Tree Solutions Inc
Consulting Arborists

Project No. TS -8207

Arborist Report

To:	Ross Murray, Thomas Quigley
Site:	4803 Forest Ave SE, Mercer Island, WA 98040
Re:	Micro-resistance drill testing of bigleaf maple 746
Date:	Jan. 19, 2022
Project Arborist:	Joseph Sutton-Holcomb ISA Certified Arborist #PN-8397AM Municipal Specialist, ISA Qualified Tree Risk Assessor
Reviewed By:	Connor McDermott, ISA Certified Arborist #PN- 8704A ISA Qualified Tree Risk Assessor
Attached:	Micro-resistance drill test results

Assignment and Scope of Work

This report outlines the site inspection by Joseph Sutton-Holcomb, of Tree Solutions Inc, on Jan. 6, 2022. I was asked to visit the site and provide a level 3 risk assessment of one bigleaf maple (*Acer macrophyllum*) tree on-site. The tree was tagged 746 at the time of my assessment.

I was asked to produce an arborist report documenting my findings and management recommendations. Thomas Quigley, acting on behalf of the property owner Ross Murray, requested these services to better understand the structural condition of the tree and how that condition may inform management and construction decisions.

The likelihood of whole tree or part failure is based on what is visible during the time of the assessment and what would likely occur under normal weather conditions over a 3-year time period. This time frame should not be considered a guarantee period for the risk assessment. This assessment discusses the tree conditions found at the time of the inspection, but weather and activities in and around the tree since this inspection can have a significant impact on tree condition and likelihood of failure. I recommend a follow-up inspection after abnormal weather events.

A “Hazard Tree” is defined as “a tree that has been assessed as having characteristics that make it an unacceptable risk for continued retention. A hazard tree, or a hazardous component, exist when the sum of the risk factors equals or exceeds a predetermined threshold of risk.” The predetermined threshold for risk and the actions required to reduce the risk below that threshold are established by the risk manager.

As a Qualified Tree Risk Assessor, my job is to provide the risk manager, in this case the property owner, with technical information required to make informed decisions. The risk manager must make the decision about how to implement the actions required to reduce risk to acceptable levels.

Observations

Site

The site fronts Forest Ave SE on Mercer Island, WA. A single-family home recently constructed exists on site. A review of GIS information for the area shows that the tree is in close proximity to a newly constructed home.

The site is adjacent to a Mercer Island Park property, Miller Landing. At the time of my assessment, it was unclear whether the tree in question was located on private property or Miller Landing. Regardless, the tree is growing within a steep slope environmentally critical area and subject to protections under Mercer Island City Code Chapters 19.07.090 (Critical Area Reviews), 19.10.050 (Tree removal – Not associated with a development proposal), 19.10.060 (Tree Removal – Associated with a development proposal), and 19.10.090 (Application requirements).

Tree

Tree 746 is a bigleaf maple in fair health and fair structural condition. The tree has two codominant stems that divide at approximately 3.5-feet above grade. The downslope stem is the “south stem” and will be referred to as such in this report. The upslope stem will be referred to as the “north stem.” The south stem is 20.9-inches Diameter at Standard Height (DSH). The north stem is 16.8-inches DSH. The tree is approximately 75-feet in height.

I measured the newly constructed house to be 20-feet to the east of the trunk of the maple tree in question. I measured the staked location of the proposed new garage to be 16.5-feet to the south of the trunk.

I observed included bark and a narrow angle of attachment at the union of the south and north stems. I observed a large cavity with associated decay on the west side of the south stem. I observed a seam of reaction wood on the south stem from the top of the open cavity to approximately 20-feet above grade. This seam could be the result of an old branch or stem failure.

I noted that the south stem was cantilevered downslope to the south. I observed that several branches have been pruned out of the south’ stem’s upper canopy in the past. This reduction pruning appears to have contributed to the cantilevered form of this stem by encouraging lateral growth downslope to the south.

I observed some small wounds with associated decay and response growth on the north stem.

Table 1. Tree Inventory

Tree ID	Common Name	Botanical Name	DSH *	Dripline Radius **	General Health	Tree Height	Notes
746	Bigleaf maple	*Acer macrophyllum*	16.8, 20.9	24 feet	Fair	75 feet	Codominant with included bark, large cavity with decay on west side of south stem, south stem cantilevered down slope, history of branch removal on south stem, north stem has small wounds with minor associated decay, new house 20 feet east of trunk, foundation corner stake 16.5 feet south of trunk

Tree ID is numerical if on-site and alphabetical if off-site or on adjacent property.
** DSH is Diameter at standard height (inches)*
*** Dripline was measured from the center of the trunk to the outermost limits of the canopy (feet)*

Table 2. Risk Assessment Matrix – 3-year timeframe

				Likelihood that…				
Tree No.	**Common Name**	**Part of Concern**	**Target**	**Part will Fail**	**Part will Impact Target**	**Impact / Failure**	**Level of Consequence**	**Risk Rating**
746	Bigleaf maple	South stem	New garage*	Probable	High**	Likely	Severe	High*
746	Bigleaf maple	South stem	Existing house	Probable	Low	Unlikely	Severe	Low
746	Bigleaf maple	North stem	New garage	Possible	Medium	Unlikely	Severe	Low
746	Bigleaf maple	North stem	Existing house	Possible	Medium	Unlikely	Severe	Low

**Garage does not currently exist on site. Risk rating from this tree at the time of this report is written is low in a 2-year timeframe.*
***Likelihood of impact rating is based on staked location of garage on the site at time of site inspection.*
Details of the ISA risk assessment method can be found in Appendix G.

Discussion

Test Results
I conducted four micro-resistance drill tests on this tree. Three of the tests assessed the southern stem due to the structural defects observed in the visual tree assessment. The results of the tests with accompanying analysis are attached to this report. The tests found significant internal decay in the south stem, and decay to a lesser extent in the north stem.

Analysis
Based on visual tree assessment and micro-resistance drill test assessment, I believe the likelihood of the southern stem failing in a 3-year time period to be probable. In my opinion, the stem is likely to fail downslope, which makes the likelihood of the stem impacting the house to the east low. However, if the new garage is constructed at the staked location on site, the south stem would have a high likelihood of impacting it with severe consequences. If the garage is permitted for construction, I recommend

reducing the south stem to a wildlife snag and monitoring the north stem regularly for changes in condition.

Recommendations

- If the new garage is permitted for construction downslope to the south of tree 746, reduce the south stem of the tree to a 20' wildlife snag to mitigate the risk of stem failure onto the garage.
    - Reducing the south stem to a snag will likely trigger response growth in the form of sprouts arising from the trunk. These sprouts should be regularly managed to allow the stem to have a "second life" as a living snag.
    - The sprouts should be regularly thinned and reduced so the south stem does not exceed a height of 35 feet.
- Complete all application and permitting requirements per MICC 19.07.090, 19.10.050, 19.10.060, and 19.10.090.
        - Mitigation activities may be required to replace the removed tree canopy as a condition of any permitted pruning.
- If retained, monitor the northern stem for changes in condition. At some point in the future, it may be advisable to reduce the northern stem to a wildlife snag as well, depending on changes in the health and structural condition of the tree.

Respectfully submitted,

Joseph Sutton-Holcomb,
Senior Arborist, Tree Solutions Inc.

Appendix A **Photographs**

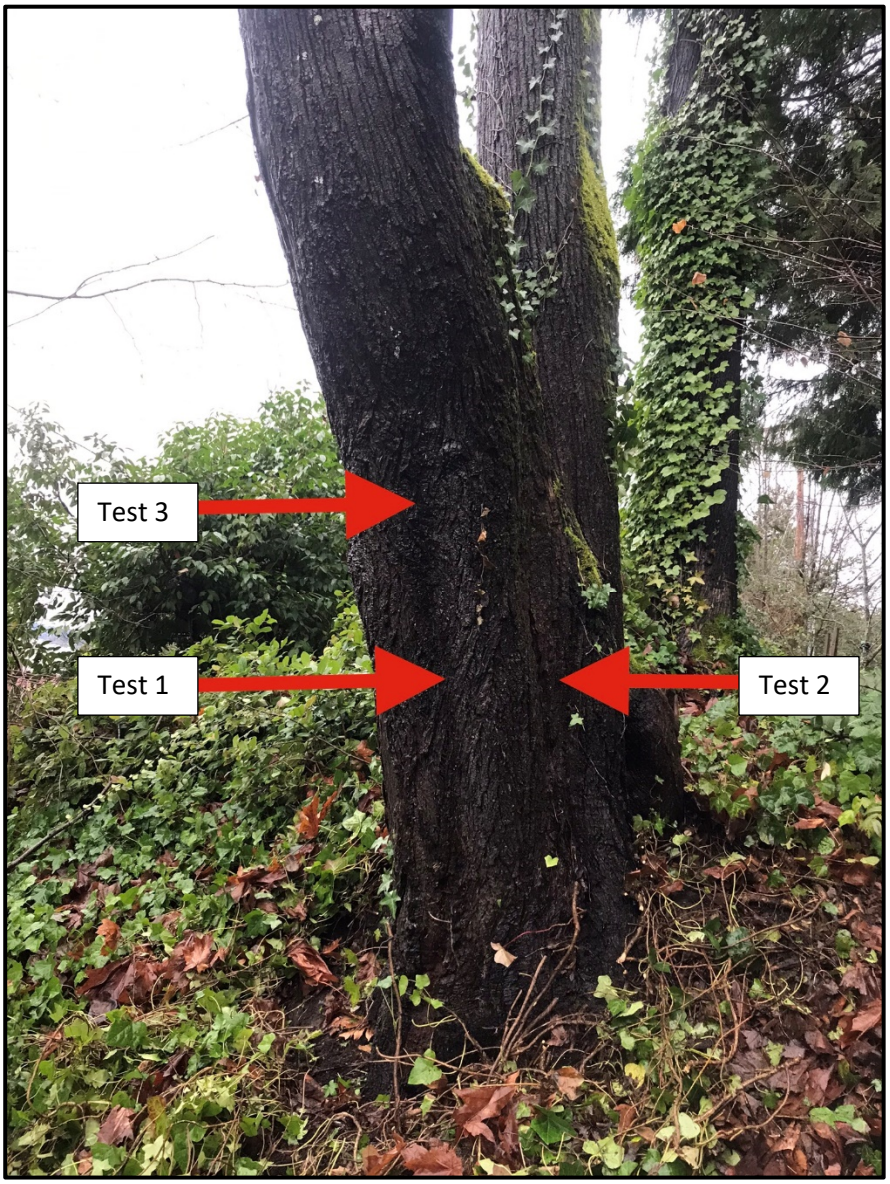


Photo 1. A view looking north at the tree in question. The approximate locations of the Tests 1, 2 and 3 in the south stem are indicated.

Photo 2. A view looking south at the tree in question. The approximate location of test 4 on the north stem is indicated.

Photo 3. A view of the crown of the tree in question with the two stems indicated. The red circles indicate past pruning cuts, which has resulted in the southern stem having a cantilevered form to the south.

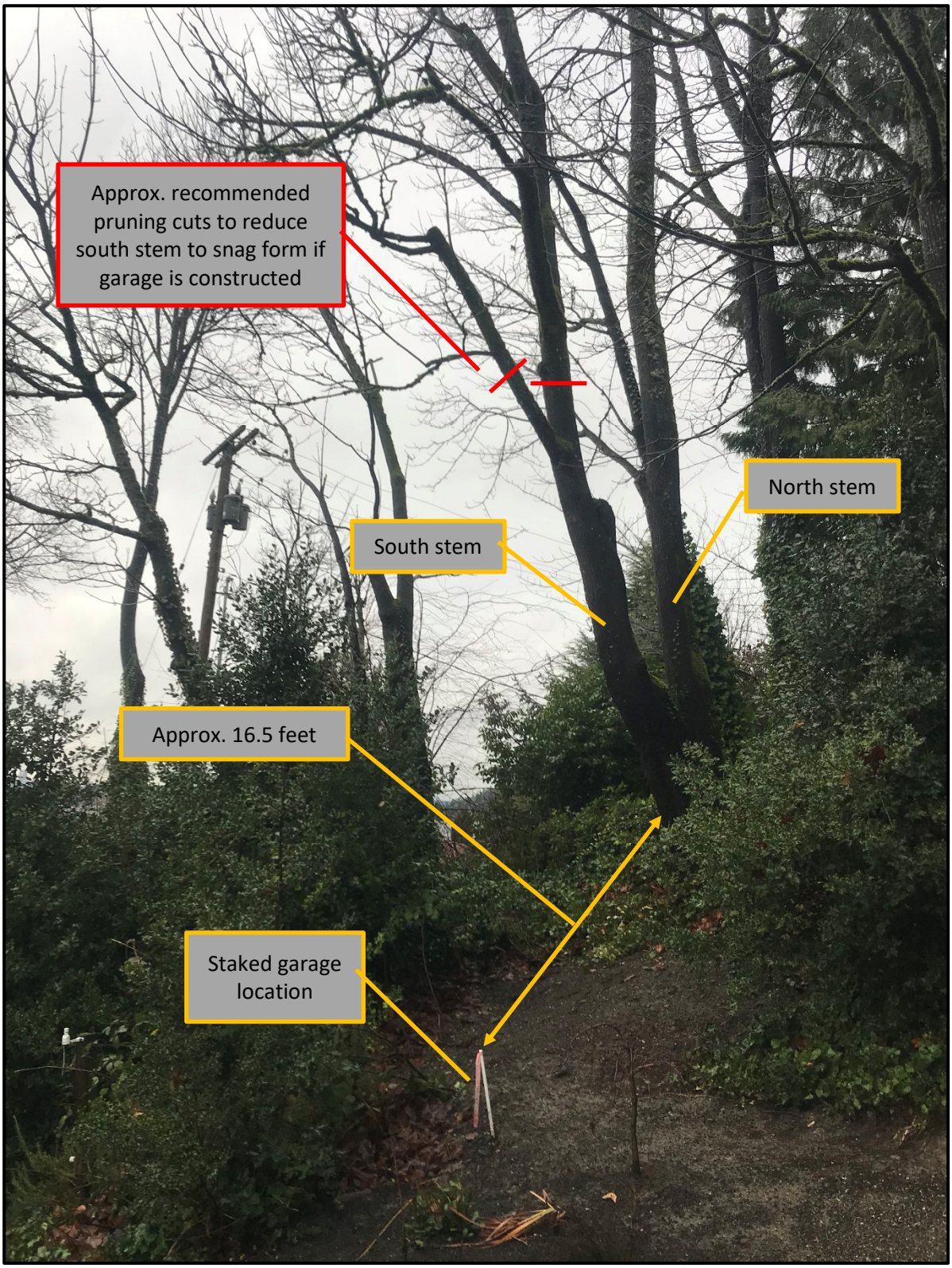


Photo 4. A view looking northwest at tree 746 and the staked location of the proposed garage.

Appendix B **Site Map**

Figure 1. Site Map. The yellow arrow indicates 4803 Forest Ave SE. The green circle indicates the approximate location of tree 746. (Source: Mercer Island GIS, accessed 01.18.2022)

Appendix C **Glossary**

advanced assessment: an assessment performed to provide detailed information about specific tree parts, defects, targets, or site conditions. Specialized equipment, data collection and analysis, and/or expertise are usually required (Dunster 2017)

ANSI A300: American National Standards Institute (ANSI) standards for tree care

Codominant stems: stems or branches of nearly equal diameter, often weakly attached (Matheny *et al.* 1998)

crack: separation in wood fibers; narrow breaks or fissures in stems or branches. If severe may result in tree or branch failure. (Dunster 2017)

crown: the aboveground portions of a tree (Lilly 2001)

DBH or DSH: diameter at breast or standard height; the diameter of the trunk measured 54 inches (4.5 feet) above grade (Matheny *et al.* 1998)

epicormic: arising from latent or adventitious buds (Lilly 2001)

ISA: International Society of Arboriculture

included bark: bark that becomes embedded in a crotch between branch and trunk or between codominant stems and causes a weak structure (Lilly 2001)

landscape function: the environmental, aesthetic, or architectural functions that a plant can have (Lilly 2001)

lateral: secondary or subordinate branch (Lilly 2001)

level(s) of assessment: categorization of the breadth and depth of analysis used in an assessment (Dunster 2017)

micro-resistance drill: a drilling instrument used to determine the density of wood by measuring the amount of resistance presented to the drilling needle as it is driven into the wood. The drilling resistance profiles show where compression wood, annual rings, rot in various stages and other defects have been encountered by the drilling needle.

mitigation: process of reducing damages or risk (Lilly 2001)

monitoring: keeping a close watch; performing regular checks or inspections (Lilly 2001)

owner/manager: the person or entity responsible for tree management or the controlling authority that regulates tree management (Dunster 2017)

phototropic growth: growth toward light source or stimulant (Harris *et al.*1999)

retain and monitor: the recommendation to keep a tree and conduct follow-up assessments after a stated inspection interval (Dunster 2017)

snag: a tree left partially standing for the primary purpose of providing habitat for wildlife

structural defect: feature, condition, or deformity of a tree that indicates a weak structure or instability that could contribute to tree failure (Dunster 2017)

Visual Tree Assessment (VTA): method of evaluating structural defects and stability in trees by noting the pattern of growth. Developed by Claus Mattheck (Harris, *et al* 1999)

Appendix D **References**

Accredited Standards Committee A300 (ASC 300). ANSI A300 (Part 1) – 2017 Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning). Londonderry: Tree Care Industry Association, 2017.

Dunster & Associates Environmental Consultants Ltd. Assessing Trees in Urban Areas and the Urban-Rural Interface, US Release 1.0. Silverton: Pacific Northwest Chapter ISA, 2006

Dunster, Julian, E. T. Smiley, N. Matheny, S. Lilly. Tree Risk Assessment Manual Second Edition. Champaign, IL: International Society of Arboriculture, 2017.

Lilly, Sharon. Arborists' Certification Study Guide. Champaign, IL: The International Society of Arboriculture, 2001.

Matheny, Nelda and James R. Clark. Trees and Development: A Technical Guide to Preservation of Trees During Land Development. Champaign, IL: International Society of Arboriculture, 1998.

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

Smiley, E. Thomas, N. Matheny, S. Lilly. Best Management Practices: Tree Risk Assessment Second Edition. Champaign, IL: International Society of Arboriculture, 2017.

Appendix E **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.

Appendix F **Methods**

Measuring

I measured the diameter of each tree at 54 inches above grade, diameter at standard height (DSH). If a tree had multiple stems, I measured each stem individually at standard height and determined a single-stem equivalent diameter by using the method outlined in the city of Seattle Director's Rule 16-2008 or the Guide for Plant Appraisal, 10th Edition Second Printing published by the Council of Tree and Landscape Appraisers. A tree is regulated based on this single-stem equivalent diameter value. Because this value is calculated in the office following field work, some trees in our data set may have diameters smaller than 6 inches. These trees are included in the tree table for informational purposes only and not factored into tree totals discussed in this report.

Tagging

I tagged each tree with a circular aluminum tag at eye level. I assigned each tree a numerical identifier on our map and in our tree table, corresponding to this tree tag. I used alphabetical identifiers for trees off-site.

Evaluating

I evaluated tree health and structure utilizing visual tree assessment (VTA) methods. The basis behind VTA is the identification of symptoms, which the tree produces in reaction to a weak spot or area of mechanical stress. A tree reacts to mechanical and physiological stresses by growing more vigorously to re-enforce weak areas, while depriving less stressed parts. An understanding of the uniform stress allows the arborist to make informed judgments about the condition of a tree.

Rating

When rating tree health, I took into consideration crown indicators such as foliar density, size, color, stem and shoot extensions. When rating tree structure, I evaluated the tree for form and structural defects, including past damage and decay. Tree Solutions has adapted our ratings based on the Purdue University Extension formula values for health condition (*Purdue University Extension bulletin FNR-473-W - Tree Appraisal*). These values are a general representation used to assist arborists in assigning ratings.

Health

Excellent - Perfect specimen with excellent form and vigor, well-balanced crown. Normal to exceeding shoot length on new growth. Leaf size and color normal. Trunk is sound and solid. Root zone undisturbed. No apparent pest problems. Long safe useful life expectancy for the species.

Good - Imperfect canopy density in few parts of the tree, up to 10% of the canopy. Normal to less than ¾ typical growth rate of shoots and minor deficiency in typical leaf development. Few pest issues or damage, and if they exist, they are controllable, or tree is reacting appropriately. Normal branch and stem development with healthy growth. Safe useful life expectancy typical for the species.

Fair - Crown decline and dieback up to 30% of the canopy. Leaf color is somewhat chlorotic/necrotic with smaller leaves and "off" coloration. Shoot extensions indicate some stunting and stressed growing conditions. Stress cone crop clearly visible. Obvious signs of pest problems contributing to lesser condition, control might be possible. Some decay areas found in main stem and branches. Below average safe useful life expectancy

Poor - Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Stunting of shoots is obvious with little evidence of growth on smaller stems. Leaf size and color

reveals overall stress in the plant. Insect or disease infestation may be severe and uncontrollable. Extensive decay or hollows in branches and trunk. Short safe useful life expectancy.

Structure

Excellent - Root plate undisturbed and clear of any obstructions. Trunk flare has normal development. No visible trunk defects or cavities. Branch spacing/structure and attachments are free of any defects.

Good - Root plate appears normal, with only minor damage. Possible signs of root dysfunction around trunk flare. Minor trunk defects from previous injury, with good closure and less than 25% of bark section missing. Good branch habit; minor dieback with some signs of previous pruning. Codominant stem formation may be present, requiring minor corrections.

Fair - Root plate reveals previous damage or disturbance. Dysfunctional roots may be visible around the main stem. Evidence of trunk damage or cavities, with decay or defects present and less than 30% of bark sections missing on trunk. Co-dominant stems are present. Branching habit and attachments indicate poor pruning or damage, which requires moderate corrections.

Poor - Root plate disturbance and defects indicate major damage, with girdling roots around the trunk flare. Trunk reveals more than 50% of bark section missing. Branch structure has poor attachments, with several structurally important branches dead or broken. Canopy reveals signs of damage or previous topping or lion-tailing, with major corrective action required.

Advanced Testing

I used a micro-resistance drill to test for decay in the trees. These drill systems measure the amount of resistance presented to the drilling needle as it is driven into the wood, perpendicular to the annual rings. The drilling needle is driven into the wood, at a constant rate, up to ½ meter deep, and can detect minute changes in wood density. The data is recorded as a graphic resistance profile using a vertical scale that represents wood density. It is then analyzed.

Appendix G **Qualified Tree Risk Assessment**

The International Society of Arboriculture has developed a standardized and systematic process for assessing tree risk. This approach evaluates the likelihood of whole tree or part failure and any associated consequences, based on what is visible during the time of the site visit and what would likely occur under normal weather conditions, over a limited time period.

Following are excerpts from Best Management Practices - Tree Risk Assessment Second Edition.[1]

Levels of Risk Assessment

Level 1 – Survey
Level 1 shall be a limited visual assessment of an individual tree or a population of trees to identify specified conditions or defects. Conditions to be identified should include obvious defects. Level 1 assessment shall be from a limited, specified perspective, such as drive-by, walk-by or aerial patrol. Level 1 survey assessment methodology shall be specified. Periodic assessments, monitoring, and follow-up recommendations should be made based on the outcome of the assessment and the objectives.

Level 2 – Basic
Level 2 assessments shall include a 360-degree, ground-based visual inspection of the tree crown, trunk, above-ground roots, and site conditions around the tree. Use of hand tools, trowels, binoculars, or probes shall not be precluded from a level 2 assessment. A mallet or other tool should be used to sound the trunk, root collar and above ground buttress roots in order to detect large hollows and loose bark. Level 2 shall provide a detailed visual inspection of a tree(s) to detect the conditions specified and tree defects in relation to surrounding targets.

A basic assessment should include the identification of conditions indicating the presence of structural defects including, but not limited to:

- Dead, diseased, broken branches, stems, and roots;
- Weakly attached branches and co-dominant stems;
- Mechanical damage and cracks into the wood;
- Abnormal growth such as swelling, ribs, flat areas, or seams;
- Indications of decay and cankers;
- Root plate lifting, abnormal trunk flare, lack of trunk flare, soil cracks, grade change, restricted or undermined roots;
- Unusual tree architecture including lean, low live crown ratio, poor taper, and crown asymmetry

Level 2 inspections should be conducted annually; more frequently if species, tree size, tree condition or other factors indicate a need for a more frequent interval. Scheduling inspections shall be the responsibility of the tree owner. Monitoring and follow-up recommendations should

[1] Smiley, E. Thomas, N. Matheny, S. Lilly. Best Management Practices: Tree Risk Assessment Second Edition. Champaign, IL: International Society of Arboriculture, 2017.

be made based on the outcome of the assessment and the objectives.

Level 3 – Advanced
Level 3 assessments shall include all Level 2 requirements. Level 3 shall include advanced method(s) to provide more detailed information on tree structural strength, the extent of specific structural defects, conditions, or other factors in relation to a target. Level 3 assessment shall include, but is not limited to, one or more of the following tree assessment techniques: *aerial assessment* of branch or stem defects; *micro-resistance* d*rilling*; evaluation of *target risk*; *increment boring*; *probing*; *pull testing*; *radiation assessment* (e.g. radar, x-ray, gamma ray); *sonic assessment*; s*ounding*; and s*ub-surface root* and/or *soil assessment*.

Likelihood of Failure

Improbable: the tree or tree part is not likely to fail during normal weather conditions and may not fail in extreme weather conditions within the specified time frame.

Possible: failure may be expected in extreme weather conditions, but it is unlikely during normal weather conditions within the specified time frame.

Probable: failure may be expected under normal weather conditions within the specified time frame.

Imminent: failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load. This is an infrequent occurrence for a risk assessor to encounter, and it may require immediate action to protect people from harm.

Likelihood of Impacting a Target

Very Low: the chance of the failed tree or tree part impacting the specified target is remote. Likelihood of impact could be very low if the target is outside the anticipated target zone or if occupancy rates are rare. Another example of very low likelihood of impact is people in an occasionally used area with protection against being struck by the tree failure due to the presence of other trees or structures between the tree being assessed and the targets.

Low: there is a slight chance that the failed tree or tree part will impact the target. This is the case for people in an occasionally used area with no protection factors and no predictable direction of fall, a frequently used area that is partially protected, or a constant target that is well protected from the assessed tree. Examples are vehicles on an occasionally used service road next to the assessed tree, or a frequently used street that has a large tree providing protection between vehicles on the street and the assessed tree.

Medium: the failed tree or tree part could impact the target, but is not expected to do so. This is the case for people in a frequently used area when the direction of fall may or may not be toward the target. An example of a medium likelihood of impacting people could be passengers in a car travelling on an arterial street (frequent occupancy) next to the assessed tree with a large, dead branch over the street.

High: the failed tree or tree part is likely to impact the target. This is the case when there is a constant target with no protection factors, and the direction of fall is toward the target.

Figure 2. Likelihood Matrix

Likelihood of Failure (Tree)	Likelihood of Impacting Target (Person or Property)			
	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 shows the level of risk as the combined factors of 'likelihood of a tree failing' and 'likelihood of impacting a specified target'.

Consequences of Failure

Negligible: consequences are those that involve low-value property damage or disruption that can be replaced or repaired, and do not involve personal injury.

Minor: consequences are those that involve low-to-moderate value property damage or small disruptions of activities (e.g., traffic, power, utilities).

Significant: consequences are those that involve property damage of moderate-to-high value, considerable disruption to activities, or substantial personal injury.

Severe: consequences are those that could involve serious personal injury or death, damage to high-value property, or major disruption of important activities.

Figure 3. Risk Rating Matrix

Likelihood of Failure and Impact	Consequences (to target)			
	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**

Matrix showing the level of risk as the combination of the likelihood of a tree failing and impacting a specified target, and the severity of the associated consequences.

Risk Rating Categories, Timing for Mitigation

In the tree risk assessment matrix, four terms are used to define levels of risk: low, moderate, high, and extreme. These risk ratings are used to communicate the level of risk and to assist in making recommendations to the owner or risk manager for mitigation and inspection frequency. **The priority for action depends upon the risk rating and risk tolerance of the owner or manager.**

Extreme: The extreme-risk category applies in situations in which failure is *imminent* and there is a high likelihood of impacting the target, and the consequences of the failure are "severe." The tree risk assessor should recommend that **mitigation measures be taken as soon as possible.** In some cases, this may mean immediate restriction of access to the target zone area to avoid injury to people.

High: High-risk situations are those for which consequences are "significant" and likelihood is "very likely" or "likely," or consequences are "severe", and likelihood is "likely." This combination of likelihood and consequences indicates that the tree risk assessor should recommend mitigation measures be taken. **The decision for mitigation and timing of treatment depends upon the risk tolerance of the tree owner or manager. In populations of trees, the priority of high-risk trees is second only to extreme-risk trees.**

Moderate: Moderate-risk situations are those for which consequences are "minor" and likelihood is "very likely" or "likely"; or likelihood is "somewhat likely" and consequences are "significant" or "severe." The tree risk assessor may recommend mitigation and/or retaining and monitoring. **The decision for mitigation and timing of treatment depends upon the risk tolerance of the tree owner or manager. In populations of trees, moderate-risk trees represent a lower priority than high- or extreme-risk trees.**

Low: The low-risk category applies when consequences are "negligible "and likelihood is "unlikely"; or consequences are "minor", and likelihood is "somewhat likely." **Some trees with this level of risk may benefit from mitigation or maintenance measures, but immediate action is not usually required. Tree risk assessors may recommend retaining and monitoring these trees, as well as mitigation that does not include removal of the tree.**

Options for Mitigation

Remove the risk altogether, if possible, by cutting off one or more branches, removing dead wood, or possibly removing the entire tree. Extreme risk situations should be closed off until the risk is abated.

Modify the risk of failure probability. In some cases, it may be possible to reduce the probability of failure by adding mechanical support in the form of cables braces or props.

Modify the risk rating by moving the target. Risk ratings can sometimes be lowered by moving the target so that there is a much lower probability of the defective part striking anything. Moving the target should generally be seen as an interim measure.

Retain and monitor. This approach is used where some defects have been noted but they are not yet serious, and the present risk level is only moderate.

Definitions (Risk)

acceptable risk: the degree or amount of risk that the owner, manager, or controlling authority is willing to accept (Dunster 2017)

acceptable risk threshold: the highest level of risk that does not exceed the owner/manager's tolerance (Dunster 2017)

consequences: outcome of an event (Dunster 2017)

consequences of failure: personal injury, property damage, or disruption of activities due to the failure of a tree or tree part (Dunster 2017)

likelihood: the chance of an event occurring. In the context of tree failures, the term may be used to specify: 1) the chance of a tree failure occurring; 2) the chance of impacting a specified target; and 3) the combination of the likelihood of a tree failing and the likelihood of impacting a specified target (Dunster 2017)

likelihood of failure: the chance of a tree or tree part failure occurring within the specified time frame (Dunster 2017)

likelihood of failure and impact: the chance of a tree failure occurring and impacting a target within the specified time frame (Dunster 2017)

likelihood of impact: the chance of a tree failure impacting a target during the specified time frame (Dunster 2017)

limited visual assessment: a visual assessment from a specified perspective such as foot, vehicle, or aerial (airborne) patrol of an individual tree or a population of trees near specified targets to identify specified conditions or obvious defects (Dunster 2017)

mitigation: process of reducing damages or risk (Lilly 2001)

mitigation options: alternatives for reducing risk (Dunster 2017)

mitigation priority: established hierarchy for mitigation of risks based on risk ratings, budget, resources, and policies (Dunster 2017)

residual risk: risk remaining after mitigation (Dunster 2017)

risk perception: the subjective perceived level of risk from a situation or object, often differing from the actual level of risk (Dunster 2017)

risk rating: the level of risk combining the likelihood of a tree failing and impacting a specified target, and severity of the associated consequences (Dunster 2017)

risk tolerance: degree of risk that is acceptable to the owner, manager, or controlling authority (Dunster 2017)

target: people, property, or activities that could be injured, damaged, or disrupted by a tree failure (Dunster 2017)

target-based actions: risk mitigation actions aimed at reducing the likelihood of impact in the event of tree failure (Dunster 2017)

target management: acting to control the exposure of targets to risk (Dunster 2017)

target value: the monetary worth of something; the importance or preciousness of something (Dunster 2017)

target zone: the area where a tree or branch is likely to land if it were to fail (Dunster 2017)

tree risk assessment: a systematic process used to identify, analyze, and evaluate tree risk (Dunster 2017)

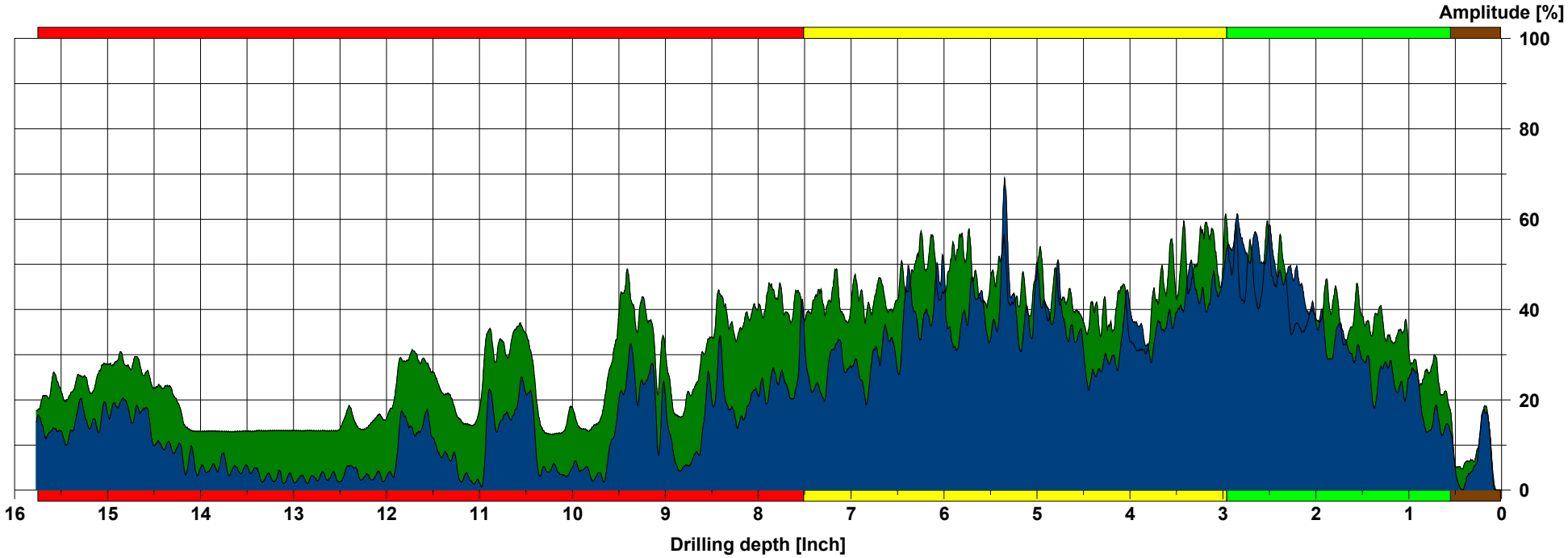
tree risk evaluation: the process of comparing the assessed risk against given risk criteria to determine the significance of the risk (Dunster 2017)

tree risk management: the application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate tree risk (Dunster 2017)

unacceptable risk: a degree of risk that exceeds the tolerance of the owner, manager, or controlling authority (Dunster 2017)

Measuring / object data

Measurement no.	1	**Speed**	2500 r/min	**Diameter**	22,00 in
ID number	746	**Needle state**	ok	**Level**	39 inches
Drilling depth	15,77 in	**Tilt**	+19°	**Direction**	South>North
Date	06.01.2022	**Offset**	97 / 315	**Species**	Acer macrophyllum
Time	09:44:50	**Avg. curve**	off / off	**Location**	4803 Forest Ave SE
Feed	59 in/min			**Name**	Murray, Ross



Assessment

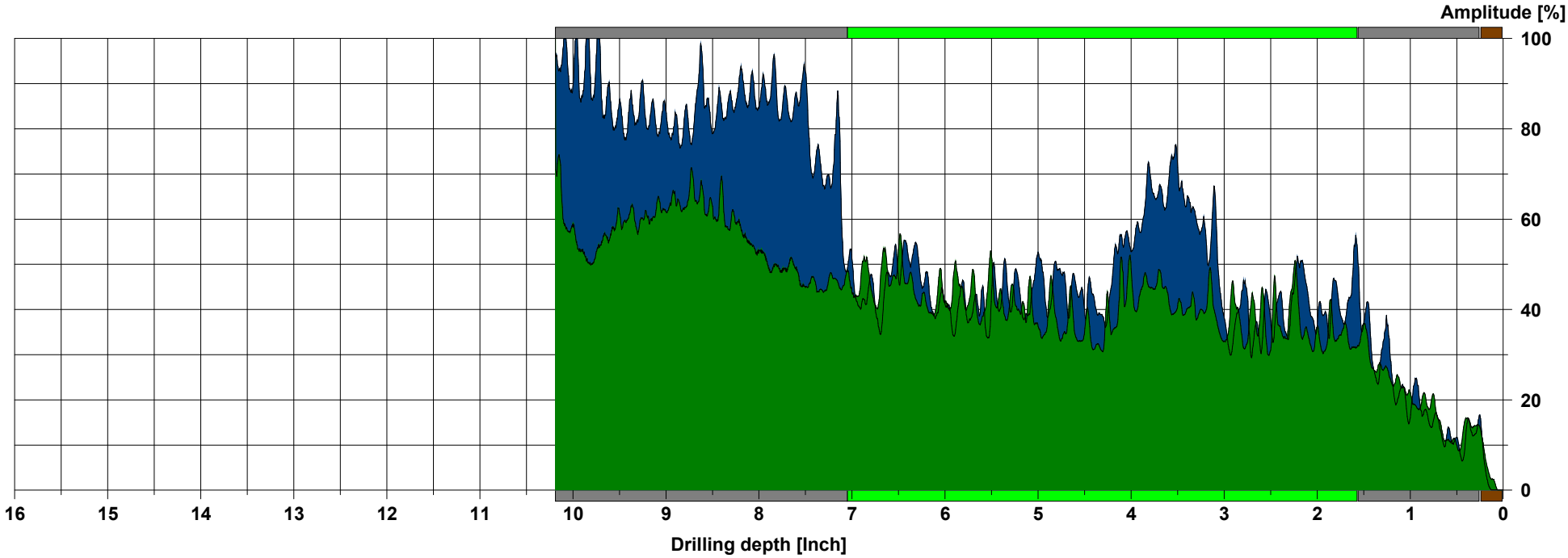
From	0,01 in	**to**	0,55 in	: Air/Bark
From	0,55 in	**to**	2,96 in	: Sound Wood
From	2,96 in	**to**	7,51 in	: Early Decay
From	7,51 in	**to**	15,75 in	: Decay/Hollow

Comment

Test occured in the south stem, drilling south to north approx. 39 inches above grade near an open cavity in the stem. The test shows an approx. 2.5 inch shell wall of sound wood followed by extensive internal decay to the limit of the testing depth.

Measuring / object data

Measurement no.	2	**Speed**	2500 r/min	**Diameter**	20,00 in
ID number	746	**Needle state**	ok	**Level**	55 inches
Drilling depth	10,19 in	**Tilt**	+39°	**Direction**	South>North
Date	06.01.2022	**Offset**	84 / 310	**Species**	Acer macrophyllum
Time	09:50:50	**Avg. curve**	off / off	**Location**	4803 Forest Ave SE
Feed	39 in/min			**Name**	Murray, Ross



Assessment

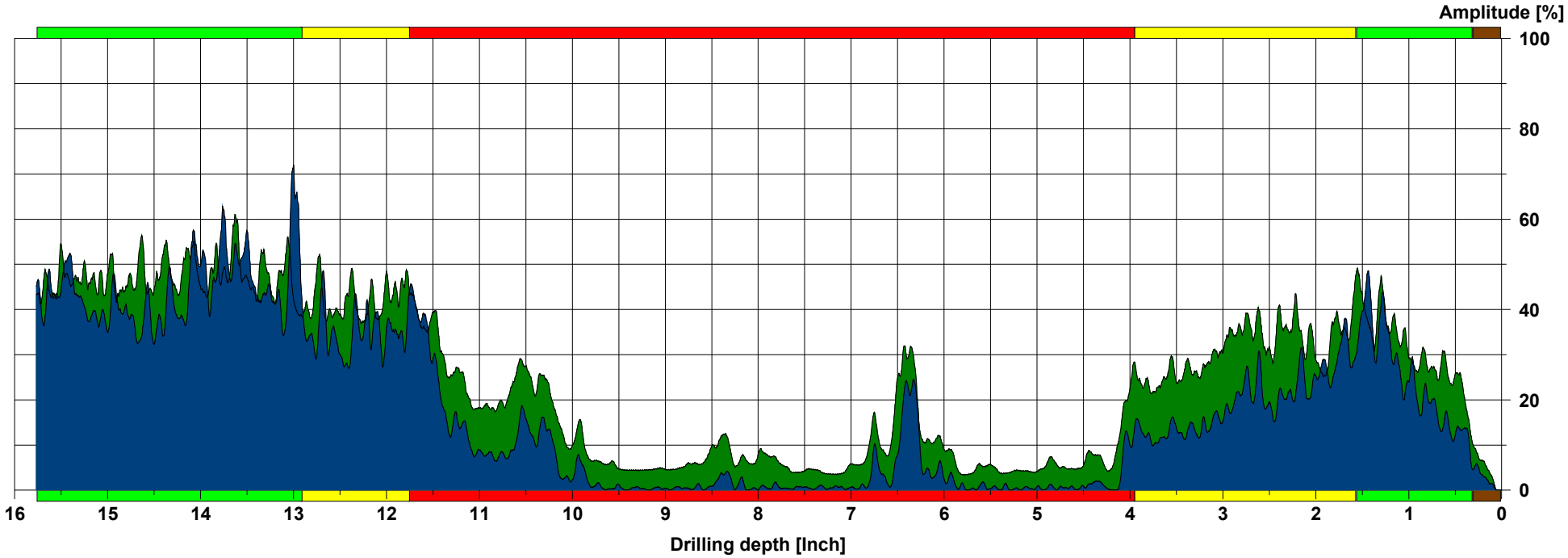
From	0,01 in	**to**	0,24 in	: Air/Bark
From	0,26 in	**to**	1,56 in	: Unusual Pattern
From	1,57 in	**to**	7,05 in	: Sound Wood
From	7,05 in	**to**	10,19 in	: Unusual Pattern

Comment

Test occured in the south stem, drilling south to north approx. 55 inches above grade, above the codominant union of the north and south stems. It shows sound wood with unusually high resistance patterns, which may indicate reaction wood. Unusual patterns are likely sound wood.

Measuring / object data

Measurement no.:	3	**Speed**	: 2500 r/min	**Diameter:**	22,00 in
ID number	: 746	**Needle state:**	ok	**Level**	: 36 inches
Drilling depth	: 15,77 in	**Tilt**	: -9°	**Direction:**	East>West
Date	: 06.01.2022	**Offset**	: 70 / 318	**Species**	: Acer macrophyllum
Time	: 09:53:55	**Avg. curve**	: off / off	**Location**	: 4803 Forest Ave SE
Feed	: 59 in/min			**Name**	: Murray, Ross



Assessment

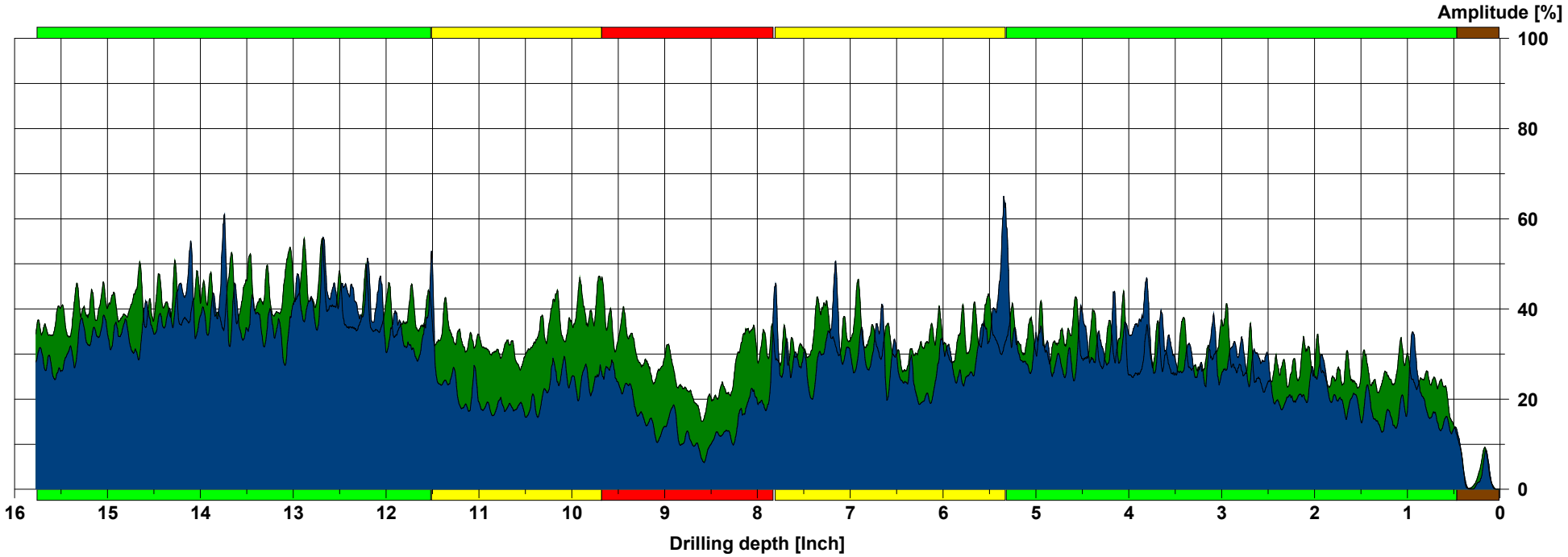
From	0,01 in	**to**	0,31 in	: Air/Bark
From	0,32 in	**to**	1,56 in	: Sound Wood
From	1,57 in	**to**	3,95 in	: Early Decay
From	3,95 in	**to**	11,76 in	: Decay/Hollow
From	11,75 in	**to**	12,92 in	: Early Decay
From	12,91 in	**to**	15,76 in	: Sound Wood

Comment

Test drilled east to west in the southern stem approx. 36 inches above grade. The test showed a thin shell wall of sound wood, followed by extensive decay that appears to be spreading, followed by a slightly larger margin of sound wood at the end of the test.

Measuring / object data

Measurement no.	4	**Speed**	2500 r/min	**Diameter**	16,50 in
ID number	746	**Needle state**	ok	**Level**	5 feet
Drilling depth	15,77 in	**Tilt**	0°	**Direction**	North>South
Date	06.01.2022	**Offset**	62 / 307	**Species**	Acer macrophyllum
Time	10:00:50	**Avg. curve**	off / off	**Location**	4803 Forest Ave SE
Feed	39 in/min			**Name**	Murray, Ross



Assessment

From	0,01 in	**to**	0,47 in	: Air/Bark
From	0,47 in	**to**	5,32 in	: Sound Wood
From	5,33 in	**to**	7,81 in	: Early Decay
From	7,83 in	**to**	9,68 in	: Decay/Hollow
From	9,68 in	**to**	11,51 in	: Early Decay
From	11,52 in	**to**	15,76 in	: Sound Wood

Comment

Test drilled north to south in the northern stem approx. 5 feet above grade. The test show several inches of sound wood followed by internal decay that is spreading outward toward the periphery of the stem. Some wood marked "sound" may be partially compromised by decay.