



Connick Tree Care
Specialists in the Preservation and Maintenance of Trees

Arboricultural Level 3 Assessment: (Sonic Tomography and Microdrill)

Our Reference
227837

Client
Upgrade Bikes Ltd

Tree ID
T1 - Quercus Robur

Assessment & Report By
Mr Joe Howard TechArborA

Date
19th January 2026

Date Of Assessment
8th January 2026

Next Assessment Recommended By
January 2029





Contents

1 ASSESSMENT DETAILS 3

2 TREE DETAILS 4

3 OBSERVATIONS. REASONING. ASSESSMENT METHOD. 4

4 FINDINGS 8

5 CONCLUSIONS & RECOMMENDATIONS 9

APPENDIX I QUALIFICATIONS AND EXPERIENCE 11

APPENDIX II EXPLANATORY NOTES 12

1 Assessment Details

Assessment Details	
Site Address:	Units A-B, Star Road, Partridge Green, West Sussex, RH13 8RA
Tree Species:	Pedunculate Oak (Quercus Robur)
Reason for Assessment:	A fungal fruiting body has been observed at the base of the stem. Further investigation of the tree has been requested by the client.
Tree Location:	Located in a village environment on the outskirts of Partridge Green. What3Words location: ///offstage.ended.obstruct
	
Growing Area & Topography:	Located to the north of the industrial estate entrance on a level grassed area behind a warehouse unit.
Exposure:	Low. Sheltered by younger trees to the west and a warehouse to the east, with no significant crown extension above the roofline or surrounding tree canopies.
Target Risk:	Moderate to High. Located in close proximity to the highway and adjacent warehouse units.
Assessor(s):	Mr Joe Howard TechArborA
Date of Assessment:	8 th January 2026
Assessment Method(s):	Level 3 non-invasive. Sonic Tomography using the Fakopp Arborsonic and IML RESI PD Micro Drill.

2 Tree Details

Tree No.	Tag No.	Common Name	Age Class	Height (m)	Canopy underside	DBH (mm)	Crown Spread (m)				Vitality	Life expectancy	Risk Assessment
							N	E	S	W			
T1	N/A	Pedunculate Oak	Semi Mature	13	2	790	7.5	6.5	5	5	Good	40+ Yrs	High Target

3 Observations. Reasoning. Assessment Method.

Observations, Reasoning and Assessment Method

The following VTA summary was made on the day of SOT and Microdrill survey.

- The tree is in good physiological condition, with no obvious signs of crown decline or dieback observed at the time of inspection. The assessment was undertaken outside of the main growing season, and the absence of leaf coverage limited full evaluation of crown density and vitality. The crown exhibits a spreading structure, with a primary crown break occurring at approximately 2.0m in height.
- Historical crown lifting has resulted in multiple pruning wounds; some have fully occluded, while others remain open and have developed minor cavities. Exposed heartwood associated with these wounds was found to be firm. The deepest cavity probed measured approximately 200mm in depth and was located on the north-west aspect at approximately 1.2m in height.
- Deadwood is present within the crown; however, it overhangs a low-use target area. A fungal fruiting body was identified at the base of the tree and confirmed as *Ganoderma resinaceum*. A significant change in resonance was detected around and above the fungal fruiting body, extending to approximately 1.0m height and measuring around 400mm in width. A further area of resonance change was identified on the north-north-west aspect, extending from ground level to approximately 600mm in height and approximately 500mm in width.
- The crown maintains an approximate clearance of 2.0 m from the adjacent warehouse unit.



Based on these observations, a sonic tomography (SOT) and Microdrill assessment was conducted at three heights: 10cm, 40cm and 60cm above ground level. These heights are referred to as “layers” throughout this report. Each layer was assessed using sixteen microsecond sensors.

The Microdrill was employed in areas identified as concerning based on the tomograph readings. While resistance to drilling is not a definitive measure of wood strength, it is typically reduced in decayed wood. This device excavates a narrow penetration track using a fine drill bit where decay is suspected. The resistance encountered by the drill bit is recorded electronically, and the resulting graph can be used to visualise internal decay.

The microdrill causes minimal damage due to its small-diameter bit, leaving only a narrow penetration track.

Photograph 1 below shows the position of each assessment level, indicated by blue dashed lines.

Photo 1. SOT assessment positions looking West



Photo 2. SOT sensor positions looking South
Yellow arrow = sensor 1 at North Blue arrow = sensor 16



Photo 3. Looking North with dimensions & lean angle

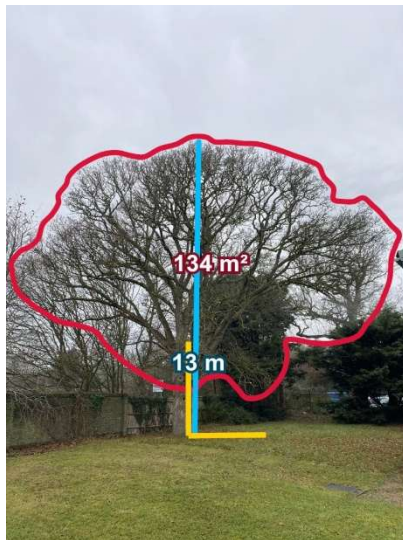


Image 4. 10cmH layer sound speed graph

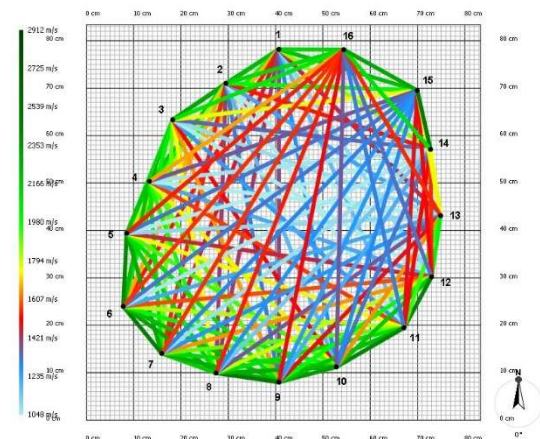


Image 5. 10cmH layer - 2D Map

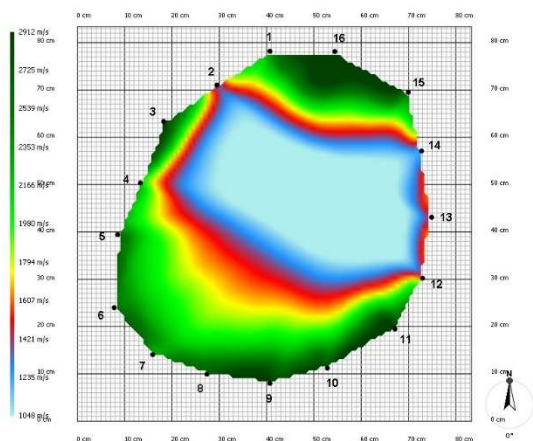


Image 6. 10mH layer – Biomechanical Layer Map

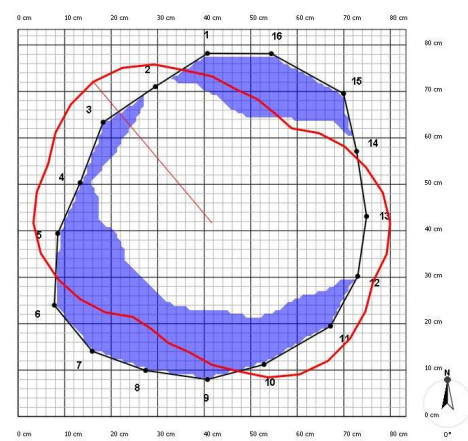


Image 7. 40cmH layer - 2D Map

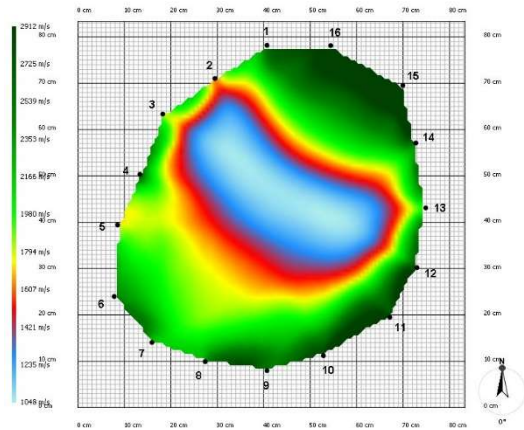


Image 8. 40cmH layer – Biomechanical Layer Map

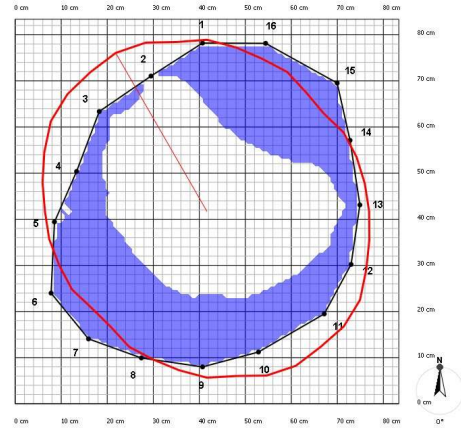


Image 9. 60cmH layer - 2D Map

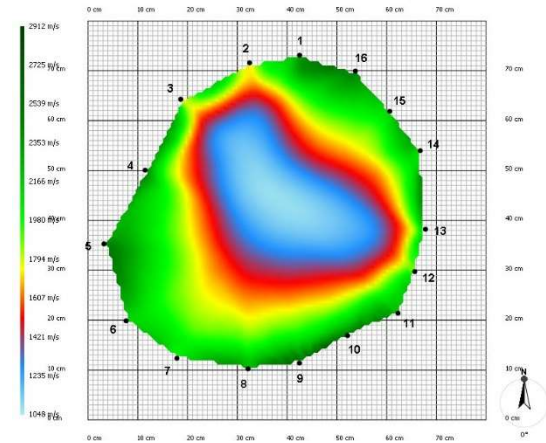


Image 10. 60cmH layer – Biomechanical Layer Map

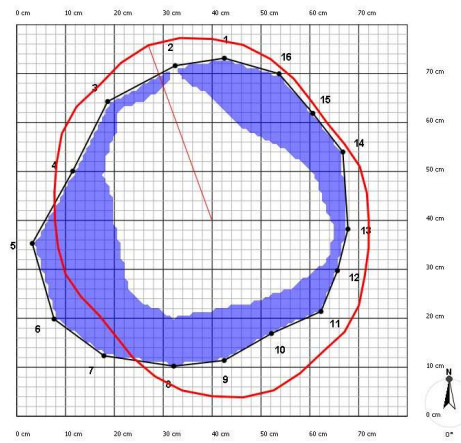


Image 11. Multilayer views

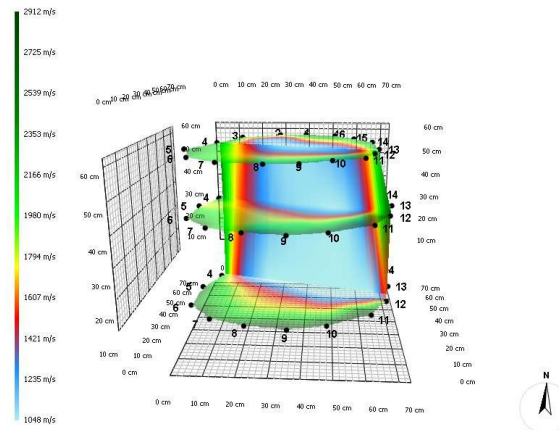
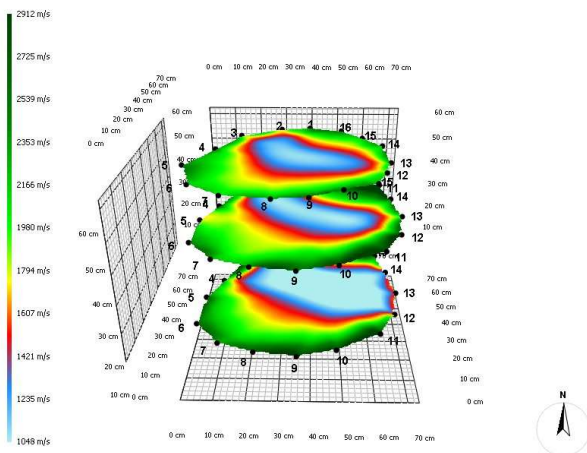


Image 12. Microdrill Trace Results - 10cm Layer at Sensor 2

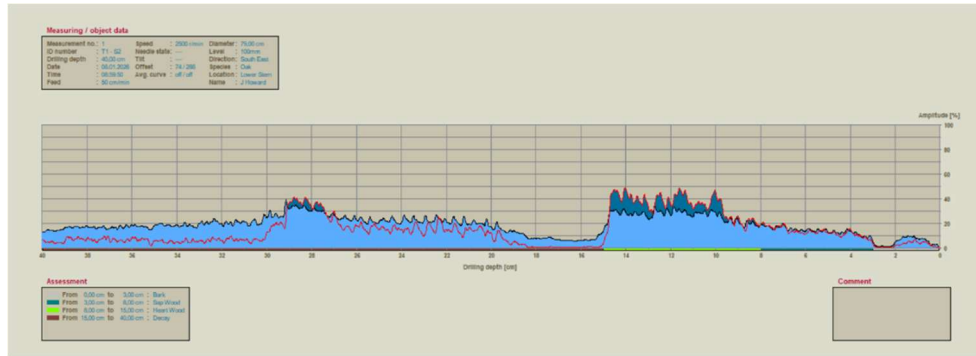


Image 13. Microdrill Trace Results – 10cm Layer at sensor 7

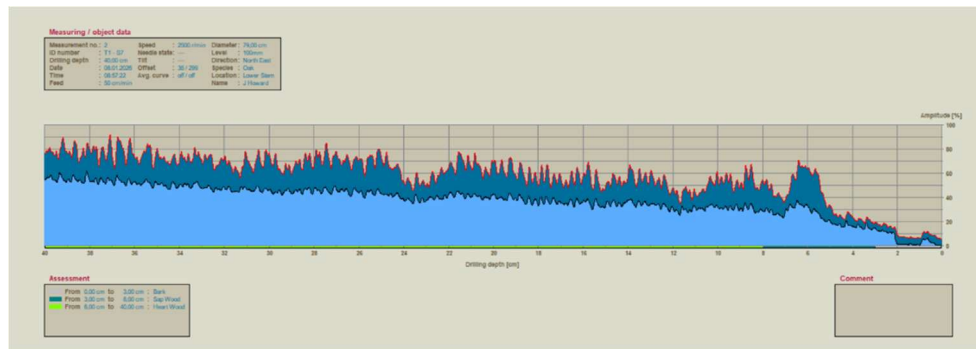
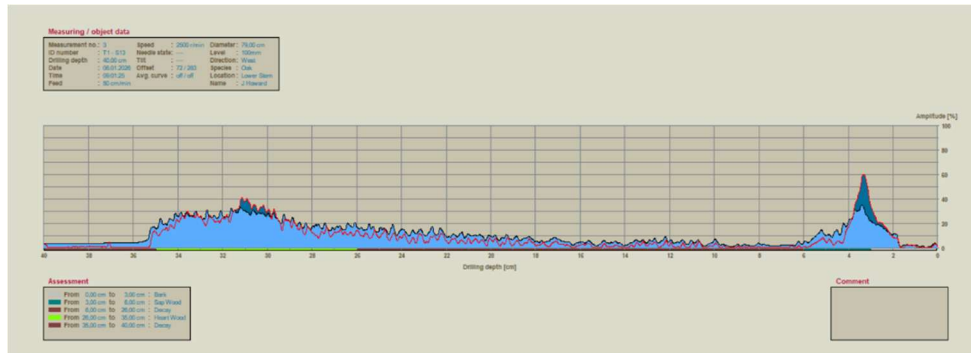


Image 14. Microdrill Trace Results – 10cm Layer at sensor 13



4 Findings

Findings

An example of how the SOT data is processed is shown above in image 1 using the 10cmH layer. This shows that there are significant variations in the transfer of sound through the stem. The speed sound is transferred between sensors is coloured depending upon the time taken in meters per second.

The green lines indicate high sound transfer abilities between sensors indicating that the wood in these areas is generally free of defects. The darker red through to light blue lines indicate a slow transfer of sound suggesting decay is present within the wood.

The software identified no cracks within the planes assessed; cracks can disrupt the transfer of sound and have the potential to give false readings that may distort colours in the image.

The 2D layer images 5, 7 & 9 on the left provide a pictorial representation of the sound transfer between sensors. This gives a simplified view of the data gathered and indicates visually the suspected transition from unaffected to decayed wood across the section of stem assessed. These images show that there is significant decaying of the Oak trees heartwood, more pronounced near ground level.

The Multilayer views (Images 11) are created by the software infilling the colours between the 2D layers. . The image shows the approximate locations of decay through all three layers.

Analysis of the data collected indicates that the potential extent of decay for each section is:

10cmH layer **58%**

40cmH layer **44%**

60cmH layer **51%**

The biomechanical layer maps images 6, 8 & 10 above and to the right are generated by the software. These consider onsite measurements of the tree, calculations using photo 3 above and the SOT results.

A comparison of the bearing capacity of the stem based upon the biomechanic layer (supportive tissue in blue) and wind loading from the estimated crown area (shown as the red perimeter line), provides the most critical direction of the wind load (shown by the straight red line). For this tree this would be from:

Northwest for 10cm layers.

Northwest for 40cm layers.

Northwest for 60cm layers.

The prevailing wind on site is from the southwest.

Microdrill testing was undertaken on at approximately 100 mm above ground level, with three drillings carried out at different orientations around the stem (Drill IDs T1-S2, T1-S7 and T1-S13). Each drilling was advanced to a depth of 40 cm. The resistance traces differentiate clearly between bark, sapwood, heartwood and zones of decay.

Drill ID T1-S2 (Image 12) shows bark to approximately 3 cm, followed by sapwood from 3–8 cm. Heartwood is indicated between approximately 8 cm and 15 cm, where resistance values are moderate to high. From approximately 15 cm through to the maximum drilling depth of 40 cm, resistance values reduce significantly and remain consistently low, indicating a substantial zone of internal decay or hollowing occupying the majority of the inner stem radius at this orientation.

Drill ID T1-S7 (Image 13) presents a comparatively sound profile. Bark is recorded to approximately 3 cm, with sapwood extending from 3–8 cm. From approximately 8 cm to 40 cm, resistance remains consistently moderate to high, characteristic of intact heartwood. No sustained reductions in resistance are evident, and minor fluctuations are consistent with normal wood density variation rather than structural defects. This drilling indicates a largely intact load-bearing section of the stem at this orientation.

Drill ID T1-S13 (Image 14) indicates a mixed internal condition. Bark extends to approximately 3 cm, with sapwood present between 3 cm and 8 cm. A pronounced and sustained reduction in resistance occurs from approximately 8 cm to 28 cm, consistent with extensive internal decay. Resistance increases again between approximately 28 cm and 35 cm, suggesting a residual band of intact heartwood, before decreasing once more from 35 cm to 40 cm, indicating further internal degradation toward the opposite side of the stem.

5 Conclusions & Recommendations

Conclusions

Analysis of the tomographic data, supported by targeted microdrill investigations, has been combined with additional measured parameters including stem diameter, stem lean angle and an upper anticipated site wind speed to calculate a basic safety factor for each assessed SOT layer. A minimum safety factor of **150%** is generally accepted as suitable for most situations.

For Tree T1, the calculated basic safety factors are as follows:

- **10 cm height layer: 275%**
- **40 cm height layer: 441%**
- **60 cm height layer: 310%**

These values exceed the minimum recommended threshold at all assessed heights. The 'village' exposure setting has been applied to the assessment, reflecting the tree's location on the outskirts of Partridge Green, with nearby buildings and surrounding tree canopies influencing wind loading.

The results assume an upper site wind speed of 33 m/s (equivalent to 118.8 km/h, 73.8 mph or Beaufort Force 12), which represents a severe but plausible storm event that could reasonably be experienced on site within the next year. Under these conditions, the tomographic analysis indicates a low risk of stem failure at all three assessed layers. Although the prevailing wind direction on site is from the south-west, the most critical loading scenario is considered to be from the north-west, and this has been accounted for within the safety factor calculations.

The microdrill results for Tree T1 demonstrate a clearly asymmetrical internal stem condition. One drilling orientation (T1-S7) shows intact heartwood to the full depth tested, providing a continuous load-bearing section. In contrast, drillings T1-S2 and T1-S13 reveal significant internal decay extending through large portions of the stem radius, with only residual bands of intact heartwood present. These findings confirm that, despite the retention of sound outer wood and localised areas of denser internal material, decay occupies a substantial proportion of the cross-section and contributes to an uneven distribution of structural strength.

The visual tree assessment found the tree to be in good physiological condition, indicating that the current extent of decay is not adversely affecting crown vitality. Observed deadwood is consistent with natural shading effects rather than symptomatic decline. The presence of *Ganoderma resinaceum* confirms an active decay process within the stem; however, based on current crown condition and growth response, it is considered likely that the tree is producing new functional wood at a rate broadly comparable to the progression of decay at present.

Taking the tomograph, microdrill data and visual assessment together, it is concluded that internal decay is negatively affecting stem integrity at the assessed SOT heights, but that current safety margins remain within acceptable limits for the site context. Structural stability can be further improved and risk reduced through the implementation of appropriate management measures, as outlined in the recommendations below.

Recommendations

The visual assessment indicates that the tree is in good physiological condition, with sufficient vitality to continue laying down new functional wood. As a result, the tree is expected to respond favourably to a measured crown reduction. Provided that overall vitality is maintained, adaptive growth should progressively increase the effective stem wall thickness at the assessed heights, thereby strengthening the residual load-bearing shell. This assumes that the rate of new wood formation exceeds, or at least keeps pace with, the ongoing decay associated with fungal activity.

To further improve the calculated safety factors and reduce mechanical loading, a crown reduction of approximately 2 metres is recommended and should be applied sympathetically in accordance with BS 3998, retaining the tree's natural form and functional leaf area. An Image of crown reduction dimensions is below. This work should be carried out within the next 12 months.

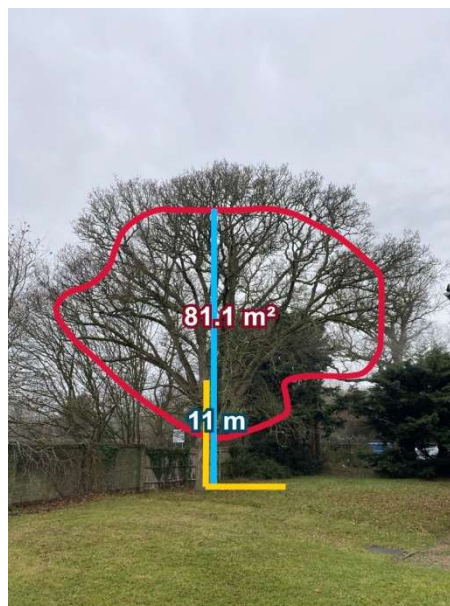
The biometric assessment was repeated within the modelling software assuming an approximate 2 m crown reduction. Under these revised conditions, the basic safety factors at the assessed stem layers are calculated as follows:

- **10 cm height layer:** 524%
- **40 cm height layer:** 844%
- **60 cm height layer:** 597%

These values represent a substantial improvement over the existing safety margins and provide a robust buffer above the minimum recommended threshold for the site context.

A repeat sonic tomography assessment of the same stem layers is recommended three years from the date of this report. The future results should be directly compared with the current findings to assess the progression of internal decay, the effectiveness of compensatory growth, and any changes in overall structural integrity.

In addition, the tree should be monitored through routine inspections. Any notable changes in crown condition such as unexpected leaf loss, progressive limb dieback, abnormal discoloration, or the emergence of new fungal fruiting bodies should be reported promptly to Connick Tree Care Consultancy for further assessment.



APPENDIX I QUALIFICATIONS AND EXPERIENCE

Subjects	Level	Dates
Technician member of the Arboricultural Association		2023 ongoing
Professional Tree Inspection (LANTRA)	Pass	April 2023
Level 3 diploma in forestry and arboriculture	Distinction	2015
NPTC cs30, cs31, cs38, cs39	Pass	from 2015 ongoing.

2. CAREER SUMMARY

I began my career in forestry and arboriculture in 2015 by completing a Level 3 Diploma through a two-year college course. This provided me with the essential knowledge and practical skills needed to enter the industry. After qualifying, I started work as an arborist with a local arboricultural company, where I gained hands-on experience in tree care and management.

Over time, I developed my skills further and took on greater responsibilities, eventually progressing to a team management role. This position helped build both my technical and leadership abilities as I oversaw tree operations and coordinated projects.

To advance my career, I pursued additional training and became a certified professional tree inspector, which expanded my opportunities within the field. With this qualification and a solid foundation of practical experience, I moved into a consultancy role at Connick Tree Care.

As an Arboricultural Consultant, I now provide expert advice to clients on managing their tree assets safely and sustainably, drawing on my years of field experience and ongoing professional development.

3. AREAS OF EXPERTISE

Tree hazard risk assessments for tree owners
 Decay assessment and mapping
 Tree management reports on prioritizing maintenance programs.
 Diagnosis of tree disorders
 General arboricultural advice
 Trees in relation to subsidence
 Arboricultural surveys to BS5837

APPENDIX II EXPLANATORY NOTES

This assessment has been prepared from a visual assessment taken from ground level and then enhanced by the use of sonic tomography. Observations are based upon the body language of the trees (Claus Mattheck principal) at the time of inspection. This survey should be regarded as a preliminary overview; ongoing inspections will be required as specified in the report. In most situations the health, condition and safety of trees should be checked on a cyclic basis, alternating between early and late seasons to ensure a full picture of tree health is established. Inspections should only be carried out by a suitably qualified arborist.

Potential defects may not be detectable dependent upon timing of inspection, in particular, wood decay fungi, which may only occasionally produce external fructifications annually (rather than perennially), or may not provide external symptoms until an advanced state is achieved.

Reasonable risk management generally aims to provide a tree that can be regarded stable in a normal / foreseeable, regularly experienced storm event i.e. force 10 storms. The level of risk offered by the tree will be significantly greater as the wind speed the tree is exposed to increases beyond this level. Additionally, the threat from aerial parts failing during periods of extreme weather may be wholly unpredictable.

As an Arboriculturalist, I am a tree specialist and use my knowledge, education, training and experience to examine trees, recommend measures to enhance their health and longevity, and attempt to reduce the risks of living near trees. As a client, you may choose to accept or disregard these recommendations or seek additional advice for a second opinion.

As an Arboriculturalist I cannot detect every condition that could possibly lead to a tree or limb failure. Trees are living organisms that may fail in many ways, some of which we do not fully understand.

Conditions are often hidden within the tree and below the ground. As arborists, we cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Sometimes trees may appear "healthy," but may be structurally unsound. Likewise, remedial treatment, like any medicine, cannot be guaranteed.

Treatment, pruning and removal of trees may involve considerations beyond the Arboricultural perspective, such as property boundaries and ownership, disputes between neighbours, planning issues, sight lines, landlord-tenant matters etc. Arboriculturalist cannot take such issues into account unless complete and accurate information is given to them. Likewise, as an Arboriculturalist I cannot accept any responsibility for the authorization or non-authorization of any recommended treatment or remedial measure.

Certain trees may be 'borderline cases' as to whether they should remain or be removed. If conditions change a tree may need further monitoring in the future to determine its health and structure. Trees can be managed, but they cannot be controlled, and to live near a tree is to accept some degree of risk.

Mathematical abbreviations: > Greater than. < Less than. = Equal to

Measurements / estimates: All dimensions are estimates unless otherwise indicated. Measurements taken with a tape or clinometer. Less reliable estimated dimensions are indicated with a '?', for example where access limits accurate measuring.

Tree number and tag number: Numerical identification of the tree within this or a preceding report. Numbered Tag attached to each stem roughly 2metres.

Name: Tree species are detailed by their common name and botanical name in italics.

Age: I record the age as an estimate of the tree likely span for guidance only i.e.:

Y	Young -	Recently established/planted tree.
EM	Early Mature -	An established tree in the first third of its likely expected life span
SM	Semi Mature	Fully established and growing with high vigour
M	Mature -	The middle one third of its likely expected life span
EOM	Early Over Mature -	Clear reduction in vitality, typically small deadwood early canopy retrenchment.
OM	Over Mature -	The later one third of its likely expected life span with sign of canopy retrenchment.
V	Veteran -	An aged example of the species, typically with defects & high conservation value
S	Senescent -	Beyond its expected Life span possible of historical interest or in a state of decline.

Height: I estimate height to the nearest metre to the mean height.

Height to underside: I estimate height to the nearest half metre to the mean underside of the canopy.

Diameter: These figures relate to a measurement of the stem at 1.5m above ground level recorded in millimetres, measured with a rounded down diameter tape. Figures prefixed with MS denote trees or shrubs with multiple stems.

Canopy (N S E W): I estimate the distance of the canopy radius to the nearest metre to provide a mean distance of separation between the stem and the outer canopy.

Vitality: Is a personal assessment of the tree's growth rate in the current season, in comparison to other trees within the locality, region and an indicator of the tree likely response to site change.

D - Dead	A dead or very low vitality tree
P - Poor	A tree of low vitality
L - Low	A tree in noticeable poor state
F - Fair	A tree of lower vitality
G - Good	A tree of high vitality
E -Excellent	A tree of very high vitality

Safe Expectancy: Is a personal assessment of the trees likely expected remaining safe life span in years, assuming the site management continues as it is at present, or the tree is protected from significant environmental change. Trees can reverse even serious decline and the expected safe life can be significantly improved following changes / improvements to site management and following remedial works.

40+	Good vitality a tree a tree with high potential.
20+	Normal vitality a tree in good health.
10+	Early reduction in vitality / reducing foliage cover.
<10	Marked decline / reduced foliage cover.
<5	Serious decline or very low vitality tree.
<1	Dead / almost dead tree

Comments / Observations: General comments referring to tree health, structure and condition.

Management Options or Recommendations: Comments detailing remedial works required improving immediate safety or improve the management of the tree.

Priority: Guidance for the time scale in which works should be completed, from the date of the report.

Tree Risk Assessment: The International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ) takes a qualitative rather than quantitative approach to risk assessment. It uses matrices to compare the likelihood of failure of a tree or tree part, the likelihood that it will impact the target and the potential consequences of failure.

Unless stated otherwise the risk assessment assumes the risk offered over the next year.

Matrix 1. Likelihood of failure

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

Glossary of Terms.

Sonic Tomography (SOT): Sonic tomographs detect defects (e.g., hollows or wood rot) in a non-invasive way by generating a two-dimensional map of the sound velocity transmitted across a tree's section, mirroring the integrity of the inspected wood. It works on the principle that sound waves passing through decay move more slowly than sound waves traversing solid wood. The system sends sound waves from a number of points around a tree trunk to the same number of receiving points, the relative speed of the sound can be calculated, and a two-dimensional image is generated. Using the differences in the transit times between sensors, the analysis software constructs a two-dimensional picture, which show zones of differing sound transmission properties within the stem. The software uses pre-set colours, for example, areas with high "sonic speed" in green whereas low sonic values are shown in magenta. Other colours of yellow & red represent various levels of rotting zones based on sonic speed measurements in the respective areas. Sonic Tomography gives valuable density information about the trees. The density strongly correlates with the soundness of the wood. This is very useful to access the stability of the tree. In some situations, the sonic investigation is interfered with by the internal structure of the wood.

Safety Factor. Safety factor is the ratio of the wood strength from the species database and shown as "Strength" and this computed maximal stress, multiplied by a correction factor of 70%. The formula is: $(SF = 0.7 \text{ Strength} / \text{MaxStress})$. The rationale behind this approach is that given all the parameters above the software tries to estimate the stress in the wood and if this exceeds the maximum limit the material can resist, then the trunk would break. This is based upon several key elements including:

- Expected wind speed will not breach 33m/s or 72 mph.
- Drag factor is the drag coefficient of the crown, taken from the tree species database.
- Strength is the yield strength of the trunk wood, also taken from the species database.
- Wind force is the calculated force acting on the crown centre at the given wind speed and crown size.
- Tree weight above layer is the estimated total weight of tree that is above the selected layer.
- The torque resulting from the wind and gravity forces.
- Max stress is the maximal stress resulting from the torque and mass of the tree, taking into consideration the tomogram. The Layer Details section shows the details for the selected layer. Decayed area is the percentage of the decayed region on the selected layer compared to the total layer area.

Safety Factor	below 50%	50% - 100%	100% - 150%	above 150%
Risk Rating	Extreme Risk	High Risk	Moderate Risk	Low Risk



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