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S O U N D U R B A N F O R E S T R Y, LLC

Appraisals ~ Site Planning ~ Urban Landscape Design and Management
Environmental Education ~ Environmental Restoration ~ Risk Assessments

10/10/2023

City of Tumwater
Marc LaVack
555 Israel Rd SW
Tumwater, WA 98501

RE: Meeker Oak Risk Assessment

Mr. LaVack:

Upon your request, a thorough evaluation of the Meeker Oak located at the Olympia Regional Airport has been conducted. This tree has become of concern due to the recent failure of a two large diameter scaffold branches on the north side. Per your direction, this evaluation has included a risk assessment by myself, an aerial assessment by a climbing certified arborist and a sonic tomography by Tree Solutions Inc, all conducted during the months of June -August of this year. The purpose of this report is to present the findings and offer my recommendations based on those findings to the City of Tumwater.

Tree Risk Assessment Methodology

The tree risk assessment methodology used for this report was developed by the International Society of Arboriculture in 2013. It replaces the original method adopted in 2011.

Tree risk assessment can be conducted at different levels of intensity, each employing varying methods and providing the client with varied options of reporting and recommendations. The level selected should be appropriate for the assignment.

The ANSI standard for risk assessment and ISA's *Best Management Practices: Tree Risk Assessment* defines three levels of tree risk assessment:

- Level 1: Limited visual
- Level 2: Basic
- Level 3: Advanced

Level 1 assessment involves a visual assessment of an individual tree or populations of trees near specified targets, conducted from a specified perspective in order to identify certain obvious defects or specified conditions. A limited visual assessment typically focuses on identifying trees with *imminent* and/ or *probable* likelihood of failure.

A Level 2 or basic assessment is the standard assessment performed by arborists in response to most private client requests for tree risk assessments. It consists of a detailed visual inspection of a tree and its surrounding site and a synthesis of the information collected. A basic assessment requires walking completely around the tree – looking at the site, buttress roots, trunk and branches. Looking at the tree from some distance away, as well as close up, to consider crown shape and surroundings.

Level 3 is an advanced assessment and it is performed to provide detailed information about specific tree parts, defects, targets, or site conditions. It may be in conjunction with or after a basic assessment if additional information is needed and the client approves the additional service. Specialized equipment, data collection and analysis, and/or expertise are usually required for advanced assessments. These assessments are, therefore, generally more time intensive and more expensive.

After determining the likelihood of failure and the likelihood of impacting a target, the combined likelihood of a failure impacting a target can be categorized. Matrix 1 can be used as a guide in relating these likelihood factors within a given time frame. The resulting terms (unlikely, somewhat likely, likely, very likely) are defined by their use within the table and are used to represent this combination of occurrences in Matrix 2.

Matrix 1. Likelihood of Failure

Likelihood of Failure	Likelihood of Impacting Target			
	Very Low	**Low**	**Medium**	**High**
Imminent	Unlikely	Unlikely	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

Field Data and Recommendations

A level 3 risk assessment was conducted by myself on June 14, 2023. The following table presents a summary of my findings. More detail can be found in Appendix 1, Tree Risk Assessment Form.

Table 3. Complete Risk Assessment Summary

Species	DBH (in)	Height (ft)	Live Canopy Ratio	Target	Distances to Target	Condition	Comments	Risk Rating
Oregon White Oak *Quercus garryana*	66	125	35	Hwy 99, south parking, north parking, power-lines, aircraft hangar	6', 30', 40', 4', 12'	Poor	Recent failure of an 18" scaffold branch on the north side at 50'. Also, a former failure of a 12" scaffold branch on the east side at 65'. There are signs of white rot infection on the upper sides of both points of failure. Failures were likely due to the infection along with the inclusions and end weight. Trunk soundings on the north and northeast sides at the base indicated probable interior decay up to 6'+. An open decay cavity is present within this location. Two core samples extracted from this area at 3' above grade: #1 taken above the cavity revealed 5" of solid wood, #2 revealed 4" of solid wood. A probe inserted into the cavity did not meet any resistance until 2' and the tip was covered in wet, decayed wood.	High

Aerial Assessment

An aerial assessment was conducted by Amanda Hancock (ISA Certified Arborist TX4155AU & TRAQ) with Waxwing Tree Specialists on June 29, 2023. This inspection found extensive white rot decay within the large scaffold that recently experienced failure at the union (see photo). Further examination determined that the main stem's decay column continues upward into the eastern co-dominant stem and large diameter scaffold branches (see attached diagram). The west facing co-dominant stem contains solid healthy interior wood upward into the large scaffold branches overhanging the drive and aircraft hangar.

Sonic Tomography

A sonic tomography was conducted on the tree by Tyler Bunton (ISA Certified Arborist PN-8715A and TRAQ) with Tree Solutions Inc. on August 24, 2023. A detailed summary of his findings can be found in Appendix 2 but essentially, his test conducted at 50 cm above the base found that due to the extent of decay, the tree has slightly more sound wood than required to support itself. He is recommending the tree receive retrenchment pruning to reduce the height and spread by 15 feet in order to lower the chance of future failures.

Comments

With the exception of the recent large branch failures, the Meeker Oak appears to be in very good health. The crown density, leaf color, leaf size and internode growth all indicate a vigorous tree. However, there are structural concerns associated with the significant decay found in the stem base, lower main stem, east facing co-dominant stem and large scaffold branches. Probable future failures include large diameter scaffold branches from the east facing co-dominant stem and the entire west facing co-dominant stem at the union. The associated inclusions and stress loads will contribute to future failures. Structural support systems in conjunction with pruning were considered but the extent of decay in the main stem and upper east side of the canopy removes that as a mitigation option in my opinion.

The other mitigation options are retrenchment pruning and removal. A considerable amount of thought has been put into my final recommendation. The retrenchment option would be controversial to say the least along with the potential of its ineffectiveness. The targets around this veteran tree are many and high-use and the risk rating would remain high. If the City of Tumwater and the community opts for retrenchment pruning, there will be a need for the development of pruning specifications and a long-term management plan.

Based on my findings and information I have been provided, I am recommending removal.

Professionally Submitted,

Kevin M. McFarland, Principal
Consulting Urban Forester, Contracted City of Tumwater Tree Protection Professional
ISA Certified Arborist PN-0373 & Tree Risk Assessment Qualified
Sound Urban Forestry, LLC
P.O. Box 489
Tahuya, WA 98588
360-870-2511

References

Dunster, Dr, Julian et al. 2017. *Tree Risk Assessment Manual. Second Edition* International Society of Arboriculture. Champaign, IL.

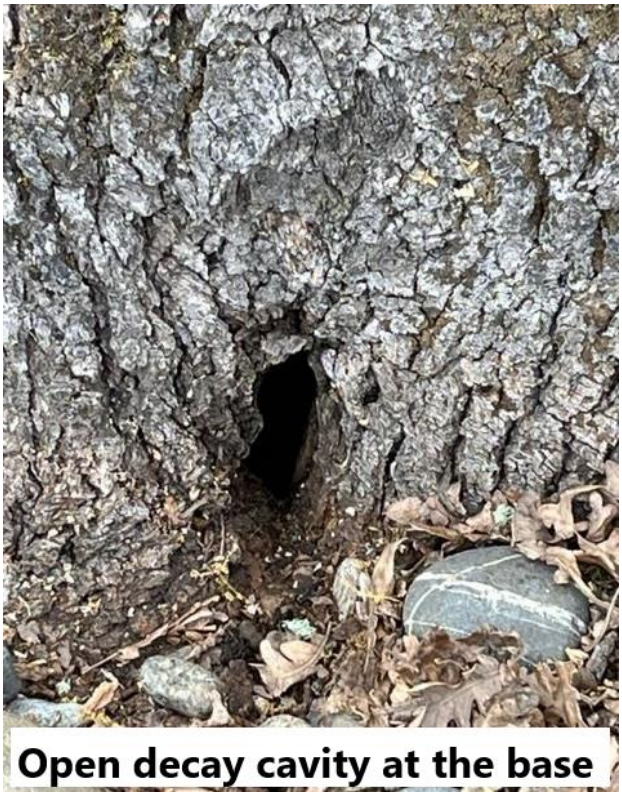
Mattheck, C. & Brelor, H (1998). *The body language of trees. A handbook for failure Analysis*. Research for Amenity Trees No. 4. The Stationary Office, London.

Smiley, E. Thomas, Nelda Matheny and Sharon Lilly. 2011. *Best Management Practices – Tree Risk Assessment.* International Society of Arboriculture. Champaign, IL.

Location of Assessed Tree

Photos

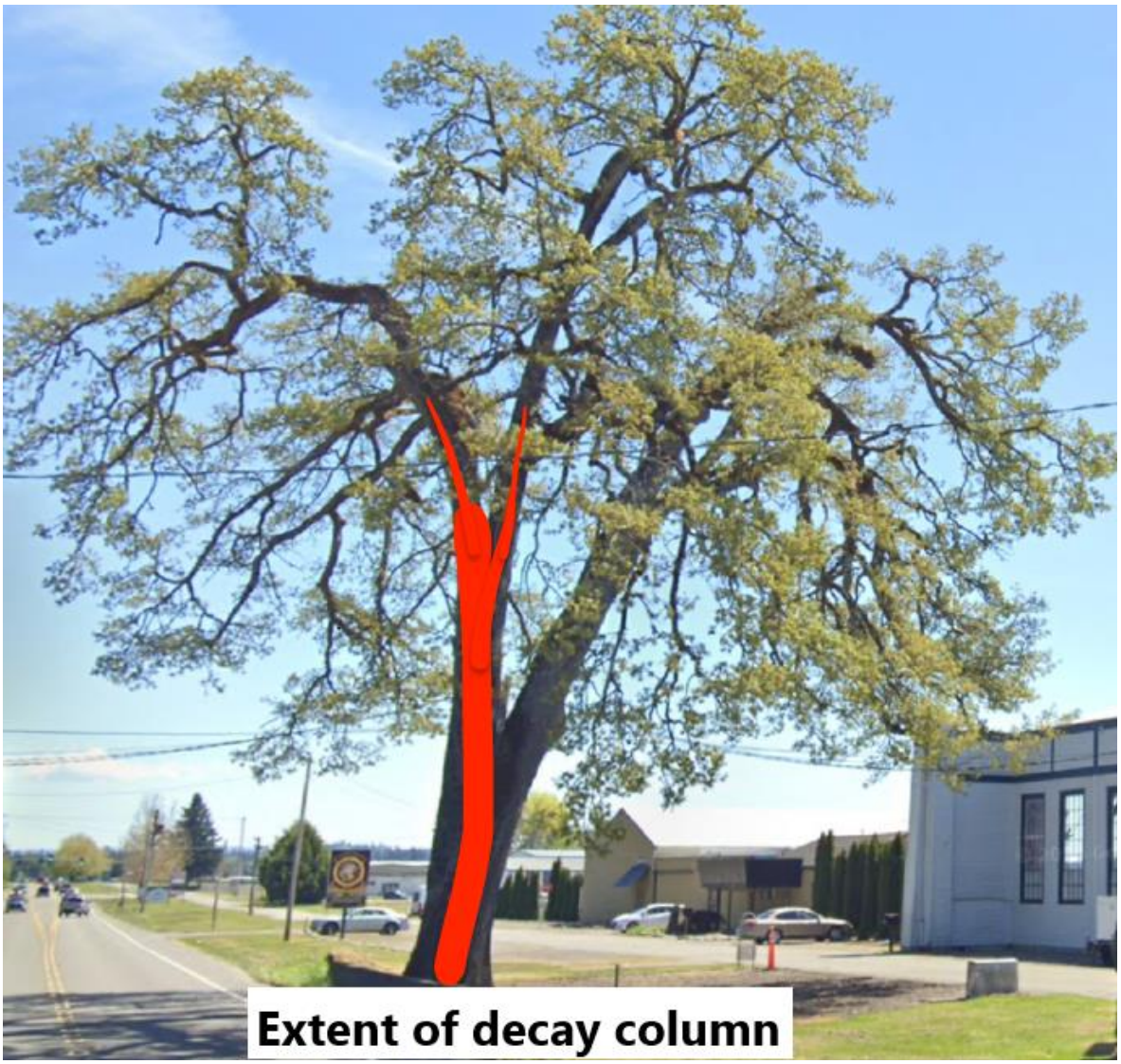
Point of recent failure



Open decay cavity at the base

Points of failure of eastern stem

Aerial assessment by climbing arborist


Extent of decay column

Appendix 1

ISA Basic Tree Risk Assessment Form

Client City of Tumwater Date June 14, 2023 Time 10AM

Address/Tree location 7637 Old Hwy 99 SW, between airport and Hwy 99 Tree no. 1 Sheet 1 of 2

Tree species Oregon White Oak, Quercus garryana dbh 66" Height 125' Crown spread dia. 70'

Assessor(s) Kevin M. McFarland Time frame 1 year Tools used Mallet, increment borer, binoculars, probe, D-tape

Target Assessment

Target number	Target description	Target zone: Target within drip line	Target zone: Target within 1x Ht.	Target zone: Target within 1.5 x Ht.	Occupancy rate (1–rare 2–occasional 3–frequent 4–constant)	Practical to move target?	Restriction practical?
1	Hwy 99	✓			4	No	No
2	Airplane hangar		✓		3	No	No
3	North and south parking		✓		3	No	No
4	Electric service drop	✓			4	No	No

Site Factors

History of failures Large scaffold branches, recent and past **Topography** Flat ■ Slope ☐ _____% **Aspect** _____

Site changes None ■ Grade change ☐ Site clearing ☐ Changed soil hydrology ☐ Root cuts ☐ Describe _____

Soil conditions Limited volume ■ Saturated ☐ Shallow ☐ Compacted ■ Pavement over roots ■ 40 % Describe Road and parking

Prevailing wind direction SW **Common weather** Strong winds ■ Ice ☐ Snow ☐ Heavy rain ■ Describe _____

Tree Health and Species Profile

Vigor Low ☐ Normal ■ High ☐ **Foliage** None (seasonal) ☐ None (dead) ☐ Normal 100 % Chlorotic ____% Necrotic ____%

Pests _____ **Abiotic** _____

Species failure profile Branches ■ Trunk ■ Roots ☐ Describe _____

Load Factors

Wind exposure Protected ☐ Partial ☐ Full ■ Wind funneling ☐ _____ **Relative crown size** Small ☐ Medium ☐ Large ■

Crown density Sparse ☐ Normal ■ Dense ☐ **Interior branches** Few ☐ Normal ■ Dense ☐ **Vines/Mistletoe/Moss** ☐ _____

Recent or planned change in load factors _____

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR 35 %

Dead twigs/branches ■ 5 % overall Max. dia. 5"

Broken/Hangers Number _____ Max. dia. _____

Over-extended branches ■

Pruning history

Crown cleaned ■ Thinned ☐ Raised ☐

Reduced ■ Topped ☐ Lion-tailed ☐

Flush cuts ☐ Other _____

Cracks ☐ _____ Lightning damage ☐

Codominant ■ _____ Included bark ■

Weak attachments ☐ _____ Cavity/Nest hole ____% circ.

Previous branch failures ■ _____ Similar branches present ☐

Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐

Conks ☐ Heartwood decay ■ White Rot

Response growth Normal

Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ■

Likelihood of failure Improbable ☐ Possible ☐ Probable ■ Imminent ☐

— Trunk —

Dead/Missing bark ☐ Abnormal bark texture/color ☐

Codominant stems ■ Included bark ■ Cracks ☐

Sapwood damage/decay ☐ Cankers/Galls/Burls ☐ Sap ooze ☐

Lightning damage ☐ Heartwood decay ■ Conks/Mushrooms ☐

Cavity/Nest hole 50 % circ. Depth _____ Poor taper ☐

Lean ____° Corrected? _____

Response growth _____

Main concern(s) Decay present at co-dominant union

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ■

Likelihood of failure

Improbable ☐ Possible ☐ Probable ■ Imminent ☐

— Roots and Root Collar —

Collar buried/Not visible ☐ Depth _____ Stem girdling ☐

Dead ☐ Decay ■ Conks/Mushrooms ☐

Ooze ☐ Cavity ■ 50 % circ.

Cracks ☐ Cut/Damaged roots ☐ Distance from trunk _____

Root plate lifting ☐ Soil weakness ☐

Response growth _____

Main concern(s) Suspect root collar and flare decay

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐

Likelihood of failure

Improbable ☐ Possible ■ Probable ☐ Imminent ☐

Risk Categorization

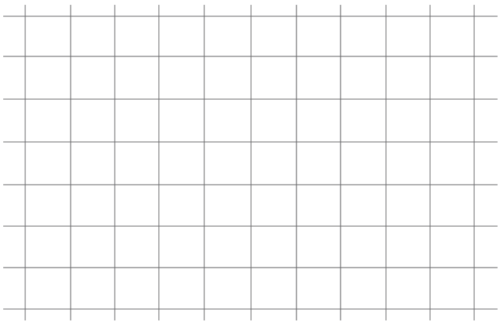
Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood: Failure: Improbable	Likelihood: Failure: Possible	Likelihood: Failure: Probable	Likelihood: Failure: Imminent	Likelihood: Impact: Very low	Likelihood: Impact: Low	Likelihood: Impact: Medium	Likelihood: Impact: High	Likelihood: Failure & Impact (from Matrix 1): Unlikely	Likelihood: Failure & Impact (from Matrix 1): Somewhat	Likelihood: Failure & Impact (from Matrix 1): Likely	Likelihood: Failure & Impact (from Matrix 1): Very likely	Consequences: Negligible	Consequences: Minor	Consequences: Significant	Consequences: Severe	Risk rating of part (from Matrix 2)
1	Large scaffold branch	Failure due to decay	16"	6'	1	None	○	●	○	○	○	○	○	●	○	○	●	○	○	○	○	●	High
			16"	30'	3	None	○	●	○	○	○	○	○	●	○	○	●	○	○	○	○	●	High
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
2	Co-dominant stem	Suspect weak union at stem inclusion due to decay	30"	80'	2	None	○	●	○	○	○	○	○	●	○	○	●	○	○	○	○	●	High
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3	Branch	Poor attachment	6"	4'	4	None	○	●	○	○	○	○	●	○	●	○	○	○	○	○	●	○	Low
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
4							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

Matrix 1. Likelihood matrix.

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 matrix.

Likelihood of Failure & 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



Notes, explanations, descriptions _____

Mitigation options Retrenchment pruning — **Residual risk** High

Removal — **Residual risk** None

Residual risk _____

Residual risk _____

Overall tree risk rating Low ☐ Moderate ☐ High ■ Extreme ☐ **Work priority** 1 ■ 2 ☐ 3 ☐ 4 ☐

Overall residual risk Low ☐ Moderate ☐ High ■ Extreme ☐ **Recommended inspection interval** _____

Data ■ Final ☐ Preliminary **Advanced assessment needed** ☐ No ■ Yes-Type/Reason Aerial inspection, sonic tomography

Inspection limitations ■ None ☐ Visibility ☐ Access ☐ Vines ☐ Root collar buried Describe _____

Appendix 2

Tree Solutions Inc
Consulting Arborists

Project No. TS - 9053

Memorandum

To:	Kevin McFarland – Sound Urban Forestry LLC
Site:	Olympia Regional Airport 7525 Old Highway 99 SE Tumwater, WA 98501
Re:	Sonic Tomography of One Garry Oak Tree
Date:	September 5, 2023
Project Arborist:	Tyler Bunton ISA Certified Arborist PN-8715A ISA Qualified Tree Risk Assessor
Reviewed By:	George White, ISA Certified Arborist PN-8908A ISA Qualified Tree Risk Assessor

This memorandum documents the visit by Tyler Bunton of Tree Solutions Inc. to the above referenced site on August 24, 2023 to perform sonic tomography on one Garry oak (***Quercus garryana***) tree. Kevin McFarland requested these services to obtain additional information about the extent of decay at the base of the tree to provide the City of Tumwater with a more informed risk assessment and management recommendations. The sonic tomogram can be found in Appendix A.

I used a PiCUS sonic tomograph to obtain a tomogram 50 centimeters above the tree base. I selected this height based on soundings of the trunk which indicated the most extensive decay was located low in the trunk. I used the PiCUS Q74 program to analyze the data and obtain a rough estimate of the remaining sound wood shell wall required to maintain tree stability, indicated by the green line in Figure 1 in Appendix A.

The tomogram indicates there is slightly more sound wood than is required to support the tree. However, due to the extent of the decay and thin shell wall around measuring points 3, 4, and 18 it is my opinion that this tree should be managed as a veteran tree and have retrenchment pruning performed to reduce the tree height and spread by approximately 15 feet. Reducing the tree height and spread will result in lowered wind loads acting on the trunk and branch unions resulting in a lower likelihood of failure.

If this tree is retained, it should be reassessed with sonic tomography in five years to determine if the decay is continuing to spread and what the remaining shell wall is at that time. Additionally, 4 to 6 inches of wood chip mulch should be added within the dripline of the tree to improve soil conditions. The wood chip mulch should be kept 12 inches from the base of the tree.

Appendix A **Test Results**

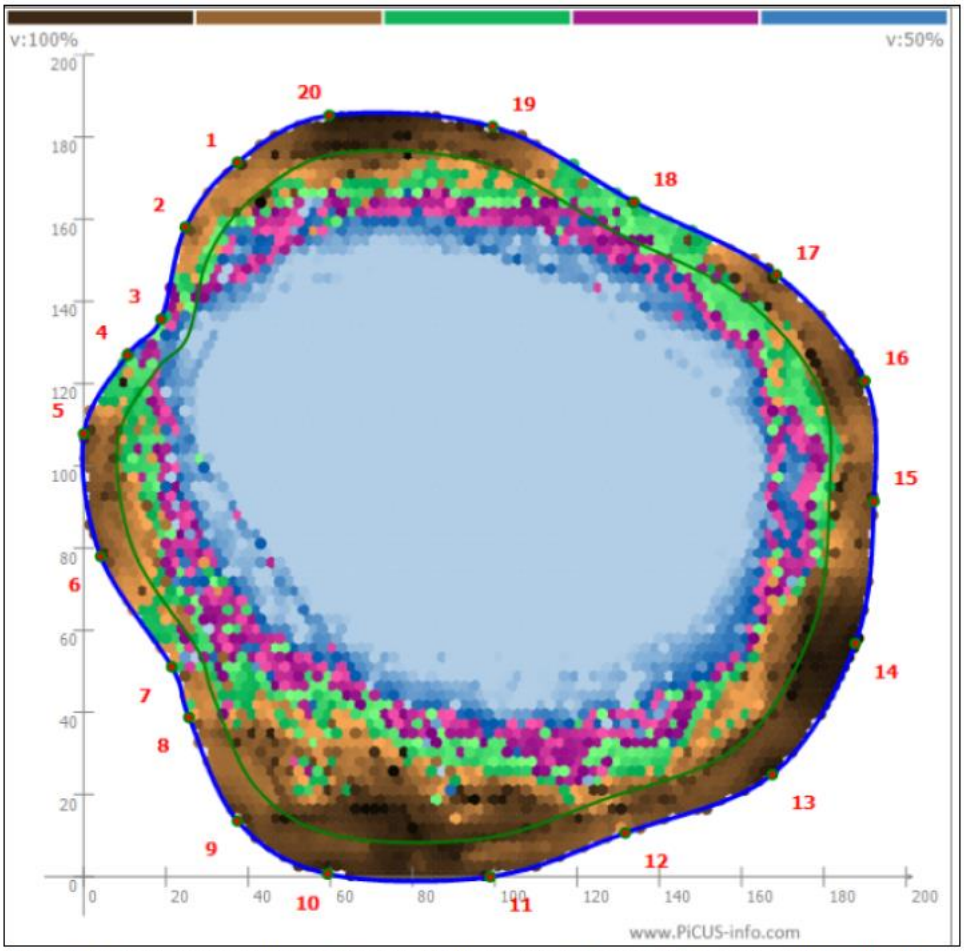


Figure 1. Sonic tomogram of the subject tree. North is located at measuring point 1, and the side of the tree towards the highway is along measuring points 17, 18, and 19. The blue areas indicate decay or a decay cavity, and the brown areas indicate sound wood. The purple and green areas indicate early or spreading decay. The green line is the calculated shell wall of sound wood required for the tree to remain stable.

Appendix B **Photographs**

Photograph 1. Measuring point 1 is circled in red. An opening into the decay cavity is indicated by the red arrow.

Photograph 2. The crown of the subject tree viewed from the southeast. The red line indicates approximately 15 feet of crown reduction.

Appendix C **Assumptions & Limiting Conditions**

1 Consultant assumes that the site and its use do not violate, and is in compliance with, all applicable codes, ordinances, statutes, or regulations.

2 The consultant may provide a report or recommendation based on published municipal regulations. The consultant assumes that the municipal regulations published on the date of the report are current municipal regulations and assumes no obligation related to unpublished city regulation information.

3 Any report by the consultant and any values expressed therein represent the opinion of the consultant, and the consultant's fee is in no way contingent upon the reporting of a specific value, a stipulated result, the occurrence of a subsequent event, or upon any finding to be reported.

4 All photographs included in this report were taken by Tree Solutions, Inc. during the documented site visit, unless otherwise noted. Sketches, drawings, and photographs (included in, and attached to, this report) are intended as visual aids and are not necessarily to scale. They should not be construed as engineering drawings, architectural reports, or surveys. The reproduction of any information generated by architects, engineers or other consultants and any sketches, drawings or photographs is for the express purpose of coordination and ease of reference only. Inclusion of such information on any drawings or other documents does not constitute a representation by the consultant as to the sufficiency or accuracy of the information.

5 Unless otherwise agreed, (1) information contained in any report by consultant covers only the items examined and reflects the condition of those items at the time of inspection; and (2) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, climbing, or coring.

6 These findings are based on the observations and opinions of the authoring arborist, and do not provide guarantees regarding the future performance, health, vigor, structural stability, or safety of the plants described and assessed.

7 Measurements are subject to typical margins of error, considering the oval or asymmetrical cross-section of most trunks and canopies.

8 Tree Solutions did not review any reports or perform any tests related to the soil located on the subject property unless outlined in the scope of services. Tree Solutions staff are not and do not claim to be soils experts. An independent inventory and evaluation of the site's soil should be obtained by a qualified professional if an additional understanding of the site's characteristics is needed to make an informed decision.

9 Our assessments are made in conformity with acceptable evaluation/diagnostic reporting techniques and procedures, as recommended by the International Society of Arboriculture.

Definitions

Included Bark (Inclusion): Bark that becomes embedded in a crotch (union) between branch and trunk or between co-dominant stems. Causes a weak structure.

Retrenchment: Natural process during which an overly mature tree reduces its crown and increases its girth to consolidate resources and increase longevity; the deliberate process of reducing tree height to mimic process.

Sounding: Process of striking a tree with a mallet or other appropriate tool and listening for tones that indicate dead bark, a thin layer of wood outside a cavity, or crack in wood.

Tomography: The use of multiple sensors placed around a trunk or limb to record sound or magnetic waves traveling through the wood, with measurements resulting in a picture of internal density characteristics. Typically used in arboriculture to measure the extent of decay in trees.

Assumptions and Limitations of Tree Risk Assessment

1. Tree risk assessment is limited in scope to the specific risks(s) of interest, and does not include any and all risks.

2. Tree risk assessment considers significant known and/or assigned targets and visible or detectable tree conditions.

3. Tree risk assessments represent the condition of the tree and site at the time of inspection.

4. Only those trees specified in the scope of work were assessed, and assessments were performed within the limitations specified.

5. Any tree, whether it has visible weaknesses or not, will fail if the forces applied exceed the strength of the tree or its parts.

6. Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/appraiser can neither guarantee not be responsible for the accuracy of information provided by others. Any legal description provided to the consultant/appraiser is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable.

7. Loss or alteration of any part of this report invalidates the entire report.

8. 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 the prior expressed written or verbal consent of Sound Urban Forestry, LLC.

9. Neither all or any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales or other media, without the prior expressed written or verbal consent of Sound Urban Forestry, LLC – particularly as to the value considerations, identity of Sound Urban Forestry, LLC, or any reference to any professional society or to any initialed designation conferred upon Sound Urban Forestry, LLC as stated in its qualifications.

10. This report and any values expressed herein represent the opinion of Sound Urban Forestry, LLC and the fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence neither of a subsequent event, nor upon any finding to be reported.

11. Diagrams, graphs, photographs and sketches in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.

12. Sound Urban Forestry, LLC shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made.

13. Unless expressed otherwise: 1) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection; and 2) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, drilling or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the tree or other plant or property in question may not arise in the future.

14. The time frame for risk categorization should not be considered a “guarantee period” for the risk assessment.