

Tree Health & Risk Assessment

17th March 2025

Report No.2202_QTRA.01

Project: Bardon II Ellistown

Authored by: Matthew Lally



TREE HEALTH & RISK ASSESSMENT

PROJECT

Bardon II Ellistown

Coalville

LE67 1FB

DOCUMENT ISSUE RECORD

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1.0 INTRODUCTION

1.1. Author Professional Details

1.1.1. My name is Matthew Lally and I have been working and studying in the Arboricultural Industry since 2005. I have many years practical experience as an arborist and professional experience as a consulting arboriculturist.

1.1.2. I so far hold the following Arboricultural qualifications and technical memberships:

- FdSc Arboriculture
- LANTRA Professional Tree Inspection Certificate
- VALID – Validator
- QTRA Registered User
- Professional Member of the Consulting Arborist Society
- Professional member of the Arboricultural Association

1.2. Tree Risk Assessment (QTRA Approach)

What is Quantified Tree Risk Assessment (QTRA)?

Tree safety management is a matter of balancing the Risk of Harm from falling trees with the benefits from trees. Although it may seem counter intuitive, the condition of trees should not be the first consideration. Instead, tree managers should first consider the usage of the land on which the trees stand, which in turn will inform the process of assessing the trees.

Quantified Tree Risk Assessment (QTRA) applies established and accepted risk management principles to tree safety management in accordance with ISO 31000:2009, Risk management – Principles and guidelines, which is published by national standards agencies. By quantifying the Risk of Harm as a probability, QTRA enables the tree manager to manage the risk from tree failure to widely accepted risk thresholds.

Using the QTRA approach, the land-use (people and property) upon which trees could fail is assessed and quantified first. This enables tree managers to determine whether or not and to what degree of rigour

a survey or inspection of the trees is required. Where necessary, the tree or branch is then considered in terms of both size (potential impact) and probability of failure. Values derived from the assessment of these three components are combined to calculate the risk of harm as a probability, which can then be compared to advisory levels of risk acceptability.

The method moves the management of tree safety away from labelling trees as either 'safe' or 'unsafe', thereby requiring definitive statements of tree safety from either tree surveyors or tree managers. Instead, QTRA quantifies the risk of significant harm from tree failure in a way that enables tree managers to balance safety with tree value and operate to predetermined risk thresholds.

By taking a QTRA approach to tree risk, tree managers commonly find they spend less resources on assessing and managing tree risk, whilst maximising the benefits their tree populations provide. Furthermore, in the event of a 'tolerable' or 'acceptable' tree risk being realised, they are in a robust position to demonstrate that they have acted reasonably and proportionately.

1.3. Instructions and Scope of Report

- 1.3.1. This report was commissioned to carry out a site visit and to make a 'walkthrough' visual assessment of all the trees standing within the grounds of Bardon II Ellistown, Coalville, LE67 1FB as shown on the site plan in Appendix II.
- 1.3.2. During the walkthrough visual assessment every tree on this site was inspected. All trees onsite were assessed by eye from ground level. Only trees requiring works, trees requiring management notes, or trees with notable features were recorded in the report and shown in the tree schedule and on the tree location plan. Trees not requiring works or management notes are considered to be in an acceptable condition and are recorded broadly in the Site Tree Schedule data in Appendix I.
- 1.3.3. This document has been completed using the QTRA approach to risk management and should be read in conjunction with the data tables

of Appendix I and site plan of Appendix II. The QTRA Practice Note explaining the principles and methodology of QTRA can be found in Appendix IV.

- 1.3.4. The survey on which the findings of this report are based on was undertaken in 13/03/2025.
- 1.3.5. All comments and recommendations have taken into account the location of each tree, their surroundings and their likely impact on persons or property.
- 1.3.6. Trees were surveyed from ground level only and a visual assessment undertaken. A percussion hammer may also have been used as part of the assessment where required. Only trees with a stem diameter over 75mm within the agreed site boundary are included in the survey.

1.4. Limitations

- 1.4.1. The limitations of this report are restricted to the persons, time, information made available, and purpose for which this report has been prepared.
- 1.4.2. The report is based upon the information gained from the visual inspection on the date of the survey. The consultant will not be held responsible for events that occur after the survey date or factors that were not apparent at the time and therefore the consultant cannot be held responsible for damage resulting from such events.
- 1.4.3. Trees are growing dynamic structures. Whilst all reasonable effort has been made to identify defects within the trees inspected, no guarantee can be given as to the absolute safety or otherwise of any individual tree. No tree is ever absolutely safe due to the unpredictable laws and forces of nature. Strong wind events and extreme climatic conditions can cause damage to even apparently healthy trees.

2.0 FINDINGS & RECOMMENDATIONS

- 2.0.1 The trees were visually assessed and given an identification number which is marked clearly on the site plan. The results are clearly described in the data tables of Appendix I and site plan of Appendix II. A glossary of terms to assist in reading the findings is available in Appendix III.
- 2.0.2 It is recommended that all works to the trees be carried out in accordance with the data tables of Appendix I in order to bring them into good management and continue long-term tree cover in this area. The works can be summarised as follows:

Priority	Other	Prune	Remove
1	-	-	-
2	-	-	-
3	11‡,	2*, 7, 11‡, 14, 15≠, 16≠,	4≠, 5**, 6, 8‡, 9, 10‡,
4	12,	1, 3, 12,	15, 16,

Priority Rating:

- 1** Immediate- Action should be taken immediately. No delay. Danger to life.
- 2** - High – Works should be undertaken as soon as possible. There is time to obtain quotes and to book works in line with a tree surgeons diary.
- 3** - Moderate - Work should be implemented in a programme of works. (Within 12 months unless otherwise stated)
- 4** - Low - Work that would benefit the trees or other issues. Work not considered essential but should be implemented if funding becomes available.

* Action to be undertaken within 4 weeks

** Action to be undertaken within 2 months

‡ Action to be undertaken within 3 months

≠ Action to be undertaken within 6 months

2.1. Standard of work

All tree work undertaken should be done in accordance with British Standard 3998:2010 and by competent contractors who are insured with public liability cover of at least two million pounds.

3.0 STATUTORY CONTROLS & OTHER CONSTRAINTS

3.1. Statutory controls

Tree preservation Orders & Conservation Areas

3.1.1. The Town and Country Planning Act (1990) (the Act) and associated Regulations empower Local Planning Authorities (LPAs) to protect trees in the interests of amenity by making Tree Preservation Orders (TPOs). The Act also affords protection for trees with a diameter at breast height over 75 mm diameter that stand within the curtilage of a Conservation Area. An application must be made to the LPA in question to carry out works upon or to remove trees that are subject to a TPO, whilst six weeks' notice of intention must be given to carry out works upon or to remove trees within a Conservation Area that are not protected by a TPO.

3.1.2. A Tree Preservation Order (TPO) is an order made by a local planning authority to protect specific trees, groups of trees or woodlands in the interests of amenity. A TPO prohibits the:

- cutting down
- topping
- lopping
- uprooting
- wilful damage
- wilful destruction

of trees without the local planning authority's written consent. If consent is given, it can be subject to conditions which have to be followed. In the Secretary of State's view, cutting roots is also a prohibited activity and requires the authority's consent. Anyone found guilty of such an offence is liable and in serious cases, may result in prosecution and incur an unlimited fine.

3.1.3. A search via the Hinckley & Bosworth Borough Council website indicated that there are trees with Tree Preservation Orders on this site. It is believed that T1, W12 and part of G3 in this report are protected by TPO 83/00007/TPORD. (See Below Map)

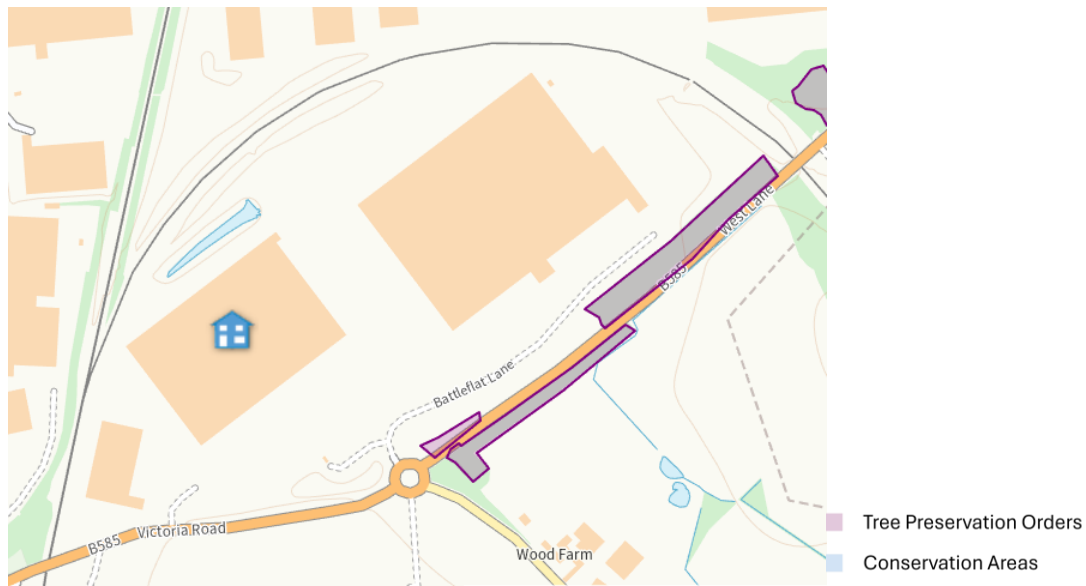


Figure 1. A screenshot of the Hinckley & Bosworth Borough Council interactive map showing the location of any TPO's or Conservation Areas in relation to the site. (<https://www.hinckley-bosworth.gov.uk/tpomap> Accessed 17.03.2025)

- 3.1.4. As some of the trees on site are subject to a Tree Preservation Order, then statutory permission from the Local Planning Authority (LPA) will be required before any tree works take place.

3.2. Wildlife

All operations should take account of wildlife needs and be planned to take advantage of weather conditions and time of year for minimum damage and disturbance. If any protected species or nesting birds are present or discovered while the works are taking place all work should cease until contact has been made with Natural England for further advice. Natural England can be contacted on 0845 600 3078 or by e-mail to: enquiries@naturalengland.org.uk. Specific consideration should be given to the possible presence of roosting bats, which are protected by the Wildlife and Countryside Act 1981 (schedule 5) and included in schedule 2 of the Conservation Regulations 1994. Ideally, a survey should be carried out to identify any potential roost sites and if bats are found to be present advice should be sought from a person qualified and experienced in handling such matters and fully conversant with the implications of the Act.

3.3. Repeat Surveys

The frequency of the repeat surveys can be found in the tree schedule in Appendix I titled "next survey (months)".

Appendix I

Tree Survey Data

TREE RISK ASSESSMENT SCHEDULE



SURVEYOR: Matthew Lally
DATE: 13/03/2025
PROJECT ADDRESS: Bardon II Ellistown, Coalville, LE67 1FB
PROJECT REF: 2202_QTRA.01

Tree No.	T/G/W/H	Species	Height (m)	Age Class	Condition	Comments	Recommendations	Priority	Next Survey (months)	RISK ASSESSMENT OF	TARGET TYPE	Mx TARGETS	TARGET	SIZE	POF	MASS %	ROH
Site	G	Mixed	0 to 25	Y to OM	A to B	I've walked the entire site and inspected all trees. Internally the trees are young and newly established - more mature trees located on site boundaries especially adjacent to the road. All trees deemed to be in an acceptable condition aside from the trees listed below.	No action	-	36	RISK <1/1M. CALCULATION NOT REQUIRED							

- 1

Immediate - Action should be taken immediately. No Delay
- 2

High - Work should be undertaken as soon as possible
- 3

Moderate - Work should be implemented in a programme of works
- 4

Low - Work that would benefit the trees or other issues. Work not considered essential but should be implemented if funding becomes available.

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PROJECT REF: 2202_QTRA.01

Tree No.	T/GW/H	Species	Height (m)	Age Class	Condition	Comments	Recommendations	Priority	Next Survey (months)	RISK ASSESSMENT OF	TARGET TYPE	Mx TARGETS	TARGET	SIZE	POF	MASS %	ROH
1	T	Sycamore	11 to 15	EM	C	Tag 2941. An early mature sycamore adjacent to road. In significant decline. Within falling distance of road, however more likely to fall within woodland or limbs to break apart within grass bank area.	Pollard at 6m	4	24	Limb failure onto grass bank	H	1	5	3	2	100%	<1/1M
2	T	Oak	16 to 20	OM	A	Tag 2942. A mature oak located on site boundary. Vitality appears to be within the normal range. Some significant deadwood present throughout crown. Minor ivy on stem. Tree appears stable. Hanging branch in mid crown over road.	Remove significant deadwood and hanging branch from over the road within 4 weeks	3	24	Hanging branch	V	1	2	3	1	100%	1/500
3	G	Predominantly Oak and Sycamore with occasional Holly and Elder.	0 to 20	SM to M	A to B	A linear boundary group located adjacent to the B585. The vitality of the group is generally good. Deadwood present throughout group but will likely fall onto low occupancy grass verge or within other low occupancy areas. I observed all of these trees from the roadside and from within the site. Access to the base of the trees was limited in places due to dense vegetation. Some dead trees within group, however will likely fall within woodland area and is of little concern.	Monitor branches over the road and prune to 5m as required	4	24	RISK <1/1M, CALCULATION NOT REQUIRED							
4	T	Sycamore	16 to 20	M	C	Tag 2943. A multi-stemmed sycamore located adjacent to the B585. Sooty bark disease present. Two stems appear to be dead. Remaining parts of tree are in significant decline. Within falling distance of busy road.	Remove within 6 months	3	n/a	Stem failure into road	V	1	2	2	2	100%	1/1K

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PROJECT ADDRESS: Bardon II Ellistown, Coalville, LE67 1FB
PROJECT REF: 2202_QTRA.01

Tree No.	T/GW/H	Species	Height (m)	Age Class	Condition	Comments	Recommendations	Priority	Next Survey (months)	RISK ASSESSMENT OF	TARGET TYPE	Mx TARGETS	TARGET	SIZE	POF	MASS %	ROH
5	T	Oak	11 to 15	EM	D	Tag 2944. A dead standing tree with significant basal decay leaning towards road. Tree is within falling distance of road.	Remove within 2 months	3	n/a	Total tree failure into road	V	1	2	1	1	100%	1/40
6	T	Rowan	0 to 5	SM	C	Tag 2945. Stem lean and asymmetrical crown biased to road. Tree is in decline with peeling bark. Basal movement went pushed by hand. Tree is quite small but is within falling distance of road and should be removed.	Remove	3	n/a	Total tree failure	V	1	2	3	2	100%	1/5K
7	T	Oak	11 to 15	SM	C	Tag 1000. Top of tree has snapped out and is resting in adjacent holly over road. It appears to have been like this for sometime and is well wedged however this limb needs to be removed. The standing stem has little chance of recovery and should be pollarded at 3m so that any future failure will not reach the road.	Pollard at 3m and removed snapped stem from adjacent holly	3	24	Snapped stem falling into road	V	1	2	3	2	100%	1/5K
8	T	Rowan	6 to 10	M	D	Tag 0999. A fallen rowan resting in adjacent holly leaning towards road. Appears well wedged but should be removed.	Remove within 3 months	3	n/a	Total tree failure into road	V	1	2	2	2	100%	1/1K
9	T	Holly	11 to 15	EM	D	Tag 2946. A dead standing holly within falling distance of road. Minor basal movement when pushed by hand. Direction of future failure unknown but could reach road if the tree was to fail in that direction.	Remove	3	n/a	Total tree failure into road	V	1	2	3	3	100%	1/50K
10	T	Ash	11 to 15	EM	C	Tag 0538. A partially uprooted and leaning ash tree adjacent to B585. Minor basal movement when pushed by hand suggesting tree is unstable.	Remove within 3 months	3	n/a	Total tree failure into road	V	1	2	2	2	100%	1/1K

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Tree No.	T/GW/H	Species	Height (m)	Age Class	Condition	Comments	Recommendations	Priority	Next Survey (months)	RISK ASSESSMENT OF	TARGET TYPE	Mx TARGETS	TARGET	SIZE	POF	MASS %	ROH
11	T	Oak	16 to 20	M	B	Tag 0539. A large mature oak adjacent to the B585. Snapped hanging branches in the mid and upper crown. Decayed central stem evident but unable to fully assess due to height.	Remove snapped hanging branches and conduct a climbing inspection of the decayed stem to assess stability. Within 3 months	3	3	More information required							
12	W	Mixed Woodland	6 to 20	SM to M	A to D	A mixed woodland group adjacent to road. I have walked through the woodland and walked around the perimeter. Some areas were inaccessible due to bramble and the stacking of fallen trees. Dead trees present throughout woodland but of little concern due to distance from road and footpaths. Occupancy within woodland is low. There is evidence of multiple fallen trees within the wood. Deadwood present over the road, but it is quite small.	Clear paths to significant trees and reinspect in summer 2026 to ascertain vitality levels and inspect for fungal fruiting bodies. Consider removal of deadwood within falling distance of road and internal footpath	4	18	Deadwood over road	V	1	2	4	2	100%	1/50K
13	T	Sycamore	11 to 15	EM	C	Located in unmanaged area adjacent to footpath and road. Significant cavity in upper parts of stem at 6m however, any likely failure will be within low occupancy area. Minor reduction in vitality. No evidence of fungal fruiting bodies, splits, cracks or instability.	Reinspect in summer 2026 to assess vitality and check for fungal fruiting bodies	-	18	Lim failure into low occupancy area	H	1	4	3	2	100%	1/500K
14	T	Sycamore	11 to 15	EM	B	Tag 2948. In decline. Sooty bark disease evident. Limb over footpath is dead.	Remove dead limb over footpath and monitor vitality in the summer of 2026 to ascertain levels of dieback	3	18	Dead limb over path	H	1	3	3	2	100%	1/50K

Immediate - Action should be taken immediately. No Delay

High - Works should be undertaken as soon as possible

Moderate - Work should be implemented in a programme of works

Low - Work that would benefit the trees or other issues. Work not considered essential but should be implemented if funding becomes available.

TREE RISK ASSESSMENT SCHEDULE



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DATE: 13/03/2025
PROJECT ADDRESS: Bardon II Ellistown, Coalville, LE67 1FB
PROJECT REF: 2202_QTRA.01

Tree No.	T/GW/H	Species	Height (m)	Age Class	Condition	Comments	Recommendations	Priority	Next Survey (months)	RISK ASSESSMENT OF	TARGET TYPE	Mx TARGETS	TARGET	SIZE	POF	MASS %	ROH
15	T	Sycamore	11 to 15	EM	C	Tag 0540. An early mature sycamore located adjacent to road. Top of tree appears to be dead and within falling distance of road. Tree is in decline. Suspected sooty bark disease.	Consider removal. If retained then remove top dead section within 6 months. Monitor vitality and stability in summer 2026	3	18	Dead stem	V	1	2	3	2	100%	1/5K
16	T	Sycamore	11 to 15	SM	C	Tag 2947. Sycamore located on site boundary adjacent to road. In significant decline with some significant dieback in upper crown. Suspected sooty bark disease. The tree needs to be inspected in summer to ascertain the vitality.	Consider removal. If retained then remove dead section within falling distance of road within 6 months. Reinspect in summer 2026 to ascertain vitality	3	6	Dead stem	V	1	2	3	2	100%	1/5K
17	G	Sycamore and Elm	11 to 15	EM	B	A linear group adjacent to road. Vitality is reduced with evidence of early stage sooty bark disease. These trees need to be monitored as I expect them to decline further over the coming years.	Reinspect in summer 2026 to ascertain levels of dieback and check for fungal fruiting bodies	-	18	RISK <1/1M, CALCULATION NOT REQUIRED							

1 Immediate - Action should be taken immediately. No Delay

2 High - Works should be undertaken as soon as possible

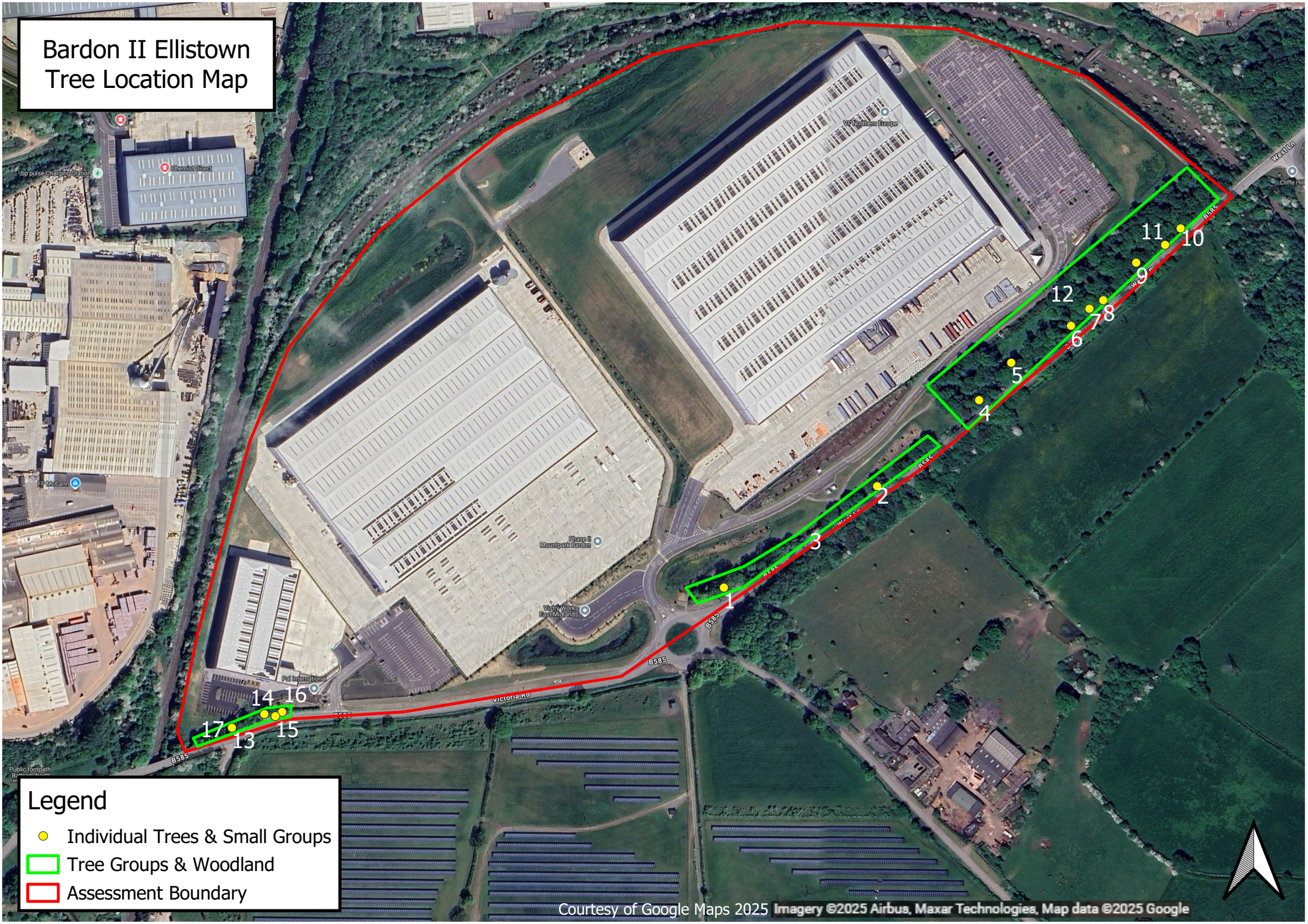
3 Moderate - Work should be implemented in a programme of works

4 Low - Work that would benefit the trees or other issues. Work not considered essential but should be implemented if funding becomes available.

Appendix II

Site Plan

Bardon II Ellistown Tree Location Map



Legend

- Individual Trees & Small Groups
- ▭ Tree Groups & Woodland
- ▭ Assessment Boundary

Appendix III

Glossary of Terms

Arboricultural Glossary of Terms

The following terms are concurrent with best Arboricultural practice and within the guidelines set by the International Society of Arboriculture (ISA), the Arboricultural Association (AA) and the British Standards Institute (BSI).

Age Range: Age is site specific and categorised:

Young (Y)	Newly Planted trees that have not yet established
Semi-Mature (SM)	Established trees up to 1/3 of expected height, stem girth and crown spread
Early Mature (EM)	Between 1/3 and 2/3 of expected height, stem girth and crown spread
Mature (M)	Between 2/3 and full expected height, stem girth and crown spread
Fully Mature (FM)	Full expected height, stem girth and crown spread
Over Mature (OM)	Exceeding life expectancy & Evidence of die back in crown.
Senescent (S)	In advanced stages of decline

Height: Height was estimated and recorded in five metre intervals such as: 0-5, 6-10, 11-15, 16-20, 21-25 and 26+

T/G/W/H - T = Tree. G = Group. W= Woodland. H = Hedge.

Condition: Assessment of current physiological and structural condition incorporating vigour and vitality. Condition is to be categorised as follows:

- A –** Tree needing little, if any attention
- B –** Tree with some risk features, or in the early stages of physiological stress
- C –** Tree with significant risk features and/or extremely stressed
- D –** Tree that is dead, biologically/physically moribund or dangerous

Priority Rating:

Priority Rating		
1	Immediate	Action should be taken immediately. No delay. Danger to life.
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RISK RATING KEY

Target Type: P= Property V= Vehicles H = Humans

Mx Targets: If there are multiple targets or a target well above the top value then this can be multiplied using this field to give a more accurate output.

Target: Rated from 1 to 6. 1 being the highest value and 6 being the lowest value.

Size: This is the size of the part that could fail. These are given values 1 to 4 and a P represents property.

Probability of Failure: Likelihood of failure given a value of 1 to 7. 1 being certain of failure and 7 being certain of no failure.

Mass%: Percentage of mass lost from part.

ROH: Risk of Harm calculated from the above inputs.

Definition of Physiological & Morphological Terms

- Adaptive Growth** - The process whereby wood formation is influenced both in quantity and in quality by the action of gravitational force and mechanical stresses on the cambial zone.
- Cankers** - A localised area of dead bark and cambium on a stem or branch which can be caused by bacterial or fungal agents.
- Cavity** - An open area within the stem or branches of the tree. The cavity forms by the presence of fungal decay.
- Chlorotic Leaf** - Lacking in chlorophyll, typically yellow in colour.
- Compartmentalisation** - The physiological process that creates the chemical and mechanical boundaries that act to limit the spread of disease and decay organisms.
- Coppicing** - An ancient form of woodland management that involves repetitive felling and re-growth on the same stool, near to ground level.
- Compression wood** – A type of wood found in Gymnosperms (Coniferous Trees) that is created as a reaction to compressive forces. This type of wood is more resistant to compressive forces than normal wood.
- Crack** - A split in the stem or branch, involving bark and/or underlying wood. These may be vertically and horizontally orientated.
- Decay** - Process of degradation of woody tissues by fungi and bacteria through decomposition of cellulose and lignin.
- Deadwood** - Deadwood is often present within the crown or on the stems of trees. In some instances, it may be an indication of ill health, however, it may also indicate natural growth processes.
- Design Wind Load**- The maximum static load to which a tree is expected to be exposed during a chosen extreme wind event. It is the interaction between the wind force and the

size and shape of the crown of the tree. Design Wind Load is expressed as a moment.

- Girdling Root** - Root which circles and constricts the stem or roots causing death of phloem and/or cambial tissue.
- Hazard Beam** - An upwardly curved branch in which strong internal stresses may occur without the compensatory formation of extra wood (longitudinal splitting may occur in some cases).
- Included Union** - Pattern of development at branch junctions where bark is turned inward rather than pushed out. Potential weakness due to a lack of a woody union.
- Ivy Growth** - Ivy growth may ascend into the tree's crown, increasing wind resistance, concealing potential defects and reducing the tree's photosynthetic capacity. Ivy growth is often acceptable in woodland areas as a conservation benefit.
- Live Crown Ratio** - The relative proportion of photosynthetic mass (leaf area) to overall tree height.
- Root Plate Lift** - The physical movement of the rooting plate causing soils to shift and crack. May occur during adverse weather conditions. Trees may become unstable.
- Suppressed** - Trees which are dominated by surrounding vegetation and whose crown development is restricted from above.
- Topping** - A highly disfiguring practise, likely to cause severe xylem dysfunction and decay in major structural parts of the wood.
- Wound** - Any injury, which induces a compartmentalisation response.
- Wound wood** - Wood with atypical anatomical features, formed in the vicinity of a wound and a term to describe the occluding tissues around a wound as opposed to the ambiguous term "callus."
- Woodland Structure** - The vertical and horizontal arrangement of trees within a group or woodland i.e. Dominant - trees with

a crown above the upper layer of the canopy, Co-dominant - trees that define the general upper edge of the canopy, Intermediate - trees that have been largely overgrown by others, Suppressed - trees that have been overgrown and occupy an under storey position and grow slowly, often severely asymmetrical.

Note: The definitions described above, may not necessarily be included within the Arboricultural Survey Data.

Appendix IV

Pictorial Evidence



Picture 2. T1-Sycamore in significant decline.



Picture 1. T1-Sycamore in significant decline located adjacent to road.



Picture 4. T2-Oak with significant deadwood (Red circle) and hanging branch in crown over road (Blue Arrow).



Picture 3. T4-Sycamore adjacent to road. Sooty bark disease present. Two stems are dead and remaining parts in significant decline.



Picture 5. T5-Dead standing tree with significant basal decay.



Picture 6. T6-Rowan in decline with basal movement when pushed by hand.



Picture 7. T7-Oak with top of tree snapped out and resting in adjacent holly indicated by red arrow.



Picture 8. T8-A fallen rowan resting in adjacent holly.



Picture 9. T8-Base of fallen rowan.



Picture 10. T9-A dead standing holly within falling distance of road.



Picture 11. T10-A partially uprooted and leaning ash adjacent to road.



Picture 12. T10-Partially uprooted ash with minor basal movement when pushed by hand.



Picture 13. T11-Oak with snapped hanging branches indicated by red arrow and decayed central stem indicated by blue arrow.



Picture 14. T13-Sycamore with significant cavity at 6m indicated by red circle.



Picture 15. T14-Sycamore in decline with sooty bark disease evident, Red arrow indicates dead stem.



Picture 16. T15-Sycamore in decline with top of tree dead.



Picture 17. T16-Sycamore in significant decline with significant dieback in upper crown.

Appendix V

QTRA Practice Note



Quantified Tree Risk Assessment
Simply Balancing Risks With Benefits



Quantified Tree Risk Assessment **PRACTICE NOTE**

VERSION 5

Quantified Tree Risk Assessment Practice Note

"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind"

William Thomson, Lord Kelvin, Popular Lectures and Addresses [1891-1894]

1. INTRODUCTION

Every day we encounter risks in all of our activities, and the way we manage those risks is to make choices. We weigh up the costs and benefits of the risk to determine whether it is acceptable, unacceptable, or tolerable. For example, if you want to travel by car you must accept that even with all the extensive risk control measures, such as seat-belts, speed limits, airbags, and crash barriers, there is still a significant risk of death. This is an everyday risk that is taken for granted and tolerated by millions of people in return for the benefits of convenient travel. Managing trees should take a similarly balanced approach.

A risk from falling trees exists only if there is both potential for tree failure and potential for harm to result. The job of the risk assessor is to consider the likelihood and consequences of tree failure. The outcome of this assessment can then inform consideration of the risk by the tree manager, who may also be the owner.

Using a comprehensive range of values¹, Quantified Tree Risk Assessment (QTRA) enables the tree assessor to identify and analyse the risk from tree failure in three key stages. 1) to consider land-use in terms of vulnerability to impact and likelihood of occupation, 2) to consider the consequences of an impact, taking account of the size of the tree or branch concerned, and 3) to estimate the probability that the tree or branch will fail onto the land-use in question. Estimating the values of these components, the assessor can use the QTRA manual calculator or software application to calculate an annual Risk of Harm from a particular tree. To inform management decisions, the risks from different hazards can then be both ranked and compared, and considered against broadly acceptable and tolerable levels of risk.

A Proportionate Approach to Risks from Trees

The risks from falling trees are usually very low and high risks will usually be encountered only in areas with either high levels of human occupation or with valuable property. Where levels of human occupation and value of property are sufficiently low, the

assessment of trees for structural weakness will not usually be necessary. Even when land-use indicates that the assessment of trees is appropriate, it is seldom proportionate to assess and evaluate the risk for each individual tree in a population. Often, all that is required is a brief consideration of the trees to identify gross signs of structural weakness or declining health. Doing all that is reasonably practicable does not mean that all trees have to be individually examined on a regular basis (HSE 2013).

The QTRA method enables a range of approaches from the broad assessment of large collections of trees to, where necessary, the detailed assessment of an individual tree.

Risk of Harm

The QTRA output is termed the Risk of Harm and is a combined measure of the likelihood and consequences of tree failure, considered against the baseline of a lost human life within the coming year.

ALARP (As Low As Reasonably Practicable)

Determining that risks have been reduced to As Low As Reasonably Practicable (HSE 2001) involves an evaluation of both the risk and the sacrifice or cost involved in reducing that risk. If it can be demonstrated that there is gross disproportion between them, the risk being insignificant in relation to the sacrifice or cost, then to reduce the risk further is not 'reasonably practicable'.

Costs and Benefits of Risk Control

Trees confer many benefits to people and the wider environment. When managing any risk, it is essential to maintain a balance between the costs and benefits of risk reduction, which should be considered in the determination of ALARP. It is not only the financial cost of controlling the risk that should be considered, but also the loss of tree-related benefits, and the risk to workers and the public from the risk control measure itself.

When considering risks from falling trees, the cost of risk control will usually be too high when it is clearly 'disproportionate' to the reduction in risk. In the

¹ See Tables 1, 2 & 3.

context of QTRA, the issue of ‘gross disproportion’², where decisions are heavily biased in favour of safety, is only likely to be considered where there are risks of 1/10 000 or greater.

Acceptable and Tolerable Risks

The Tolerability of Risk framework (ToR) (HSE 2001) is a widely accepted approach to reaching decisions on whether risks are broadly acceptable, unacceptable, or tolerable. Graphically represented in Figure 1, ToR can be summarised as having a Broadly Acceptable Region where the upper limit is an annual risk of death 1/1 000 000, an Unacceptable Region for which the lower limit is 1/1 000, and between these a Tolerable Region within which the tolerability of a risk will be dependent upon the costs and benefits of risk reduction. In the Tolerable Region, we must ask whether the benefits of risk control are sufficient to justify their cost.

In respect of trees, some risks cross the Broadly Acceptable 1/1 000 000 boundary, but remain tolerable. This is because any further reduction would involve a disproportionate cost in terms of the lost environmental, visual, and other benefits, in addition to the financial cost of controlling the risk.

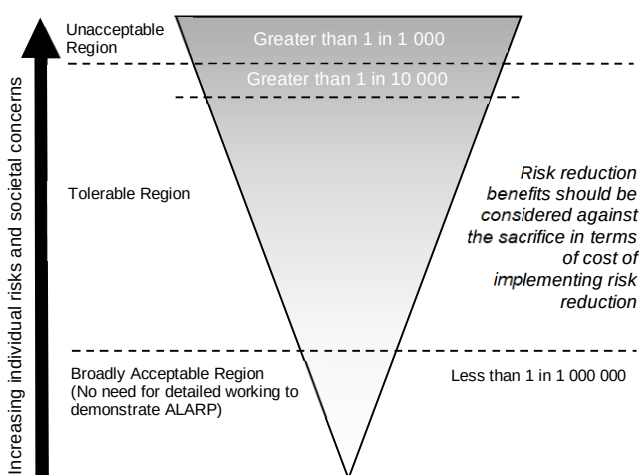


Figure 1. Adapted from the Tolerability of Risk framework (HSE 2001).

Value of Statistical Life

The Value of Statistical Life (VOSL), is a widely applied risk management device, which uses the value of a hypothetical life to guide the proportionate allocation of resources to risk reduction. In the UK, this value is currently in the region of £2 000 000, and this is the value adopted in the QTRA method.

In QTRA, placing a statistical value on a human life has two particular uses. Firstly, QTRA uses VOSL to

enable damage to property to be compared with the loss of life, allowing the comparison of risks to people and property. Secondly, the proportionate allocation of financial resources to risk reduction can be informed by VOSL. *“A value of statistical life of £1 000 000 is just another way of saying that a reduction in risk of death of 1/100 000 per year has a value of £10 per year”* (HSE 1996).

Internationally, there is variation in VOSL, but to provide consistency in QTRA outputs, it is suggested that VOSL of £2 000 000 should be applied internationally. This is ultimately a decision for the tree manager.

2. OWNERSHIP OF RISK

Where many people are exposed to a risk, it is shared between them. Where only one person is exposed, that individual is the recipient of all of the risk and if they have control over it, they are also the owner of the risk. An individual may choose to accept or reject any particular risk to themselves, when that risk is under their control. When risks that are imposed upon others become elevated, societal concern will usually require risk controls, which ultimately are imposed by the courts or government regulators.

Although QTRA outputs might occasionally relate to an individual recipient, this is seldom the case. More often, calculation of the Risk of Harm is based on a cumulative occupation – i.e. the number of people per hour or vehicles per day, without attempting to identify the individuals who share the risk.

Where the risk of harm relates to a specific individual or a known group of people, the risk manager might consider the views of those who are exposed to the risk when making management decisions. Where a risk is imposed on the wider community, the principles set out in the ToR framework can be used as a reasonable approach to determine whether the risk is ALARP.

3. THE QTRA METHOD - VERSION 5

The input values for the three components of the QTRA calculation are set out in broad ranges³ of Target, Size, and Probability of Failure. The assessor estimates values for these three components and inputs them on either the manual calculator or software application to calculate the Risk of Harm.

² Discussed further on page 5.

³ See Tables 1, 2 & 3.

Assessing Land-use (Targets)

The nature of the land-use beneath or adjacent to a tree will usually inform the level and extent of risk assessment to be carried out. In the assessment of Targets, six ranges of value are available. Table 2 sets out these ranges for vehicular frequency, human occupation and the monetary value of damage to property.

Human Occupation

The probability of pedestrian occupation at a particular location is calculated on the basis that an average pedestrian will spend five seconds walking beneath an average tree. For example, an average occupation of ten pedestrians per day, each occupying the Target for five seconds is a daily occupation of fifty seconds, giving a likelihood of occupation 1/1,728. Where a longer occupation is likely, as with a habitable building, outdoor café, or park bench, the period of occupation can be measured, or estimated as a proportion of a given unit of time, e.g. six hours per day (1/4). The Target is recorded as a range (Table 2).

Weather Affected Targets

Often the nature of a structural weakness in a tree is such that the probability of failure is greatest during windy weather, while the probability of the site being occupied by people during such weather is often low. This applies particularly to outdoor recreational areas. When estimating human Targets, the risk assessor must answer the question 'in the weather conditions that I expect the likelihood of failure of the tree to be initiated, what is my estimate of human occupation?' Taking this approach, rather than using the average occupation, ensures that the assessor considers the relationship between weather, people, and trees, along with the nature of the average person with their ability to recognise and avoid unnecessary risks.

Vehicles on the Highway

In the case of vehicles, likelihood of occupation may relate to either the falling tree or branch striking the vehicle or the vehicle striking the fallen tree. Both types of impact are influenced by vehicle speed; the faster the vehicle travels the less likely it is to be struck by the falling tree, but the more likely it is to strike a fallen tree. The probability of a vehicle occupying any particular point in the road is the ratio of the time it is occupied - including a safe stopping distance - to the total time. The average vehicle on a UK road is occupied by 1.6 people (DfT 2010). To account for the substantial protection that the average vehicle provides against most tree impacts and in particular, frontal collisions, QTRA values the substantially

protected 1.6 occupants in addition to the value of the vehicle as equivalent to one exposed human life.

Property

Table 1. Size

Size Range	Size of tree or branch	Range of Probability
1	> 450mm (>18") dia.	1/1 - >1/2
2	260mm (10½") dia. - 450mm (18") dia.	1/2 - >1/8.6
3	110mm (4½") dia. - 250mm (10") dia.	1/8.6 - >1/82
4	25mm (1") dia. - 100mm (4") dia.	1/82 - 1/2 500

* Range 1 is based on a diameter of 600mm.

Property can be anything that could be damaged by a falling tree, from a dwelling, to livestock, parked car, or fence. When evaluating the exposure of property to tree failure, the QTRA assessment considers the cost of repair or replacement that might result from failure of the tree. Ranges of value are presented in Table 2 and the assessor's estimate need only be sufficient to determine which of the six ranges the cost to select.

In Table 2, the ranges of property value are based on a VOSL of £2 000 000, e.g. where a building with a replacement cost of £20 000 would be valued at 0.01 (1/100) of a life (Target Range 2).

When assessing risks in relation to buildings, the Target to be considered might be the building, the occupants, or both. Occupants of a building could be protected from harm by the structure or substantially exposed to the impact from a falling tree if the structure is not sufficiently robust, and this will determine how the assessor categorises the Target.

Multiple Targets

A Target might be constantly occupied by more than one person and QTRA can account for this. For example, if it is projected that the average occupation will be constant by 10 people, the Risk of Harm is calculated in relation to one person constantly occupying the Target before going on to identify that the average occupation is 10 people. This is expressed as Target 1(10T)/1, where 10T represents the Multiple Targets. In respect of property, a Risk of Harm 1(10T)/1 would be equivalent to a risk of losing £20 000 000 as opposed to £2 000 000.

Tree or Branch Size

A small dead branch of less than 25mm diameter is not likely to cause significant harm even in the case of direct contact with a Target, while a falling branch with a diameter greater than 450mm is likely to cause some harm in the event of contact with all but the most robust Target. The QTRA method categorises

Size by the diameter of tree stems and branches (measured beyond any basal taper). An equation derived from weight measurements of trees of different stem diameters is used to produce a data set of comparative weights of trees and branches ranging from 25mm to 600mm diameter, from which Table 1 is compiled. The size of dead branches might be

discounted where they have undergone a significant reduction in weight because of degradation and shedding of subordinate branches. This discounting, referred to as 'Reduced Mass', reflects an estimated reduction in the mass of a dead branch.

Table 2. Targets

Target Range	Property (repair or replacement cost)	Human (not in vehicles)	Vehicle Traffic (number per day)	Ranges of Value (probability of occupation or fraction of £2 000 000)
1	£2 000 000 – >£200 000	Occupation: Constant – 2.5 hours/day Pedestrians & cyclists: 720/hour – 73/hour	26 000 – 2 700 @ 110kph (68mph) 32 000 – 3 300 @ 80kph (50mph) 47 000 – 4 800 @ 50kph (32mph)	1/1 – >1/10
2	£200 000 – >£20 000	Occupation: 2.4 hours/day – 15 min/day Pedestrians & cyclists: 72/hour – 8/hour	2 600 – 270 @ 110kph (68mph) 3 200 – 330 @ 80kph (50mph) 4 700 – 480 @ 50kph (32mph)	1/10 – >1/100
3	£20 000 – >£2 000	Occupation: 14 min/day – 2 min/day Pedestrians & cyclists: 7/hour – 2/hour	260 – 27 @ 110kph (68mph) 320 – 33 @ 80kph (50mph) 470 – 48 @ 50kph (32mph)	1/100 – >1/1 000
4	£2 000 – >£200	Occupation: 1 min/day – 2 min/week Pedestrians & cyclists: 1/hour – 3/day	26 – 4 @ 110kph (68mph) 32 – 4 @ 80kph (50mph) 47 – 6 @ 50kph (32mph)	1/1 000 – >1/10 000
5	£200 – >£20	Occupation: 1 min/week – 1 min/month Pedestrians & cyclists: 2/day – 2/week	3 – 1 @ 110kph (68mph) 3 – 1 @ 80kph (50mph) 5 – 1 @ 50kph (32mph)	1/10 000 – >1/100 000
6	£20 – £2	Occupation: <1 min/month – 0.5 min/year Pedestrians & cyclists: 1/week – 6/year	None	1/100 000 – 1/1 000 000

Vehicle, pedestrian and property Targets are categorised by their frequency of use or their monetary value. The probability of a vehicle or pedestrian occupying a Target area in Target Range 4 is between the upper and lower limits of 1/1 000 and >1/10 000 (column 5). Using the VOSL £2 000 000, the property repair or replacement value for Target Range 4 is £2 000 - >200.

Probability of Failure

In the QTRA assessment, the probability of tree or branch failure within the coming year is estimated and recorded as a range of value (Ranges 1 – 7, Table 3).

Selecting a Probability of Failure (PoF) Range requires the assessor to compare their assessment of the tree or branch against a benchmark of either a non-compromised tree at Probability of Failure Range 7, or a tree or branch that we expect to fail within the year, which can be described as having a 1/1 probability of failure.

During QTRA training, Registered Users go through a number of field exercises in order to calibrate their estimates of Probability of Failure.

Table 3. Probability of Failure

Probability of Failure Range	Probability
1	1/1 - >1/10
2	1/10 - >1/100
3	1/100 - >1/1 000
4	1/1 000 - >1/10 000
5	1/10 000 - >1/100 000
6	1/100 000 - >1/1 000 000
7	1/1 000 000 - 1/10 000 000

The probability that the tree or branch will fail within the coming year.

The QTRA Calculation

The assessor selects a Range of values for each of the three input components of Target, Size and Probability of Failure. The Ranges are entered on either the manual calculator or software application to calculate a Risk of Harm.

The Risk of Harm is expressed as a probability and is rounded, to one significant figure. Any Risk of Harm

that is lower than 1/1 000 000 is represented as <1/1 000 000. As a visual aid, the Risk of Harm is colour coded using the traffic light system illustrated in Table 4 (page 7).

Risk of Harm - Monte Carlo Simulations

The Risk of Harm for all combinations of Target, Size and Probability of Failure Ranges has been calculated using Monte Carlo simulations⁴. The QTRA Risk of Harm is the mean value from each set of Monte Carlo results.

In QTRA Version 5, the Risk of Harm should not be calculated without the manual calculator or software application.

Assessing Groups and Populations of Trees

When assessing populations or groups of trees, the highest risk in the group is quantified and if that risk is tolerable, it follows that risks from the remaining trees will also be tolerable, and further calculations are unnecessary. Where the risk is intolerable, the next highest risk will be quantified, and so on until a tolerable risk is established. This process requires prior knowledge of the tree manager's risk tolerance.

Accuracy of Outputs

The purpose of QTRA is not necessarily to provide high degrees of accuracy, but to provide for the quantification of risks from falling trees in a way that risks are categorised within broad ranges (Table 4).

4. INFORMING MANAGEMENT DECISIONS

Balancing Costs and Benefits of Risk Control

When controlling risks from falling trees, the benefit of reduced risk is obvious, but the costs of risk control are all too often neglected. For every risk reduced there will be costs, and the most obvious of these is the financial cost of implementing the control measure. Frequently overlooked is the transfer of risks to workers and the public who might be directly affected by the removal or pruning of trees. Perhaps more importantly, most trees confer benefits, the loss of which should be considered as a cost when balancing the costs and benefits of risk control.

When balancing risk management decisions using QTRA, consideration of the benefits from trees will usually be of a very general nature and not require detailed consideration. The tree manager can consider, in simple terms, whether the overall cost of risk control is a proportionate one. Where risks are

approaching 1/10 000, this may be a straightforward balancing of cost and benefits. Where risks are 1/10 000 or greater, it will usually be appropriate to implement risk controls unless the costs are grossly disproportionate to the benefits rather than simply disproportionate. In other words, the balance being weighted more on the side of risk control with higher associated costs.

Considering the Value of Trees

It is necessary to consider the benefits provided by trees, but they cannot easily be monetised and it is often difficult to place a value on those attributes such as habitat, shading and visual amenity that might be lost to risk control.

A simple approach to considering the value of a tree asset is suggested here, using the concept of 'average benefits'. When considered against other similar trees, a tree providing 'average benefits' will usually present a range of benefits that are typical for the species, age and situation. Viewed in this way, a tree providing 'average benefits' might appear to be low when compared with particularly important trees – such as in Figure 2, but should nonetheless be sufficient to offset a Risk of Harm of less than 1/10 000. Without having to consider the benefits of risk controls, we might reasonably assume that below 1/10 000, the risk from a tree that provides 'average benefits' is ALARP.

In contrast, if it can be said that the tree provides lower than average benefits because, for example, it is declining and in poor physiological condition, it may be necessary to consider two further elements. Firstly, is the Risk of Harm in the upper part of the Tolerable Region, and secondly, is the Risk of Harm likely to increase before the next review because of an increased Probability of Failure. If both these conditions apply then it might be appropriate to consider the balance of costs and benefits of risk reduction in order to determine whether the risk is ALARP. This balance requires the tree manager to take a view of both the reduction in risk and the costs of that reduction.

⁴ For further information on the Monte Carlo simulation method, refer to http://en.wikipedia.org/wiki/Monte_Carlo_method



Lower Than Average Benefits from Trees

Usually, the benefits provided by a tree will only be significantly reduced below the 'average benefits' that are typical for the species, age and situation, if the life of the benefits is likely to be shortened, perhaps because the tree is declining or dead. That is not to say that a disbenefit, such as undesirable shading, lifting of a footpath, or restricting the growth of other trees, should not also be considered in the balance of costs and benefits.

The horse chestnut tree in Figure 3 has recently died, and over the next few years, may provide valuable habitats. However, for this tree species and the relatively fast rate at which its wood decays, the lifetime of these benefits is likely to be limited to only a few years. This tree has an already reduced value that will continue to reduce rapidly over the coming five to ten years at the same time as the Risk of Harm is expected to increase. There will be changes in the benefits provided by the tree as it degrades. Visual qualities are likely to reduce while the decaying wood provides habitats for a range of species, for a short while at least. There are no hard and fast measures of these benefits and it is for the tree manager to decide what is locally important and how it might be balanced with the risks.

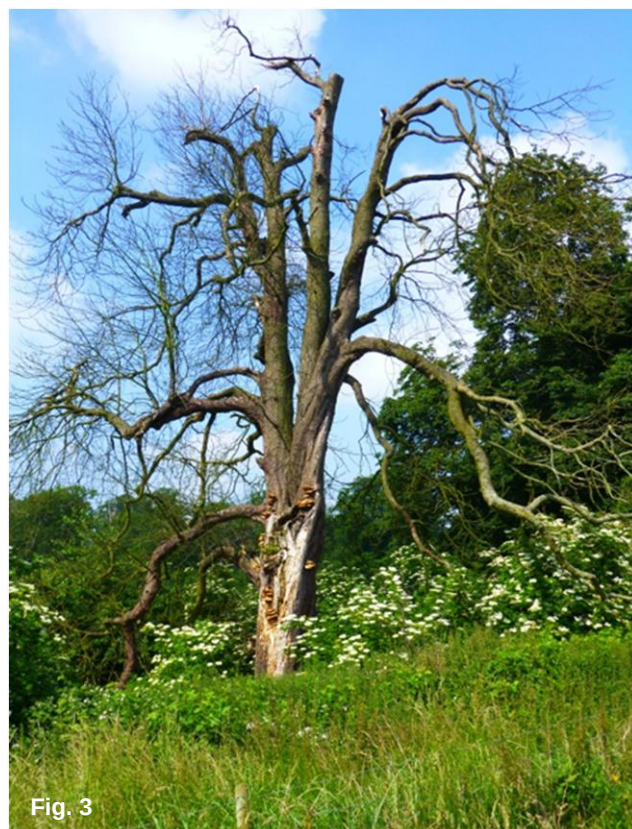
Where a risk is within the Tolerable Region and the tree confers lower than average benefits, it might be appropriate to consider implementing risk control while taking account of the financial cost. Here, VOSL can be used to inform a decision on whether the cost of risk control is proportionate. Example 3 below puts this evaluation into a tree management context.

There will be occasions when a tree is of such minimal value and the monetary cost of risk reduction so low that it might be reasonable to further reduce an

already relatively low risk. Conversely, a tree might be of such considerable value that an annual risk of death greater than 1/10 000 would be deemed tolerable.

Occasionally, decisions will be made to retain elevated risks because the benefits from the tree are particularly high or important to stakeholders, and in these situations, it might be appropriate to assess and document the benefits in some detail. If detailed assessment of benefits is required, there are several methodologies and sources of information (Forest Research 2010).

Delegating Risk Management Decisions



Understanding of the costs with which risk reduction is balanced can be informed by the risk assessor's knowledge, experience and on-site observations, but the risk management decisions should be made by the tree manager. That is not to say that the tree manager should review and agree every risk control measure, but when delegating decisions to surveyors and other staff or advisors, tree managers should set out in a policy, statement or contract, the principles and perhaps thresholds to which trees and their associated risks will ordinarily be managed.

Based on the tree manager accepting the principles set out in the QTRA Practice Note and or any other specific instructions, the risk assessor can take account of the cost/benefit balance and for most situations will

be able to determine whether the risk is ALARP when providing management recommendations.

Table 4. QTRA Advisory Risk Thresholds

Thresholds	Description	Action
1/1,000	Unacceptable Risks will not ordinarily be tolerated	Control the risk
	Unacceptable (where imposed on others) Risks will not ordinarily be tolerated	- Control the risk - Review the risk
	Tolerable (by agreement) Risks may be tolerated if those exposed to the risk accept it, or the tree has exceptional value	- Control the risk unless there is broad stakeholder agreement to tolerate it, or the tree has exceptional value - Review the risk
1/10 000	Tolerable (where imposed on others) Risks are tolerable if ALARP	- Assess costs and benefits of risk control - Control the risk only where a significant benefit might be achieved at reasonable cost - Review the risk
1/1 000 000	Broadly Acceptable Risk is already ALARP	- No action currently required - Review the risk

QTRA Informative Risk Thresholds

The QTRA advisory thresholds in Table 4 are proposed as a reasonable approach to balancing safety from falling trees with the costs of risk reduction. This approach takes account of the widely applied principles of ALARP and ToR, but does not dictate how these principles should be applied. While the thresholds can be the foundation of a robust policy for tree risk management, tree managers should make decisions based on their own situation, values and resources. Importantly, to enable tree assessors to provide appropriate management guidance, it is helpful for them to have some understanding of the tree owner's management preferences prior to assessing the trees.

A Risk of Harm that is less than 1/1 000 000 is Broadly Acceptable and is already ALARP. A Risk of Harm 1/1 000 or greater is unacceptable and will not ordinarily be tolerated. Between these two values, the Risk of Harm is in the Tolerable Region of ToR and will be tolerable if it is ALARP. In the Tolerable Region, management decisions are informed by

consideration of the costs and benefits of risk control, including the nature and extent of those benefits provided by trees, which would be lost to risk control measures.

For the purpose of managing risks from falling trees, the Tolerable Region can be further broken down into two sections. From 1/1 000 000 to less than 1/10 000, the Risk of Harm will usually be tolerable providing that the tree confers 'average benefits' as discussed above. As the Risk of Harm approaches 1/10 000 it will be necessary for the tree manager to consider in more detail the benefits provided by the tree and the overall cost of mitigating the risk.

A Risk of Harm in the Tolerable Region but 1/10 000 or greater will not usually be tolerable where it is imposed on others, such as the public, and if retained, will require a more detailed consideration of ALARP. In exceptional circumstances a tree owner might choose to retain a Risk of Harm that is 1/10 000 or greater. Such a decision might be based on the agreement of those who are exposed to the risk, or perhaps that the tree is of great importance. In these circumstances, the prudent tree manager will consult with the appropriate stakeholders whenever possible.

5. EXAMPLE QTRA CALCULATIONS AND RISK MANAGEMENT DECISIONS

Below are three examples of QTRA calculations and application of the QTRA Advisory Thresholds.

Example 1.

	Target	Size	Probability of Failure	Risk of Harm
Range	6	x	1 x 3	= <1/1 000 000

Example 1 is the assessment of a large (Size 1), unstable tree with a probability of failure of between 1/100 and >1/1 000 (PoF 3). The Target is a footpath with less than one pedestrian passing the tree each week (Target 6). The Risk of Harm is calculated as less than 1/1 000 000 (green). This is an example of where the Target is so low consideration of the structural condition of even a large tree would not usually be necessary.

Example 2.

	Target	Size	Probability of Failure	Risk of Harm
Range	1	x	4	x
			3	=
				1(2T)/50 000

In Example 2, a recently dead branch (Size 4) overhangs a busy urban high street that is on average occupied constantly by two people, and here Multiple Target occupation is considered.

Having an average occupancy of two people, the Risk of Harm 1(2T)/50 000 (yellow) represents a twofold increase in the magnitude of the consequence and is therefore equivalent to a Risk of Harm 1/20 000 (yellow). This risk does not exceed 1/10 000, but being a dead branch at the upper end of the Tolerable Region it is appropriate to consider the balance of costs and benefits of risk control. Dead branches can be expected to degrade over time with the probability of failure increasing as a result. Because it is dead, some of the usual benefits from the branch have been lost and it will be appropriate to consider whether the financial cost of risk control would be proportionate.

Example 3.

	Target	Size	Probability of Failure	Risk of Harm
Range	3	x	3	x
			3	=
				1/500 000

In Example 3, a 200mm diameter defective branch overhangs a country road along which travel between 470 and 48 vehicles each day at an average speed of 50kph (32mph) (Target Range 3). The branch is split and is assessed as having a probability of failure for the coming year of between 1/100 and 1/1 000 (PoF Range 3). The Risk of Harm is calculated as 1/500 000 (yellow) and it needs to be considered whether the risk is ALARP. The cost of removing the branch and reducing the risk to Broadly Acceptable (1/1 000 000) is estimated at £350. To establish whether this is a proportionate cost of risk control, the following equation is applied. £2 000 000 (VOSL) x 1/500 000 = £4 indicating that the projected cost of £350 would be disproportionate to the benefit. Taking account of the financial cost, risk transfer to arborists and passers-by, the cost could be described as being grossly disproportionate, even if accrued benefits over say ten years were taken into account.

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Revision 5.2.4. Monetary values for non-uk versions updated at 1st January 2019.

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