

Quantified Tree Risk Assessment

Compiled by: J Urwin

15th August 2019



Commissioned by D Childerhouse

On behalf of
Great Hockham Parish Council

Refs. GHC/THA/19819

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1 Introduction

Instruction and brief

- 1.1 Ravencroft Tree Services Ltd. has been instructed by D Childerhouse of Great Hockham Parish Council, to undertake an inspection of trees and provide a risk assessment of the same for the village green and The Paddocks at Great Hockham.
- 1.2 This appraisal aims to evaluate any existing and potential tree hazards and specify works to mitigate any risk of harm to persons or property using the Quantified Tree Risk Assessment (QTRA) system.
- 1.3 The assessment of tree risk takes into consideration the social, environmental and economic benefits which the trees provide to the site and surrounding area.

Limitations

- 1.4 The collection of all tree survey data was undertaken from ground level without detailed invasive inspection of individual trees, trunks, buttresses or root flares; the disclosure of hidden defects cannot therefore be expected. Were more detailed assessments using invasive equipment required, recommendations would have been set out in the survey schedules. Height, spread and other dimensions were estimated unless otherwise stated.
- 1.5 This report is confidential to the client and their professional advisers. No liability is accepted for its contents to any other than our client.
- 1.6 This report and its recommendations relate specifically to the condition of the trees on the day that the inspection was carried out. They are necessarily invalid if development or construction works of any type (including any changes to soil levels or excavations carried out on the land subject to this survey) are undertaken on or close to trees other than those recommended herein, or in the event of abnormal weather conditions generating new defects or exacerbating existing ones.
- 1.7 Trees are dynamic living organisms and failures a part of their natural processes. Even healthy trees or their parts may fail, particularly - although not exclusively - as a result of strong winds or violent storms. Occasionally, yet with ever greater frequency, extreme weather systems occur bringing with them an unusual degree of tree damage. Clearly, Ravencroft Tree Services Ltd. cannot be held liable for the consequences of any such events or similarly unpredictable failures.

- 1.8 Assessment of the potential effects of trees on buildings or other structures resulting from the trees' abstraction of water from shrinkable load-bearing soils was not included in our instruction and is not considered here.
- 1.9 The trees may be subject to conservation area or Tree Preservation Order protection. If so, prior to any works being instructed or undertaken, the council's tree officer must be informed to verify all proposed works are in compliance with all applicable regulations. Please note that the council requires 6 weeks notification of proposed tree works within conservation areas, in accordance with section 211 of the Town and Country Planning Act (1990). Where trees are protected by a Tree Preservation Order, an application for works will be required to ensure adherence to the stipulations of this same Act. Trees identified by our inspection as being dead or dangerous *may* be exempt from the Act, requiring only five days notification to the council's tree officer before commencement of works.
- 1.10 This report is based on findings from the site survey, tree observations and any information provided. Conclusions have been formed in the light of the author's professional qualifications and experience in arboriculture.

Documents received

- 1.11 No documents were received prior to the survey being undertaken.

2 Inspection method

Consideration of risk

- 2.1 Under the Quantified Tree Risk Assessment system the ‘targets’ (people and property) onto which trees could fail are assessed and quantified, thus enabling the arboriculturist to determine whether or not and to what degree of rigour an inspection of any tree is required.

Tree plotting and identification

- 2.2 Any trees recorded were mapped during inspection to a level of detail sufficient to enable distinction and position. Subsequent individual numbering may not reflect any previous documentation. Individual trees were tagged where applicable at an appropriate place on the stem with aluminium tags. Tag numbering forms the basis of the identification system used in the survey schedule. It cannot be guaranteed that this numbering is sequential.
- 2.3 Trees may have been grouped where individual numbering was neither feasible nor useful. These trees typically share a taxonomic or spatial connection. Marked individuals may remain as part of the group in which they are located for the purposes of reference, but they may have received a different work priority or re-inspection interval.

Quantified Tree Risk Assessment

- 2.4 After the mapping of target areas the surveyor will have walked the site, not necessarily with the intention of inspecting or surveying each tree or of viewing all parts or all sides of every tree but to take a general overview of trees and look for signs of substantial defects which might be significant in relation to the targets. Only these would then be recorded.
- 2.5 The level of detail with which trees were assessed was guided by the target appraisal. This involved assessing the trees on approach before undertaking a closer inspection in line with recognised Visual Tree Assessment principles and may have involved the use of binoculars, probe or mallet. Where necessary, the tree or branch was then considered in terms of both size and probability of failure. Values derived from the assessment of these three components (target range, size and probability of failure) were combined to calculate the risk of that harm occurring. This risk of harm for all combinations of target, size and probability of failure ranges has been calculated using Monte Carlo simulations*. The QTRA risk of harm is the mean value from each set of Monte Carlo results.

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

- 2.6 This assessment was based on average occupancy of any area over a 24 hour period throughout one year. Judgements on levels of occupancy were based on observations made on site such as desire lines, compaction etc., if no other information was available.
- 2.7 Once these calculations to assess the risk of harm were completed, remedial works were specified which should reduce that risk to more tolerable levels. For the purposes of this survey, a tolerable risk of harm (where that risk is imposed on an unwitting general public and is judged to be **as low as reasonably practicable** [ALARP]) is set at <1 in 10 thousand to 1 in 1 million, in keeping with industry and HSE guidelines. Risks less than 1 in 1M have been judged to be broadly acceptable.
- 2.8 These works were subsequently assigned a work priority based on their risk of harm, ensuring that the most significant risks are to be reduced first. Tree hazards that are found to present a more acceptable risk were given a lower priority. Implementation of works recommended remains at the discretion of the site manager.

For context, works priority ratings are assessed as follows:-

Risk of harm	Works priority	Degree of urgency	To be completed~
>1 in 1k	1 Unacceptable risk of harm	Requiring immediate action *	within 7 days or as advised
<1 in 1k to 1 in 10k	2 Significant risk of harm	Requiring swift action	within 2 months
<1 in 10k to 1 in 60k	3 Tolerable risk of harm	Important management	within 6 months
<1 in 60k to 1 in 1M	4 Tolerable to broadly acceptable	General management, as budget allows **	within 9 months
<1 in 1M	5 Broadly acceptable		as recommended

* notification of these trees would have been given directly to the person instructing this report on the day the survey was carried out. This date is to be found on the cover page of this report.

Recommended works in priorities 1 & 2 may be deemed to be required in order to discharge the duty of care owed by tree owners to the general public and other users of their land under the Occupier's Liability Act 1984. Recommended works in priority 3 & 4 may be judged necessary to ensure the risks are ALARP.

**These categories exist to inform of potential defects which may worsen over time. As the risks decrease to the broadly acceptable threshold of 1 in 1M they may only require demonstration that the risks are ALARP, i.e. they are at a point where the cost of mitigatory work disproportionately outweighs an insignificant risk. The categories are a guide for what in reality is a sliding scale. For example, a risk of harm at the upper end of work priority 3 may be treated similarly to those at the lower end of priority 2.

- 2.9 Contained within the schedule are some of the general management recommendations considered by the surveyor significant enough to be worthy of mention. These recommendations cannot be expected to be exhaustive. Whilst of lower priority at present, if these works were to be carried out before the next survey due date, consequently greater expenses may be avoided. It may also be considered prudent to undertake these works proactively as funds become available, to minimise the urgency and expense of remedial works. In addition to reducing risks associated with tree failure, general management of tree stocks, carried out to British Standard 3998:2010 Tree work - Recommendations, may improve the structural form of trees, increasing their aesthetic value and prolonging their use for shading, wildlife and air cooling.

3 Future management

Survey frequency

- 3.1 A walkover assessment of trees is recommended to be repeated every 18 months, unless any identifiable problems or noticeable defects appear, in which case professional arboricultural advice should be sought. It may also be beneficial to inspect the trees in late summer or early autumn when the majority of fungus fruit bodies are to be found.

Planting

- 3.2 Opportunities exist on these sites to increase diversity by planting a wider variety of trees and plants which will in turn encourage a more complete native ecosystem capable of co-existence with their environment. In order to maintain an ongoing tree stock, we recommend planting wherever possible. Whether a native species to encourage wildlife, or more unusual species to make an impact; a smaller tree as a focal point or a larger specimen as an architectural statement, we would be pleased to offer advice on selection, planting and aftercare, this latter being perhaps the most important part of the process.
- 3.3 In order to safeguard the sustainability of the tree population on site, planting and establishment works may be given precedence over - without replacing - the lowest priority tree works, when assigning budgets.

4 Site summary

Site visit

- 4.1 Jonathan Urwin, arboriculturist for Ravencroft Tree Services Ltd., undertook data collection and the assessment of the trees at Great Hockham during a visit on 15th August 2019.

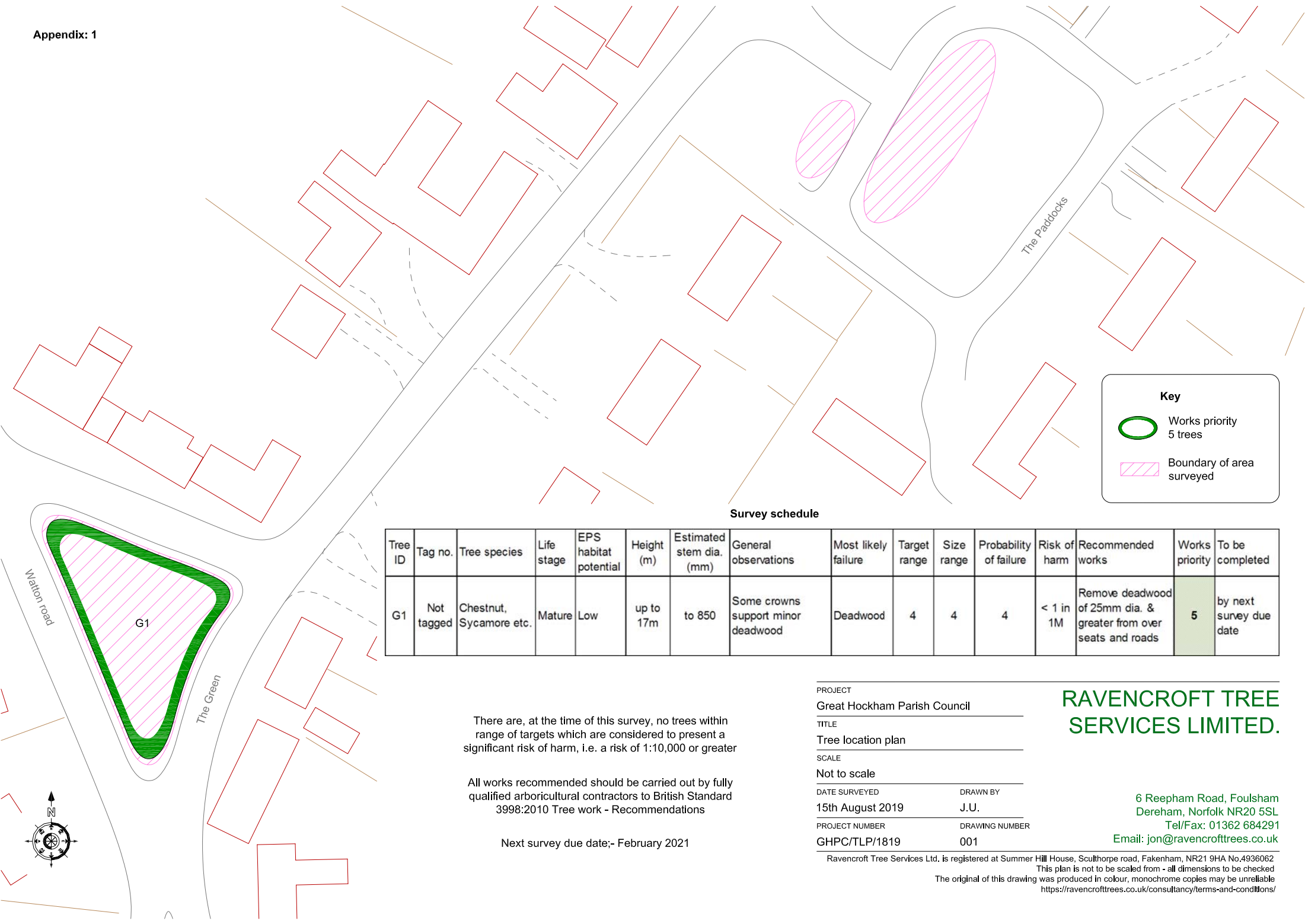
Site descriptions

- 4.2 The village Green lies near the centre of Great Hockham and The Paddocks a short distance north from there. There is public access onto both sites and roads around all boundaries. Beyond the roads stand various residential properties.

General assessment and mitigation

- 4.3 The trees included in this survey have been planted to aesthetically improve the areas in which they stand. There is a range of ages and developmental stages which include a variety of naturalised species. Although the structural and physiological condition of the trees varies, most have been assessed as fair to good.
- 4.4 The target ranges vary little across these sites, dependant as they are on how frequently any area within failing distance of trees is occupied. Roads and parking areas along them have been designated a slightly higher target range as the people & property which could be impacted are either static or sufficiently numerous. Static targets may induce a higher risk of harm as they occupy spaces beneath trees permanently or for much longer periods. In addition to occupancy levels, approximate repair costs of property have been taken into account. The remainder of the surveyed areas remain a slightly lower target range.
- 4.5 Works recommended are expected to be carried out by **fully qualified arboricultural contractors to British Standard 3998:2010 Tree work - Recommendations**. As the sites' aesthetic depends heavily on their trees' good conditions and forms, careful works of high standard are important.
- 4.6 The common hazard in several trees is dead wood. Clearly the cost of removing all dead wood from the trees' crowns may be prohibitive and unnecessary, therefore only instances with a higher probability of failure and/or larger pieces likely to contact a target such as a seat beneath the canopy need be considered.

- 4.7 Deadwood removal may be undertaken by grounds maintenance staff or volunteers to reduce risk of harm and inexpensively discharge some of the duty of care imposed by the Occupier's Liability Act. This may be done subject to a risk assessment from the ground with care, the correct PPE, a strong nylon line and a small weighted bag. The bag with line attached can be thrown over the dead branch and both ends of the line pulled to break the branch at a point nearer to its union with live wood. This activity may be carried out regularly - perhaps annually and a record kept of trees cleared of the most likely deadwood to fail over a target. This record will provide proof of an effective system which may be used as part of any defence against the remote possibility of a claim.
- 4.8 No trees fully inspected are calculated to fall outside the level of risk generally accepted by HSE and industry standards as tolerable. The recommended works fall into the category of general management and as such may be carried out within the recommended timeframe as budget restrictions allow. The recommended works are relatively straightforward requiring little time. They may be carried out by maintenance staff or volunteers, providing they have the relevant PPE, tools and training. It should be made certain that any works near carriageways are compliant with Highways regulations.



Key

Works priority 5 trees

Boundary of area surveyed

Survey schedule

Tree ID	Tag no.	Tree species	Life stage	EPS habitat potential	Height (m)	Estimated stem dia. (mm)	General observations	Most likely failure	Target range	Size range	Probability of failure	Risk of harm	Recommended works	Works priority	To be completed
G1	Not tagged	Chestnut, Sycamore etc.	Mature	Low	up to 17m	to 850	Some crowns support minor deadwood	Deadwood	4	4	4	< 1 in 1M	Remove deadwood of 25mm dia. & greater from over seats and roads	5	by next survey due date

There are, at the time of this survey, no trees within range of targets which are considered to present a significant risk of harm, i.e. a risk of 1:10,000 or greater

All works recommended should be carried out by fully qualified arboricultural contractors to British Standard 3998:2010 Tree work - Recommendations

Next survey due date:- February 2021

PROJECT	
Great Hockham Parish Council	
TITLE	
Tree location plan	
SCALE	
Not to scale	
DATE SURVEYED	DRAWN BY
15th August 2019	J.U.
PROJECT NUMBER	DRAWING NUMBER
GHPC/TLP/1819	001

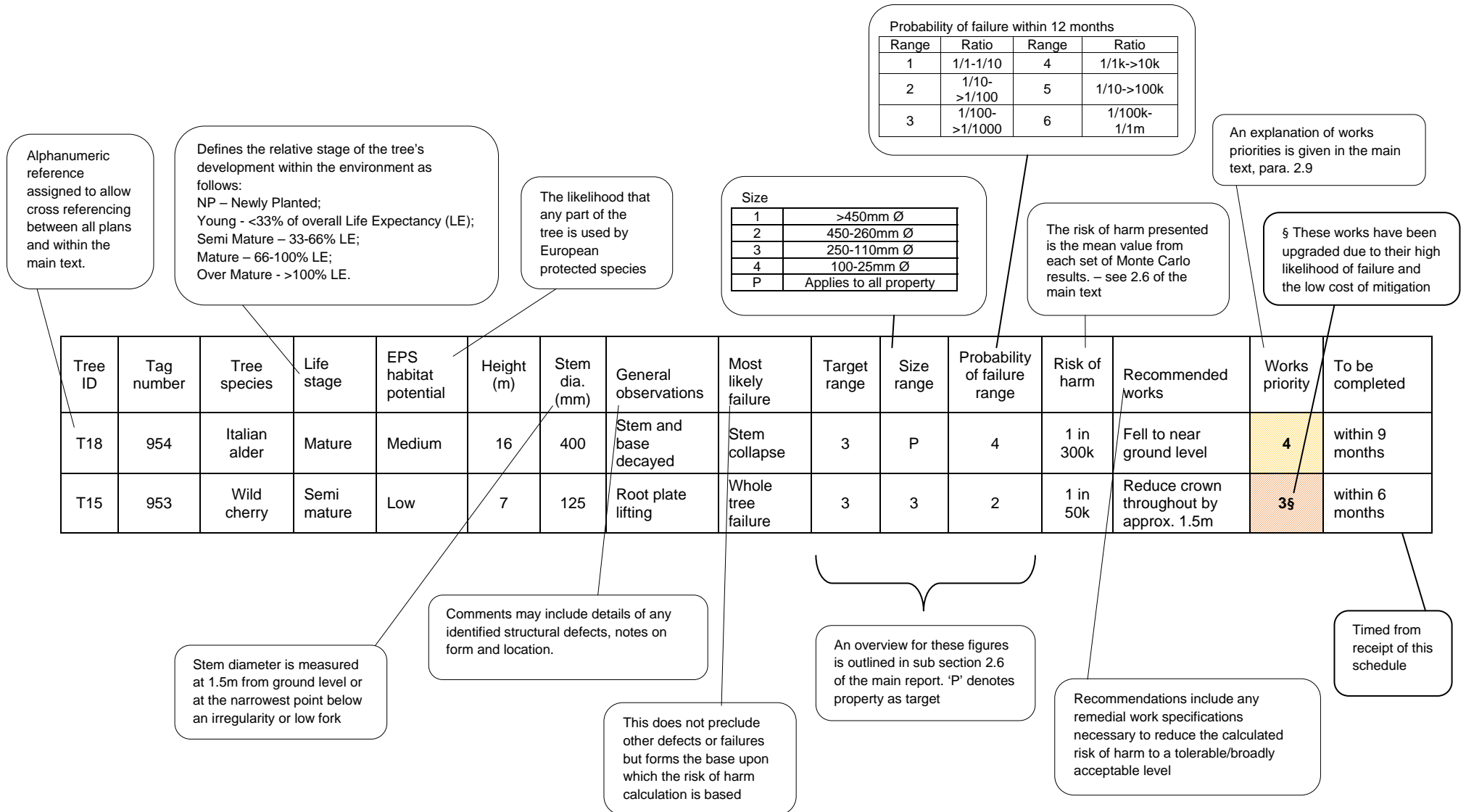
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Ravencroft Tree Services Ltd., is registered at Summer Hill House, Sculthorpe road, Fakenham, NR21 9HA No.4936062
This plan is not to be scaled from - all dimensions to be checked
The original of this drawing was produced in colour, monochrome copies may be unreliable
<https://ravencrofttrees.co.uk/consultancy/terms-and-conditions/>

Survey schedule explanation

The survey schedule details the data taken of trees with identifiable defects. Below is an example schedule with an explanation of its component parts.



Target ranges

Target range	Property value	Pedestrian frequency	Vehicle frequency per day	Value (probability of occupation or fraction of £2M - value of statistical life)
1	Very high £2M - >£200k	Occupation: constant - 2.5hrs/day Pedestrians & cyclists: 720/hr - 73/hr	26,000-2700 vehicles @ 110kph (68mph)	1/1 - >1/10
			32,000-3300 vehicles @ 80kph (50mph)	
			47,000-4800 vehicles @ 50kph (32mph)	
2	High £200k - >£20k	Occupation: 2.4hrs/day - 15mins/day Pedestrians & cyclists: 72/hr - 8/hr	26,00-270 vehicles @ 110kph (68mph)	1/10 - >1/100
			32,00-330 vehicles @ 80kph (50mph)	
			47,00-480 vehicles @ 50kph (32mph)	
3	Moderate high £20k - >£2000	Occupation: 14/day - 2mins/day Pedestrians & cyclists: 7/hr - 2/hr	260-27 vehicles @ 110kph (68mph)	1/100 - >1/1,000
			320-33 vehicles @ 80kph (50mph)	
			470-48 vehicles @ 50kph (32mph)	
4	Moderate £2000 - >£200	Occupation: 1min/day - 2mins/week Pedestrians & cyclists: 1/hr - 3/day	26-4 vehicles @ 110kph (68mph)	1/1,000 - > 1/10,000
			32-4 vehicles @ 80kph (50mph)	
			47-6 vehicles @ 50kph (32mph)	
5	Low £200 - >£20	Occupation: 1min/week - 1min/month Pedestrians & cyclists: 2day - 2/week	3-1 vehicles @ 110kph (68mph)	1/10,000 - >1/100,000
			3-1 vehicles @ 80kph (50mph)	
			5-1 vehicles @ 50kph (32mph)	
6	Very low £20 - £1	Occupation: <1min/month Pedestrians & cyclists: 1/week - 6/year	None	1/100,000 - 1/1,000,000

Vehicle, pedestrian & property targets are categorised by their frequency of use or their monetary value. The probability of a vehicle or pedestrian occupying a target area in, for example, target range 4 is between the upper and lower limits of >1/1,000 and 1/10,000. Using the value of statistical life (VOSL) of £2,000,000 the property repair or replacement value for target range 4 is £2,000 - £200

What is Quantified Tree Risk Assessment?

A Non-technical Summary

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

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

Using the QTRA approach, the land-use (people and property) upon which trees could fail is assessed and quantified first. This enables tree managers to determine whether or not and to what degree of rigour a survey or inspection of the trees is required. Where necessary, the tree or branch is then considered in terms of both size (potential impact) and probability of failure. Values derived from the assessment of these three components are combined to calculate the risk of harm as a probability, which can then be compared to advisory levels of risk acceptability.

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

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