cheshire woodlands
arboricultural consultancy

REPORT OF CHESHIRE WOODLANDS

ON THE

SURVEY AND RISK ASSESSMENT OF WOODLAND

AT

LADY'S AND PRINCE'S INCLINES
WOODSIDE LANE, POYNTON, CHESHIRE

ON BEHALF OF

POYNTON TOWN COUNCIL
C/O SWIFT TREE SERVICES LTD.
21 PARKLANDS WAY
POYNTON
CHESHIRE
SK12 1AL

REF: CW/6590-R1-12

DATE: 30 JULY 2012

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APPENDICES

1. EXECUTIVE SUMMARY

1.1 A remnant of a colliery transport system, the site comprises the routes of two former incline railways, which for many years have served solely as footpaths. Adjacent to both inclines many gardens and some dwellings are overhung by trees.

1.2 Many trees on Prince's Incline and a small number on Lady's Incline pre-date removal of the rail tracks, but most are the result of unmanaged natural colonisation following cessation of the industrial use. The dense tree cover presents various conflicts with the residential amenities of the Council's neighbours, with the most acute being shading of gardens and dwellings to the north of Lady's Incline.

1.3 There are a small number of trees that present elevated risks and proposals are provided for their management. To strike a balance between the risks and benefits from the trees, these proposals should be considered according to the Council's priorities and resources. If the benefits from the woodlands are to be maintained and improved at a proportionate financial cost, it will be necessary to accept that some residual risk will remain. Using the Quantified Tree Risk Assessment method, it is proposed that the risk from falling trees should be managed within predefined tolerances, taking account of both the risks and the benefits conferred by the trees.

1.4 There is little evidence of proactive management of the woodlands. Trees have been planted but this has been on an ad hoc basis. Removal of trees appears to have taken place when particular problems of safety, shading or other conflicts have been identified.

1.5 To all areas, the absence of a structured management approach has potential to result in the gradual degradation of the woodland. There are currently opportunities for improving the quality of the tree stock by light thinning and managing against non-native species. There would also be benefits from supplementary planting to increase both species and age diversity.

1.6 A long-term strategy is required if the woodlands are to be managed to optimise the amenity, conservation and other benefits at reasonable cost while taking account of and moderating the associated conflicts. A management plan would assist the Council in managing the woodland taking into account the views of all stakeholders and should enable the Council to resist unreasonable requests to remove or prune trees.

2. TERMS OF REFERENCE

2.1 My name is Michael Ellison, senior partner with Cheshire Woodlands Arboricultural. My assessment of the woodlands was carried out on 20 July 2012.

2.2 Cheshire Woodlands are instructed by Adam Lawson of Swift Tree Services Ltd. on behalf of Poynton Town Council to:

- carry out a walkover assessment of the sites
- produce a tabulated schedule of trees setting out the survey data
- attach durable, numbered steel tags to trees where necessary for identification purposes
- provide general silvicultural management advice
- produce a report outlining our findings and proposing future management of the surveyed trees
- produce a tree management schedule

3. LIMITATIONS

3.1 This report, plan and associated digital files remain the copyright of Cheshire Woodlands and transfer of rights to any third party must be with our express written consent.

3.2 The assessment of risk from falling trees is substantially informed by land use, which is assessed as viewed during the site visit and by applying a general understanding of vehicular and pedestrian usage of roads, paths and land. Where property is considered at risk from tree failure, the repair or replacement value is estimated within broad bands as set out in table 1 of the Quantified Tree Risk Assessment Practice Note at appendix 5. Over time, the occupancy rates and values might change and if the client recognises any significant changes, errors or under or over estimates they should be notified to Cheshire Woodlands.

3.3 Assessment of the potential influence of trees, upon buildings or other structures resulting from the effects of trees abstracting water from shrinkable load-bearing soils, was not included in the client's instruction and is not considered here.

3.4 The assessment of trees was carried out from ground level. The disclosure of hidden crown defects cannot, therefore, be expected and in the view of the surveyor, climbing inspections were not necessary. The assessment of some trees was restricted where trees were ivy-clad or where views were obscured by basal growth or other vegetation.

4. INTRODUCTION

4.1 The assessment is structured to take a reasonable and proportionate view of the tree population in consideration of the risks from trees, and to assess the general condition of trees on the land identified by the client.

4.2 In consideration of the risks from falling trees, the Quantified Tree Risk Assessment (QTRA) method (Ellison 2005) has been applied. This method is summarised in the enclosed practice note and I can provide further guidance on application of the method as required. Cheshire Woodlands propose that when managing risks from the structural failure of trees, an annualised risk of harm of 1 in 10,000 should be considered the limit of tolerability where a risk is imposed on those who have no control over the source of the risk, providing that the tree in question confers a reasonable degree of benefit through its contribution to the landscape, wildlife conservation, human health etc. The 1 in 10,000 threshold is a guide for implementing risk control measures and not an absolute and inflexible threshold. Where there is a particularly valuable tree and the risk is imposed upon identifiable individuals, those affected may consider it appropriate to accept a higher risk. Conversely, it might be appropriate to remove a lower value tree even though it has a risk that is lower than but approaching the tolerable threshold.

4.3 In the risk assessment schedule, the risk of harm is expressed as a 'risk index', e.g. a risk index of 10 represents an annualised risk of harm of 1 in 10,000 and Risk Index 140 represents a risk of harm of 1 in 140,000.

4.4 Management recommendations are proposed on the basis of the assessed risk and other possible requirements such as silvicultural or ecological considerations, reducing conflicts with infrastructure, and taking a view of long-term safety management. Recommendations are prioritised to enable you to make informed management decisions but where the safety from falling trees is concerned, it is necessary to have a basic understanding of the Quantified Tree Risk Assessment concept. In this regard, the practice note is provided at appendix 5 and if any clarification is required, you should contact Cheshire Woodlands for guidance.

5. THE SITE

5.1 A remnant of a colliery transport system, the site comprises two former incline rail tracks. The inclines have, for many years, served solely as footpaths, linking residential development on the north-east side of the urban settlement with the village centre to the south-west and with open countryside to the north and east. Adjacent to both inclines are residential properties, which in the case of Lady's Incline are in very close proximity, with gardens and some dwellings overhung by trees.

6. STATUTORY CONTROLS

6.1 Trees on the site stand within the Macclesfield Rural District Council (Prince's and Lady's Inclines, Poynton) Tree Preservation Order 1973. The trees are variously protected under 'Woodland' and 'Area' classifications. Subject to certain specified exemptions, the Town and Country Planning Act 1990, requires that an application must be made to the local planning authority, to carry out works upon or to remove trees that are subject to a tree preservation order.

6.2 The Wildlife and Countryside Act 1981 (together with the amendments of 1985 & 1991, the subsequent variations to the schedule orders, and strengthening amendments made within the Countryside and Rights of Way Act 2000) forms the basis for legislation protecting Britain's flora and fauna. Nesting birds and all species of bat are afforded statutory protection. It is therefore important to be vigilant when implementing tree and woodland management operations and an appropriate level of risk assessment should be carried out in consideration of the following.

6.3 It is an offence to:

- disturb a nesting bird
- disturb a roosting bat or damage, destroy or block access to a bat roost
- intentionally kill, injure or take a bat
- sell, hire, barter or exchange a bat, dead or alive
- be in possession or control of a bat or anything derived from a bat

7. SURVEY METHODOLOGY

7.1 The surveyed trees were plotted, either individually or by group onto an Ordnance Survey base plan with sufficient accuracy to identify their locations. 4 groups and 9 individual trees were plotted. In the schedules and plan, groups are prefixed 'G' and trees are either prefixed by the reference of the group within which they are located (e.g. G2 / 4) or by 'T' if they are not associated with a group. To inform the risk assessments, highways and footpaths on and adjacent to the site have also been recorded and prefixed 'H'.

7.2 The trees were assessed using the 'walkover assessment' method, recording the general attributes of groups and identifying trees that justify either an individual record or a greater level of assessment by virtue of their location and their structural or physiological state. A detailed assessment of each and every tree has not been carried out, but a reasonable view has been taken of all trees within the site. My survey notes and management recommendations are set out in the risk assessment schedule, and the management recommendations are reproduced in three schedules relating to three management areas defined by the client.

7.3 Risk calculations were carried out only where considered appropriate. In the assessment of groups of trees, the risk from the highest risk tree was recorded and where that tree had a risk of harm greater than 1 in 10,000, the next highest risk would be calculated, and so on. If the risk of harm for a tree or group was obviously lower than 1 in 1,000,000, a risk calculation was not carried out, but where a calculation was carried out, the risk was always recorded irrespective of whether it was higher or lower than this threshold.

7.4 The trees were assessed from ground level in relation to the adjacent land-use and in enough detail to inform the risk assessment. Although the trees were assessed only from the inclines and not from neighbouring land, a reasonable and sufficient view was taken of the trees to inform the risk assessment. Where management works might be appropriate they are listed as prioritised options in the schedules.

7.5 Trees often contain dead branches, cavities and other structural defects but these are recorded in the schedule only where they could significantly affect the outcome of the risk assessment, or where there are other management reasons to do so.

8. SIGNIFICANT FINDINGS

8.1 No major safety concerns were identified. Trees G2/2 and G4/7 have elevated risks and it would be reasonable to implement remedial works to these as set out in the schedules. The dead horse chestnut (***Aesculus hippocastanum***) trees G2/5 and G2/6 present a low risk of harm and both are likely to collapse in small sections onto areas of low use ground. However, while G2/5 could reasonably be retained and allowed to collapse into the woodland, retaining associated wildlife benefits, it may be unreasonable to allow G2/6 to collapse over the neighbouring garden to the west. In this regard, there would be some merit in discussing the options with the neighbouring householders, who may be prepared to allow the tree to collapse into a low use area of their garden in return for the wildlife benefits. On the other hand, the householders may not wish to be inconvenienced by the falling debris, in which case it would be appropriate to remove tree G2/6 or reduce it to a stump that can be retained for wildlife habitat.

8.2 G3 is an area of Japanese knotweed (***Fallopia japonica***). The Wildlife and Countryside Act 1981 states that it is an offence to plant or otherwise cause to grow in the wild any plant listed in Schedule nine, Part II of the Act. Japanese knotweed is listed in Schedule 9.

8.3 There is little evidence of proactive management of the woodlands. There are signs that trees have occasionally been planted but this has been on an ad hoc basis. Removal of trees appears to have taken place when particular problems of safety, shading or other conflicts have been identified. The presence of extensive cherry laurel (***Prunus laurocerasus***), along with other exotic shrubs, is problematic insofar as it causes dense shade and is inhibiting the establishment of native vegetation.

9. CONCLUSIONS

9.1 Risks from falling trees. There are a small number of trees that present elevated risks and proposals for their management are detailed in the schedules. These trees should be dealt with according to the Council's priorities and the availability of resources. In implementing risk control measures, the Council should be mindful that reasonable risk management requires a balance to be struck between the risks and benefits from trees. If the benefits from the woodlands are to be maintained and improved at a realistic financial cost and without a disproportionate cost to the tree asset, it is necessary to accept that there will be some residual risk.

9.2 It should be borne in mind that the risk assessment should guide but not dictate your management of the trees and you may wish to apply a threshold other than 1 in 10,000, in which case the management proposals can be amended accordingly.

9.3 In considering the management of tree risk on your land, you should be aware that probably the greatest duty of care is under the Health and Safety at Work Act 1974 and in particular your responsibilities, as a duty holder, to people affected by your undertakings under Section 3 of the Act. In this regard, it is perhaps helpful to be aware of the Health and Safety Executive's (HSE) own internal guidance on the matter of tree safety, which is set out in their Sector Information Minute – Management of the Risk from Falling Trees (2007) and is broadly accords with the approach set out here. A copy of the HSE guidance is appended at CW6.

9.4 General Management. To all areas of the site, the absence of a structured management approach has potential to lead to the gradual degradation of the woodland. There are currently opportunities for improving the quality of the tree stock by light thinning and managing against non-native species. There would also be benefits from supplementary planting to increase diversity.

9.5 The woodlands present significant conflicts with residential amenity, which is evident in the patchy distribution of past management. Trees are absent from some sections of residential boundary while in other areas trees have been allowed to almost completely overshadow gardens and dwelling. A long-term strategy is required if the woodlands are to be managed to optimise benefits at reasonable cost while taking account of and moderating the conflicts. A woodland management plan would assist the Council in resisting unreasonable requests to implement tree pruning and removal.

10. RECOMMENDATIONS

10.1 Implementation of the risk control and general management recommendations detailed in the schedules should be considered for implementation in accordance with the Council's priorities and the availability of resources. In this regard, I suggest that the management priorities should be implemented first in respect of 'Safety High' then 'Safety Medium' followed by 'General High', 'General Medium' and 'Safety Low'. The implementation of management should be informed by the client's own priorities and resources. I can offer guidance on but cannot set the level of risk at which the trees are managed. The current management proposals are formulated on the basis of the 1 in 10,000 risk of harm threshold. Where trees are identified as having low value and elevated risk of harm it might be reasonable to implement risk controls even where the risk is below 1 in 10,000. This is an area where a balance must be struck between the risk and the cost of implementing the control measure, and I have provided management options where it seems that risk control would be reasonable.

10.2 In consultation with key stakeholders, a long-term management strategy should be developed for the woodland. The strategy should be supported by a management plan to include the programmed pruning, removal and replacement of trees and understorey shrubs, along with maintenance of footpaths, drainage, fences and gates.

10.3 Some trees are protected by the tree preservation order under the 'Area' classification. This classification is potentially problematic insofar as it does not protect trees that have grown after the date that the Order was made. There would be some merit in approaching the local planning authority with a request to consider re-making the Order to classify the 'Areas' as 'Woodland', which would afford protection to all of the trees.

10.4 Trees and shrubs should be carefully inspected for birds' nests prior to pruning or removal and any work likely to destroy or disturb active nests should be avoided until the young have fledged.

10.5 All tree pruning and removal works should be carried out by a qualified contractor, carrying appropriate insurance cover and should be implemented to the minimum current CE and UK industry standards and in accordance with current industry codes of practice. In particular, the performance of all tree work should comply with BS3998 (2010).

10.6 All personnel working with or in the trees should be vigilant and mindful of the possible presence of roosting bats. A competent ecologist should investigate and advise on any indications that trees on the site are used as bat roosts.

10.7 In addition to the appended survey schedules and maps, a digital .kmz file is supplied that is viewed in the freely available Google Earth™. The .kmz file provides a user interface that allows the user to view a summary of the survey data on free to view aerial photographs. A guidance note on installation and use is provided.

11. REFERENCES.

Anon. 2010. BS3998 - Recommendations for Tree Work. British Standards Institute, London.

Ellison, M. J. 2005. Quantified Tree Risk Assessment Used in the Management of Amenity Trees. J. Arboric. 31: 57-65

APPENDIX CW 1

TREE RISK ASSESSMENT SCHEDULE

CLIENT: Poynton Town Council

PROJECT: Lady's and Prince's Inclines
Poynton

REF: CW/6590-RAS-12

DATE: 31 July 2012

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HEADINGS & ABBREVIATIONS

REFERENCE:	TREE OR GROUP REFERENCE
TAG NO:	TAG NUMBER WHERE A TAG HAS BEEN AFFIXED TO TREE
HEIGHT:	HEIGHT OF TREE OR MAXIMUM HEIGHT FOR THE GROUP , APPROXIMATELY 1 IN 10 TREES ARE MEASURED AND THE REMAINDER ESTIMATED AGAINST THE MEASURED TREES
AGE RANGE:	Y = YOUNG, SM = SEMI MATURE, EM = EARLY MATURE, M = MATURE, PM = POST MATURE
DIA:	STEM DIAMETER FOR THE TREE OR MAXIMUM DIAMETER FOR THE GROUP- MEASURED OR ESTIMATED AT A HEIGHT OF APPROXIMATELY 1.5 METRES
VITALITY:	A MEASURE OF PHYSIOLOGICAL CONDITION. D = DEAD, MD = MORIBUND, P = POOR, M = MODERATE, G = GOOD
SIZE VALUE:	VALUE FOR THE RISK ASSESSED TREE OR BRANCH - EXPRESSED AS A FRACTION
PROB OF FAILURE:	PROBABILITY OF FAILURE WITHIN 12 MONTHS OF THE ASSESSMENT
TARGET VALUE:	LIKELIHOOD OF A TARGET BEING OCCUPIED OR THE REPAIR OR REPLACEMENT VALUE OF PROPERTY EXPRESSED AS A FRACTION OF £1,000,000
MULTIPLE TARGET:	WHERE TARGET HAS A VALUE GREATER THAN CONSTANT OCCUPATION BY ONE PERSON, OR A LIKELY REPAIR/REPLACEMENT VALUE GREATER THAN £1M, A MULTIPLE VALUE IS RECORDED
WEATHER FACTOR:	SEE QUANTIFIED TREE RISK ASSESSMENT PRACTICE NOTE
REDUCED MASS %:	WHERE THE MASS OF A BRANCH IS REDUCED BY DEGRADATION, A FRACTION MAY BE INTRODUCED TO REFLECT THE PROPORTION OF THE REDUCTION
RISK INDEX:	E.G. RISK INDEX 20 = RISK OF SIGNIFICANT HARM 1 IN 20,000
HIGHWAY:	SIGNIFICANT THOROUGHFARES ARE RECORDED AND ALLOCATED A BUFFER DISTANCE, WHICH IS EQUAL TO OR GREATER THAN THE HEIGHT OF ANY TREE THAT IS WITHIN FALLING DISTANCE

MANAGEMENT PRIORITIES

1) SAFETY - HIGH
2) SAFETY - MEDIUM
3) SAFETY - LOW
4) SAFETY - LONG TERM
5) DAMAGE TO STRUCTURES - HIGH
6) DAMAGE TO STRUCTURES - MEDIUM
7) DAMAGE TO STRUCTURES - LOW
8) GENERAL MANAGEMENT - HIGH
9) GENERAL MANAGEMENT - MEDIUM
10) GENERAL MANAGEMENT - LOW
11) ONGOING MANAGEMENT
12) IMMEDIATELY PRIOR TO NEXT ASSESSMENT
13) NO PRIORITY

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G1	Mixed broadleaved species [Sycamore, Hawthorn, Beech, Pedunculate oak, Wych elm]	Y/SM/EM/M	17	650	G/P/D	Vehicle						
						Human	1	72.0	81.83	100	1	590
						Property						
						Risk assessment of:	dead branch failure onto footpath					

Comments	Management & Priority
Narrow linear group extending to both sides of Prince's incline. Trees in close proximity to and overhanging the residential boundaries on both sides. Adjacent to the two westernmost properties on the south side of the incline there are no significant trees and it is possible that this area of ground is being managed to prevent the establishment of trees. Decay to stem/s. Adaptive growth to stem/s.	8: Consider formulating a programme of silvicultural management.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2	Mixed species [Sycamore, Horse chestnut, Silver birch, Hawthorn, Beech, Ash, Holly, Pedunculate oak, Yew, Wych elm, Elder, Lime]	Y/SM/EM/M	23	1,150	G/P/D	Vehicle						
						Human	1	72.0	8.60	100	1	62
						Property						
						Risk assessment of:	G2/2					

Comments	Management & Priority
Planted cherry laurels at the Eastern and western ends of the group are dominating the understorey and inhibiting the development of new native trees and shrubs. No signs of silvicultural management in recent years but ad hoc felling of trees has taken place. Appropriate re-spacing of young trees would benefit the long-term management of the woodland and could reduce conflicts with neighbouring residential amenities. A section of ground to the north side of the incline, adjacent to the rear garden boundaries of Waters Reach, is dominated by exotic shrubs, which are inhibiting the development of native trees and shrubs. Some young ash saplings are present but this area has the appearance of being managed against the establishment of trees. Many tree stems are shrouded in ivy but those that were considered to require assessment were tapped with a sounding hammer and a sufficient view was taken to inform the risk assessment. Bark wounds to stem/s. Decay to stem/s. Stem/s colonised by ivy. Acute included bark union/s to stem/s with signs of adaptive growth. Fungal/bacterial cankers to stem/s. Branch/es encroaching into highway.	8: Liaise with local authority tree offices to develop a management strategy. 8: Consider formulating a programme of silvicultural management. 9: Prune to provide 5m clearance over highway/access.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2/1	Beech	SM/M	22	1,150	M	Vehicle						
Tag No						Human	1	720.0	1.00	10000	1	7,200
						Property						
212						Risk assessment of:	tree failure onto footpath					

Comments	Management & Priority
Appears to have been partially windthrown many years ago and has re-stabilised with a lean to the north across the footpath and towards a neighbouring woodland garden. Decay to the rootplate. Adaptive growth to the root-collar Visual and audible signs of decay to the lower stem and exhibiting adaptive growth	

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2/2	Sycamore	Y	9	150	D	Vehicle						
Tag No						Human	1	72.0	8.60	100	1	62
						Property						
225						Risk assessment of:	tree failure onto footpath					

Comments	Management & Priority
Dead.	2: Fell and stack on site.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2/4	Small leaved lime	M	18	600	G	Vehicle						
Tag No						Human						
						Property	1	20.0	1.00	10000	1	200
						Risk assessment of:	tree failure onto dwelling					

Comments	Management & Priority
Decay of the sapwood to the stem/s.	2: Monitor stability.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2/5	Horse chestnut	M	18	550	D	Vehicle						
Tag No						Human	1	720.0	2.03	1000	1	1,500
						Property						
						Risk assessment of:	first order branch failure onto private garden					
Comments						Management & Priority						
Most likely to collapse in small sections. Dead.												

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G2/6	Horse chestnut	EM	17	550	D	Vehicle						
Tag No						Human	1	17,280.0	8.60	10	1	1,500
						Property						
219						Risk assessment of:	first order branch failure onto private garden					
Comments						Management & Priority						
Most likely to collapse in small sections. Dead.						3: Dismantle to retain 4m high stump/s.						

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G3	Japanese knotweed	Y				Vehicle						
						Human						
						Property						
						Risk assessment of:						
Comments						Management & Priority						
						8: Apply chemical treatment in accordance with the Control of Pesticides Regulations 1986 (as amended 1997) to eradicate the Japanese knotweed. Reassess anually until absent.						

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G4	Mixed species [Sycamore, Horse chestnut, Silver birch, Beech, Ash, Holly, Pedunculate oak, Hazel]	Y/SM/EM/M	18	950	G/P/D	Vehicle						
						Human	1	72.0	8.60	1	1	0.62
						Property						
						Risk assessment of:	G4/7					

Comments	Management & Priority
No signs of silvicultural management in recent years but ad hoc felling of trees has taken place. Appropriate re-spacing of young trees would benefit the long-term management of the woodland and could reduce conflicts with neighbouring residential amenities. Many tree stems are shrouded in ivy but those that were considered to require assessment were tapped with a sounding hammer and a sufficient view was taken to inform the risk assessment. High levels of shading of both dwellings and gardens to the north side.	8: Liaise with local authority tree offices to develop a management strategy. 8: Consider formulating a programme of silvicultural management.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G4/7	Pedunculate oak	SM	11	400	MD	Vehicle						
Tag No						Human	1	72.0	8.60	1	1	0.62
						Property						
223						Risk assessment of:	second order branch failure onto footpath					

Comments	Management & Priority
Exhibits signs of terminal decline.	2: Dismantle to retain 4m high stump/s.

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G4/8	Pedunculate oak	M	16	600		Vehicle						
Tag No						Human	1	17,280.0	81.83	1	1	1,400
						Property						
218						Risk assessment of:	dead branch failure onto private garden					

Comments	Management & Priority
Deadwood within crown. Crown reduced in the past. Crown lifted in the past. Located within overgrown hedgerow. Exhibits signs of past decline.	

TREE RISK SURVEY

CLIENT: Poynton Town Council
PROJECT: Lady's and Prince's Inclines
BRIEF: Walkover tree risk assessment

SURVEYOR: MJE
DATE: 31 July 2012
REF: CW/6590-RAS-12

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
G4/9	Pedunculate oak	SM	15	350	G	Vehicle						
Tag No						Human	1	72.0	2.03	1000	1	150
						Property						
222						Risk assessment of:	first order branch failure onto footpath					
Comments						Management & Priority						
Acute included bark union/s with signs of partial failure. Adaptive growth to the stem/s.						2: Monitor stability.						

Reference	Species	Age	Height (m)	Dia (mm)	Vitality	Targets	Multiple Targets	Target Value (1 in)	Size Value (1 in)	Prob Failure (1 in)	Reduced Mass (1 in)	Risk Index
T3	Pedunculate oak	EM	11	400	P	Vehicle						
Tag No						Human	1	120,960.0	8.60	100	1	100,000
						Property						
						Risk assessment of:	first order branch failure onto low use recreational land					
Comments						Management & Priority						
Crown failed onto incline but remains hung-up.						2: Collapse onto ground.						

Highway Reference	Name	Type	Buffer Distance	Comments
H1	Prince's Incline	PROW	25	<10 ped/hr

Highway Reference	Name	Type	Buffer Distance	Comments
H2	Lady's Incline	PROW	25	<10 ped/hr

Highway Reference	Name	Type	Buffer Distance	Comments
H3	Woodside Lane	Minor Road	25	<200 veh/day

Highway Reference	Name	Type	Buffer Distance	Comments
H4	Towers Road	Minor Road	25	<500 veh/day

APPENDIX CW 2

TREE MANAGEMENT SCHEDULE

CLIENT: Poynton Town Council

PROJECT: Lady's and Prince's Inclines
Poynton

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DATE: 31 July 2012

HEADINGS & ABBREVIATIONS

REFERENCE: TREE OR GROUP REFERENCE
TAG NO: TAG NUMBER WHERE A TAG HAS BEEN AFFIXED TO TREE
RISK INDEX: E.G. RISK INDEX 20 = RISK OF SIGNIFICANT HARM 1 IN 20,000

MANAGEMENT PRIORITIES

1) SAFETY - HIGH
2) SAFETY - MEDIUM
3) SAFETY - LOW
4) SAFETY - LONG TERM
5) DAMAGE TO STRUCTURES - HIGH
6) DAMAGE TO STRUCTURES - MEDIUM
7) DAMAGE TO STRUCTURES - LOW
8) GENERAL MANAGEMENT - HIGH
9) GENERAL MANAGEMENT - MEDIUM
10) GENERAL MANAGEMENT - LOW
11) ON-GOING MANAGEMENT
12) IMMEDIATELY PRIOR TO NEXT ASSESSMENT
13) NO PRIORITY

Reference	Tag	Species	Risk Index	Management	Priority
G1		Mixed broadleaved species		Consider formulating a programme of silvicultural management.	General High
G2		Mixed species		Consider formulating a programme of silvicultural management.	General High
				Liaise with local authority tree offices to develop a management strategy.	General High
				Prune to provide 5m clearance over highway/access.	General Medium
G2/2	225	Sycamore	62	Fell and stack on site.	Safety Medium
G2/4		Small leaved lime	200	Monitor stability.	Safety Medium
G2/6	219	Horse chestnut	1,500	Dismantle to retain 4m high stump/s.	Safety Low
G3		Japanese knotweed		Apply chemical treatment in accordance with the Control of Pesticides Regulations 1986 (as amended 1997) to eradicate the Japanese knotweed. Reassess anually until absent.	General High

Reference	Tag	Species	Risk Index	Management	Priority
G4		Mixed species		Consider formulating a programme of silvicultural management.	General High
				Liaise with local authority tree offices to develop a management strategy.	General High
G4/7	223	Pedunculate oak	0.62	Dismantle to retain 4m high stump/s.	Safety Medium
G4/9	222	Pedunculate oak	150	Monitor stability.	Safety Medium
T3		Pedunculate oak	100,000	Collapse onto ground.	Safety Medium

APPENDIX CW 3

TREE RISK ASSESSMENT DRAWING

TREE RISK ASSESSMENT DRAWING

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Client:	**Poynton Town Council**
Project:	**Lady's and Prince's Inclines Poynton SK12**
Reference:	**CW/6590-P-RA-12**
Date:	**31 July 2012**
Scale:	**Not to scale**

Legend:

- Group of trees
- Group of trees not in current review
- Stump of felled tree
- Motorway
- Dual-carriageway
- A Road
- B Road
- PROW
- Private Footpath
- Individual tree
- Individual tree not in current review
- Tree felled and stump removed
- Minor Road
- Private Track
- Railway
- Waterway
- Waterway & Path

APPENDIX CW 4

GLOSSARY OF ARBORICULTURAL TERMS

Abscission. The shedding of a leaf or other short-lived part of a woody plant, involving the formation of a corky layer across its base; in some tree species twigs can be shed in this way

Abiotic. Pertaining to non-living agents; e.g. environmental factors

Absorptive roots. Non-woody, short-lived roots, generally having a diameter of less than one millimetre, the primary function of which is uptake of water and nutrients

Adaptive growth. In tree biomechanics, the process whereby the rate of wood formation in the cambial zone, as well as wood quality, responds to gravity and other forces acting on the cambium. This helps to maintain a uniform distribution of mechanical stress

Adaptive roots. The adaptive growth of existing roots; or the production of new roots in response to damage, decay or altered mechanical loading

Adventitious shoots. Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage. The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Architecture. In a tree, a term describing the pattern of branching of the crown or root system

Axil. The place where a bud is borne between a leaf and its parent shoot

Bacteria. Microscopic single-celled organisms, many species of which break down dead organic matter, and some of which cause diseases in other organisms

Bark. A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Basidiomycotina (Basidiomycetes). One of the major taxonomic groups of fungi; their spores are borne on microscopic peg-like structures (basidia), which in many types are in turn borne on or within conspicuous fruit bodies, such as brackets or toadstools. Most of the principal decay fungi in standing trees are basidiomycetes

Bolling. A term sometimes used to describe pollard heads

Bottle-butt. A broadening of the stem base and buttresses of a tree, in excess of normal and sometimes denoting a growth response to weakening in that region, especially due to decay involving selective delignification

Bracing. The use of rods or cables to restrain the movement between parts of a tree

Branch:

- Primary. A first order branch arising from a stem
- Lateral. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
- Sub-lateral. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch bark ridge. The raised arc of bark tissues that forms within the acute angle between a branch and its parent stem

Branch collar. A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot. A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling. An irreversible deformation of a structure subjected to a bending load

Buttress zone. The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium. Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker. A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Canopy species. Tree species that mature to form a closed woodland canopy

Cleaning out. The removal of dead, crossing, weak, and damaged branches, where this will not damage or spoil the overall appearance of the tree

Compartmentalization. The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and / or active defences operating at the boundaries of the affected region

Compression fork. An acute angled fork that is mechanically optimised for the growth pressure that two or more adjacent stems exert on each other.

Compression strength. The ability of a material or structure to resist failure when subjected to compressive loading; measurable in trees with special drilling devices

Compressive loading. Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition. An indication of the physiological vitality of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Construction exclusion zone. Area based on the Root Protection Area (in square metres) to be protected during development, by the use of barriers and / or ground protection

Crown/Canopy. The main foliage bearing section of the tree

Crown lifting. The removal of limbs and small branches to a specified height above ground level

Crown thinning. The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping. A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

Crown reduction/thinning. Reduction of the canopy volume by thinning to remove dominant branches whilst preserving, as far as possible the natural tree shape

Deadwood. Dead branch wood

Decurrent. In trees, a system of branching in which the crown is borne on a number of major widely-spreading limbs of similar size (cf. excurrent). In fungi with toadstools as fruit bodies, the description of gills which run some distance down the stem, rather than terminating abruptly

Defect. In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Delamination. The separation of wood layers along their length, visible as longitudinal splitting

Dieback. The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease. A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Distal. In the direction away from the main body of a tree or subject organism (cf. proximal)

Dominance. In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud. An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction. In woody tissues, the loss of physiological function, especially water conduction, in sapwood

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

DBH (Diameter at Breast Height). Stem diameter measured at a height of 1.5 metres (UK) or the nearest measurable point. Where measurement at a height of 1.5 metres is not possible, another height may be specified

Deadwood. Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Endophytes. Micro-organisms which live inside plant tissues without causing overt disease, but in some cases capable of causing disease if the tissues become physiologically stressed, for example by lack of moisture

Epicormic shoot. A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Excrescence. Any abnormal outgrowth on the surface of tree or other organism

Excurrent. In trees, a system of branching in which there is a well defined central main stem, bearing branches which are limited in their length, diameter and secondary branching (cf. decurrent)

Fastigiate. Having upright, often clustered branches

Felling licence. In the UK, a permit to fell trees in excess of a stipulated number of stems or volume of timber

Flush-cut. A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root. A root which circles and constricts the stem or roots possibly causing death of phloem and / or cambial tissue

Guying. A form of artificial support with cables for trees with a temporarily inadequate anchorage

Habit. The overall growth characteristics, shape of the tree and branch structure

Hazard beam. An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Heartwood/false-heartwood/ripewood. Sapwood that has become dysfunctional as part of the natural aging processes

Heave. A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

High canopy tree species. Tree species having potential to contribute to the closed canopy of a mature woodland or forest

Incipient failure. In wood tissues, a mechanical failure which results only in deformation or cracking, and not in the fall or detachment of the affected part

Included bark (ingrown bark). Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Increment borer. A hollow auger, which can be used for the extraction of wood cores for counting or measuring wood increments or for inspecting the condition of the wood

Infection. The establishment of a parasitic micro-organism in the tissues of a tree or other organism

Internode. The part of a stem between two nodes; not to be confused with a length of stem which bear nodes but no branches

Lever arm. A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin. The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing. A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end-loading

Loading. A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Longitudinal. Along the length (of a stem, root or branch)

Lopping. A term often used to describe the removal of large branches from a tree, but also used to describe other forms of cutting

Mature Heights (approximate):

- Low maturing – less than 8 metres high
- Moderately high maturing – 8 – 12 metres high
- High maturing – greater than 12 metres high

Microdrill. An electronic rotating steel probe, which when inserted into woody tissue provides a measure of tissue density

Minor deadwood. Deadwood of a diameter less than 25mm and or unlikely to cause significant harm or damage upon impact with a target beneath the tree

Mulch. Material laid down over the rooting area of a tree or other plant to help conserve moisture; a mulch may consist of organic matter or a sheet of plastic or other artificial material

Mycelium. The body of a fungus, consisting of branched filaments (hyphae)

Occluding tissues. A general term for the roll of wood, cambium and bark that forms around a wound on a woody plant (cf. woundwood)

Occlusion. The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen. A micro-organism which causes disease in another organism

Photosynthesis. The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Phytotoxic. Toxic to plants

Pollarding. The removal of the tree canopy, back to the stem or primary branches, usually to a point just outside that of the previous cutting. Pollarding may involve the removal of the entire canopy in one operation, or may be phased over several years. The period of safe retention of trees having been pollarded varies with species and individuals. It is usually necessary to re-pollard on a regular basis, annually in the case of some species

Primary branch. A major branch, generally having a basal diameter greater than 0.25 x stem diameter

Primary root zone. The soil volume most likely to contain roots that are critical to the health and stability of the tree and normally defined by reference BS5837 (2005) Guide for Trees in Relation to Construction.

Priority. Works may be prioritised, 1. = high, 5. = low

Probability. A statistical measure of the likelihood that a particular event might occur

Proximal. In the direction towards from the main body of a tree or other living organism (cf. distal)

Pruning. The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial. In the plane or direction of the radius of a circular object such as a tree stem

Rams-horn. In connection with wounds on trees, a roll of occluding tissues which has a spiral structure as seen in cross-section

Rays. Strips of radially elongated parenchyma cells within wood and bark. The functions of rays include food storage, radial translocation and contributing to the strength of wood

Reactive Growth/Reaction Wood. Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Removal of dead wood. Unless otherwise specified, this refers to the removal of all accessible dead, dying and diseased branchwood and broken snags

Removal of major dead wood. The removal of, dead, dying and diseased branchwood above a specified size

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Respacing. Selective removal of trees from a group or woodland to provide space and resources for the development of retained trees.

Residual wall. The wall of non-decayed wood remaining following decay of internal stem, branch or root tissues

Ring-barking (girdling). The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage.

Root-collar. The transitional area between the stem / s and roots

Root-collar examination. Excavation of surfacing and soils around the root-collar to assess the structural integrity of roots and / or stem

Root protection area. An area of ground surrounding a tree that contains sufficient rooting volume to ensure the tree's survival. Calculated with reference to Table 2 of BS5837 (2005) and shown in plan form in square metres

Root zone. Area of soils containing absorptive roots of the tree / s described. The Primary root zone is that which we consider of primary importance to the physiological well-being of the tree

Sapwood. Living xylem tissues

Secondary branch. A branch, generally having a basal diameter of less than 0.25 x stem diameter

Selective delignification. A kind of wood decay (white-rot) in which lignin is degraded faster than cellulose

Shedding. In woody plants, the normal abscission, rotting off or sloughing of leaves, floral parts, twigs, fine roots and bark scales

Silvicultural thinning. Removal of selected trees to favour the development of retained specimens to achieve a management objective

Simultaneous white-rot. A kind of wood decay in which lignin and cellulose are degraded at about the same rate

Snag. In woody plants, a portion of a cut or broken stem, branch or root which extends beyond any growing-point or dormant bud; a snag usually tends to die back to the nearest growing point

Soft-rot. A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Spores. Propagules of fungi and many other life-forms; most spores are microscopic and dispersed in air or water

Shrub species. Woody perennial species forming the lowest level of woody plants in a woodland and not normally considered to be trees

Sporophore. The spore bearing structure of fungi

Sprouts. Adventitious shoot growth erupting from beneath the bark

Stem/s. The main supporting structure / s, from ground level up to the first major division into branches

Stress. In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

Stress. In mechanics, the application of a force to an object

Stringy white-rot. The kind of wood decay produced by selective delignification

Storm. A layer of tissue which supports the fruit bodies of some types of fungi, mainly ascomycetes

Structural roots. Roots, generally having a diameter greater than ten millimetres, and contributing significantly to the structural support and stability of the tree

Subsidence. In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Subsidence. In relation to branches of trees, a term that can be used to describe a progressive downward bending due to increasing weight

Taper. In stems and branches, the degree of change in girth along a given length

Target canker. A kind of perennial canker, containing concentric rings of dead occluding tissues

Targets. In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping. In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Torsional stress. Mechanical stress applied by a twisting force

Translocation. In plant physiology, the movement of water and dissolved materials through the body of the plant

Transpiration. The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

Understorey. A layer of vegetation beneath the main canopy of woodland or forest or plants forming this

Understorey tree species. Tree species not having potential to attain a size at which they can contribute to the closed high canopy of a woodland

Vascular wilt. A type of plant disease in which water-conducting cells become dysfunctional

Vessels. Water-conducting cells in plants, usually wide and long for hydraulic efficiency; generally not present in coniferous trees

Veteran tree. A loosely defined term for an old specimen that is of interest biologically, culturally or aesthetically because of its age, size or condition and which has usually lived longer than the typical upper age range for the species concerned

Vigour. The expression of carbohydrate expenditure to growth (in trees).

Vitality. A measure of physiological condition expressed through the health and growth of foliage, shoots and adaptive woody tissues.

White-rot. A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure. The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure. The force exerted by a wind on a particular object

Windthrow. The blowing over of a tree at its roots

Wound dressing. A general term for sealants and other materials used to cover wounds in the hope of protecting them against desiccation and infection; only of proven value against fresh wound parasites

Woundwood. Wood with atypical anatomical features, formed in the vicinity of a wound

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

APPENDIX CW 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

The Quantified Tree Risk Assessment (QTRA) method was first published in 2005 (Ellison 2005), following which a programme of training and user registration was developed. Registered users of the QTRA method attend either a one or a two-day training workshop and receive tuition in the basic application of the method. Update workshops provide both advanced training and update information relating to revision of the method; attendance is at the discretion of the user. Users, currently, from fifteen countries have access to an internet discussion forum and receive updated information as the method evolves and develops.

A Balanced Approach

In the management of trees, risk minimisation is often cited as an objective. This alone is not a reasonable aim because the benefits of risk reduction must be balanced with its costs, both financial and in terms of lost benefits from the tree. Where risk reduction comes at a disproportionately high cost in relation to lowering the level of risk, the risk control measure can be said to be disproportionate and unreasonable. Indeed, where safety from trees is concerned, the law in the UK, both common and in statute, requires only that the occupier of land does what is reasonable (Mynors 2011). By quantifying the risk of harm from falling trees, QTRA enables comparison of the costs and benefits of risk reduction.

When managing risks in all walks of life we strive to balance the costs of our actions and choices with the benefits that they provide, and managing trees should be no different. Although the majority of tree-risk management decisions are not analysed in terms of the detailed costs and benefits of risk reduction, the balance between the costs and benefits of implementing risk control underpins the process.

Risk Assessment

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation. (ISO 2009). Developed for the assessment of risks from falling trees, the QTRA method enables cost-effective identification of the risks and quantification of the risk analysis to provide a numerical aid for the evaluation and treatment of risks.

A risk from tree failure exists only if (1) there is potential for tree failure and (2) potential for harm to result. It is the task of the risk assessor to consider both the likelihood and potential consequences of tree failure. The outcome of this assessment, which in QTRA is termed the 'risk of harm', will then inform the tree manager's evaluation of the risks. Additionally, the assessor's observations can inform consideration of benefits accruing from the tree.

Through the provision of a comprehensive range of values[1], QTRA enables the tree assessor to evaluate and quantify the risk from tree failure in three key stages. (1) to value property and land-use in terms of both vulnerability to impact and likelihood of occupation, (2) to consider the relative severity of impact, taking account of the size category of the tree or branch etc. concerned, (3) to quantify within broad bands, the assessor's estimate of the probability that the tree or branch will fail within the coming year. By multiplying these values the assessor can calculate an annualised[2] risk of harm from a particular hazard. This risk is considered against broadly acceptable and tolerated levels of risk and the risks from different hazards can be ranked and compared.

Taking a Proportionate Approach

The risks from tree failure are usually very low and high risks will most commonly be encountered in areas either with high levels of human occupation or

[1] See tables 1, 2, 3 & 4.

[2] The inputs to the calculation are considered over the coming year, therefore the risk of harm relates to the same timeframe.

with valuable property. In areas of low human occupation and low property value, the assessment of risks from trees may be unnecessary beyond valuing or categorising land-use. Even when land-use indicates that the assessment of trees is appropriate, it is seldom proportionate to calculate the risk for each tree in a population. Often, all that is required is a brief but particular consideration of the trees to identify gross characteristics of structural weakness or declining health.

QTRA enables a range of approaches from the broad risk assessment of large collections of trees to the detailed assessment of each tree where land-use and the character of the trees dictate. QTRA risk calculations for groups of trees are based on the highest risk tree and if the risk from that tree is tolerable, it follows that risks from the remaining trees will also be tolerable and further calculations are unnecessary.

2. DEFINITION OF TERMS

Risk

Risk is the combination of the probability of an event and its consequence (ISO 2009).

In terms of assessing risks from falling trees and branches, the commonly quoted equation 'risk = likelihood x consequence' is appropriate; e.g. risk is the product of (1) the likelihood that the tree will fail in the coming year, (2) the likelihood of the target being occupied, and (3) the magnitude of the expected consequence.

Risk of Harm

The QTRA output is termed the 'risk of harm' and is a combined measure of the likelihood and the consequence of tree failure considered in terms of the loss, within the coming year, of a human life, something of comparable value or a proportion thereof.

ALARP (As Low As Reasonably Practicable)

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

Cost and Benefit

Trees confer many benefits on people and the wider environment. Trees are essential to our well-being and enhance both built and natural environments. It is reasonable to assume that removal of all risks from trees would have disastrous consequences for the quality of life and our environment. When managing the risk from falling trees, as with 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 (HSE. 2001). 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.

Acceptable and Tolerable Risks

People are constantly exposed to and accept varying degrees of risk. 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, air bags, and crash barriers, there is still a significant risk of death. This is an everyday risk that is taken for granted and accepted by millions of people in return for the benefits of convenient travel.

The 'Tolerability of Risk Framework' (ToR) (HSE 2001), which is represented graphically in Figure 1 considers a range of risk, with at one end the risk being 'broadly acceptable' – where there is no need to consider further risk reduction – and at the other end the risk is 'unacceptable' and not to be tolerated. However, when a risk is of such a magnitude that it is no longer broadly acceptable, it may still be tolerated if it is ALARP. In other words, the risk may be tolerable if the cost of further reducing it is grossly disproportionate to the benefit of risk reduction. Both 'tolerability' and 'gross disproportion' are concerned with whether or not the benefits of risk control are sufficient to justify the cost of the control.

In terms of its general application, the Tolerability of Risk Framework can be summarised as having (1) a 'broadly acceptable region' where the upper limit is an annualised risk of death 1/1 000 000, (2) an 'unacceptable region' of which the lower limit is 1/1 000, and between these (3) a necessarily wide 'tolerable region' within which the tolerability of a

risk will be dependent upon the costs and benefits of further risk reduction.

In respect of trees, many risks cross the broadly acceptable 1/1 000 000 boundary, but remain tolerable 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.

The UK Health and Safety Executive (HSE 2001) suggests that "***an individual risk of death of one in a thousand per annum should on its own represent the dividing line between what could be just tolerable for any substantial category of workers for any large part of a working life, and what is unacceptable for any but fairly exceptional groups. For members of the public who have a risk imposed on them 'in the wider interest of society' this limit is judged to be an order of magnitude lower – at 1 in 10 000 per annum.***" Furthermore, ***"HSE believes that an individual risk of death of one in a million per annum for both workers and the public corresponds to a very low level of risk and should be used as a guideline for the boundary between the broadly acceptable and tolerable regions."***(ibid).

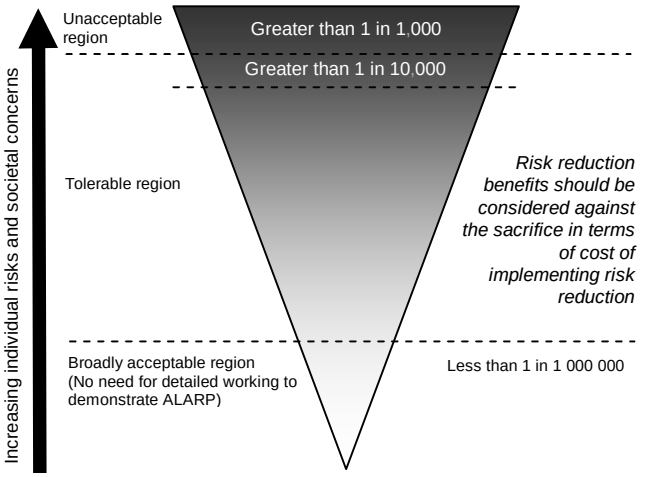

Figure 1. Adapted from the Tolerability of Risk framework (HSE 2001)

Value of Statistical Life

In QTRA, placing a statistical value on a human life has two particular benefits. Firstly, the 'value of statistical life' (VOSL), as a widely applied risk management device, uses the notional value of a hypothetical individual life to guide the proportionate allocation of resources to risk reduction. In the UK, this value is currently in the region of £1 000 000 - £1 500 000. ***"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). Secondly, the QTRA method utilises VOSL to equate the value of damage to property with the value of life e.g. where a life has a statistical value of £1 000 000, a building with a replacement cost of £10 000 is valued at 0.01 (1/100) of a life, which allows comparison of the risks to people and property.

Internationally, there is wide variation in VOSL and its computation. In QTRA, the value of £1 000 000 is currently applied both to provide a consistent basis for comparing the loss of life with the loss of property and to equate the costs and benefits of risk reduction. To provide consistency in QTRA outputs VOSL should be applied consistently across international boundaries.

Target

In the context of tree-failure risk assessment, a target is anything of value that could be harmed in the event of tree failure.

3. 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. As individuals, we are concerned mostly with the risks to ourselves and those close to us, but as shared risks that are imposed upon the wider community become elevated, societal concern – through regulatory control or common law duties - will usually require the implementation of risk controls.

Although QTRA outputs might occasionally relate to the individual, this is seldom the case. More often in QTRA, calculation of the risk of harm is based on the total time that the target area is occupied – i.e. how many people per hour or how many vehicles per day – without attempting to identify how many different individuals 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 when formulating management decisions. On the one hand, the benefits associated with the risk may be enjoyed by the wider community, but not by those exposed to the risk and on the other, an

exposed person might explicitly accept an elevated risk in return for particular benefits.

4. THE QTRA METHOD

When applying the QTRA method, the assessor quantifies, as probabilities, the three components of the tree failure risk: 1) Target, 2) Impact Potential (size), and 3) Probability of Failure within the coming year. The quantifications are applied in broad ranges of value[3] and calculated using the upper value for each range, which are multiplied and their product is the annualised 'risk of harm'. To simplify the assessment process, the ranges, or bands, are applied on the basis of their upper values, but where the risk of harm approaches an actionable threshold the assessment can be considered in more detail before proposing control measures.

Target Evaluation

Frequent assessment of trees and of associated risks may be essential in areas of high public access where trees are within striking range of people or valuable property that is susceptible to damage. Conversely, in locations without valuable property and having very low human access, the survey and assessment of trees for safety is unlikely to be necessary. Therefore, the nature of the target beneath or adjacent to a tree will usually dictate the level of risk assessment that is required.

In the initial assessment of targets, six ranges of value are used. Table 1 sets out these values 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 a pedestrian will spend, on average, five seconds walking beneath the average tree. For example, ten pedestrians per day each occupying the target for five seconds is a daily occupation of fifty seconds, by which 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 structure, 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).

[3] See tables 1, 3 & 4.

The target will ordinarily be recorded in the QTRA as a range (1 - 6, Table 1). When the assessor identifies an elevated risk, the target can be more accurately calculated and recorded.

Often the nature of a structural weakness in a tree is such that the probability of failure is greatest during windy weather, whilst the probability of the site being occupied by people during such weather conditions is often considerably reduced; this particularly applies in woodlands, parks and private gardens. To account for the influence of weather on the risk from tree failure, the occupation by people is considered specifically in relation to weather conditions. 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 significantly increase, what will be the likely level of human occupation?' Taking this approach, rather than valuing the average usage, ensures that the assessor considers the multi-faceted relationship between weather, people and trees, and the sentient nature of the average person with their ability to recognise and avoid unnecessary risks.

A target can be constantly occupied by more than one person and it is necessary to consider the probability of multiple occupancy. For example, if it is projected that the average over a one-year period will be constant occupation by 10 people, the risk of harm in relation to one person constantly occupying the target is calculated before going on to identify that the average occupation is 10 people. This is expressed as target 1(10T)/1, where 10T represents the number of people or vehicles constantly occupying the target. In respect of monetary value of property, this would be equivalent to a risk of losing £10 000 000 as opposed to £1 000 000.

Vehicles on the Highway

In the case of vehicles, probability 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. 'Stopping distances' and an average vehicle length are used in the calculation of vehicle occupation of highways. The probability of a vehicle occupying any particular point in the road is the ratio of the time a point in the road is occupied by vehicles - including a safe stopping distance - to the total time in a day. 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-failure impacts and in particular, frontal collisions, QTRA values the substantially protected 1.6 average occupants summed with the average vehicle value as equivalent to one exposed human life.

Property

When assessing risks in relation to buildings, the target might be the building or the occupants and the building. It is necessary for the assessor to consider whether occupants of a building are either protected from harm by the structure or substantially exposed to the impact from a falling tree.

When evaluating the exposure of property to tree failure, it is necessary to estimate approximately the cost of repair or replacement that might result from failure of the tree as represented in Table 1.

As previously described, the ranges of monetary value for property used in Table 1 are based on the assumption that, for the purpose of the risk assessment, the loss of £1 000 000 is equivalent to the loss of a life. For example, target range 2 represents a probability of human occupation up to 1/20 (£1 000 000 ÷ 20 = £50 000). Therefore, a likely property repair cost of £50 000, which is one-twentieth the value of VOSL, is apportioned 1/20 in the QTRA.

On 1st January each year, Quantified Tree Risk Assessment Ltd. provides users of the method with monetary conversion rates that enable application of the method internationally.

Table 1. 'Target' ranges for property, pedestrians and vehicles.

Target Range	Property (repair or replacement costs)	Pedestrian Frequency	Vehicular Frequency examples	Probability (of occupation or fraction of value of £1 000 000)
1	>£50 000 - £1 000 000	>36 per hour - constant	26 102 vehicles @ 110kph (68mph) 32 359 vehicles @ 80kph (50mph) 46 702 vehicles @ 50kph (32mph)	1/1
2	>£14 000 - £50 000	>10 per hour - 36 per hour	1 305 vehicles @ 110kph (68mph) 1 617 vehicles @ 80kph (50mph) 2 335 vehicles @ 50kph (32mph)	1/20
3	>£1 400 - £14 000	>1 per hour - 10 per hour	363 vehicles @ 110kph (68mph) 449 vehicles @ 80kph (50mph) 649 vehicles @ 50kph (32mph)	1/72
4	>£60 - £1 400	>1 per day - 1 per hour	36 vehicles @ 110kph (68mph) 45 vehicles @ 80kph (50mph) 65 vehicles @ 50kph (32mph)	1/720
5	>£10 - £60	> 1 per week - 1 per day	2 vehicles @ 110kph (68mph) 2 vehicles @ 80kph (50mph) 3 vehicles @ 50kph (32mph)	1/17 280
6	≤ £10	≤ 1 per week	None	1/120 960

Vehicular, pedestrian and property targets are categorised by their frequency of use or their monetary value. For example, the probability of a vehicle or pedestrian occupying a target area in 'target' range 4 is between the lower and upper limits of >1/17 280 and 1/720. E.g. using the 'value of statistical life' of £1 000 000 the property repair or replacement value for 'target' range 4 is >£60 - £1,400.

Vehicular frequency examples for 'target' range 1 are calculated on the basis of the stopping distance for a given road speed providing a duration of occupation for the average vehicle on that road. The total time in a day is divided by the duration of occupation with the quotient being the number of vehicles per day required to produce constant occupation. All other 'target' ranges are calculated as a proportion of the 'target' range 1 value

Impact Potential

A small dead branch of less than 10mm diameter is unlikely to cause significant harm even in the case of direct contact with a target, whilst on average 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 increased potential for harm in relation to the size of tree or branch is proportional to a degree but this is by no means a linear relationship and there is a limit to the severity of harm in relation to the force upon impact by a tree.

The QTRA method categorises 'Impact Potential' by the diameter of tree stems and branches. A biomass equation derived from weight measurements of trees of different stem diameters is used to produce a data set (Table 2) of comparative weights of trees and branches ranging from 10 to 600mm diameter.

A diameter of 600mm has been selected to represent upper limit of size in the QTRA calculation. This threshold provides a baseline for the comparative valuation of potential impacts from trees. The increased potential for harm from trees larger than 600mm diameter is not considered in terms of increased force upon impact, but might be considered in relation to the increased target area that could be affected by a larger tree.

The 'impact potential' values are grouped into five ranges of size (Table 3).

Occasionally, an assessor will take the view that the reduction in mass arising from dieback and degradation of a tree or branch is significant in the risk assessment and will discount the Impact Potential component by applying a 'reduced mass' value. If the mass of a branch is considered to be half that of a live branch of the same diameter, a reduced mass of 1/2 might be applied, reducing the 'impact potential' and thereby the overall risk of harm by half. This consideration might be on the basis that the branch is lighter as a result of degradation (lesser force on impact) or is reduced in size (smaller area of impact), and while the latter could be considered by adjusting the target value, this would usually require a disproportionate amount of time in revaluing the target.

Table 2. Biomass weight estimates.

Dbh (mm)	Weight (kg) $y=ax^b$	Fraction of weight as a ratio
10	0. 11263	1/23 505.722
25	1. 0713	1/2 471.6699
50	5. 8876	1/449.74
100	32. 357	1/81.834
150	87. 67	1/30.203
200	177. 82	1/14.891
250	307. 77	1/8.604
300	481. 81	1/5.496
350	703. 8	1/3.762
400	977. 26	1/2.71
450	1 305. 5	1/2.03
500	1 691. 4	1/1.566
550	2 138	1/1.24
600	2 647	1/1

Source. Tritton & Hornbeck (1982)x=dbh (cm); y=dry weight estimate; a=allometric coefficient 0.1126294414; b= allometric coefficient 2.458309949

Table 3. Impact Potential.

Impact potential range	Size of part likely to impact the target	Impact Potential
1	> 450mm (18") dia.	1/1
2	> 250mm (10") dia.- 450mm (18") dia.	1/2
3	>100mm (4") dia.- 250mm (10") dia.	1/8.6
4	> 25mm (1") dia.- 100mm (4") dia.	1/82
5	10mm ($^2/_5$") dia.- 25mm (1") dia.	1/2 500

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

Probability of Failure

The Probability of Failure component has seven ranges, each representing a range of probability of tree or branch failure occurring within the coming year, and calculated from the upper value of that range. Probability of failure is recorded in the QTRA assessment as the upper limit of a range (1 – 7, Table 4).

Table 4. Probability of Failure.

Probability of failure range	Probability
1	≤1/1
2	≤1/10
3	≤1/100
4	≤1/1 000
5	≤1/10 000
6	≤1/100 000
7	≤1/1 000 000

The probability that the tree or selected tree-part will fail within a year.

The QTRA Calculation

The product of the three component values is the annualised 'Risk of Harm', which is expressed as a probability and rounded, to one significant figure.

Below are two examples of QTRA calculations.

Example 1.

	Target		Impact Potential		Probability of Failure		Risk of Harm
Range	6		1		3		
Probability	1/120,960	x	1/1	x	1/100	=	1/10 000 000

Example 1 is the assessment of a large, very unstable tree with a probability of failure of 1/100 for the coming year situated in a low use recreational area. The target is a footpath with less than one pedestrian passing the tree each day and falls within target range six.

Example 2.

	Target		Impact Potential		Probability of Failure		Risk of Harm
Range	1		2		5		
Probability	1(5T)/1	x	1/1	x	1/10 000	=	1(5T)/10 000

In example 2, a large defective branch overhangs a busy urban high street that is on average occupied constantly by five people and here multiple target occupation is considered.

The risk of harm 1(5T)/10 000, having an occupancy of five people, has a fivefold increase in the magnitude of consequence and is therefore equivalent to a risk of harm 1/2 000 and would ordinarily require risk control.

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 a risk can be assessed within broad ranges where this is sufficient and with greater rigour when required.

Where the input values are broadly estimated, the proposed risk thresholds should be applied cautiously. Where the manager is reasonably confident in the input values, the thresholds can be more rigorously applied. An example of this would be where, based on an initial brief assessment, a recreational woodland target is estimated to be within range 5 (up to one person passing each day). As a result, no tree in the woodland can achieve a 'risk of harm' exceeding 1/20 000. This is because even with a large unstable tree the 'general limit of tolerability' of 1/10 000 is not exceeded (target 1/17 280 x impact potential 1/1 x probability of failure 1/1 = 1/20 000). If the occupancy is based on accurate historical data their detailed assessment unlikely to be necessary for safety purposes. However, in order to make a decision not to assess the trees, it would be necessary to be reasonably confident that the target valuation is either based on accurate data or an over estimate. If the landowner had estimated an occupation of one person every two or three days, one could be reasonably confident that there was no need to assess the trees because range 5 values the target at one person a day. Conversely, where the occupancy might be as high as two or three people a day, then it could be appropriate to monitor and measure occupation more accurately.

5. MAKING RISK MANAGEMENT DECISIONS

Applying the ToR Framework to QTRA Outputs

It is proposed that, in applying ToR to the outputs of QTRA, an annualised risk of harm 1/1 000 000 is the 'broadly acceptable limit', below which the risk is already ALARP. A risk of significant harm, 1/10 000 is the 'general limit of tolerability' and 1/1 000 is the 'extraordinary limit of tolerability'.

Between the 'broadly acceptable limit' (1/1 000 000) and the 'extraordinary limit of tolerability' (1/1 000) is the 'tolerable region of ToR. Where a risk falls within this region, it is necessary to consider whether it is ALARP. Here, management decisions are informed by consideration of the costs of risk control, including the nature and extent of benefits that would be lost to risk control measures. The assessor might consider the costs of risk control when providing options for management, but the tree manager, who owns the risk and exercises control over the costs, will consider the balance and make the final decision.

Considering Benefits from Trees

When implementing risk reduction there will usually be a financial cost. In this regard and even without considering the non-monetary costs, VOSL can be used to evaluate the proportionality of a risk control. Using a VOSL of £1 000 000, it can be established that a reduction in the risk of death from 1/10 000 to 1/1 000 000 – from the 'general limit of tolerability' to 'broadly acceptable' - has a value of £100 per year. Example 3 puts this evaluation into a tree management context where the benefit in terms of risk reduction can be considered against the financial cost.

Example 3.

	Target		Impact Potential		Probability of Failure		Risk of Harm
Range	3		3		3		
Probability	1/72	x	1/8.6	x	1/100	=	1/60 000

In example 3, a large defective branch (impact potential range 3) overhangs a country road along which travel on average five hundred vehicles each day at an average speed of 30 mph (target range 3). The branch has a compromised attachment to the tree and is assessed as having a probability of failure for the coming year of between 1/1 000 and 1/100. The risk of harm is calculated as 1/60 000 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 roughly estimated at £250. To establish whether this is a reasonable cost of risk control, the following equation is applied. £1 000 000 x 1/60 000 = £16.66 indicating that the projected cost of £250 would, even if allocated over ten years, probably be grossly disproportionate to the risk when considered in addition to the tree-related benefits that will be lost and the risks to tree workers from implementing the risk control measure.

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 the 'general limit of acceptability' of 1/10 000 would be deemed tolerable. These thresholds and costs, against which risk reduction is balanced, can be informed by the risk assessor but must be selected by or agreed with the owner or manager of the risk.

Summary of QTRA Risk Thresholds

1. Broadly Acceptable: 1/1 000 000 – below which the risk is already ALARP.
2. Tolerable Region: between 1/1 000 000 and 1/1 000 – risks will be considered in order to determine whether they are ALARP and the costs of both expenditure and lost benefits will be balanced against the benefits of risk reduction.
3. General Limit of Tolerability: 1/10 000 – the limit of tolerability for the imposition of a risk upon others. This limit will usually be tolerable if the risk manager considers that tree confers not necessarily a special benefit, but a reasonable level of benefit that might ordinarily be expected from a tree of its type and age.
4. Extraordinary Limit of Tolerability: 1/1 000 – The upper limit of risk tolerance, which might be applied in exceptional circumstances where particularly special benefits would be lost to risk control measures. Management decisions to retain trees that are assessed as being between 1/10 000 and 1/1 000 would ordinarily require broad stakeholder support.

A tree owner may choose to operate to a higher or lower 'general limit of tolerability' than the proposed 1/10 000, but whatever level is chosen, the precision with which limits are applied should reflect the manager's confidence in the risk assessment outputs.

International Versions

As with previous versions, monetary values in this practice note will be adapted for use in all countries where there are QTRA users. Currency specific versions will be available at www.qtra.co.uk from 1 September 2012.

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Revisions

Revision 4.02 (September 2011). Modified layout.
Revision 4.03 (August 2012). Modified probability of failure component. Table 6 and examples updated. Outputs modified to one significant figure. Comma separators removed from numerical values. References updated.

APPENDIX CW 6

Health and Safety Executive

Management of the risk from falling trees

SIM 01/2007/05

Target Audience:

FOD Inspectors
Local Authority Enforcement Officers

Date issued: 2007-07-03	**OG Status:** Fully open
Review date: 2011-07-03	**Author Unit/Section:** Agriculture & Food Sector (Agricultural Safety Section)

Summary

This SIM outlines guidance on the standard of risk management of trees, including risk assessment and where appropriate, routine checks by a competent person. Duty holders should have such systems in place to control risks from trees to their employees, contractors and members of the public. This SIM is aimed specifically at duties under Section 3 HSW Act and should be read in conjunction with HSC's Enforcement Policy Statement, HSC policy on Section 3 enforcement and HSE's guidance on Section 3 enforcement. It also gives guidance on enforcement action, which should be taken in accordance with the principles and expectations of HSC's Enforcement Policy Statement (EPS). It is **not** intended as a guide to duty holders.

Background

What is the risk?

1 Each year between 5 and 6 people in the UK are killed when trees fall on them. Thus the risk of being struck and killed by a tree falling is extremely low. Around 3 people are killed each year by trees in public spaces; but as almost the entire population of the UK is exposed, the risk per person is about one in 20 million. The risk, per tree, of causing fatality is of the order of one in 150 million for all trees in Britain or one in 10 million for those trees in, or adjacent to areas of high public use. However the low level of overall risk may not be perceived in this way by the public, particularly following an incident.

2 The average risk is firmly in the "broadly acceptable" region of the tolerability of risk triangle published in HSE's "Reducing Risks Protecting People". However, "Reducing Risks, Protecting People" explicitly states that "broadly acceptable" is a general guide and not a definitive statement of what is reasonably practicable in law.

What is required?

3 Employers, persons carrying out undertakings or in control of premises all have duties under the HSW Act. In particular, there is the duty to do all that is reasonably practicable to ensure that people are not exposed to risk to their health and safety. Doing all that is reasonably practicable does **not** mean that all trees have to be individually examined on a regular basis. A decision has to be taken on what is reasonable in the circumstances and this will include consideration of the risks to which people may be exposed. The issues that need to be included in the risk assessment are discussed in paragraph 10.

4 Around half of all fatalities due to falling trees occur in public spaces, such as a park or beside roads, so Section 3 HSW Act may be applicable. Whilst HSE may regard the

average risk as extremely low, the law requires that where reasonably practicable measures are available in individual cases they should be taken. Whilst the risk of such incidents puts them outside HSE's and LAs main proactive priorities, inspectors may be called upon to investigate serious incidents, including fatalities.

Other legislation

5 In addition to duties under the HSWA there are a number of reasons why LAs (as duty holders) and others may want to manage their tree stocks, for example responsibilities under other legislation and the risk of civil liabilities to:

- reduce the risk of property damage from subsidence;
- maintain stocks to preserve their amenity, conservation, and environmental value;
- prevent personal injury through trips and falls on footways disturbed by tree roots; and
- prevent vehicle damage and personal injury from obscured sightlines on the highway.

For these and other reasons, some duty holders may undertake inspection of trees in a manner well beyond the reasonably practicable requirements of the HSW Act.

6 Other legislation relevant to the management of trees includes, for example the Occupiers' Liability Acts 1957 and 1984, Occupiers Liability Act (Scotland)1960, Land Reform (Scotland) 2003, the Countryside and Rights of Way Act 2000(CRoW), the Wildlife and Countryside Act 1981 as well as legislation relating to Sites of Special Scientific Interest, planning issues and Tree Preservation Orders.

Suggested approach

7 This SIM provides guidance on handling these issues and approaching enforcement decisions for HSE Inspectors and LA Enforcement Officers. Stakeholders, including LAs (as duty holders), major landowners and arboriculturists are being encouraged to agree a simple tree management standard. Given the large number of trees in public spaces across the country, control measures that involve inspecting and recording every tree would appear to be grossly disproportionate to the risk. Individual tree inspection should only be necessary in specific circumstances, for example where a particular tree is in a place frequently visited by the public, has been identified as having structural faults that are likely to make it unstable, but a decision has been made to retain it with these faults.

8 HSE believes that public safety aspects can be addressed as part of the approach to managing tree health and tree owners should be encouraged to consider public safety as part of their overall approach to tree management. A sensible approach will ensure the maintenance of a healthy tree stock, the sound management of the environment and will usually satisfy health and safety requirements.

9 There are several approaches to managing the risks from trees that involve 'zoning' trees according to the risk of them falling and causing serious injury or death. Zoning approaches have been adopted by a number of large land owners and can be an effective approach. The complexity of zoning systems varies considerably, some involving as many as 12 different levels. Given the relatively low risk, some will involve a level of sacrifice

(time, trouble and money) that not only meets, but goes beyond reasonable practicability, as required by HSWA s3.

10 An effective system for managing trees should meet the requirements set out in the Management of Health and Safety at Work Regulations 1999 and the associated ACoP (guidance is contained in HSG 65 Successful health and safety management and INDG 163 Five steps to risk assessment) and is likely to address the following:

i. An overall assessment of risks from trees, particularly identifying groups of trees by their position and degree of public access. This will enable the risks associated with tree stocks to be prioritised, and help identify any checks or inspections needed. As a minimum, trees should be divided into two zones: one zone where there is frequent public access to trees (e.g. in and around picnic areas, schools, children's playgrounds, popular foot paths, car parks, or at the side of busy roads); and a second zone where trees are not subject to frequent public access. As a rough guide 'trees subject to frequent public access' are those that are closely approached by many people every day. Maps may be useful here as individual records for individual trees are unlikely to be necessary if zones and the trees in the zones are clearly defined.

ii. For trees in a frequently visited zone, a system for periodic, proactive checks is appropriate. This should involve a quick visual check for obvious signs that a tree is likely to be unstable and be carried out by a person with a working knowledge of trees and their defects, but who need not be an arboricultural specialist. Informing staff who work in parks or highways as to what to look for would normally suffice. Duty holders should ensure that any system that is put in place for managing tree safety is properly applied and monitored.

iii. A short record of when an area or zone or occasionally an individual tree has been checked or inspected with details of any defects found and action taken.

iv. A system for obtaining specialist assistance / remedial action when a check reveals defects outwith the experience and knowledge of the person carrying out the check.

v. A system to enable people to report damage to trees, such as vehicle collisions, and to trigger checks following potentially damaging activities such as work by the utilities in the vicinity of trees or severe gales.

vi. Occasionally a duty holder may have responsibility for trees that have serious structural faults but which they decide to retain. Where such a condition is suspected and the tree also poses a potentially serious risk because, for example its proximity to an area of high public use, a specific assessment for that tree and specific management measures, are likely to be appropriate.

vii. Once a tree has been identified by a check to have a structural fault that presents an elevated risk, action should be planned and taken to manage the risk. Any arboricultural work required should be carried out by a competent arboriculturist, as such work tends to present a relatively high risk to the workers involved. Duty

holders should **not** be encouraged to fell or prune trees unnecessarily.

viii. Inspection of individual trees will only be necessary where a tree is in, or adjacent to, an area of high public use, has structural faults that are likely to make it unstable and a decision has been made to retain the tree with these faults.

ix. Monitoring to ensure that the arrangements are implemented in practice.

Enforcement guidance

11 Enforcement action may be appropriate following an incident or investigation of a complaint and should be in accordance with HSC's EPS and with HSE's Enforcement Management Model (EMM). In particular, consideration should be given as to how far the duty holder fell below what could reasonably be expected in the circumstances. This should be informed by the broad approach outlined above and factors such as:

i. the frequency of public access to the tree;

ii. the existence of a system for managing trees based on the level of risk;

iii. the implementation of the system in practice, including a procedure to act on reports of structural faults;

iv. the need to comply with other legislation e.g. the Wildlife and Countryside Act, Tree Preservation Orders etc. Such legislation generally allows that trees in a dangerous condition may be felled, however a specific check should be made before considering enforcement action.

12 Consideration should also be given to the risks to persons that arise from the failings of the duty holder, along with the factors set down in paragraph 39 of the EPS. Of particular relevance will be any history of previous incidents in the area managed by the duty holder and any previous advice or enforcement in relation to the duty holder.

13 For the purposes of the EMM, the guidance in this SIM should be 'established' guidance. The benchmark, based on duties under HSW Act is a 'remote' risk of 'serious personal injury.

14 Inspectors should seek advice from either the Agriculture and Food Sector or the Central and Local Government, Education and Research Sector as appropriate before issuing an improvement notice or considering prosecution

Action by inspectors

15 When called upon to examine standards of tree management following an incident or if they identify a matter of evident concern during a visit, inspectors should base their approach in deciding whether to investigate on HSC's general guidance on Section 3 HSW Act and HSE's operational guidance on Section 3 enforcement as well as the additional advice and guidance in this SIM. Proactive inspection of duty holders' systems for tree management is **not** envisaged. Any enforcement action should be taken in accordance

with HSC's EPS.

16 A good deal of relevant guidance is produced by various organisations, including the Arboricultural Association and Forestry Commission. Their guidance provides advice to help duty holders comply with the Occupiers Liability Acts and other legislation. It is also likely to be helpful to investigating inspectors, however it should be remembered that it represents **best practice** guidance for managing trees, not the minimum standard required by Section 3 HSW Act outlined above.

Further information and contacts

Arboricultural Association, Ampfield house, Romsey, Hampshire, SO51 9PA Tel 01794 368717 Fax 01794 368 978, email admin@trees.org.uk. Website Information available includes Tree Surveys**:** A guide to good practice Arboricultural Association Guidance Note 7

Forestry Commission website where you can down load best practice guidance, including "Hazards from trees – a general guide".

"Managing Visitor Safety in the Countryside – principles and practice" produced by the Visitor Safety in the Countryside Group.