Gilles Consulting
Brian K. Gilles
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ANALYSIS OF TREES
AT

[redacted]

1332 35TH AVENUE SOUTH
SEATTLE, WA 98144-4002

February 18, 2011

PREPARED FOR:
David Neiman
David Neiman Architects
1521 31st Ave
Seattle, WA 98122

PREPARED BY:
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CONTENTS

EXECUTIVE SUMMARY

25	Trees were evaluated:
- Off Property Trees:	
- 9 trees are presumed to be off the property:	
- There are 3 trees on the S. Irving NE 110th Street Right-of-Way. They are #'s 447, 448, & 449.	
	- They are all in poor condition.
	- However, they appear that they will not be impacted by the house construction.
- There are 6 trees off the subject property to the North and east.	
	- Of the 6 trees only # 441 at the top of the steep bank to the north is in Fair condition. The other 5 are in poor condition.
	- All 6 trees can be adequately protected with tree protection fence along the Temporary Erosion Control & Sedimentation Fence.
- Subject Property Trees:	
- 16 trees were evaluated on the subject property:	
- Status:	
- All 16 trees were found to be in poor health, poor vigor, poor structure, or a combination of factors.	
	- 1 Tree is dead.
	- 4 Trees are dying.
	- 11 Trees are in Poor condition.
	- Therefore, all 16 trees are *Non-Significant. There are no Exceptional Trees on the property or adjacent right-of-way.*
- It is likely that tees # 450 -- 457 and 461 may need to be removed for the safety of the new structure and the workers. The remaining trees may or may not need to be removed. The decision should be made when the area of the house and construction footprint is designed and marked for construction.	

ASSIGNMENT

David Neiman, of David Neiman Architects, contracted with Gilles Consulting to evaluate the trees at the Stuart property at 1332 35th Avenue South, Seattle, Washington. The property is being considered for development with a single-family home and the City of Seattle requires an analysis of the trees as part of the permit process. This report provides the analysis. The information in this report can be utilized to create a Tree Retention/Protection Plan as required by Code.

METHODOLOGY

To evaluate the trees and to prepare the report, I drew upon my 25+ years of experience in the field of arboriculture and my formal education in natural resources management, dendrology, forest ecology, plant identification, and plant physiology. I also followed the protocol of the International Society of Arboriculture (ISA) for Visual Assessment (VA) that includes 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 complete look at the trees themselves.

In examining each tree, I looked at such factors as: size, vigor, canopy and foliage condition, density of needles, injury, insect activity, root damage and root collar health, crown health, evidence of disease-causing bacteria, fungi or virus, dead wood and hanging limbs.

Failure

While no one can predict with absolute certainty which trees will or will not fail, we can, by using this scientific process, assess which trees are most likely to fail and take appropriate action to minimize injury and damage.

Tree Tags

The trees were tagged and numbered 441 through 465. The tags are made of shiny aluminum approximately one inch by three inches in size and are attached to the tree with staples and a one foot strip of brightly colored survey tape. The tags were placed as high as possible to minimize their removal and were generally placed on the backsides of the trees as inconspicuously as possible. Please refer to *Attachment 1, Site Plan* for an orientation to the site and the approximate location of the trees.

OBSERVATIONS

On January 11, 2011, I met with Mr. Neiman at site. Mr. Neiman was able to confirm where the property corners were located and what trees specifically needed to be evaluated. The work was done that day.

The property slopes down from 35th Avenue South towards the east and Lakeside Avenue South below. There is an undeveloped section of the South Irving Street right-of-way that extends along the south property line.

The slope is dotted with trees that all appear to be stump sprouted Big Leaf Maples with extensive trunk and root decay. All of the trees are in Poor condition on the subject property as are the three trees on the South Irving Street right-of-way.

Photo # 1: Google Earth image of the site,

In an effort to present the information and conclusions for each tree in a manner that is clear and easy to understand, as well as to save paper, (the ISA form is a two page form for each tree), I have included a detailed spreadsheet, *Attachment 2, Tree Inventory/Condition Spreadsheet*. All the same information from the ISA Tree Hazard Form is included in this spreadsheet and the attached glossary. The descriptions on the spreadsheet were left brief in order to include as much pertinent information as possible and to make the report manageable. The attached glossary provides a detailed description of the terms used in the spreadsheet and in this report. It can be found in *Attachment 3, Glossary*. A brief review of these terms and descriptions will enable the reader to rapidly move through the spreadsheet and better understand the information.

Photo # 2: Tree # 455 and the new addition of the house to the north

Photo # 3: The base of # 455 showing extensive decay

Photo # 4: the base of another Maple—typical of all the Maples with extensive internal decay extending down into the base

DISCUSSION

Trees on Adjacent Properties

There is only one tree on the adjacent property to the north that has a canopy that overhangs the subject property. The tree is far enough south and so hi above the subject property that it will not likely be impacted by the construction of the new home. The

remaining trees to the north and east of the subject property are in Poor condition. However, due to their location they should not be impacted by construction on the subject property.

Trees on the Subject Property

There are 16 trees on the subject property. They are all Big Leaf Maples that all have varying degrees of center rot, base rot, root rot, carpenter ant infestations, and poor structure. Even thought they vigorously grow new canopies every year, advancing decay in the trunks and bases leave them vulnerable to windthrow failure.

Trees 450 ï 457 and 461 will likely all have to be removed for the safety of construction workers, the new home, its new occupants and guests. The remaining trees may or may not have to be removed depending upon how large the new house is and whether any are within striking distance of the new house or surrounding high use areas. That determination will need to be made once the final design has been completed.

Right-of-Way Trees

There are three Maple trees on the South Irving Street right-of-way. They are all three in Poor condition. Trees 447 and 448 are far enough away that they will not be impacted by the house construction. However, depending upon the final design, they may or may not be within striking distance of the new house.

Tree # 449 will not be impacted by the construction of the new house. However, tree # 449 is likely to be within striking distance of the new house and the construction zone around the new house. It may be wise to petition the City to have the tree removed as part of the construction process.

CONCLUSIONS AND RECOMMENDATIONS

Only one of the 25 trees evaluated was rated as Fair. It is # 441 on the neighborôs property to the north. All the other trees were rated as Dead, Dying, or Poor. Most will need to be removed for safety. Once the house design is finalized a decision on all of the trees can be made. Once the decision to remove trees has been made this should be run past the geotechnical engineer to decide if there are any negative impacts on the soil stability. The landscape architect will need to know of any requirements by the City to install replacement treesð both on the subject property and the right-of-way.

WAIVER OF LIABILITY

There are many conditions affecting the stability of a slope. The recommendations in this report are to reduce the risk of catastrophic tree failure only. It is not a guarantee against severe erosion or landslide. Tree, shrub, and groundcover roots cannot prevent deep-seated landslides from occurring. If a severe landslide occurs, all trees and vegetation will be swept away as part of the landslide. It is strongly recommended that a qualified geotechnical engineer be retained to review the recommendations involved in this report and the condition of the slope itself.

There are also many conditions affecting a treeôs 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 slope stability. While I have used every reasonable means to examine the slope and all relevant factors, this tree management plan represents my opinion of the situation at this point in time. These findings do not guarantee future safety nor are they predictions of future events. It is the property owner/project managerôs responsible to engage the services of a qualified geotechnical engineer to ascertain the conditions of the slope and actions that will enhance or destabilize the slope.

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&Rôs) 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 opinion is recommended. The client shall hold the evaluator harmless for any and all injuries or damages incurred if the evaluatorôs recommendations are not followed or for acts of nature beyond the evaluatorôs reasonable expectations, such as severe winds, excessive rains, heavy snow loads, etc.

This report and all attachments, enclosures, and references, are confidential and are for the use of the client concerned. They may not be reproduced, used in any way, or disseminated in any form without the prior consent of the client concerned and Gilles Consulting.

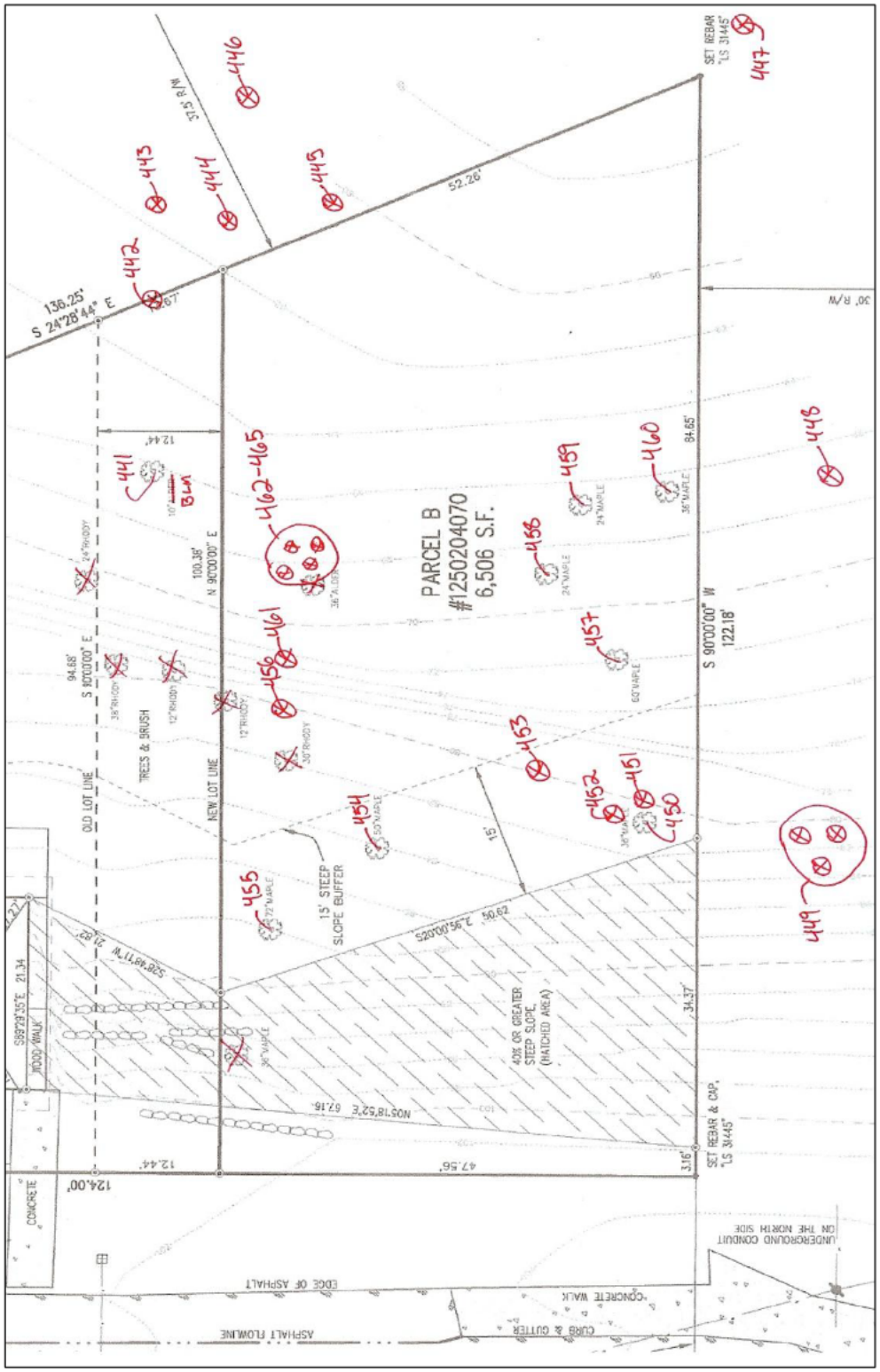
Thank you for calling Gilles Consulting for your arboricultural needs.

Sincerely,

Brian K. Gilles, Consulting Arborist
ISA Certified Arborist # PN-0260A
ASCA Registered Consulting Arborist # RCA-418
PNW-ISA Certified Tree Risk Assessor #148

ATTACHMENTS

ATTACHMENT 1 - SITE PLAN



ATTACHMENT 2 - TREE INVENTORY/CONDITIONS SPREADSHEET

ABBREVIATED LEGEND--SEE GLOSSARY IN REPORT ATTACHMENTS FOR GREATER DETAIL

#1 ***Property:*** Whether the tree is on or off the Subject Property, or a Right-of-Way tree.
#2 ***Tree Location:*** Relative placement of the tree.
#3 ***Tree #:*** The unique tag number of each tree.
#4 ***Species:*** BLM/Am Big Leaf Maple, *Acer macrophyllum*
#5 ***DBH:*** Trunk diameter @ 4.5' above average ground level.
#6 ***Drip Line:*** The radius, the distance from the trunk to the furthest branch tips.
#7 ***LCR:*** *Live Crown Ratio* - the amount of live canopy expressed as a % of the entire tree height.
#8 ***Symmetry:*** General shape of canopy and weight distribution of the tree around the trunk.
#9 ***Foliage:*** General description of foliage density that indicates tree health and vigor.
#10 ***Crown Condition:*** The most important external indication of tree health and vigor.
#11 ***Trunk:*** Description of trunk condition or abnormalities if any.
#12 ***Root Collar:*** The base of the tree where the trunk flares into the roots--deformities or problems are noted here.
#13 ***Roots:*** Root problems are noted here.
#14 ***Comments:*** Additional observations about the tree's condition.
#15 ***Current Health Rating:*** A description of general health ranging from dead, dying, hazard, poor, suppressed, fair, good, very good, to excellent.
#16 ***Recommendation:*** A recommendation for management of the tree in order to reduce the risk of failure and/or damage to an acceptable level.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PROPERTY	TREE LOCATION	TREE #	SPECIES	DBH	DRIP LINE	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	CURRENT HEALTH RATING	RECOMMENDATION
Off property	North of north property line.	441	BLM/Am	12.1"	10'	20%	Major asymmetry	ABS/ASE	Topped at 22'	Typical	Pistol butt base	Fill on 50% of critical root zone		Fair	Potential to Retain with Tree Protection Measures
Off property	North of north property line.	442	BLM/Am	9.4", 9.3", & 8.9"	16'	40%	Major asymmetry	PBS/PSE	Weak	Forked at 3' & base, center rot	Base rot	Root rot	Dead branches in canopy. Carpenter ant infestation. Hangers	Poor	Potential to Retain with Tree Protection Measures
Off property	NE of NE property corner.	443	BLM/Am	11.9" & 8.5"	10'	35%	Minor asymmetry	ABS/ASE	Average	Forked at 1' & 5', center rot	Base rot	Root rot	Base is approximately 15 feet NE of NE property corner stake.	Poor	Potential to Retain with Tree Protection Measures
Off property	East of east property line.	444	BLM/Am	5.1", 4.1" & 3.8"	6'	30%	Major asymmetry	PBS/PSE	Weak	Forked at base, center rot	Base rot	Root rot	base is approximately 6 feet NE of NE property corner stake. Hypoxylon.	Poor	Potential to Retain with Tree Protection Measures
Off property	East of east property line.	445	BLM/Am	clump of 11	24'	55%	Minor asymmetry	ABS/ASE	Average	Center rot	Base rot	Root rot	Carpenter ant infestation. Armillaria mycelium. Hypoxylon at base. All trunks are stump sprouts. DBH: 16.0", 13.8", 10.4", 10.2", 10.1", 9.8", 8.9", 8.8", 8.4", 8.3", and 4.8".	Poor	Potential to Retain with Tree Protection Measures
Off property	East of east property line.	446	BLM/Am	15.1", 13.3" & 13.3"	18'	40%	Minor asymmetry	PBS/PSE	Average	Forked at 2.5' with included bark to base, center rot	Base rot	Root rot	Advanced bark beetle infestation. Hypoxylon. Decay up approximately 30 feet in NW trunk. SE trunk broken off at 10 feet.	Poor	Potential to Retain with Tree Protection Measures
Right-of-way	SE of SE property corner.	447	BLM/Am	clump of 8	14'	50%	Generally symmetrical	PBS/PSE	Topped	Forked at base, center rot	Base rot	Exposed	Dead branches in canopy. Decay from base up to topping wounds at 18 feet. Base is approximately 13 feet from SE property stake. DBH: 6.8", 6.1", 6.1", 7.7", 5.8", 5.7", 5.3", and 4.1".	Poor	Potential to Retain with Tree Protection Measures
Right-of-way	South of south property line.	448	BLM/Am	clump of 5	5'	55%	Generally symmetrical	ABS/ASE	Topped at 14', regeneration average	Forked at 18", center rot	Base rot	Exposed, root rot	DBH: 7.9", 4.9", 4.3", 4.2" and 2.8".	Poor	Potential to Retain with Tree Protection Measures
Right-of-way	South of south property line.	449	BLM/Am	cluster of 3	14'	55%	Generally symmetrical	ABS/ASE	Regeneration average	Forked at base, center rot	Base rot	Root rot	Cluster of 3 trees. Previously topped at 12 feet, 16 feet, 20 feet and 24 feet. English Ivy up 22 feet. Hypoxylon. DBHs: 14.2", 10.4", 6.1", 5.1", 4.0", 3.5", 2.9", and 1.4".	Poor	Potential to Retain with Tree Protection Measures
Subject property		450	BLM/Am	8.9"	10'	40%	Major asymmetry	PBS/PSE	Average	Center rot	Base rot	Root rot	English Ivy up 20 feet. Rotten Big Leaf Maple trunk 18 inches to SE.	Poor	
Subject property		451	BLM/Am	8.5", 8.3", & 4.4"	14'	45%	Generally symmetrical	ABS/ASE	Average	Forked at 3.5', center rot	Base rot	Root rot	4.4 inch trunk is dead with bark sloughed. Dead branches in canopy.	Poor	
Subject property		452	BLM/Am	10.4"	12'	30%	Generally symmetrical	ABS/ASE	Average	Center rot	Base rot	Root rot	English Ivy up 85 percent.	Poor	
Subject property		453	BLM/Am	clump of 5	12'	25%	Major asymmetry	PBS/PSE	Weak	Forked at 3', center rot	Base rot	Root rot	English Ivy up 75 percent. DBH: 12.8", 11.7", 10.0", 8.6" and 4.8"	Poor	
Subject property		454	BLM/Am	8.2", 7.8" & 7.7"	12'	15%	Major asymmetry	PBS/PSE	Average	Center rot	Base rot	Root rot	Hypoxylon. 2 trunks completely dead and base leaning. All 3 trunks lean into Tree #453. DBH: 8.2", 7.8" and 7.7".	Dying	
Subject property		455	BLM/Am	clump of 8	26'	65%	Was G, now slightly MI due to house pruning	ABS/ASE	Average	Center rot	Base rot	Root rot	Fill on 50 % of critical root zone. Carpenter ant infestation. Base is 10.5 feet from new house to north. DBHs range from 17.1" to 6.3".	Poor	
Subject property		456	BLM/Am	est. 15.3"	14'	20%	Generally symmetrical	PBS/PSE	Average	Center rot	Exposed, base rot	Root rot	English Ivy up 85 percent. Hypoxylon.	Poor	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PROPERTY	TREE LOCATION	TREE #	SPECIES	DBH	DRIP LINE	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	CURRENT HEALTH RATING	RECOMMENDATION
Subject property		457	BLM/Am	clump of 6	12'	35%	Minor asymmetry	PBS/PSE	Average	Forked at 3', center rot	Base rot	Root rot	English Ivy up 30 feet. Carpenter ant infestation. Hypoxylon. DBHs range from: 12.2" to 2.0".	Poor	
Subject property		458	BLM/Am	17.1" with ivy & 7.0" with ivy	10'	35%	Minor asymmetry	PBS/PSE	Average	Forked at 3.5', center rot	Exposed, base rot	Root rot	English Ivy up 80 percent. Carpenter ant infestation.	Poor	
Subject property		459	BLM/Am	12.6" & 8.6"	12'	45%	Minor asymmetry	ABS/ASE	Average	Center rot	Base rot	Root rot	English Ivy up 85 percent. Hypoxylon.	Poor	
Subject property		460	BLM/Am	est. 14.9", 11.8" & est. 10.7"	12'	40%	Major asymmetry	PBS/PSE	Weak	Center rot	Base rot	Root rot	English Ivy up 70 percent.	Poor	
Subject property		461	BLM/Am	8.0" & 6.1"	10'	30%	Major asymmetry	PBS/PSE	Weak	2 trunks lean into Tree 453's canopy.	Pushed over	Fill on 50% of critical root zone	2 trunks lean into canopy of Tree #463. Trunks pushed over and partially cut.	Dying	
Subject property		462	BLM/Am	6.8" & 6.8"	10'	15%	Major asymmetry	PBS/PSE	Weak	Harp, leans SE, center rot	Base rot	Root rot	Carpenter ant infestation. Calloused vertical crack in north trunk.	Dying	
Subject property		463	BLM/Am	21.9"	14'	65%	Minor asymmetry	PBS/PSE	Average	Forked at 5', center rot	Base rot	Root rot	Carpenter ant infestation. Armillaria mycelium. Dead branches in canopy.	Poor	
Subject property		464	BLM/Am	7.7"	10'	35%	Major asymmetry	PBS/PSE	Broken out	Center rot	Base rot	Root rot		Dying	
Subject property		465	BLM/Am	5.9"	n/a	n/a	n/a	n/a	n/a	Center rot	Base rot	Root rot		Dead	

SUMMARY:

25 Trees were evaluated:

- Off Property Trees:

- 9 trees are presumed to be off the property:
  - There are 3 trees on the S. Irving NE 110th Street Right-of-Way. They are #'s 447, 448, & 449.
    - The are all in poor condition.
    - However, they appear that they will not be impacted by the house construction.
  - There are 6 trees off the subject property to the North and east.
    - Of the 6 trees only # 441 at the top of the steep bank to the north is in Fair condition. The other 5 are in poor condition.
    - All 6 trees can be adequately protected with tree protection fence along the Temporary Erosion Control & Sedimentation Fe

- Subject Property Trees:

- 16 trees were evaluated on the subject property
- **Status:**
  - All 16 trees were found to be in poor health, poor vigor, poor structure, or a combination of factors.
    - 1 Tree is dead.
    - 4 Trees are dying.
    - 11 Trees are in Poor condition.
  - Therefore, all 16 trees are *Non-Significant. There are no Exceptional Trees on the property or adjacent right-of-way.*
  - It is likely that tees # 450 – 457 and 461 may need to be removed for the safety of the new structure and the workers. The remaining trees may or may not need to be removed. The decision should be made when the area of the house and construction footprint is cleared and marked for construction.

ATTACHMENT 3 - GLOSSARY

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

In an effort to clearly present the information for each tree in a manner that facilitates the readerôs ability to understand the conclusions I have drawn for each tree, I have collected the information in a spreadsheet format. This spreadsheet was developed by Gilles Consulting 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 Pacific Northwest Chapter of 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 on the spreadsheet 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) **PROPERTY**ð Whether the tree is on or off the Subject Property, or a Right-of-Way tree.
2) **TREE LOCATION**ð Relative placement of the tree.
3) **TREE #**ð The unique tag number of each tree.
4) **SPECIES**ð This describes the species of each tree with both most readily accepted common name and the officially accepted scientific name.
5) **DBH**ð Diameter 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, ó28.4ò at 36òô.
    ii) Trees with multiple stems are listed as a ñclump of x,ò 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.
        (1) Every effort is made to distinguish between a single tree with multiple stems and several trees growing close together at the bases.
6) **DRIP LINE**ð the radius, the distance from the trunk to the furthest branch tips.
7) **% LCR**ð Percentage of Live Crown Ratio. The relative proportion of green crown to overall tree height. This is an important indication of a treeôs 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.

8) **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 treeôs stability, health and hazard potential– especially if other defects are noted such as cracks, rot, root defects.
9) **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 treeôs health and vigor.
    i) For Deciduous trees in the dormant season:
        (1) The structure of the tree is visible,
        (2) 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.
        (3) 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) 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:
        (1) Dense– extremely thick foliage, an indication of healthy vigorous growth,
        (2) Good– thick foliage, thicker than average for the species,
        (3) Normal/Average– thick foliage, average for the species, an indication of healthy growth,
        (4) 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,

(5) Sparseð 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
(6) Necrosisð 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 treeøs long-term health.
(7) Hangersð 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.

10) **CROWN CONDITION**ð 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 treeøs 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:
(1) Healthy Crownð exceptional growth for the species.
(2) Average Crownð typical for the species.
(3) Weak Crownð thin spindly growth with thin or sparse needles.
(4) Flagging Crownð describes a tree crown that is weak and unable to grow straight up.
(5) Dying Crownð describes obvious decline that is nearing death.
(6) Dead Crownð 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.
(7) Broken outð a formerly weak crown condition that has been broken off by adverse weather conditions or other mechanical means.
(8) Regenerated or Regeneratingð formerly broken out crowns that are now growing back, Regenerating crowns may appear healthy, average, or weak and indicate current health of the tree.
(9) Suppressedð 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.

11) **TRUNK**– this is the area to note any defects that can have an impact on the treeôs 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.
12) **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.
13) **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.
14) **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.

15) **CURRENT HEALTH RATING**– A description of the treeôs general health ranging from dead, dying, poor, senescent, suppressed, fair, good, very good, to excellent.

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 of 3 to 12 points based upon 4 component parts. They are:

16) **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.
    i) 0 Points, no target. **No Hazard.**
    ii) 1 Point, Low human use or low target value.
    iii) 2 Points, Moderate human use or moderate target value.
    iv) 3 Points, High or constant human use or high target value.
17) **SIZE OF PART--** The larger the tree or component part that fails, the greater the potential for injury or damage.
    i) 1 Point = small branches or trunks up to 4 inches in diameter.
    ii) 2 Points = branches or trunks from 4.1 to 19.9 inches in diameter.
    iii) 3 Points = large branches or trunks greater than 20 inches in diameter.
18) **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 it threshold of action recommended to reduce or minimize the potential failure and associated injuries or damages that might occur.
    i) 1 Point = Minor defect is not likely to lead to imminent failure.
        (1) No further action is required.
    ii) 2 Points = One or more defects are well established but would typically not lead to failure for several years.
        (1) Corrective action might be useful to prevent future problems but only if time and money is available. Not the highest priority for action. Generally ñretain and monitorò is acceptable action.
    iii) 3 Points = The defect(s) is serious and failure is likely.
        (1) Corrective action is required in weeks or months.
    iv) 4 Points = The defect(s) are serious and imminent failure is likely.
        (1) Action is required in days or weeks.
    v) 5 Points = The tree or component parts are already failing. Failure is imminent. This is an *emergency situation.*
        (1) *Corrective action is required immediately today.*
19) ***ISA HAZARD RATING--***The combined component ratings of *Target Rating, Size of Part, Probability of Failure, and Other Risk Factors* on a scale of 3 through 12.
20) **RECOMMENDATION**– this is an estimate of whether or not the tree is of sufficient health, vigor, and structure that it is worth retaining. Specific

recommendations for each tree are included in this column. They may include anything from pruning dead wood, mulching, aerating, injecting tree-based fertilizer into the root system, shortening into a habitat tree or wildlife snag, or to completely removing the tree.

i) **Monitor: "**Monitorò is a specific recommendation that the tree be re-evaluated on a routine basis to determine if there are any significant changes in health or structural stability. ñMonitor annuallyò (or bi-annually, tri-annually, etc.)ò means the tree should be looked at once every year (or every 2 or 3 years, etc.) This yearly monitoring can be a quick look at the trees to see if there are any significant changes. Significant changes such as storm damage, loss of crown, partial failure of one or more roots, etc. require that a full evaluation be done of the tree at that time.

ii) **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 the stresses of construction if development requirements and construction requirements allow.

iii) **Habitat or Remove:** means that the tree has a high potential to fail and cause either personal injury or property damageð in other words the tree has been declared a hazard tree and should be dealt with prior to the next large storm. If it is at all possible the recommendation is to leave some of the trunk standing for wildlife habitat and some of the trunk on the ground as a nurse log. 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 microenvironments for new plantings. The nurse logs meaning to be steak to prevent their movement and potential harm to people. If for some reason this is not possible that should be removed for safety.

NOTE: TREES WITH THE SAME DESCRIPTION AND DIFFERENT RATINGS: Two trees may have the same descriptions in the matrix boxes, one may be marked ñSignificant,ò while another may be marked ñNon-Significant.ò The difference is in the degree of the description--early ñnecrosisò versus advanced ñnecrosisò for instance. Another example is center rot or base rot. In a Western Red Cedar tree the presence of low or even moderate rot is not significant and does not diminish the strength of the tree. However, low levels of rot in the base of a Douglas Fir tree in an area known to have virulent pathogens present is highly significant and predisposes that tree to windthrow. Again, these descriptions were left brief in an effort to include as much pertinent information as possible, to make the report manageable, and, not to bore the reader with infinite levels of detail.

ATTACHMENT 4 - TREE PROTECTION MEASURES

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 will 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.

The following minimum Tree Protection Measures are included on three separate sheets so that they can be copied and introduced into all relevant documents such as site plans, permit applications and conditions of approval, and bid documents so that everyone involved is aware of the requirements. These Tree Protection Measures are intended to be generic in nature. They will need to be adjusted to the specific circumstances of your site that takes into account the location of improvements and the locations of the trees.

TREE PROTECTION MEASURES:

1. Tree Protection Fences will need to be placed around each tree or group of trees to be retained.
    a. Tree Protection Fences are to be placed according to the attached drawing at a distance of not less than 5 feet outside the dripline of the tree or group of trees to be saved.
    b. Tree Protection Fences must be inspected prior to the beginning of any demolition or construction work activities.
    c. Nothing must be parked or stored within the Tree Protection Fencesð no equipment, vehicles, soil, debris, or construction supplies of any sorts.

2. Cement trucks must not be allowed to deposit waste or wash out materials from their trucks within the Tree Protection Fences.

3. The Tree Protection Fences need to be clearly marked with the following or similar text in four inch or larger letters:

    "TREE PROTECTION FENCE
    DO NOT ENTER THIS AREA
    DO NOT PARK OR STORE MATERIALS
    WITHIN THE PROTECTION AREA

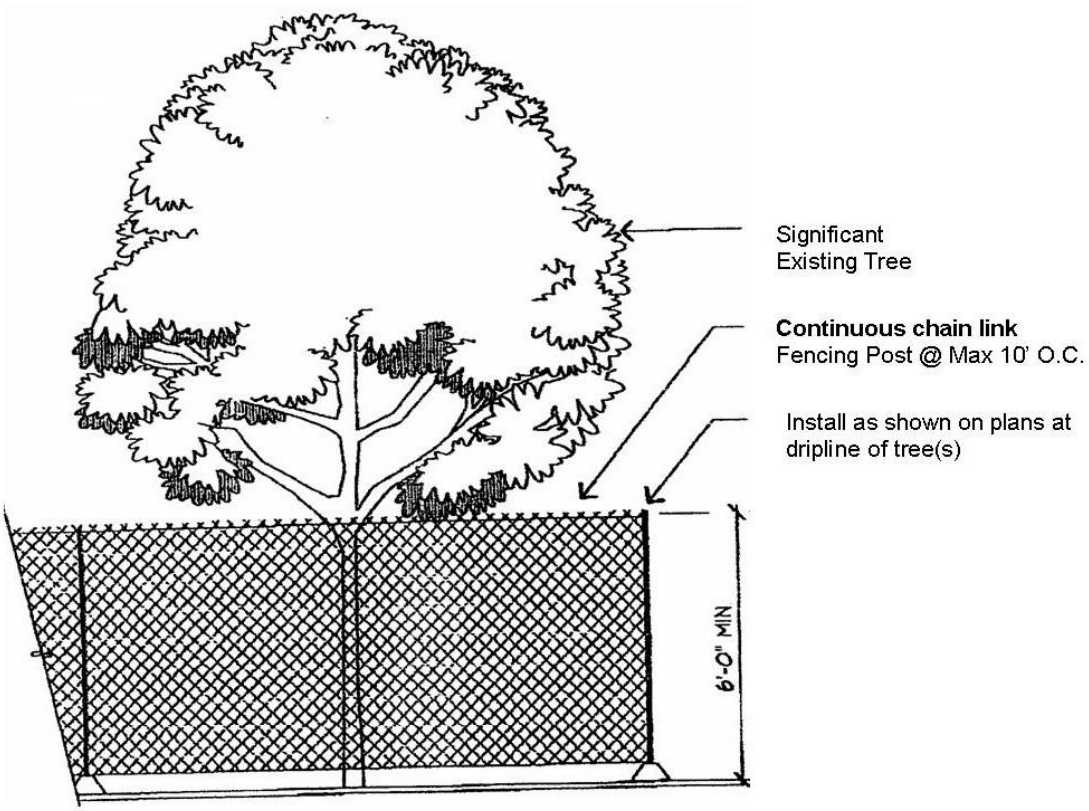
    Any questions, call Brian K. Gilles at Gilles Consulting
    @ 425-417-0850"

4. The area within the Tree Protection Fencing must be covered with wood chips, hog fuel, or similar materials to a depth of 8 to 10 inches. The materials should be placed prior to beginning construction and remain until the Tree Protection Fencing is taken down.

5. When excavation occurs near trees that are scheduled for retention, the following procedure must be followed to protect the long term survivability of the tree:
    a. An International Society of Arboriculture, (ISA) Certified Arborist must be working with all equipment operators.
        i. The Certified Arborist should be outfitted with a shovel, hand pruners, a pair of loppers, a handsaw, and a power saw (a ñsawsallò is recommended).
    b. The hoe must be placed to ñcombò the material directly away from the trunk as opposed to cutting across the roots.
        i. Combing is the gradual excavation of the ground cover plants and soil in depths that only extend as deep as the tines of the hoe.

c. When any roots of one inch diameter or greater, of the tree to be retained, is struck by the equipment, the Certified Arborist should stop the equipment operator.
d. The Certified Arborist should then excavate around the tree root by hand/shovel and cleanly cut the tree root.
    i. The Certified Arborist should then instruct the equipment operator to continue.

6. Putting Utilities Under the Root Zone:
    a. Boring under the root systems of trees (and other vegetation) shall be done under the supervision of an ISA Certified Arborist. This is to be accomplished by excavating a limited trench or pit on each side of the critical root zone of the tree and then hand digging or pushing the pipe through the soil under the tree. The closest pit walls shall be a minimum of 7 feet from the center of the tree and shall be sufficient depth to lay the pipe at the grade as shown on the plan and profile.
    b. Tunneling under the roots of trees shall be done under the supervision of an ISA Certified Arborist in an open trench by carefully excavating and hand digging around areas where large roots are exposed. No roots 1 inch in diameter or larger shall be cut.
    c. The contractor shall verify the vertical and horizontal location of existing utilities to avoid conflicts and maintain minimum clearances; adjustment shall be made to the grade of the new utility as required.



Six-foot high temporary chain link fence shall be placed as shown on plans. Fence shall completely encircle tree(s). Install fence posts using pier blocks only. Avoid driving posts or stakes into major roots.

Make a clean straight cut to remove damaged portion of root for all roots over 1" in diameter damaged during construction. ***All*** exposed roots shall be temporarily covered with damp burlap and covered with soils the same day, if possible, to prevent drying. If not possible, burlap must be kept moist at all times.

Work with the protection fencing shall be done manually. No stockpiling of materials, soil, debris, vehicle traffic, or storage of equipment or machinery shall be allowed within the limit of the fencing.

Cement trucks must not be allowed to deposit waste or wash out materials from their trucks within the Tree Protection Fences.

The area within the Tree Protection Fencing must be covered with wood chips, hog fuel, or similar materials to a depth of 8 to 10 inches. The materials should be placed prior to beginning construction and remain until the Tree Protection Fencing is taken down.

ATTACHMENT 5 - REFERENCES

1. Eric Allen, et al. *Common Tree Diseases of British Columbia*. Victoria: Canadian Forest Service, 1996.

2. Harris, Richard W. et al. *Arboriculture, Integrated Management of Landscape Trees, Shrubs, and Vines*. 4th ed. Upper Saddle River: Prentice Hall, 2004.

3. Johnson, Warren T. and Lyon, Howard H. *Insects That Feed on Trees and Shrubs*. Ithaca: Comstock Publishing Associates, 1991.

4. Matheny, Nelda P. and Clark, James R. *Evaluation of Hazard Trees*. 2nd ed. Savoy: The International Society of Arboriculture Press, 1994

5. Matheny, Nelda P. and Clark, James R. *Trees & Development, A Technical Guide to Preservation of Trees During Land Development*. Savoy: The International Society of Arboriculture Press, 1998.

6. Mattheck, Claus and Breloer, Helge. *The Body Language of Trees, A Handbook for Failure Analysis.* London: HMSO, 1994.

7. Pacific Northwest Chapter-ISA. *Tree Risk Assessment in Urban Areas and the Urban/Rural Interface.* Course Manual. Release 1.2. PNW-ISA: Silverton, Oregon, 2008.