3/2020/0694

Tree Risk Management Appraisal

at

Brockhall Village, Whalley, Lancashire, BB6 8AR

?

Prepared by:

Bowland Tree Consultancy Ltd

April 2020

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TREE RISK MANAGEMENT APPRAISAL
BROCKHALL VILLAGE, WHALLEY

Project Details

Project No.:	BTC1922
Site:	Brockhall Village, Whalley, Lancashire, BB6 8AR
Survey Type:	Negative Recording Walkover Tree Survey
Tree(s) Considered:	In areas within falling distances of buildings and areas of pedestrian and vehicular usage
Report Time Frame:	12 months from date of issue
Next Inspection Date:	≈18 months from date of issue
Agent for Client:	Hodgson's Garden Maintenance
Survey Date:	5 March 2020
Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Report Prepared by:	Joseph Lambert BSc(Hons) FdSc MArborA
Report Checked by:	Phill Harris MSc BSc(Hons) HND MArborA CEnv MICFor
Date of Issue:	7 April 2020
Version No:	1

1. CIVIL LAW REGARDING TREE OWNERSHIP AND DUTY OF CARE

1.1 Under civil law the owner of the land on which a tree stands, together with any party who has control over the tree's management, has a duty of care to take reasonable steps to prevent or minimise the risk of personal injury and/or damage to property from any tree located within the curtilage of the land in question.

1.2 In turn, it is accepted that these steps should normally include commissioning a qualified and experienced arboriculturist to survey the tree in order to identify and appraise any risk of harm to persons or damage to property that it may present and, where unacceptable risks are identified, taking suitable remedial action to negate or reduce those risks accordingly.

2. QTRA METHODOLOGY OVERVIEW AND APPLICATION IN MANAGEMENT DECISIONS

2.1 A survey was carried out in order to consider the general structural stability of the trees at the site and the associated risk of harm that they pose to persons and/or damage that they pose to property and, from this information, to make management recommendations to reduce any risks identified to be unacceptable to a level that is considered to be either tolerable or broadly acceptable (see Table 1, below).

2.2 The Quantified Tree Risk Assessment (QTRA) methodology utilised for the tree survey (see appended QTRA Practice Note for more details) quantifies the three components of tree failure risk, which are:

i. *Target* (something with potential to be harmed and/or damaged by the mechanical failure of tree parts);
ii. *Impact Potential*; and
iii. *Probability of Failure* (within the coming year).

2.3 The product of the three component values is the annualised 'Risk of Harm', which is a combined measure of the likelihood and the consequence of tree failure considered in terms of the loss within the coming year, and is expressed as a probability. In applying the 'Tolerability of Risk Framework' (ToR) the QTRA methodology divides the 'Risk of Harm' into three threshold values, being;

1. *Unacceptable* (i.e. >1/1,000), which is unacceptable and will not ordinarily be tolerated;
2. *Tolerable* (i.e. between 1/1,000,000 and 1/1,000, where the Risk of Harm will be tolerable if it is As Low As Reasonably Practicable (ALARP); but a Risk of Harm 1/10,000 or greater will not ordinarily be Tolerable where it is imposed on others, such as the public. In the Tolerable range management decisions are informed by consideration of the benefits and costs of risk control, including benefits provided by trees that would be lost to risk control measures; and
3. *Broadly Acceptable* (<1/1,000,000), which is already ALARP.

2.4 The QTRA advisory thresholds, (see Table 1, below) are proposed as a reasonable approach to balancing safety from falling trees with the costs of risk reduction. This approach takes account of the 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.

Table 1: QTRA Advisory Risk Thresholds:

Threshold	Description	Action
Risk of harm of 1/1,000 or greater	**Unacceptable** - Risks will not ordinarily be tolerated	▪ Control the risk
Risk of harm between 1/1,000 and 1/10,000	**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
Risk of harm between 1/10,000 and 1/1,000,000	**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
Risk of harm less than 1/1,000,000	**Broadly Acceptable** - Risk is already ALARP	▪ No action currently required ▪ Review the risk

2.5 As detailed in Table 1, above, a Risk of Harm less than 1/1,000,000 is Broadly Acceptable and already

ALARP (i.e. 'as low as reasonably practicable'). A Risk of Harm 1/1,000 or greater is unacceptable and will not ordinarily be tolerated. Between these two thresholds, the Risk of Harm is in the Tolerable region of the ToR Framework and will be tolerable if it is ALARP, but a Risk of Harm 1/10,000 or greater will not ordinarily be Tolerable where it is imposed on others, such as the public. Here, management decisions are informed by consideration of the benefits and costs of risk control, including benefits provided by trees that would be lost to risk control measures.

2.6 In respect of the above the assessor (i.e. Bowland Tree Consultancy Ltd) may consider the costs of risk control when providing options for management if specifically asked to do so, but the tree owner/manager, who owns the risk and therefore exercises control over the costs, must consider the balance and make the final management decision(s).

3. SUMMARY OF SURVEY FINDINGS AND RECOMMENDATIONS

3.1 A 'Negative Recording Walkover Tree Survey' (see 'Schedule of Operations' appended to agreed project quote) was carried out on 5 March 2020 at the site under consideration. The extents of the survey were based upon the information in the most previous surveys carried out at the site by Bowland Tree Consultancy during 2015 and 2016.

3.2 The survey identified 25 individual trees, four groups of trees and five woodlands, as detailed in the appended Tree Survey Schedule and on the Tree Survey Plan. The surveyed trees are in the semi-mature to mature age range and have heights of up to 24 metres, stem diameters of up to 950 millimetres, and maximum diametrical crown spreads of up to 18 metres.

3.3 The site is a private gated village consisting mainly of detached residential properties with private gardens and driveways and associated access roads, along with various areas of open space. There are also several wooded areas within the site boundaries that are evidently regularly accessed by persons via a network of footpaths and desire lines.

3.4 The site is accessed via Gleneagles Drive with this road being the singular vehicle access and egress point to the village from Old Langho Road to the south-east of the site.

3.5 The wider site is bordered to the north by agricultural land, to the east by further residential properties of Larkhill, to the south by Old Langho Road, and to the west by Ribble Valley View caravan park and further agricultural fields. According to online Ordnance Survey maps there are no public rights of way within the site boundaries.

3.6 It is understood that the training grounds of Blackburn Rovers football club, which border the residential areas to the south-west of the village, and the residential properties of Brookside which stand to the site's south-western corner, are not within the management of Brockhall Village. In turn, the survey did not include any trees that are evidently under third-party ownership, such as within Blackburn Rovers' training grounds, within private residential gardens, or within the areas surrounding the commercial buildings to the west of Gleneagles Drive.

3.7 As a component of this appraisal various targets were identified to be within falling distances of the surveyed trees, including, but not restricted to, pedestrians using both private and public rights of way, parked and moving vehicles using the internal access roads and the moderate usage Old Langho Road, residential properties and their gardens, recreational areas, including a children's playground, and the Blackburn Rovers' training grounds.

3.8 In turn, as highlighted with the colours orange and red in the appended Tree Survey Schedule and in Table 2 (overleaf), the risk assessment established that trees T1, T18, T19, T21 and T22 have calculated QTRA risk indices that fall within the unacceptable risk threshold range of 1/10,000 or over (please refer to Table 1, on the previous page, with regard to advisory tree risk thresholds). Consequently, as also detailed in Table Two, remedial works are recommended in order to negate the risk that these trees currently present.

3.9 However, as also detailed in Table 2 (overleaf), various works have also been recommended to several of the surveyed trees with calculated QTRA risk indices that fall within the tolerable and broadly acceptable risk threshold ranges (as highlighted with the colours yellow and green, respectively), either for general non-risk management related reasons (as denoted with the suffix (M)) or, where applicable,

to enable applicable trees to be inspected in further detail for risk assessment purposes (as denoted with the suffix (I)).

Table 2: Tree Work Recommendations:

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
T1	Common Beech	1. Remove tree due to identified increased risk of whole tree failure and subsequent unacceptable risk of harm to persons	1. Tree contractor	1. High
T5	Common Ash	1. Remove tree in accordance with pertinent arboricultural management due to colonisation by Ash Dieback Disease (M).	1. Tree contractor	1. Moderate
T7	Crack Willow	1. Remove tree due to short projected remaining life expectancy (M).	1. Tree contractor	1. Moderate
T14	Sycamore	1. Remove tree due to evidently progressive state of decline and relatively short projected remaining safe life expectancy (M).	1. Tree contractor	1. Moderate
T15	Sycamore	1. Remove tree due to evidently progressive state of decline and relatively short projected remaining safe life expectancy (M).	1. Tree contractor	1. Moderate
T16	Cherry	1. Remove tree as is dead (M).	1. Tree contractor	1. Moderate
T17	Goat Willow	1. Remove tree due to basal decay and subsequent identified increased risk of failure (M).	1. Tree contractor	1. Moderate
T18	Silver Birch	1. Remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T19	Common Beech	1. Remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 6m for habitat value.	1. Tree contractor	1. High
T20	Common Oak	1. Remove tree due to identified increased risk of failure (M). NB: Main stem to be retained at a height of approximately 8m for habitat value.	1. Tree contractor	1. Moderate
T21	Sycamore	1. Remove tree due to identified increased risk of primary branch failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 8m for habitat value.	1. Tree contractor	1. High
T22	Sycamore	1. Remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 8m for habitat value.	1. Tree contractor	1. High
T23	Common Beech	1. Remove tree due to identified increased risk of failure (M).	1. Tree contractor	1. Moderate
T24	Common Ash	1. Remove tree in accordance with pertinent arboricultural management due to colonisation by Ash Dieback Disease (M).	1. Tree contractor	1. Moderate
T25	Common Oak	1. Remove tree due to identified increased risk of failure. NB: Main stem to be retained at a height of approximately 8m for habitat value.	1. Tree contractor	1. Moderate
G1	7no. Horse Chestnut	1. Remove tree to centre and tree to south-east of group due to evident condition and projected short remaining safe life expectancies (M).	1. Tree contractor	1. Moderate

continued overleaf

Table 2 (continued):

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
G2	approx. 5no. Sycamore	1. Identify and remove those trees within group that are within falling distance of unmade paths (M). NB: Main stems to be left at a suitable height for habitat value.	1. Tree contractor	1. Moderate
G3	approx. 5no. Sycamore	1. Identify and remove those trees within group that are within falling distance of unmade paths (M). NB: Main stems to be left at a suitable height for habitat value.	1. Tree contractor	1. Moderate
W1	Common Oak, Beech, Alder, Silver Birch, Scots Pine, Hazel, Holly, Rowan	1. Remove debris from around tree stems and prevent continued disposal of debris in this area (M).	1. Grounds maintenance staff	1. Moderate
W2	Common Alder, Oak, Beech, Ash, Horse Chestnut, Sycamore, Silver Birch, Norway Maple, Scots Pine, Weeping Willow	1. Sever ivy around entire stem circumferences at ground level and clear to a height of approximately 1.5m of those trees within falling distance of road and/or properties to enable future detailed inspections (I).	1. Tree contractor/ Ground maintenance staff	1. Moderate

*Note: it shall be the client's responsibility to arrange contact with the applicable local council's planning department in order to check for the presence of any statutory tree protection measures, such as the site's location within a Conservation Area and/or the presence of any Tree Preservation Orders, prior to scheduling or carrying out any tree works

3.10 In turn, Table 3, below, details the trees that are recommended for more detailed inspections for risk management related reasons following any works recommended in Table 2, along with their accompanying re-inspection schedule. In consideration of the above, it is recommended trees T2 and T6 be reviewed during late summer 2020 when in leaf (see Table 3 below) in order to appraise the canopy condition and vitality.

Table 3: Tree Re-Inspection Recommendations:

No.	Species	Re-Inspection Recommendations*	When?
T2	Common Beech	▪ Re-inspect tree during late summer 2020 in order to appraise canopy condition when in leaf and inspect buttress area for fruiting bodies.	Late Summer 2020
T6	Common Beech	▪ Re-inspect tree during late summer 2020 in order to appraise canopy condition when in leaf.	Late Summer 2020

*Note: Unless otherwise specified, all inspections detailed in Table 3 are to be carried out by the project consulting arboriculturist

3.11 In consideration of the moderately to moderately high usage of various areas adjacent to and within the site, in particular along Old Langho Road and the access driveways and around the properties themselves, and the associated identified targets such as moving vehicles and their occupants and pedestrians, it is subsequently recommended that all of the retained trees be re-inspected on a cyclical programme of roughly every 18 months, so that they can be alternately viewed whilst in and out of leaf in order to monitor both their structural and physiological condition and, consequently, for the site occupiers to meet their duty of care. In this respect it is therefore recommended that the trees be re-inspected during late summer 2021.

3.12 In addition to the re-inspection cycle mentioned above, the trees, groups and in particular the woodlands on site should be passively monitored by the grounds maintenance staff during normal routine ground works in order to look for obvious defects and hazards, such as stem or branch splits and cracks, broken branches etc., particularly following severe inclement weather events. As such, it is strongly recommended that the persons charged with maintaining the grounds undertake some basic tree risk

management training in order to confidently identify obvious tree defects which, in turn, can then be rectified where appropriate or, where considered necessary referred to the tree consultant.

3.13 With regard to general arboricultural management it was also noted that there is likely to be a widespread presence of Ash Dieback Disease. As such, it is strongly recommended that a planned approach be adopted by those managing the site in order to monitor and remove any trees that succumb to the disease that are within falling distances of identifiable targets such as roads, footpaths and buildings. In turn, consideration should also be given to providing replacement trees of suitable species and in appropriate number and locations in compensation of any Ash tree losses.

3.14 Finally, where trees are recommended for removal, either for risk management purposes or for arboricultural management reasons, then it is strongly recommended that, in order to mitigate for the loss of the benefits the trees provide to the local environment, and to ensure a continuity of canopy cover in the locality, replacement trees of a suitable size and species be planted in appropriate locations within the site under consideration.

3.15 In this respect it is essential that all new tree planting be carried out in strict accordance with BS8545:2014 (Trees: From Nursery to Independence in the Landscape – Recommendations) in order to ensure that they are provided with adequate care and maintenance to ensure their successful establishment and growth.

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Client:	Hodgson's Garden Maintenance
Brief:	Carry out a negative recording 'Walkover Tee Survey' within area specified by client, report on risk posed to persons and property, and make management recommendations where appropriate

Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	5 March 2020
Viewing Conditions:	Bright, calm with very light breeze
Job Reference:	BTC1922

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T1	Common Beech	M	22	860	15	M	▪ Both mature black and immature white *Kretzschmaria deusta* soft rot decay causing fungal fruiting bodies between buttresses on north, east and west sides, from ground level to a height of approximately 500mm. ▪ Hollowing detected in buttresses to north and west when sounded with nylon mallet.	▪ Tree contractor to remove tree due to identified increased risk of whole tree failure and subsequent unacceptable risk of harm to persons.	P = Whole tree at ground level. T = Vehicles and pedestrians using Old Langho Road to south-east.	2	1	2	N/A	400	H
T2	Common Beech	M	20	730	14	M/P	▪ Soil deposited around buttress roots to north, thereby partially restricting detailed inspection. ▪ Areas of bark necrosis up to approximately 100mm width and 500mm length between buttresses to south-east and south-west. ▪ Canopy showing a substantial reduction in vitality..	▪ Tree consultant to re-inspect tree during late summer 2020 in order to appraise canopy condition when in leaf and inspect buttress area for fruiting bodies.	P = Main stem at ground level. T = Vehicles and occupants using Old Langho Road.	2	1	4	N/A	40K	M
T3	Scot Pine	M	18.5	710	8	M	▪ Basal inspection partially restricted by location within hedgerow. ▪ Three branches which overhang pavement, of approximately 150mm to 200mm diameter, have severe curvature at a distance of approximately 1.2m from stem, possibly indicative of previous branch fracture. ▪ Canopy highly biased to south-east.	▪ Tree consultant to monitor structural condition of branches as a component of future cyclical inspections (see comments).	P = Branches with curvature up to approximately 200mm diameter. T = Pedestrians using footpath adjacent to Old Langho Road.	2	3	3	N/A	50K	L
T4	Common Horse Chestnut	M	15	690	11	M	▪ Unoccluded stem wound of approximately 1m width to south-east from ground level to a height of approximately 1.2m, with evident reaction wood either side of wound. ▪ Stem bifurcates at a height of approximately 3.5m. ▪ Partially unoccluded and occluded pruning wounds on main stem from a height of 3m to 5m. ▪ Canopy showing a slight reduction in vitality.	▪ Tree consultant to monitor tree vitality and condition of stem wound as components of subsequent cyclical inspections.	P = Main stem at ground level. T = Vehicles and occupants using Gleneagles Drive to east.	2	1	4	N/A	40K	L

HEADINGS & ABBREVIATIONS

NO. TREE/GROUP REFERENCE NUMBER. REFER TO PLAN OR NUMBERED TAGS WHERE APPLICABLE
SPECIES: COMMON NAME
AGE: Y = YOUNG, SM = SEMI MATURE, EM = EARLY MATURE, M = MATURE, PM = POST MATURE
HEIGHT: APPROXIMATELY 80% OF TREES ARE MEASURED USING AN ELECTRONIC CLINOMETER AND THE REMAINDER ESTIMATED AGAINST THE MEASURED TREES
DIAMETER: STEM DIAMETER MEASURED OR ESTIMATED AT A HEIGHT OF APPROXIMATELY 1.3 METRES
CROWN SPREAD: MEASURED OR ESTIMATED DIAMETER OF CROWN(S) AT THE WIDEST POINT
VITALITY: A MEASURE OF PHYSIOLOGICAL CONDITION WHEREBY D = DEAD, MD = MORIBUND, P = POOR, M = MODERATE, G = GOOD
MANAGEMENT: SUFFIXES: (M) = FOR GENERAL ARBORICULTURAL OR SILVICULTURAL MANAGEMENT; (S) = TO REMOVE OR REDUCE THE RISK OF DIRECT DAMAGE TO A FIXED STRUCTURE BY MEANS OF CIRCUMFERENTIAL ROOT, STEM OR BRANCH GROWTH; (I) = TO ENABLE THE TREE(S) TO BE INSPECTED FURTHER FOR RISK ASSESSMENT PURPOSES
TARGET RANGE: HIGHEST VALUE TARGET THAT THE MOST SIGNIFICANT PART LIKELY TO FAIL COULD STRIKE. RANGES 1-6. 1 = HIGH, 6 = LOW VALUE/OCCUPANCY
RISK ASSESSMENT DESCRIPTION: DESCRIPTION OF PART IDENTIFIED AS MOST LIKELY TO FAIL AND ASSOCIATED TARGET, ASSESSED IN ACCORDANCE WITH QTRA SYSTEM
SIZE RANGE: SIZE CATEGORY OF MOST SIGNIFICANT PART CONSIDERED LIKELY TO FAIL. - RANGES 1-4 WHEREBY 1 = LARGE, 4 = SMALL, P = PROPERTY
P.O.F: PROBABILITY OF FAILURE WITHIN 12 MONTHS. RANGES 1-7. 1 = HIGH, 7 = LOW
REDUCED MASS %: WHERE THE MASS OF A TREE OR BRANCH IS REDUCED BY DEGRADATION THE RISK INDEX IS MULTIPLIED TO REFLECT THE PERCENTAGE OF MASS REDUCTION
RISK INDEX: E.G. RISK INDEX 20 = RISK OF SIGNIFICANT HARM 1 IN 20,000. AN ADDITIONAL FIGURE, IN BRACKETS, MAY BE SUFFIXED 'T' REPRESENTING THE RATE OF MULTIPLE OCCUPATION OVER THE YEAR, E.G. 10(10T) REPRESENTS A RISK OF HARM 1/10,000 TO 10 OCCUPANTS OR AN EQUIVALENT MONETARY VALUE. SEE QTRA PRACTICE NOTE FOR MORE INFORMATION REGARDING COLOURS USED TO SIGNIFY RISK INDEX
WORK PRIORITY: H (HIGH) = TREE WORKS TO BE GIVEN IMMEDIATE CONSIDERATION. M (MODERATE) = TREE WORKS TO BE CARRIED OUT WITHIN 12 MONTHS OF SURVEY (TIMING MAY BE SPECIFIED IN MANAGEMENT RECOMMENDATIONS). L (LOW) = TREE WORKS THAT ARE NOT CONSIDERED ESSENTIAL FOR RISK MANAGEMENT PURPOSES, BUT ARE RECOMMENDED IN ACCORDANCE WITH PRUDENT ARBORICULTURAL MANAGEMENT (TO BE REVIEWED IN 12 MONTHS, OR SPECIFIED TIME, IF APPLICABLE). N/A = NOT APPLICABLE

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Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	5 March 2020
Viewing Conditions:	Bright, calm with very light breeze
Job Reference:	BTC1922

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T5	Common Ash	M	19	590	10	MD	▪ Canopy showing a severe reduction in vitality due to colonisation by Ash Dieback Disease *(Hymenoscyphus fraxineus)*, with significant twig and secondary branch dieback throughout.	▪ Tree contractor to remove tree in accordance with pertinent arboricultural management due to colonisation by Ash Dieback Disease (M).	P = Moribund branches up to 200mm diameter. T = Persons using wooded area below tree canopy.	4	3	2	N/A	500 K	M
T6	Common Beech	M	21	820	14	M/P	▪ Moderate ivy on main stem to a height of approximately 6m. ▪ Canopy sparse and showing a significant reduction in vitality. ▪ Moderate amount of deadwood up to approximately 75mm diameter.	▪ Tree consultant to re-inspect tree during late summer 2020 in order to appraise canopy condition when in leaf.	P = Deadwood up to approximately 75mm diameter. T = Persons using wooded area.	4	4	2	50%	1M	M
T7	Crack Willow	SM	14	320	9	MD	▪ Canopy showing a severe reduction in vitality with up to 75% circumference of main stem comprising of dysfunctional wood. ▪ Short remaining projected life expectancy.	▪ Tree contractor to remove tree due to short projected remaining life expectancy (M).	P = Main stem of approximately 200mm diameter at a height of approximately 6m. T = Persons using wooded area adjacent to tree canopy.	4	3	2	N/A	500 K	M
T8	Common Alder	M	15	440	12	G	▪ Basal cavity with opening of approximately 600mm height, 120mm width and up to 200mm depth to south side of main stem. ▪ Woodpecker hole present on south-east side of main stem at a height of approximately 6m, thereby indicating an extension of hollowing into stem.	▪ Tree consultant to monitor progression of basal and stem decay and monitor canopy vitality as components of future cyclical inspections.	P = Main stem at ground level. T = Persons using wooded area.	4	2	3	N/A	1M	L
T9	Sycamore	EM	16	410	10	M	▪ Large progressive target canker of approximately 1m length and 400mm width on south-east side of main stem at a height of approximately300mm.	▪ Tree consultant to monitor progression of basal and stem decay and monitor canopy vitality as a component of future cyclical inspections.	P = Main stem at point of canker. T = Persons using wooded area.	4	2	3	N/A	1M	L

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T10	Common Beech	EM	16	570	12	M	▪ Stem bifurcates at a height of approximately 2m with a tight fork. ▪ 150mm diameter primary branch is crossing and rubbing against northwest primary leader with wound at a height of 4m. ▪ Upper canopy showing a moderately severe reduction in vitality.	▪ Tree consultant to monitor physiological condition as a component of future cyclical inspections.	P = Crossing branch of approximately 150mm diameter. T = Vehicles and occupants using driveway to residential property.	3	3	4	N/A	<1M	L
T11	Common Oak	M	17	900	16	M	▪ Detailed inspection significantly restricted by location within closely spaced group of dense Cherry Laurel and Leyland Cypress. ▪ Main stem heavily burred. ▪ Canopy evidently previously pruned to remove deadwood. ▪ Canopy showing a moderately severe reduction in vitality.	▪ Tree consultant to monitor physiological condition as a component of future cyclical inspections.	P = Deadwood up to approximately 75mm. T = Persons using adjacent driveways and private gardens.	3	4	3	50%	<1M	L
T12	Common Beech	M	17	600	14	M	▪ Detailed inspection significantly restricted by location within closely spaced group of dense Cherry Laurel and Leyland Cypress. ▪ Stem bifurcates at a height of approximately 3.5m with very tight fork and included bark union. ▪ Upper canopy showing a moderately severe reduction in vitality with dieback of upper twigs and tertiary branches.	▪ Tree consultant to monitor physiological condition as a component of future cyclical inspections.	P = Deadwood up to approximately 75mm diameter. T = Persons using footpath below tree canopy.	3	4	3	50%	<1M	L
T13	Common Oak	M	18	720	16	M	▪ Canopy showing a moderately severe reduction in vitality. ▪ Detailed inspection significantly restricted by location within closely spaced group of dense Cherry Laurel and Leyland Cypress.	▪ Tree consultant to monitor physiological condition as a component of future cyclical inspections.	P = Deadwood up to approximately 75mm diameter. T = Persons using footpath below tree canopy.	3	4	3	50%	<1M	L
T14	Sycamore	M	15	750	10	P	▪ Dense ivy covering main stem and primary branches, which significantly impeded inspection. ▪ Moderate amount of deadwood up to approximately 120mm diameter. ▪ Canopy highly biased to south-west and showing a significant reduction in vitality with moderately severe tertiary branch dieback to upper section. ▪ Tree evidently in a progressive state of decline with a relatively short projected remaining life expectancy.	▪ Tree contractor to remove tree due to evidently progressive state of decline and relatively short projected remaining safe life expectancy (M).	P = Dead and moribund branches up to approximately 120mm diameter. T = Persons using greenspace below tree canopy.	4	3	2	N/A	500 K	M

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T15	Sycamore	EM	12	400	7	MD	▪ Canopy highly biased to south-east and showing a severe reduction in vitality. ▪ Moderate amount of deadwood up to approximately 100mm diameter. ▪ Tree evidently in a progressive state of decline with a relatively short projected remaining life expectancy.	▪ Tree contractor to remove tree due to evidently progressive state of decline and relatively short projected remaining life expectancy (M).	P = Dead and moribund branches up to approximately 100mm diameter. T = Persons using greenspace below tree canopy.	4	4	2	N/A	<1M	M
T16	Cherry	SM	4	1x160 1x130 1x110 2x90 (ms)	6	D	▪ Tree is evidently dead. ▪ Self-set Ash growing within canopy and crossing main stems.	▪ Tree contractor to remove tree as is dead (M).	P = Dead and moribund stems and branches up to approximately 120mm diameter. T = Persons using greenspace below tree canopy.	4	3	1	50%	1M	M
T17	Goat Willow	M	18	430	10	M	▪ Evident basal decay. ▪ Slight stem lean to east from ground level and old fruiting bodies, possibly of white rot basal decay causing fungi *Pholiota squarrosa*, to west side at ground level. ▪ Further decayed strip of approximately 800mm length and 75mm width at a height of approximately 1.5m on south side.	▪ Tree contractor to remove tree due to basal decay and subsequent identified increased risk of failure (M).	P = Whole tree at ground level. T = Fence and property within neighbouring garden to east.	4	P	2	N/A	30K	M
T18	Silver Birch	M	18	530	8	M	▪ Tree has evidently failed to east at rootplate and is resting in neighbouring Sycamore to east.	▪ Tree contractor to remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons.	P = Whole tree at ground level. T = Persons using unmade pathways and desire lines through woodland.	4	1	1	N/A	4K	H
T19	Common Beech	PM	22	680	14	P	▪ Tree located adjacent to informal path/desire line through woodland. ▪ Significant basal decay to north, east and south sides from ground level to a height of approximately 3m. ▪ Canopy showing a severe reduction in vitality.	▪ Tree contractor to remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 6m for habitat value.	P = Whole tree at ground level. T = Persons using unmade path/ desire line adjacent to tree.	4	1	1	N/A	4K	H

Site:	Brockhall Village, Whalley, Lancashire, BB6 8AR
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Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	5 March 2020
Viewing Conditions:	Bright, calm with very light breeze
Job Reference:	BTC1922

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T20	Common Oak	M	25	590	10	MD	▪ Canopy showing a severe reduction in vitality. ▪ Evidently extensive decay to north side from ground level to a height of approximately 1.5m, with further necrotic areas of bark on south side to a height of approximately 2m. ▪ Rhizomorphs evident within necrotic areas indicative of colonisation by white rot basal decay causing fungi *Armillaria* sp..	▪ Tree contractor to remove tree due to identified increased risk of failure (M). NB: Main stem to be retained at a height of approximately 8m for habitat value.	P = Whole tree at ground level. T = Persons using unmade path to south-west approximately 15m from main stem.	4	1	2	N/A	40K	M
T21	Sycamore	PM	22	570	10	MD	▪ Main stem mostly dysfunctional from a height of approximately 6m. ▪ Significant dead primary and secondary branches up to approximately 300mm diameter. ▪ Canopy is evidently largely dead.	▪ Tree contractor to remove tree due to identified increased risk of primary branch failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 8m for habitat value.	P = Dead primary branches up to approximately 300mm diameter T = Persons using unmade path adjacent to main stem.	4	2	1	N/A	10K	H
T22	Sycamore	EM	15	420	10	M	▪ Severe basal decay on north-east side of main stem from ground level to a height of approximately 1.5m, with decay evidently extending below buttresses and up into main stem.	▪ Tree contractor to remove tree due to identified increased risk of failure and subsequent unacceptable risk of harm to persons. NB: Main stem to be retained at a height of approximately 8m for habitat value.	P = Whole tree at ground level. T = Persons using unmade path adjacent to main stem.	4	2	1	N/A	10K	H
T23	Common Beech	M	12	520	10	M	▪ Tree has evidently failed to east at rootplate and is resting in neighbouring trees.	▪ Tree contractor to remove tree due to identified increased risk of failure (M).	P = Whole tree at ground level. T = Persons using desire lines through wooded area.	4	1	2	N/A	40K	M

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No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T24	Common Ash	M	23	900	18	P	▪ Access for detailed inspection severely restricted by dense brambles. ▪ Canopy showing a significant reduction in vitality, evidently due to colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree in accordance with pertinent arboricultural management due to colonisation by Ash Dieback Disease (M).	P = Dead and moribund branches up to approximately 150mm diameter. T = Persons using private gardens and unmade paths below tree canopy.	3	3	3	N/A	500 K	M
T25	Common Oak	PM	21	660	11	M	▪ Significant area of decay to south-west side of main stem from ground level to a height of approximately 6m extending into primary branches and covering approximately 50% stem circumference. ▪ Branch of approximately 280mm diameter arising to south at a height of approximately 3.5m is evidently dead and has previously failed at a distance of approximately 5m from main stem.	▪ Tree contractor to remove tree due to identified increased risk of failure. NB: Main stem to be retained at a height of approximately 8m for habitat value.	P = Whole tree at ground level. T = Persons using unmade path adjacent to tree	4	1	3	N/A	400 K	M
G1	7no. Common Horse Chestnut	EM	≤ 13	≤ 570	≤ 9	M-P	▪ Moderately closely spaced group to south-west of wooded area. ▪ Canopies showing moderate to severe reductions in vitality. ▪ Tree to centre and tree to south-east showing severe reductions in vitality with dead and moribund branches throughout canopy up to 150mm diameter.	▪ Tree contractor to remove tree to centre and tree to south-east of group due to evident condition and projected short remaining safe life expectancies (M).	P = Dead and moribund branches up to approximately 150mm diameter. T = Occasional users of wooded area.	4	3	2	N/A	500 K	M
G2	approx. 5no. Sycamore	Y-EM	≤ 21	≤ 500	≤ 9	P	▪ Several mostly young to semi-mature trees with basal cavities and some form of basal decay. ▪ Nearest target is unmade footpath approximately 6m from one of the stems.	▪ Tree contractor to identify and remove those trees within group that are within falling distance of unmade paths (M). NB: Man stems to be left at a suitable height for habitat value.	P = Whole tree at ground level. T = Persons using unmade footpaths adjacent to trees.	4	1	2	N/A	40K	
G3	approx. 5no. Sycamore	Y-EM	≤ 21	≤ 500	≤ 9	P	▪ Several mostly young to semi-mature trees with basal cavities and some form of basal decay. ▪ Within failing distance of two evidently frequently used unmade footpaths within wooded area.	▪ Tree contractor to identify and remove those trees within group that are within falling distance of unmade paths (M). NB: Man stems to be left at a suitable height for habitat value.	P = Whole tree at ground level. T = Persons using unmade footpaths adjacent to trees.	4	1	2	N/A	40K	

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No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
G4	28no. Beech, 2no. Ash	EM	≤ 16.5	≤ 490	≤ 12	M-G	▪ Beech trees planted as two closely spaced rows on either side of single-track gravel drive to cemetery. ▪ Seventh Beech tree from drive entrance, on eastern side, has an approximately 90mm diameter *Ganoderma applanatum* white rot decay causing fungal fruiting body on eastern side of stem base and an approximately 75mm diameter newer fruiting body below this, but is showing no noticeable reduction in canopy vitality and signs of adaptive growth around basal area. ▪ Two Ash trees are evidently self-set and are growing in a managed Hawthorn hedge on eastern edge of group. ▪ Both trees are multi-stemmed from bases, and have evidently been coppiced as part of the hedge's previous management.	▪ Tree consultant to monitor progression of basal decay of Beech (see Comments) as a component of subsequent cyclical inspections.	P = Beech tree with basal decay at ground level. T = Property within neighbouring residential garden.	4	P	4	N/A	<1M	L
W1	Common Oak, Beech, Alder, Silver Birch, Scots Pine, Hazel, Holly, Rowan	M	≤ 20	≤ 850	≤ 18	M-G	▪ Woodland belt between football training pitches and Old Langho Road. ▪ Areas within woodland are evidently being used to dispose of soil/debris and garden waste which has been deposited around various areas within woodland, particularly to north-east, subsequently causing damage to buttresses of Beech and restricting detailed inspections in parts. ▪ Ground to north-east of woodland partially waterlogged at time of survey. ▪ Several Oaks showing moderate reductions in canopy vitality.	▪ Grounds maintenance staff to remove debris from around tree stems and prevent continued disposal of debris in this area (M). ▪ Grounds maintenance staff to inspect woodland area following severe inclement weather events to identify obvious defects/ failures as a result and contact tree contractor/ tree consultant where appropriate for advice/ remedial works.	P = Deadwood up to approximately 100mm diameter. T = Vehicles and occupants on Old Langho Road.	2	4	2	50%	100 K	M

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No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
W2	Common Alder, Oak, Beech, Ash, Horse Chestnut, Sycamore, Silver Birch, Norway Maple, Scots Pine, Weeping Willow	M	≤ 21	≤ 850	≤ 18	P-G	▪ Predominantly mature deciduous trees growing within a woodland belt dividing main access road from properties on adjoining neighbouring land to east. ▪ Woodland floor is largely semi-managed grass with evidently frequently used footpaths. ▪ Some areas of ground within wooded area were waterlogged in places at time of survey. ▪ Moderate ivy to several stems restricting detailed inspection in parts. ▪ Several Ash within woodland showing moderate to significant reductions in vitality, likely due to colonisation by Ash Dieback Disease. ▪ Utility trench for cables has evidently been excavated along roadside through rooting area. ▪ Evidence of recent ground works for installation of underground utility through western edge of woodland with evidence of several severed and broken roots along entire length up to approximately 75mm diameter.	▪ Tree contractor/grounds staff to sever ivy around entire stem circumferences at ground level and clear to a height of approximately 1.5m of those trees within falling distance of road and/or properties to enable future detailed inspections (I). ▪ Grounds maintenance staff to inform tree contractor/consultant of trees succumbing to Ash Dieback Disease that are within falling distance of roads and footpaths in order for remedial works to be specified. ▪ Grounds maintenance staff to inspect woodland area following severe inclement weather events to identify obvious resultant defects/failures and to contact tree contractor/tree consultant where appropriate for advice/remedial works. ▪ Tree consultant to monitor canopy vitality in relation to potential impacts of trenching works as a component of future cyclical inspections.	P = Dead and moribund branches up to approximately 150mm diameter within Ash. T = Persons using wooded area below tree canopies.	3	3	3	N/A	500 K	M

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W3	Common Alder, Oak, Beech, Ash, Horse Chestnut, Sycamore, Silver Birch, Holly, Scots Pine, Wild Cherry, Norway Spruce, Wych Elm	M	≤ 24	≤ 950	≤ 18	P-G	▪ Predominantly mature deciduous trees growing within established woodland to east of main developed site. ▪ Eastern edge of woodland has been removed in places, initially in order to allow development to occur. ▪ Also some evidence of piecemeal removal of individual trees from along woodland edge, and retained trees having either been topped or had branches lopped back. ▪ Trees which now make up eastern edge of woodland have attenuated crowns and are relatively slim in terms of their stem widths and overall heights. ▪ Two or three main paths lead through wood from north to south, and smaller less frequently used paths were observed around eastern edge of woodland where some of the residential properties have gated access which back onto it. ▪ Small to moderate amounts of deadwood up to 200mm diameter within several mature tree canopies. ▪ Several mature Beech to top of steep bank leading to river in western area have sustained significant soil erosion below rootplate to south and west. ▪ Several semi-mature to early mature Beech and Sycamore have basal cavities. ▪ Squirrel damage observed to canopies of several Beech and Sycamore. ▪ Area of younger planting to south of mature woodland of predominantly Ash, most of which are showing significant reductions in vitality and significant twig die back associated with colonisation by Ash Dieback Disease. ▪ NB: Several areas of woodland to eastern edge have been fenced off as private areas of gardens or were indicated as private on a previous survey carried out by Bowland Tree Consultancy. As such, surveyor has presumed these areas to be under private ownership and not subsequently included them in the survey.	▪ Grounds maintenance staff to inspect woodland area following severe inclement weather events to identify obvious resultant defects/failures and to contact tree contractor/tree consultant where appropriate for advice/remedial works. ▪ Woodland owners/grounds managers to consider creation of woodland management plan to include silvicultural management of plantation and removal and replacement of Ash within woodland that is evidently succumbing to Ash Dieback Disease. ▪ Woodland owners/grounds managers to consider formalising frequently used pathways through woodland and blocking unofficial desire lines with brash barriers to control target usage within woodland.	P = Deadwood up to approximately 200mm diameter. T = Persons using unmade paths and desire line through woodland.	4	3	2	N/A	500 K	L

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W4	Ash, Spruce, Scots Pine, Sycamore, Beech, Oak, Cherry, Hawthorn	M	≤ 12	≤ 350	≤ 9	G-P	▪ Young plantation of predominantly Scots Pine, Spruce and Ash. ▪ Two or three main paths lead from cemetery area towards river and Great Wood. ▪ Lapsed Hawthorn hedge runs through wood from roughly east to west. ▪ Little silvicultural maintenance of plantation has been carried out in recent years. ▪ Areas of Ash within plantation showing signs of a significant reduction in vitality and severe twig and tertiary branch dieback.	▪ Woodland owners/grounds managers to consider creation of woodland management plan to include silvicultural management of plantation and removal and replacement of Ash within woodland that is evidently succumbing to Ash Dieback Disease.	P = Dead and moribund Ash stems up to approximately 150mm diameter. T = Persons using unmade paths through woodland.	4	3	2	N/A	500 K	M
W5	Oak, Holly, Silver Birch, Sycamore, Ash, Hawthorn.	SM-M	≤ 21	≤ 800	≤ 16	M	▪ Predominantly mature Oak woodland growing in moderately dense to dense ground vegetation and Hawthorn understorey, which restricted detailed inspection of trees within woodland in parts. ▪ Located between Blackburn Rovers' artificial sports pitch to east and rear gardens of residential houses on Brookside to west. ▪ Evident previous failure of branch at a height of approximately 14m and of approximately 280mm diameter of Oak to centre/east of woodland adjacent to training pitch. ▪ Several Oaks, particularly in southern corner of woodland, are showing moderately significant reductions in vitality. ▪ Moderate amount of deadwood up to approximately 100mm diameter over residential gardens to west.	▪ Grounds maintenance staff to inspect woodland area following severe inclement weather events to identify obvious resultant defects/failures and to contact tree contractor/tree consultant where appropriate for advice/remedial works. ▪ Tree consultant to monitor vitality of Oaks within woodland as a component of subsequent cyclical inspections.	P = Deadwood up to approximately 100mm diameter over neighbouring gardens. T = Persons using residential gardens below tree canopies.	3	4	2	50%	1M	L

T = Individual Tree, G = Group of Trees, W = Woodland

- **(Red) = Tree/Group with Risk of Harm of 1/1,000 or greater**
- **(Orange) = Tree/Group with Risk of Harm between 1/1,000 and 1/10,000**
- **(Yellow) = Tree/Group with Risk of Harm between 1/10,000 and 1/1,000,000**
- **(Green) = Tree/Group with Risk of Harm less than 1/1,000,000**

*** See QTRA Methodology Overview and Application in Management Decisions Section of Report for details regarding Risk of Harm**

Site: Brockhall Village, Whalley, Lancashire, BB6 8AR

Job No.: BTC1922

Scale: Not to Scale

Paper Size (for printing): A3

Date: April 2020

TREE SURVEY PLAN

(Overview Plan)

Bowland Tree Consultancy Ltd

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TREE SURVEY PLAN

(Plan 1 of 8)

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Site: Brockhall Village, Whalley, Lancashire, BB6 8AR

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TREE SURVEY PLAN

(Plan 2 of 8)

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Site: Brockhall Village, Whalley, Lancashire, BB6 8AR

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TREE SURVEY PLAN

(Plan 3 of 8)

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TREE SURVEY PLAN

(Plan 4 of 8)

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TREE SURVEY PLAN

(Plan 5 of 8)

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Job No.: BTC1922

Scale: Not to Scale

Paper Size (for printing): A3

Date: April 2020

TREE SURVEY PLAN

(Plan 6 of 8)

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Scale: Not to Scale

Paper Size (for printing): A3

Date: April 2020

TREE SURVEY PLAN

(Plan 7 of 8)

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TREE SURVEY PLAN

(Plan 8 of 8)

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Bowland Tree Consultancy Ltd

DISCLAIMER

Survey Limitations: Unless otherwise stated all trees are viewed from ground level using non-invasive techniques. The disclosure of hidden crown and stem defects, in particular where they may be above a reachable height or where trees are ivy clad or in areas of ground vegetation, cannot therefore be expected. All obvious defects, however, are reported. Where the QTRA Risk Index is calculated as Tolerable or Broadly Acceptable, but the tree(s) have not been adequately inspected (e.g. due to the presence of ivy and/or ground vegetation which impeded the inspection), then it is essential to follow the recommendations made in the Management Recommendations column and to have the applicable tree(s) re-inspected as recommended.

Detailed tree safety appraisals are only carried out under specific written instructions. Comments upon evident tree safety relate to the condition of said tree at the time of the survey only. The level of detail of the survey is as per the brief detailed on the Tree Survey Schedule and as per the specifics set out in the associated fee estimate for the project.

Unless otherwise stated all trees should be re-inspected annually in order to appraise their on-going mechanical integrity and physiological condition. It should, however, be recognised that tree condition is subject to change, for example due to the effects of disease, decay, high winds, development works, etc. Changes in land use or site conditions (e.g. development that increases access frequency) and the occurrence of severe weather incidents are also significant considerations with regards tree structural integrity and trees should therefore be re-assessed in the context of such changes and/or incidents and inspected at intervals relative to identified and varying site conditions and associated risks.

Where trees are located wholly or partially on neighbouring private third-party land then said land is not accessed and our inspection is therefore restricted to what can reasonably be seen from within the site. Any subsequent comments and judgments made in respect of such trees are based on these restrictions and are our preliminary opinion only. Recommendations for works to neighbouring third-party trees are only made where a potentially unacceptable risk to persons and/or property has been identified during our survey. Where significant structural defects of third-party trees are identified and associated management works are considered essential to negate any risk of harm and/or damage then we will first attempt to inform the site occupier of the issues and, if not possible, then inform the relevant Council. Where a more detailed assessment is considered necessary then appropriate recommendations are set out in the Tree Survey Schedule.

The potential influence of trees upon existing or proposed buildings or other structures, resulting from the effects of their roots abstracting water from shrinkable load-bearing soils, is not considered herein.

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Statutory Tree Protection: It is the client's responsibility to check for the presence of any statutory tree protection measures, such as the site's location within a Conservation Area and/or the presence of any Tree Preservation Orders, directly with the applicable Council's planning department prior to scheduling or carrying out any tree works. In turn, it is also the client's responsibility to check for the need for a felling licence with the Forestry Commission prior to scheduling or carrying out any tree works. Bowland Tree Consultancy Ltd cannot be held responsible for any decisions made by the client to prune or remove trees where any such statutory protection exists.

QTRA 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 values[1], 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.

[1] See Tables 1, 2 & 3.

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 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.

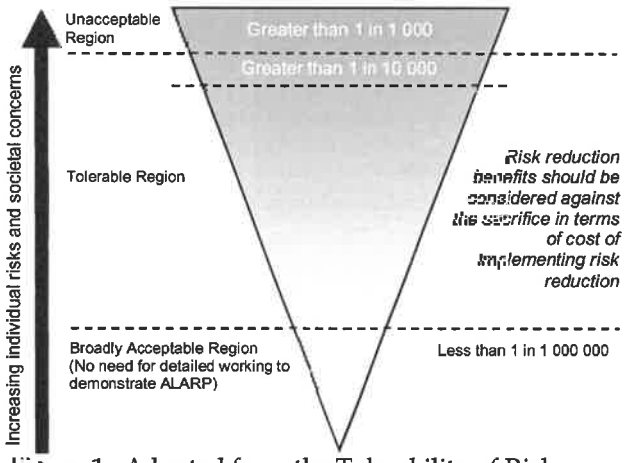

Figure 1. Adapted from the Tolerability of Risk framework (HSE 2001).

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 ranges[3] of Target, Size, and Probability of Failure. The assessor

[2] Discussed further on page 5.

[3] See Tables 1, 2 & 3.

estimates values for these three components and inputs them on either the manual calculator or software application to calculate the Risk of Harm.

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, ten pedestrians per day, each occupying the Target for five seconds, is a daily occupation of fifty seconds. The total seconds in a day are divided to give a probability of Target occupation (50/86 400 = 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

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 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.

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	26 000 – 2 700 @ 110kph (68mph)	1/1 – >1/10
		Pedestrians & cyclists:	720/hour – 73/hour	32 000 – 3 300 @ 80kph (50mph)	
				47 000 – 4 800 @ 50kph (32mph)	
2	£200 000 – >£20 000	Occupation:	2.4 hours/day – 15 min/day	2 600 – 270 @ 110kph (68mph)	1/10 – >1/100
		Pedestrians & cyclists:	72/hour – 8/hour	3 200 – 330 @ 80kph (50mph)	
				4 700 – 480 @ 50kph (32mph)	
3	£20 000 – >£2 000	Occupation:	14 min/day – 2 min/day	260 – 27 @ 110kph (68mph)	1/100 – >1/1 000
		Pedestrians & cyclists:	7/hour – 2/hour	320 – 33 @ 80kph (50mph)	
				470 – 48 @ 50kph (32mph)	
4	£2 000 – >£200	Occupation:	1 min/day – 2 min/week	26 – 4 @ 110kph (68mph)	1/1 000 – >1/10 000
		Pedestrians & cyclists:	1/hour – 3/day	32 – 4 @ 80kph (50mph)	
				47 – 6 @ 50kph (32mph)	
5	£200 – >£20	Occupation:	1 min/week – 1 min/month	3 – 1 @ 110kph (68mph)	1/10 000 – >1/100 000
		Pedestrians & cyclists:	2/day – 2/week	3 – 1 @ 80kph (50mph)	
				5 – 1 @ 50kph (32mph)	
6	£20 – £2	Occupation:	<1 min/month – 0.5 min/year	None	1/100 000 – 1/1 000 000
		Pedestrians & cyclists:	1/week – 6/year		

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 simulations[4]. 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

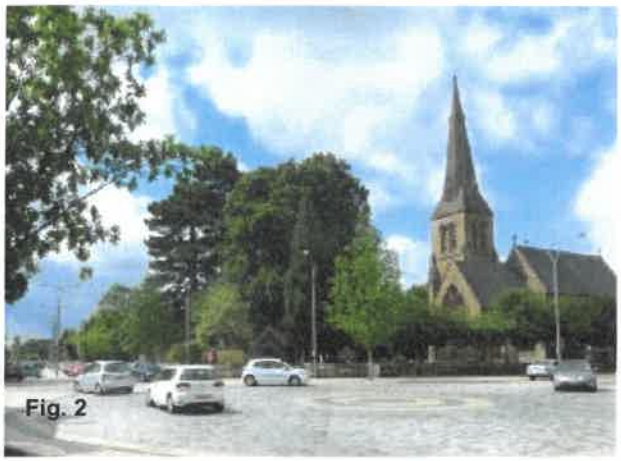
Fig. 2

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).


Fig. 3

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
	Unacceptable Risks will not ordinarily be tolerated	• Control the risk
1/1,000	**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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