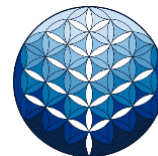


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Report	Further Investigation Report
Descriptor	A Further Investigation Report - including using Impulse Tomography testing and an aerial inspection to establish the structural condition of 1no. London Plane tree (<i>Platanus × hispanica</i>).
Address	British Museum Great Russell Street, London WC1B 3DG
Reference Number	240130
Client	British Museum Great Russell Street
Instructed	William Horton Capital Planning & Programme Management
Documents referenced	1. Tree Survey and Tree Constraints Plan Ref. 231005 2. Arboricultural Implication Assessment Ref. 231005 3. Arboricultural Method Statement Ref. 231005
Visited by	D. Riley & B. Yarwood
Date of Visit	12 th June 2024
Prepared	D. Riley
Reviewed	O. Booth
Date completed	June 2025

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1. Introduction

1.1 Instruction

Writtle Forest Consultancy Ltd has been instructed by William Horton from Capital Planning & Programme Management on behalf of the British Museum, to carry out a Further Investigation Report including Impulse Tomography and an aerial inspection in relation to 1no. London Plane tree. The subject tree is located within the bounds of Gresham Hotel, 36 Bloomsbury Street, London, WC1B 3QJ. The tree, number T8 was highlighted for further investigation within the previous BS5837 Tree Survey referenced: 231005_British Museum_BS5837 Tree Survey v1.

1.2 Tree Preservation Orders (TPO) and Conservation Areas (CA)

All of the trees surveyed fall within The Bloomsbury Conservation Area as designated by London Borough of Camden (LBC) Planning department. To this end any works to or relating to the trees will require notification to LBC, with allowance of 6 weeks to respond before such time as works can commence. (It is understood that the closest TPOs to the British Museum are at the front of 29A Montague Street, Trees 30-32).



Figure 1 – Showing the extent of Bloomsbury Conservation Area (highlighted in orange) in relation to site

1.3 Tree within the landscape

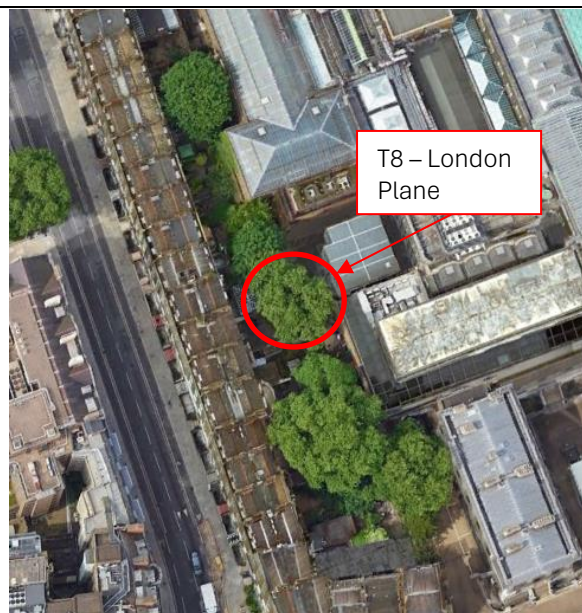


Photo 1: Aerial photograph, showing the London Plan tree (T8) in context of the Landscape.

2. Methods and Equipment

2.1 Visual Tree Assessment

A basic tree risk assessment and tree health inspection was conducted. A basic assessment, as described by the International Society of Arboriculture (ISA), is a detailed visual inspection of a tree and an overview of the tree's immediate environment. This may include the use of simple tools, such as a nylon or wooden mallet for detecting audible hollowing of the stem and a probe suitable to ascertain depth of visible decay or fractures. The inspection generally requires that the tree surveyor inspects around the stem of the tree to all compass points where possible to consider the base/ root collar of the tree, the main stem/s, the crown structure, the leaf, and physiological condition of the tree as well as a brief appraisal of the surrounding environment. Salient features will be recorded.

2.2 Arbotom

The ARBOTOM® is an impulse tomograph developed for assessment of the interior state of trees. It is based on the principle of stress wave timing. Impulse velocities within the wood are highly correlated with the density of the material and can therefore be used to gather information on internal structure. Intact wood transmits stress waves better than wood that is damaged by decay or cracks.

The system works by attaching sensors around the circumference of the stem or branch. Each sensor is tapped in turn. This sends out an impulse signal received by all other sensors. The speed at which the impulse signal travels to each sensor is cross correlated to create a tomogram representing those areas of wood which are intact or damaged / decayed.

2.3 Resistograph Drill

A wood resistance assessment of trees was made using a Resistograph R650. This is an electronic, high-resolution, needle drill-resistance measurement device. The thrust and mechanical drive of a 3mm drill bit is measured. This provides a correlation between the measured values and the condition of the penetrated wood. It is used to detect defects including decay, cavities, and cracks.

3. Visual Tree Assessment

All dimensions and measurements are estimated unless otherwise indicated.

3.1 T8 – London Plane (*Platanus × hispanica*)

Surrounding environment:	The tree is situated adjacent to boundary wall within small rear garden of the Gresham Hotel.
Targets:	Buildings (British Museum/Gresham Hotel), gardens and access road
Height:	18 metres (m)
Stem diameter:	1200cm
Crown Spread:	North – 10m East – 7m South – 6m West – 7m
Age Class:	Mature
Condition of root system:	<p>The tree is located within a small area of exposed soils with significant disruption to the concrete edging. The area surrounding the tree is predominantly hard-surfacing at varying levels, with probable limited rooting area due to proximity to boundary wall and building.</p> <p>No further visible indicators were noted to suggest any factors associated with the root system to be detrimental to the tree condition at the time of the survey.</p>
Condition of stem/s:	<p>An area of decay observed at the base of the main stem to the north-east.</p> <p>The main stem has a moderate lean to the south, the stem reverts upright at main stem break between 4 to 5m.</p> <p>2no cavities formed from historical pruning wounds at 4 to 4.5m to the south and south-west.</p> <p>The main stem breaks between 4 to 5m into 3no. stems with adequate unions, 2no. stems to the east are fused at 6m.</p>
Condition of crown structure:	<p>Dead Ivy encroaches throughout the crown structure.</p> <p>The crown is significantly over-extended laterally to the north as a result of pruning to the east and south, several dead stubs at areas of pruned lateral limbs to the south.</p> <p>An aerial inspection was carried out of the crown structure which revealed no significant structural defects. (Note: The aerial inspection was restricted due to dense inner foliage and significant amount of dead Ivy).</p> <p>No Massaria was observed during the inspection.</p> <p>Large diameter deadwood within crown.</p>
Condition of foliage and shoot growth:	Foliage and shoot growth appears normal for species.

4. Photographs



Photo 2: Showing overview of London Plane tree as viewed from the west.



Photo 3: Showing limited exposed soils around the base of the main stem significant disruption to the concrete edging.



Photo 4: Showing area of decay observed at the base of the main stem to the north-east, highlighted in red.



Photo 5: Showing the main stem with a moderate lean to the south.

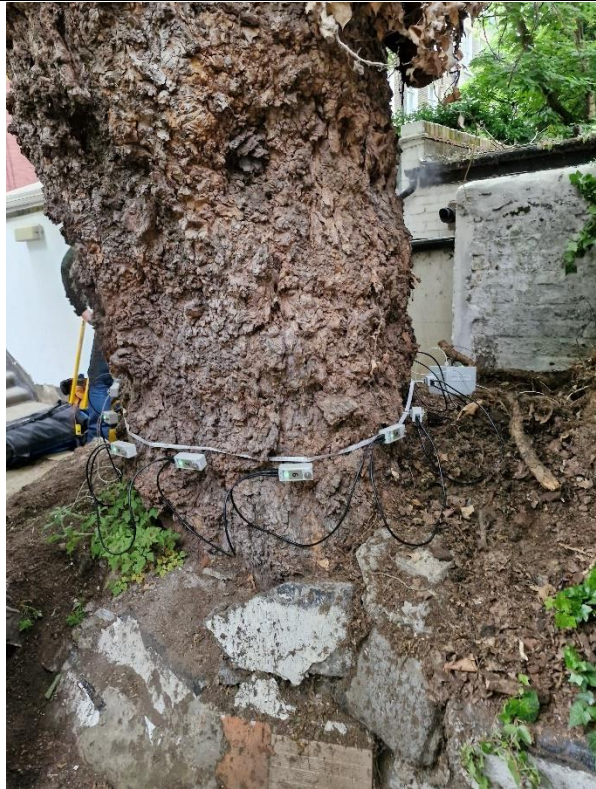


Photo 6: Showing Impluse Tomography sensors attached to the base of the main, as viewed from the south-east.



Photo 7: Showing location of 2no cavities formed from historical pruning wounds at 4 to 4.5m to the south and south-west, highlighted in red.



Photo 8: Showing dense inner foliage and dead Ivy encroaching within crown structure.

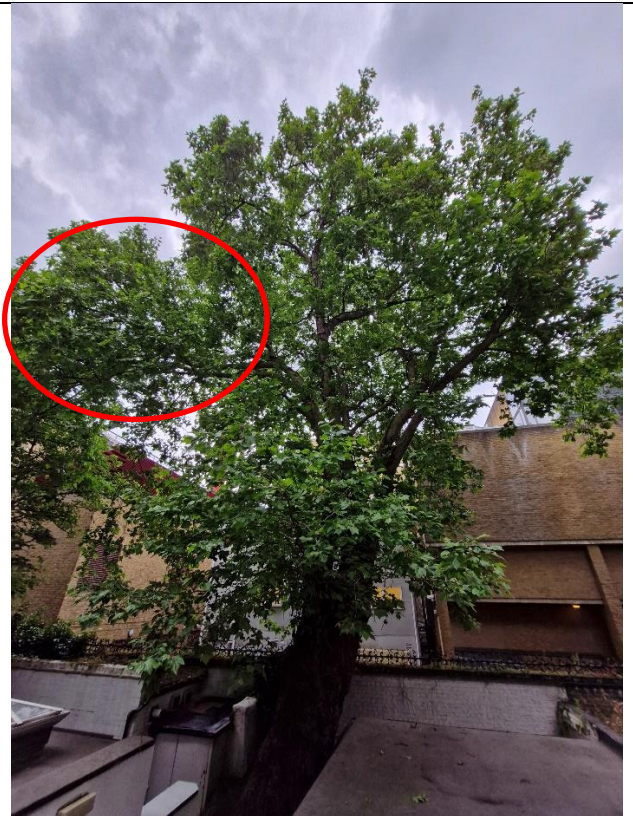


Photo 9: Showing over-extension of lateral growth to the north, highlighted in red.

5. Results

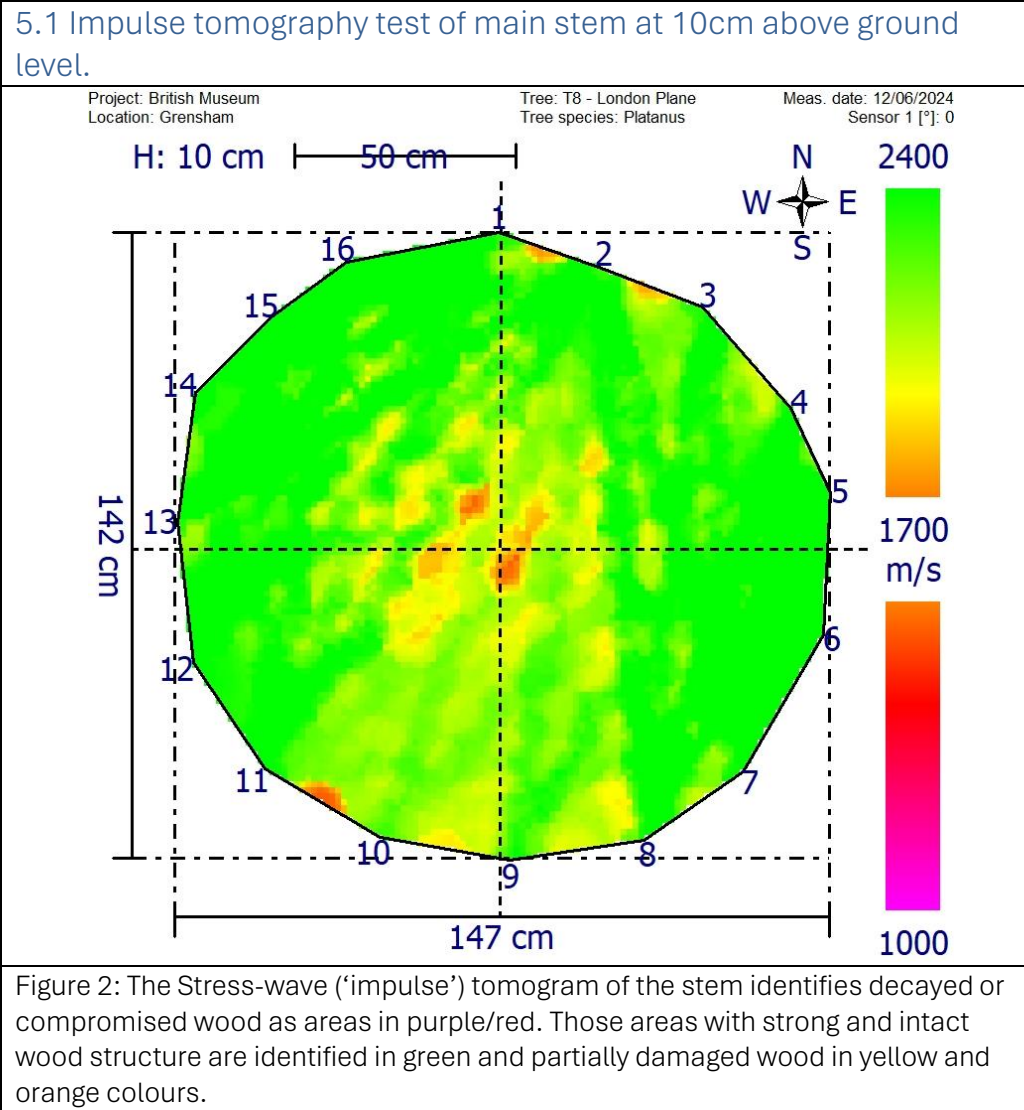


Figure 2: The Stress-wave ('impulse') tomogram of the stem identifies decayed or compromised wood as areas in purple/red. Those areas with strong and intact wood structure are identified in green and partially damaged wood in yellow and orange colours.

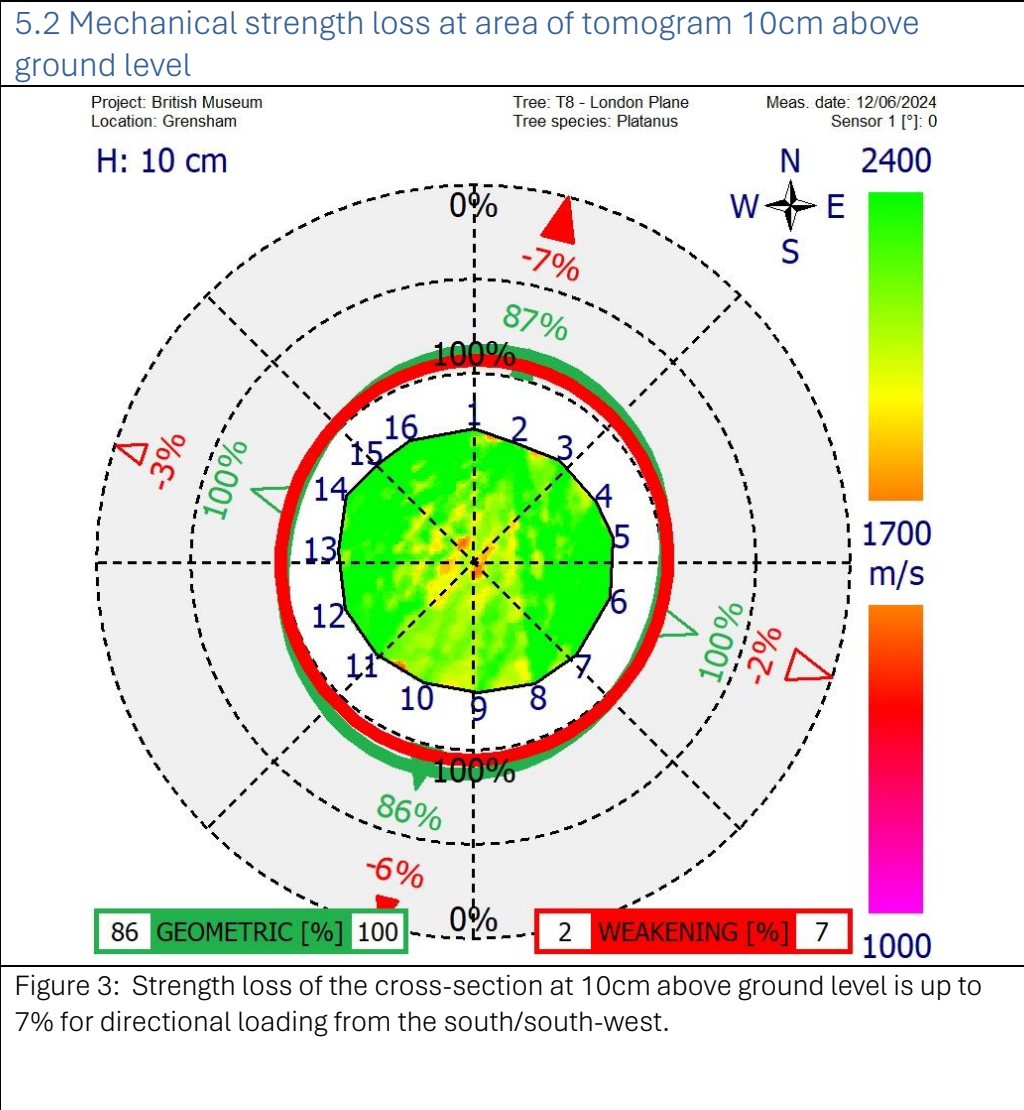


Figure 3: Strength loss of the cross-section at 10cm above ground level is up to 7% for directional loading from the south/south-west.

5.3 Resistograph Drill Profile 1 carried out at 4m to the south-west, below the historical wound towards the centre of the stem



Photo 10: Showing location of resistance drill profile 1 carried out at 4m to the south-west, below the historical wound towards the centre of the stem. Approximate projection of drill shown by a red arrow.

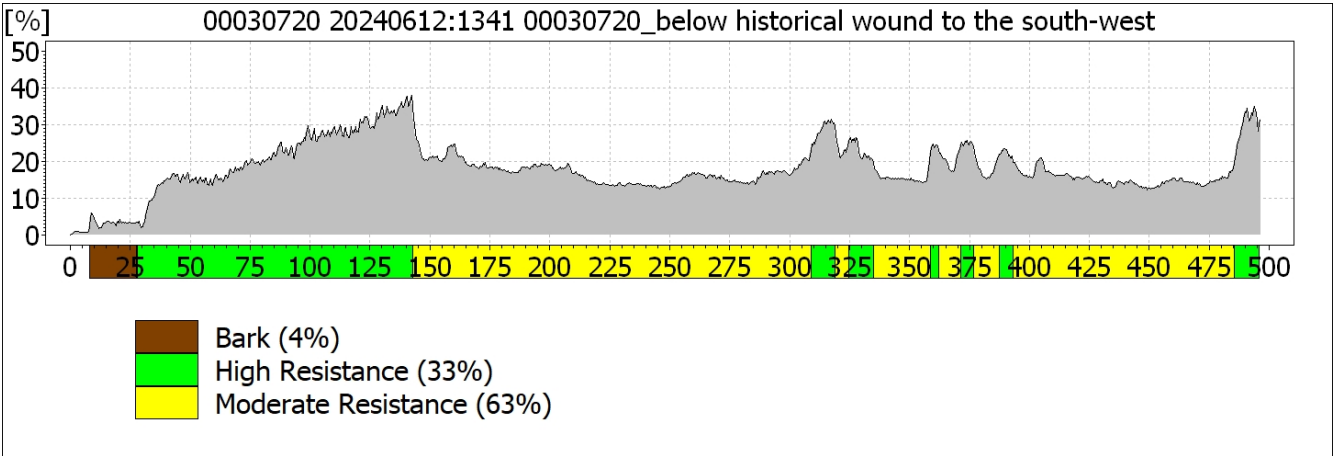


Figure 4: Resistance drill profile 1 records high resistance up to 14.5cm then an area of moderate resistance up to 48cm, several pockets of high resistance was recorded between 31cm to 39cm.

5.4 Resistograph Drill Profile 2 carried out at 4m to the south, below the historical wound towards the centre of the stem



Photo 11: Showing location of resistance drill profile 2 carried out at 4m to the south, below the historical wound towards the centre of the stem. Approximate projection of drill shown by a red arrow.

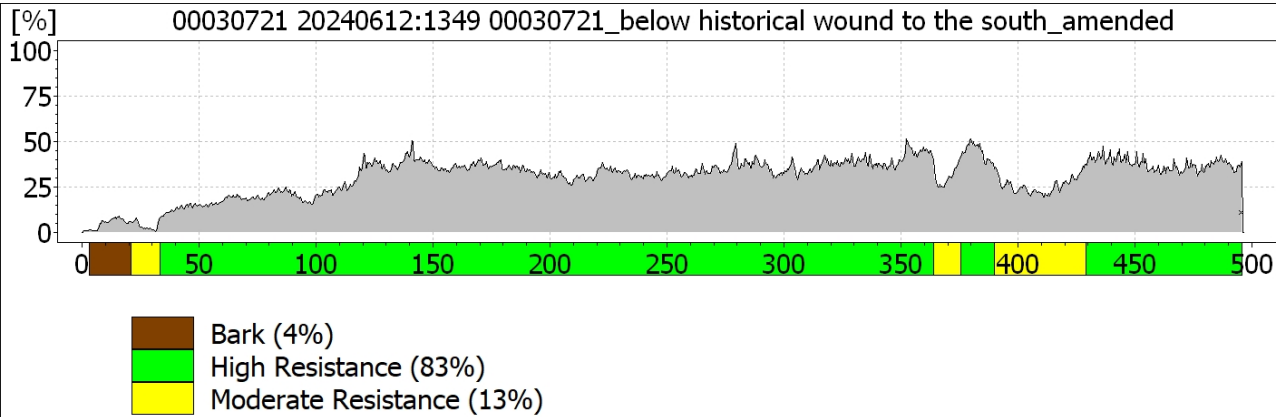


Figure 5: Resistance drill profile 2 recorded high resistance for the majority of the test, with 2no. small areas of low resistance at 36cm and 41cm.

6. Discussion of results

The Visual Tree Inspection (VTA) revealed an area of decay at the base of the main stem to the north-east. As such, an Impulse Tomography test was conducted at 10cm above ground level. The results showed an small area of decay to the north-east which corresponds to the findings of the VTA, there also was a small central area of decay. (Figure 2). The associated strength loss of the cross section at 10cm above ground level is up to 7% (Figure 3).

Further observation during the VTA were 2no. historical pruning wounds on the main stem at approximately 4m to the south and south-west. An aerial inspection was carried out which revealed cavities had formed in an area of an pruning wounds, adjacent to a main stem unions. 2no. resistance drills (Figure 4 and 5) were carried out to assess the extent of decay associated with the wounds.

The resistance drills 1 (Figure 4) shows an area of moderate resistance from 14.5cm to approximately 31cm this is deemed to be the column of decay extending down from the historical pruning wound to the south-west. The drill then records a further area of decay extending from 33cm to 39cm this is considered to be the column of decay extending from the historical wound to the south. A further resistance drill 2 (Figure 5) was carried below the historical pruning wound to the south. The readings recorded high resistance for the majority of the test, with 2no. small areas of low resistance at 36cm and 41cm. Therefore, it is considered the decay from the 2no. wounds to be confined to the south-west of the stem, between the 2no. wounds and not currently progressed further into the stem to the south.

The aerial inspection of the crown structure carried out revealed no significant structural defects. This inspection was restricted due dense inner foliage and significant amount of dead lvy throughout the entire structure, the dead lvy will eventually fall out of the crown. This will presenting a potential risk to people below.

One observation of the crown structure from a ground level inspection is that it is significantly over-extended to the north due to historical pruning to the east and south.

In conclusion, the decay at the base of the main stem and at the area 2no. historical wounds at 4m are not currently deemed significant. However, it is considered the tree is out growing its situation, with the limited rooting area and significant over-extended growth in the canopy.

To this end it is considered prudent to manage the tree with a reduced size and stature. This may be achieved by managing the tree as of a high pollard on a cyclical pruning regime of 5 to 7 years. This is outlined below within the recommendations.

7. Recommendations

The tree contractor should carry out all tree works to BS 3998: (2010) *Recommendations for Tree Work* and as modified by more recent research.

7.1 Recommendations

Aspect of Management	Recommended Management	Timeframe
Works related to bio-mechanical structure:	Remove large diameter deadwood and dead Ivy. Reduce crown to a high pollard at a finishing height of approximately 12m and maintain on re-pollarding cycle of 5 to 7 years (dependent on rate of re-growth)	6 months all works
Further monitoring:	Carry out comparative Impulse Tomography and Resistance drills to ascertain if the decay is progressing or has stabilised within the base of the tree.	24 – 36 months

Appendix 1: Risk Assessment

Risk has been assessed using the International Society of Arboriculture's (ISA) Tree Risk Assessment Methodology, referred to as TRAQ. This is a 'qualitative' system, which uses a matrix-based combination of ratings to reach a conclusion of associated risk.

Risk is the combination of the 'likelihood' of an event and the severity of the potential consequences.

A hazard is a likely source of harm, and this case relates to the tree or part of a tree that may fail.

The likelihood of failure considers all structural defects noted within the tree. The overall risk rating for the tree is derived from the tree part presenting the greatest risk.

Matrix 1. Likelihood matrix

Likelihood of Failure	Likelihood of Impact			
	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 and impact	Consequence 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

Dominant risks identified.	<ol style="list-style-type: none"> 1. Large diameter deadwood and dead Ivy 2. Over-extended lateral growth of the crown. 3. Decay associated with the 2no. wounds on the main stem
Risk based on survey and data acquisition	Moderate
Evaluated risk consequent to enacting on recommendations	Low

Appendix 2: Limitations of Tree Condition Report

Limitations of the Tree Survey

The survey was based on visual observations and aids as detailed within the report.

A climbing inspection was not carried out.

No below ground inspections were carried out.

All observations were made from within the boundaries of the property, or from public land unless otherwise stated. Trees within neighbouring property are inspected as closely as is reasonably possible from within the boundaries of the property or from public land.

This report focuses on the physiological and structural condition of the tree as identified within this report.

Findings of the Survey and the Report

The recommendations in this tree report are valid for one year.

Independent data, where provided, has not been checked unless otherwise stated. This may affect the validity of the report and the client should satisfy themselves that any independent data provided is valid.

The tree/trees in question are evaluated using both visual tree assessment and stress wave tomography.

The information pertaining to the 'Arbotom'® Stress wave ('impulse') Tomography correlates to those details as provided by the manufacturers.

Displayed information and interpretation of the Impulse Tomography

Defects within the wood, not necessarily detrimental to structural integrity of the tree, may show up as areas of decay. Such areas as included bark, crack or stress fractures may appear on the read out as decayed areas.

Such areas can only be verified by boring into the tree. This is only considered having discussed with the owner of the tree and maybe deemed necessary before felling the tree.

Timing of the Survey and the Report

Such considerations/ recommendations will become invalid if changes occur to the site as considered that affect the condition of the tree, the site as evaluated, or the hazards as identified at the time of the survey.

If there are any such alterations, it is recommended that a new tree survey/report is undertaken.

Assessment of 'Targets' as considered

'Targets' are considered as those things, people and property that could be hit by the trees failing, whether such failure is partial or total.

These Targets are identified from an evaluation of the site at the time of the survey.

Changes to the site from the time of the survey may affect the targets as considered within the report and will require review or re-appraisal of the report.

Consideration of the Trees in Relation to Subsidence/ Heave

The report does not consider an assessment of the risk of Subsidence or Heave to any properties, built structures or drainage whether within the bounds of the site considered or adjacent to the site.

It is considered prudent to consider the effects of heave on any property if trees are removed.

Such considerations would be considered within a specific report.

Consideration of the Trees in relation to direct damage

The report does not consider direct damage related to tree root growth in relation to any structures whether within the bounds of the site considered or adjacent to the site.

Direct damage in this instance is considered to be where the roots of a tree have physical contact with a structure.

Trees in relation to other Properties

Works as recommended may affect third party property owners and /or third-party trees. Considerations of these affects are not dealt with within this report.

This report/survey does not comment on possible effects of trees on neighbouring properties, including in relation to subsidence or heave, or with regard to possible hazards presented by trees surveyed.

Third party owners that maybe affected by recommended works and should be informed by the client, so that the relevant parties may seek their own advice as to possible effects of the recommendations given within this report.

Damage to, or possibility of damage to, any other structure that is not referred to within the report is not considered unless otherwise specified. This includes both neighbouring structures and any other structure on the property.

Trees subject to statutory controls

If the trees are covered by a Tree Preservation Order or are located in a conservation area it will be necessary to consult the local authority before any pruning works, other than certain exemptions, can be carried out.

The works specified above are necessary for reasonable management and should be acceptable to the local authority. However, the local authority may take an alternative point of view and have the option to refuse consent.

Trees are subject to changes outside man's control

Trees are living organisms subject to changes outside man's control. Trees and environment alter with the seasons it is as well to inspect trees whilst in full leaf and when out of leaf.

If there are any harsh or unexpected weather conditions, or heavy storms it is also prudent to inspect trees.

Changes to ground water conditions will affect the root growth of a tree. Such changes are not always the result of man's influence and other factors may be involved.

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