 to 20% of the canopy or that part of the canopy above the main trunk in deciduous trees and above the secondary bark in evergreen trees.

I. The condition of the tree's crown is a reflection of the overall health and vigor of the entire tree. The crown is one of the first places a tree will demonstrate stress and pathogenic attack such as root rot.

II. If the Crown Condition is healthy and strong, this is a good sign. If the crown condition is weak, broken out, or shows other signs of decline, it is an indication that the tree is under stress. It is such an important indication of health and vigor that this is the first place a trained forester or arborist looks to begin the evaluation of a tree. Current research reveals that, by the time trees with root rot show significant signs of decline in the crown, fully 50% or more of the roots have already rotted away. Crown Condition can be described as:

A. Healthy Crown—exceptional growth for the species.
B. Average Crown—typical for the species.
C. Weak Crown—thin spindly growth with thin or sparse needles.
D. Flagging Crown—describes a tree crown that is weak and unable to grow straight up.
E. Dying Crown—describes obvious decline that is nearing death.
F. Dead Crown—the crown has died due to pathological or physical injury. The tree is considered to have significant stress and/or weakness if the crown is dead.
G. Broken out—a formerly weak crown condition that has been broken off by adverse weather conditions or other mechanical means.
H. Regenerated or Regenerating—formerly broken out crowns that are now growing back, Regenerating crowns may appear healthy, average, or weak and indicate current health of the tree.
I. Suppressed—a term used to describe poor condition of an entire tree or just the crown. Suppressed crowns are those that are entirely below the general level of the canopy of surrounding trees which receive no direct sunlight. They are generally in poor health and vigor. Suppressed trees are generally trees that are smaller and growing in the shade of larger trees around them. They generally have thin or sparse needles, weak or missing crowns, and are prone to insect attack as well as bacterial and fungal infections.

10) **TRUNK**—this is the area to note any defects that can have an impact on the tree's stability or hazard potential. Typical things noted are:

I. FORKED—bifurcation of branches or trunks that often occur at a narrow angle.
II. INCLUDED BARK—a pattern of development at branch or trunk junctions where bark is turned inward rather than pushed out. This can be a serious structural defect in a tree that can and often does lead to failure of one or more of the branches or trunks especially during severe adverse weather conditions.
III. EPICORMIC GROWTH—this is generally seen as dense thick growth near the trunk of a tree. Although this looks like a healthy condition, it is in fact the opposite. Trees with Epicormic Growth have used their reserve stores of energy in a last ditch effort to produce enough additional photosynthetic surface area to produce more sugars, starches and carbohydrates to support the continued growth of the tree. Generally speaking, when conifers in the Pacific Northwest exhibit heavy amounts of Epicormic Growth, they are not producing enough food to support their current mass and are already in serious decline.
IV. INTERNAL STRUCTURAL WEAKNESS—a physical characteristic of the tree trunk, such as a kink, crack, rot pocket, or rot column that predisposes the tree trunk to failure at the point of greatest weakness.
V. BOWED—a gradual curve of the trunk. This can indicate an Internal Structural Weakness or an overall weak tree. It can also indicate slow movement of soils or historic damage of the tree that has been corrected by the curved growth.
VI. KINKED—a sharp angle in the tree trunk that indicates that the normal growth pattern is disrupted. Generally this means that the internal fibers and annual rings are weaker than straight trunks and prone to failure, especially in adverse weather conditions.
VII. GROUND FLOWER—an area of deformed bark near the base of a tree trunk that indicates long-term root rot.

11) **ROOT COLLAR**—this is the area where the trunk enters the soil and the buttress roots flare out away from the trunk into the soil. It is here that signs of rot, decay, insect infestation, or fungal or bacterial infection are noted. **NAD** stands for **N**o **A**pparent **D**efects.

12) **ROOTS**—any abnormalities such as girdling roots, roots that wrap around the tree itself that strangle the cambium layer and kill the tree, are noted here.

13) **COMMENTS**—this is the area to note any additional information that would not fit in the previous boxes or attributes about the tree that have bearing on the health and structure of the tree.

14) **CURRENT HEALTH RATING**—A description of the tree's general health ranging from dead, dying, poor, senescent, suppressed, fair, good, very good, to excellent.

15) **PNW-ISA TREE RISK ASSESSMENT RATINGS FOR HAZARD POTENTIAL**--The Pacific Northwest Chapter of the International Society of Arboriculture now certifies arborists as Certified Tree Risk Assessors using an adjusted scale Low to Extreme. They are:

I. **TARGET RATING**--A scale of zero to three points depending upon the amount of use within the range of the tree and the amount of injury or damage that might occur if the tree or component part does fail. Target is both the level of use and the quality/value of the target combined with the foreseeable amount of injury or damage that will likely occur should the tree or component part fail.
    - 0 Points, no target. No Hazard.
    - 1 Point, Low human use is rare and random for short periods of time and/or low target value. (country roads, long-term or overflow parking, remote parks, wilderness trails)
    - 2 Points, Moderate human use less than 50% time, occasional (any given time) and/or moderate target value. (picnic areas, camping areas, minor rural roads, moderate use trails)
    - 3 Points, Moderately high human use more than 50% of the time, frequent or high value target and/or moderate target value. (bus stops, roads, parking areas, most rarely used vacation homes, playgrounds, etc.)
    - 4 Points, High or constant human use and/or high target value. (Schools, hospitals, residential and family homes, utilities, visitor centers, emergency access roads and stations)

II. **SIZE OF PART**-- The larger the tree or component part that fails, the greater the potential for injury or damage.

III. **PROBABILITY OF FAILURE**--This component ranks the likelihood that the observed defect(s) will fail in a reasonable amount of time in the foreseeable future. The probability of failure automatically has associated with its threshold of action recommended to reduce or minimize the potential failure and associated injuries or damages that might occur.

16) **ISA HAZARD or RISK RATING**--The combined component ratings used within a specific Matrix.

17) **Recommendation—** This is an estimate of whether or not the tree is of sufficient health,vigor and structure that is worth retaining. Specific recommendations for each tree are included in this column. They may include anything from pruning deadwood, mulching, aerating, injecting tree-based fertilizers into the root system, shortening into a habitat snag, or to completely remove the tree.

I. Potential to retain with tree protection measures: means that the tree appears to have the internal resources, the health and vigor, structural stability, and the wind firmness to be able to withstand stresses of construction if development requirements and construction requirements.

II. Remove or remove for safety means that the tree has a high potential to fail and has the potential to cause either personal injury or property damage. If it is at all possible the recommendation is to leave some of the trunk standing for wildlife habitat, some of the trunk on the ground as a nurse log, and some of the canopy in a brush pile. These are 3 key elements in retention of desirable/suburban wildlife such as songbirds. Remove or remove for safety means that the tree has a high potential to fail and has the potential to cause either personal injury or property damage. If it is at all possible the recommendation is to leave some of the trunk standing for wildlife habitat, some of the trunk on the ground as a nurse log, and some of the canopy in a brush pile. These are 3 key elements in retention of desirable/suburban wildlife such as songbirds.

- The height of the standing habitat tree depends upon the size of the tree the condition of the tree and the distance to a probable target it should be short enough so that when it does fail years in the future it will not cause personal injury or property damage.
- Nurse logs can be laid horizontally across the slope to aid with erosion control and to provide micro environments for new plantings. The nurse logs may need to be staked in place to prevent their movement and potential harm to people. If for some reason this is not possible that should be removed for safety.
- Brush piles can be complex or simple. They provide important sites for cover from predators, nesting and many other benefits

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