Birtle Tree Services Ltd

Tree Services and Consultants

Penn Green House, Birtle Road, Birtle, Bury, Lancashire BL9 6US
Telephone 0161 272 0009 info@birtletreeservices.co.uk www. birtletreeservices.co.uk

Arboriculture Report for Planning Purposes

relating to proposed development at
27 Spring Bank Lane, Bamford OL11 5SE

Produced by

Hilary Birtwistle, FdSc (Arb), MArborA, MBA

of

Birtle Tree Services Ltd

On the instruction of

Mr and Mrs Bentham

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1 Introduction

1.1 Instruction and references

The residential property is located in a corner position at 27 Spring Bank Lane Ol11 5SE.

The owners of the property, Mr and Mrs Bentham, are exploring the possibility of submitting an application for planning permission to build properties on the extensive land within the boundary of the property. In order to inform the location of the planned dwellings and to ensure adequate protection of the trees on site and neighbouring trees one of which is subject to a Tree Preservation Order (TPO), the owners have requested an Arboricultural Report including Impact Assessment, Constraints Plan and Tree Protection Plan.

The neighbouring tree, which is labelled T1 (Beech) on the Tree Protection Plan, is subject to Tree Preservation Order reference number T18TPO193. T9 (Scots Pine) and H2 (leylandi hedge) on the Tree Protection Plan are also located in neighbouring gardens but are not subject to Tree Protection Orders. All other trees and hedges that are within influencing distance of the proposed dwellings are within the curtilage of the 27 Spring Bank Lane and are not subject to Tree Preservation Orders, these include T2 (Scots Pine), T3 (Sycamore), T4 (Cherry), T5 (Silver Birch), T6 (Pine), T7 (Larch), T8 (Scots Pine), H1, H2 and H3 (leylandi hedges), and G1 (mixed group of ash and holly).

Enabling works are recommended to partially remove a section of H2 that is located within the garden of the development site to provide clearance for proposed plot 1 and removal of T4 to prevent future encroachment on the property.

Note is made that as T1 is subject to a TPO, whilst no work is required or recommended, any works would require approval of the local authority.

1.2 Scope and limitations of the report

The purpose of the survey and the report is to provide an Impact Assessment, Constraints Plan and Tree Protection Plan, including protection to the tree roots, based on the trees that would be within influencing distance of the proposed dwelling in accordance with BS 5837:2012 *Trees in relation to design, demolition and construction – Recommendations* and to provide recommendations in relation to enabling works required, the retention value of the trees in relation to the development proposal, and the protection methods to be adopted to ensure the trees, including their roots, are adequately guarded before and during the construction of the building.

The report is based upon a visual inspection from ground level and no climbing has been undertaken to gather evidence. The consultant shall not be responsible for events that happen after the date of the report due to factors that were not apparent at the time, and the acceptance of this report constitutes an agreement with the guidelines and the terms listed in this report.

Any defects seen by a contractor, agent or the owner that were not apparent to the consultant must be brought to the consultant's attention immediately.

The consultant accepts no liability in respect of the trees unless the recommendations of this report are carried out under his/her authority.

The potential influence of trees upon buildings or other structures resulting from the effects of their roots abstracting water from shrinkable load-bearing soils is not considered herein. The advice of a structural engineer should be sought with regard to appropriate foundation depths for new buildings with reference to NHBC Standards Chapter 2.3 (NHBC, 2008).

The trees have been surveyed and an assessment has been undertaken of their structural and physical condition with comments and recommendations made on that assessment. No particular hazard was identified however this report should not be seen as a substitute for a full tree risk assessment or management plan which are specifically designed to minimise risk and liability associated with responsibility for trees.

The Tree Protection Area which is shown in the Tree Protection Plan (Appendix 3) is an estimation and is not intended to replace development plans. Scaling and measurements, whilst being a close approximation, should not be relied upon for construction purposes.

The limitations of this report are restricted to the persons, time, information made available and purpose for which this report has been prepared.

Please note that all trees are at risk of failure through exceptional weather conditions.

2 Executive Summary

There are three proposed developments to be built on the site.

Plot 1 is proposed to be located to the west of the current garage - In order to facilitate plot 1, the leylandi hedge (H2) which is located within the curtilage of the property should be reduced in length by 3m so that it does not encroach onto the building and become a nuisance. The foundations of plot one encroach into the Root Protection Area (RPA) of T9, and so consideration of specialist engineering for foundations and installation of utilitities as detailed in sections 8.3 and 8.4 should be adopted in order to protect the trees roots. The surrounding area of T9 is lawn and flower beds which providing a good growing environment allowing water and nutrients to penetrate to the roots and for gaseous exchange to take place so the impact on the roots of T9 will be lower than if the surrounding area was impervious, however, foundation excavation within the RPA should be undertaken by hand and in the event of roots becoming exposed they should be pruned by an arborist as detailed in Section 8.9 Foundations and pilings within and close to the RPA should be sheathed to minimise concrete leakage into the RPA.

Plot 2 is proposed to be located to the south of H1. No enabling works are required to facilitate the development of plot 2, and the location of the protective fencing is adequate to protect both the roots and the canopies of the trees and hedging. Plot 2 is far enough

away from H1 to enable future maintenance of the hedge to be undertaken to avoid it becoming a nuisance in future.

Plot 3 is proposed to be located to the east of the current dwelling - In order to facilitate the development of plot 3, removal of T4 is recommended as the canopy of T4 is likely to become a nuisance in future and encroach onto the building. T4 is a short lived species which already has an unbalanced crown due to suppression from T5 and is of reduced amenity value. The location of the protective fencing is adequate to protect both the roots and the canopies of the T5, T6 and T8 in this area.

The trees within G1 along the driveway have sufficient clearance that they do not require any enabling pruning and plant/equipment will be able to access and egress the site without problem, however ground protection should be laid as indicated in the Tree Protection Plan (Appendix 3) to protect the roots of T3.

Protection requirements, by way of protective fencing and ground protection, can be found in Sections 8.1 and 8.2 and are discussed in the Impact Assessment (Section 7) and the position of the protective fencing and ground protection is shown in the Tree Protection Plan (Appendix 3).

3 Site Visit

3.1 Weather Conditions

Hilary Birtwistle carried out the survey and assessment of the trees on 24th February 2019 and again on 18th May 2019. The weather conditions on both occasions were fair and visibility was good. The survey is limited to the area shown in Appendix 1.

3.2 Topography and surfaces

The topography of the site is level and drainage appears to be reasonable with no evidence of standing water.

The trees are, in the main, surrounded by lawned areas or flower beds. G1 and T3 have the tarmacked driveway to the south and Spring Bank Lane to the east.

4 Statutory Control and Protection in Respect of Trees and Associated Wildlife

4.1 Standard of Work

All tree works should be undertaken in accordance with British Standard 3998: 2010 and by competent arboriculture contractors with public liability insurance cover of at least two million pounds or competent local authority employed arborists.

4.2 Tree Preservation Orders and Conservation Area Designations

Desk research via the Greater Manchester Open Data Infrastructure Map indicates that T1 located in the neighbouring garden is subject to Tree Preservation Order reference number

T18TPO193 therefore any works to this tree (other than removal of deadwood) must be approved by the Local Authority prior to be undertaken. None of the trees within the boundary of 27 Spring Bank Lane or in neighbouring gardens of properties along Norford Way appear to be subject to Tree Preservation Orders.

4.3 Wildlife

All common wild birds are protected under The Wildlife and Countryside Act 1981. This legislation makes it an offence to:

- Kill, injure or take wild birds.
- Take damage or destroy the nest of wild birds while it is in use or being built.
- Take or destroy the eggs of wild birds.

Certain rare breeding birds are listed on Schedule I of The Wildlife and Countryside Act 1981. Under this legislation they are afforded the same protection as common wild birds and are also protected against disturbance whilst building a nest or on or near a nest containing eggs and or unfledged young e.g. Barn Owl Tyto alba.

All operations should take account of wildlife needs and be planned to take advantage of weather conditions and time of year for minimum damage and disturbance. If any protected species of nesting birds are present or discovered while the works are taking place all work should cease until contact has been made with English Nature for further advice. English Nature can be contacted on 01942 820342 or by e-mail to: northwest@english-nature.org.uk There was no evidence of nesting birds at the time of the survey.

Specific consideration should be given to the possible presence of roosting bats, which are protected by the Wildlife and Countryside Act 1981 (schedule 5) and included in schedule 2 of the Conservation Regulations 1994.

Bats species are afforded further protection by the Countryside and Rights of Way Act 2000; and the Natural Environment and Rural Communities Act 2006. This legislation makes it an offence to:

- Intentionally or deliberately kill, injure or capture bats.
- Deliberately disturb bats, whether at roost or not.
- Damage, destroy or obstruct access to bat roosts.
- Possess or transport bats, unless acquired legally.
- Sell, barter or exchange bats.

A bat roost is defined by the Bat Conservation Trust publication Bat Surveys—Good Practice Guidelines as “the resting place of a bat” (BCT 2007). Generally however, the word roost is interpreted as “any structure or place, which any wild bat uses for shelter or protection.” Bats tend to re-use the same roosts; therefore legal opinion is guided by recent case law precedents, that a roost is protected whether or not the bats are present at the time. This can include summer roosts, used for breeding; or winter roosts, used for hibernating.

If a bat survey is considered to be necessary Birtle Tree Services Ltd suggest contacting Angela Graham Bat Consultancy Service Ltd, telephone: 0161 763 6171, mobile: 07710 184142, email: bat.consultancy@talktalk.net

5 Tree Survey, Data Collection and Summary of Recommended Tree Works

5.1 Tree Survey and Data Collection

The following table should be read in conjunction with Appendix 4 (Tree Survey Data Explanatory Notes) in order to correctly interpret the tree data.

Table 1 Tree Survey Data

Ref	Species and Age	Height (m) Crown Clearance (m) N W E S	DBH	Approximate Crown Spread (m) N W E S	Notes	Recommendations Priority	Recommendations Inspect Freq (yrs)	Vigor Physiological Condition Structural Condition	Amenity Value Life Expectancy (yrs) Retention Category
T1	Beech *Fagus* Mature	18.0 5.0 5.0 5.0 5.0	750	3.0 3.0 3.0 3.0	T1 is subject to TPO. T4 is a single stem tree located On the fence line in the garden of the neighbouring property. The tree has been poorly pruned in the past and has been lopped and topped. The tree overhangs the garden of 27 Spring Bank Lane by approximately 3m. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA	3 – 5 yrs	Moderate Poor Poor	Moderate 40+ **A2**
T2	Scots Pine *Pinus sylvestris* Mature	18.0 2.0 1.0 0.0 1.0	300	1.0 5.0 0.0 5.0	T2 is a single stem tree which is suppressed to the east by the Leylandi hedge (H1). There is a small amount of deadwood in the canopy. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	Removal of deadwood from canopy Mod	3 – 5 yrs	Moderate Moderate Moderate	Moderate 40+ **A2**

Ref	Species and Age	Height (m) Crown Clearance (m) N W E S	DBH	Approximate Crown Spread (m) N W E S	Notes	Recommendations Priority	Recommendations Inspect Freq (yrs)	Vigor Physiological Condition Structural Condition	Amenity Value Life Expectancy (yrs) Retention Category
T3	Sycamore *Acer pseudoplatanus* Mature	25.5 6.5 8.5 7.5 8.5	770	7.5 6.0 5.0 7.5	T3 is located at the entrance to the driveway. It has two co-dominant stems split at approximately 2.5 m with a sound join. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA	3 – 5 yrs	Moderate Good Good	High 40+ A2
T4	Ornamental Cherry *Prunus serrulata* Semi Mature	8.5 0.0 0.0 0.0 0.0	220	3.0 3.0 2.0 1.5	T4 has 3 co-dominant stems split at 3m with a sound join. T4 is suppressed to the south by T5. This is not a long lived species and has a very unbalanced canopy. As the tree is close to plot 3 recommendation is to remove the tree so that it does not cause a nuisance in the future by the canopy encroaching into building.	No work required NA	3 – 5 yrs	Moderate Fair Fair	Low 20+ R
T5	Downy Birch *Betula pubescens* Early Mature	15 3.5 3.5 4.0 3.5	350	2.5 4.5 4.0 3.5	T5 is a single stem specimen which has deadwood within the canopy and pegs from previous poor pruning both of which should be removed to avoid decay entering the tree. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	Remove deadwood and pegs Mod	3 – 5 yrs	Moderate Good Fair	Moderate 40+ A2

Ref	Species and Age	Height (m) Crown Clearance (m) N W E S	DBH	Approximate Crown Spread (m) N W E S	Notes	Recommendations Priority	Recommendations Inspect Freq (yrs)	Vigor Physiological Condition Structural Condition	Amenity Value Life Expectancy (yrs) Retention Category
T6	Pine *Pinus* Mature	8.5 2.5 2.5 2.5 0.0	200	2.0 2.0 2.0 0.0	T6 is a single stem tree supressed to the south by ornamental shubs. There is deadwood within the canopy which should be removed to reduce risk of decay entering the tree. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	Removal of deadwood from canopy Mod	3 – 5 yrs	Moderate Good Fair	Moderate 40+ **A2**
T7	Larch *Larix* Mature	22 2.0 2.5 3.5 2.5	580	5.0 5.0 5.0 5.0	T7 is a single stem specimen tree. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA	3 – 5 yrs	Moderate Good Fair	Moderate 40+ **A2**
T8	Scots Pine *Pinus sylvestris* Early Mature	15.5 3.5 5.5 3.5 5.5	390	3.5 4.0 6.0 4.5	T8 is located within the middle of H3 which is suppressed to the west by the very large Scot Pine (T9) in the neighbouring garden. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA	3 – 5 yrs	Moderate Good Fair	Moderate 40+ **A2**

Ref	Species and Age	Height (m) Crown Clearance (m) N W E S	DBH	Approximate Crown Spread (m) N W E S	Notes	Recommendations Priority / Inspect Freq (yrs)	Vigor Physiological Condition Structural Condition	Amenity Value Life Expectancy (yrs) Retention Category
T9	Scots Pine *Pinus sylvestris* Mature	20.0 4.0 4.0 4.0 4.0	1170	7.0 7.0 7.0 7.0	T9 is a single stem tree which is located in the neighbouring garden. Measure are estimated because access was not possible. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA / 3 – 5 yrs	Moderate Moderate Moderate	Moderate 40+ A2
H1	Leylandi Mature	13.0 0.0 0.0 0.0 0.0	190	1.0 1.0 1.0 1.0	H1 is a 21m long hedge between 27 Spring Bank Lane and the neighbouring property. The trees are single stem and are in good condition. Long term maintenance will be required to ensure that the height and spread of the trees is managed to avoid them causing a nuisance. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA / 3 – 5 yrs	High Good Good	Moderate 40+ C2

Ref	Species and Age	Height (m) Crown Clearance (m) N W E S	DBH	Approximate Crown Spread (m) N W E S	3Notes	Recommendations Priority / Inspect Freq (yrs)	Vigor Physiological Condition Structural Condition	Amenity Value Life Expectancy (yrs) Retention Category
H2	Leylandi Mature	10.0 0.0 0.0 0.0 0.0	210	1.5 1.5 1.5 1.5	H2 is a double layer of leylandi that is located along the western boundary of the property spanning the neighbouring garden and the garden of the development site. Recommendation to reduce the length of the hedge on the development side of the boundary by 3m in order that the hedge does not become a nuisance and encroach onto plot 1. No further enabling work is required to the trees in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA / 3 – 5 yrs	High Good Good	Moderate 40+ C2
H3	Leylandi Mature	6.0 0.0 0.0 0.0 0.0	170	3.0 3.0 3.0 3.0	H3 comprises three trees located within the garden of 27 Spring Bank Lane No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	No work required NA / 3 – 5 yrs	High Good Good	Moderate 40+ C2
G1	Mixture including Ash and Holly Mature	Maximum Height 20.5 3.0 3.0 3.0 3.0	300	3.0 3.0 3.0 3.0	G1 is a mixed group of trees including ash and holly. The trees are in good condition with a small amount of deadwood within the canopies of the ash trees. The trees closest to the drive way have sufficient clearance for plant and machinery to access the site. No enabling work is required to the tree in relation to the development and the location of protective fencing to cover the RPA will sufficiently protect the canopy.	Remove deadwood from canopy Mod / 3 – 5 yrs	High Good Good	High 40+ A2

6 Summary of findings

In the main there is very little enabling works that are required to facilitate the proposed developments. H2 should be reduced in length by approximately 3m so that it does not become a nuisance to Plot 1 in future. T4 is recommended for removal as the canopy is unbalanced and, being within close proximity to Plot 3, will become a nuisance in the future.

T9 requires particular attention as Plot 1 will encroach into the Root Protection Area and the guidance provided in Sections 8.3 and 8.4 are given to mitigate risk of damage to the roots.

Protective fencing (see Section 8.1 and Appendix 5) and ground protection (see Section 8.2 and Appendix 6) as discussed in the Arboricultural Impact Assessment (Section 7) is to be positioned as indicated in the Tree Protection Plan (TPP) (Appendix 3) and will protect the roots and canopies of the trees without the need for any enabling pruning.

7 Arboricultural Impact Assessment

7.1 Summary of the proposed development

The owners of 27 Spring Bank Lane are exploring the possibility of submitting an outline planning application to develop three dwellings within the curtilage of their property. This survey is to inform the appropriate location of the proposed dwellings to have minimum impact on the trees and to ensure were possible that the retained trees and hedging are not within influencing distance of the dwellings.

7.2 Impact Assessment

Trees can be adversely affected on development sites if their protection is not factored into the wider project management of onsite operations. The Tree Protection Plan (Appendix 3) shows where the Root Protection Areas are and so indicates where construction should be avoided if possible in order to minimise the impact on the trees. The Root Protection Areas of the trees and hedges are informed by the Impact Table below in accordance with the *British Standard 5837:2012 Trees in relation to design, demolition and construction – Recommendations.* The Root Protection Area is an area that needs to be left as undisturbed as possible in order to provide adequate rooting area for the trees.

Table 2 overleaf details the implications of the trees on the development and the actions recommended to mitigate any risks to the trees, there canopies and roots.

Tree No.	Root Protection Area (RPA)	Implications and mitigation
T1	254 m^2 = circle with a radius of 9.0m	Protective fencing to be erected, positioned as shown in the Tree Protection Plan Appendix 3, prior to and throughout development enabling and construction phase – Protective fencing will protect both canopies and tree roots
T2	41 m^2 = circle with a radius of 3.5m	
T5	55m^2 = circle with a radius of 4.0m	
T6	18m^2 = circle with a radius of 2.5m	
T7	152m^2 = circle with a radius of 7.0m	
T8	69m^2 = circle with a radius of 4.5m	
H1	Radius of 2.0m from each tree stem	
H3	Radius of 2.0m from each tree stem	
T3	268m^2 = circle with a radius of 9.0m	
G1	Radius of 3.5m from each tree stem	Root Protection Area (RPA) to be established and to be protected by temporary ground protection and protective fencing to be erected and positioned as shown in the Tree Protection Plan Appendix 3 prior to and throughout development enabling and construction phases
T4	22m^2 = circle with a radius of 2.5m	
T9	620m^2 = circle with a radius of 14.0m	Construction of Plot 1 within RPA - See section 8.3 regarding design solution and foundation specifications within RPA to mitigate risk, all work within RPA to be undertaken by hand. Protective fencing to be erected positioned as shown in the Tree Protection Plan Appendix 3 prior to and throughout development enabling and construction phases
H2	Radius of 2.5m from each stem	Reduction of length of hedge on development side of boundary by 3m to prevent hedge becoming a nuisance in future. Protective fencing to be erected positioned as shown in the Tree Protection Plan Appendix 3 prior to and throughout development enabling and construction phases
All post development landscaping within the RPA of all trees and hedging must be undertaken by hand.		

Table 2 Arboricultural Impact

8 Constraints and Guidance

Whilst most of the trees and hedges will not be impacted on by the proposed developments, the following provides guidance with regards to the specific measures (see Sections 8.3 And 8.4) to be taken to protect T9 and generic measures to be taken to protect all of the trees and hedges.

8.1 Protective Fencing

Protective fencing must be erected around the Root Protection Areas as shown in the Tree Protection Plan (Appendix 3). The protective fencing should be inspected on a daily basis and any breaches repaired immediately.

All fencing used on the site should fully comply with *British Standard 5837:2012 Trees in relation to design, demolition and construction – Recommendations.*

The fencing should be strong and suitable for local conditions. It should also take into account the degree of construction activity on the site.

8.2 Temporary Ground Protection

As shown in the Tree Protection Plan (Appendix 3) the Root Protection Area for T3 extends into the driveway of the current dwelling and ,whilst this area is already covered with tarmac, in order that compaction of the soil structure is avoided during delivery and movement of materials, a temporary cover should be laid along the length of the driveway prior to work commencing. See Appendix 6 for suggested type of temporary protective ground cover.

8.3 Specialist Engineering for Foundations within the RPA

The south western corner of Plot 1 will encroach into the RPA of T9 and measures need to be taken to mitigate and minimise the adverse impact on the roots of T9.

The use of traditional strip footings can result in extensive root loss and should be avoided. Designs for foundations that would minimize adverse impact on trees should include particular attention to existing levels, proposed finished levels and cross-sectional details.

Root damage can be minimized by using:

- Piles, with site investigation used to determine their optimal location whilst avoiding damage to roots important for the stability of the tree, by means of hand tools or compressed air soil displacement, to a minimum depth of 600 mm;
- Beams, laid at or above ground level, and cantilevered as necessary to avoid tree roots identified by site investigation;
- Slabs for larger structures (e.g. dwellings) should be constructed with a ventilated air space between the underside of the slab and the existing soil surface (to enable gas exchange and venting through the soil surface). In such cases, a specialist irrigation system should also be employed (e.g. roof run-off redirected under the slab). The

design of the foundation should take account of any effect on the load-bearing properties of underlying soil from the redirected roof run-off. Approval in principle for a foundation that relies on topsoil retention and roof run-off under the slab should be sought from the building control authority prior to this approach being relied on. Where piling is to be installed near to trees, the smallest practical pile diameter should be used, as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. If a piling mat is required, this should conform to the parameters for temporary ground protection given in Section 8.2;

- Use of the smallest practical piling rig is also important where piling within the branch spread is proposed, as this can reduce the need for access facilitation pruning. The pile type should be selected bearing in mind the need to protect the soil and adjacent roots from the potentially toxic effects of uncured concrete, e.g. sleeved bored pile or screw pile.

8.4 Specification for protection to trees during installation of utilities

Utilities should be located away from the Root Protection Area however in the event that services must be located within the RPA the following guidance must be adhered to. Mechanical trenching for the installation of underground apparatus and drainage severs any roots present and can change the local soil hydrology in a way that adversely affects the health of the tree. For this reason, particular care should be taken in the routeing and methods of installation of all underground apparatus. Wherever possible, apparatus should be routed outside RPAs. Where this is not possible, it is preferable to keep apparatus together in common ducts. Inspection chambers should be sited outside the RPA.

Where underground apparatus is to pass within the RPA, detailed plans showing the proposed routeing should be drawn up in conjunction with the project arboriculturist. In such cases, trenchless insertion methods should be used (see Table 3 overleaf), with entry and retrieval pits being sited outside the RPA. Provided that roots can be retained and protected excavation using hand-held tools might be acceptable for shallow service runs.

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Method	Accuracy mm	Bore Dia [1] mm	Max sub [2] length m	Application	Not suitable for
Microtunnelling	<20	100 to 300	40	Gravity-fall pipes, deep apparatus, watercourse, roadway undercrossings	Low cost projects due to relative expense
Surface-launched directional drilling	≈ 100	25 to 1,200	150	Pressure pipes, cables including fibre optic	Gravity-fall pipes, eg drains and sewers[3]
Pipe ramming	≈ 150	150 to 2,000	70	Any large-bore pipes and ducts	Rocky and other heavily obstructed soils
Impact moling[4]	≈ 505	30 to 1806	40	Gas, water and cable connections, eg from street to property	Any application that requires accuracy over distances in excel of 5m

1 Dependent on strata encountered
2 Maximum subterranean length.
3 Pit-launched directional drilling can be used for gravity fall pipes up to 20 m subterranean length
4 Impact moling (also known as thrust-bore) generally requires soft, cohesive soils
5 Substantial inverse relationship between accuracy and distance.
6 Figures given relate to single pass: up to 300 mm bore achievable with multiple passes.

Table 3 Trenchless solutions for differing utility apparatus installation requirements adapted from BS5837: 2012

8.5 Root Protection Area and Construction Exclusion Zone

It should be noted that the Tree Protection Plan (Appendix 3) clearly indicates that the Root Protection Area of all other trees and hedges other than T9 are likely not going to encroach onto the development site at all and so the information below relates to avoiding storage of materials, mixing of concrete and potential temporary changes in soil levels around the roots.

The Tree Protection Plan (Appendix 3) indicates the Root Protection Area which is also known as the Construction Exclusion Zone. This is the area within which any risk of compaction and contamination of the tree roots must be mitigated against.

The majority of the root system of a tree is in the surface 600mm of the soil, extending radially for distances frequently in excess of the trees height. Beyond the main structural roots (close to the base of the trunk), the root system rapidly sub-divides into smaller diameter roots. Off this main system a mass of fine roots develop.

The shape of the main structural roots system develops in response to the need for the tree to have physical stability. Beyond these major roots, root growth and development is influenced by the availability of water and nutrients. Unless conditions are uniform around the tree, which would be unusual, the extent of the root system will be very irregular and difficult to predict. It will not generally show the symmetry seen in the branch system.

The parts of the root system which are active in water and nutrient uptake are very fine, typically less than 0.5 mm diameter. It is essential that conditions in the soil remain

conducive to the healthy growth and maintenance of these fine roots so that the water and nutrients necessary for healthy tree growth can be absorbed.

All parts of the root system, but especially the fine roots, are vulnerable to damage. Once they are damaged, water and nutrients update will be restricted until new roots have regenerated. Vigorous young trees will be capable of rapid regeneration but the more mature a tree is the more slowly they will respond if at all.

In order to live and grow, roots need oxygen from the soil. Respiration by the roots and other soil organisms depletes this oxygen and increases carbon dioxide levels in the soil; a correct balance of these gases is normally maintained by diffusion between the soil and the atmosphere this is known as gaseous exchange. Anything, which disturbs this balance will affect the condition of the root system.

The factors that most commonly affect this diffusion adversely and therefore damage the roots are as follows:

a) Compaction of the ground, which reduces the space between soil particles. This is particularly important on clay soils. A single passage by heavy equipment on clay soils or storage of heavy materials can cause significant damage.
b) Changing soil levels even for a few weeks.
c) Covering the root area with impervious surfaces.
d) A rise in the level of the water table. Roots can tolerate submersion for short periods, but a permanent rise will deplete the soil oxygen.

Serious damage is often caused during preliminary site works by stripping the topsoil or on brown field sites removal of hard surfaces and foundations.

Excavations in the rooting area can sever roots. As the majority of roots are in the surface 600mm, even shallow excavations can cause damage.

Excavations for foundations, landscaping or service trenches are usually sufficiently deep to sever most of the roots, and it should therefore be assumed that all parts of the root system beyond the excavation would no longer serve the tree.

Excavation or soil stripping which sever or damage the roots may impair the stability of the tree and make it dangerous.

Whilst the intention is to prevent roots becoming exposed, if any do become exposed they need immediately to be wrapped in dry, clean hessian sacking to prevent desiccation and to protect from rapid temperature changes. Roots smaller than 25mm diameter may be pruned back to a side branch using a proprietary cutting tool such as bypass secateurs or handsaws. Roots greater than 25mm diameter should be pruned if absolutely necessary by an arborist to ensure a clean pruning operation. Prior to back filling, any hessian wrapping

should be removed and retained roots should be surrounded with sharp sand (builders' sand should not be used because of its high salt content which is toxic to trees).

Where piling is to be installed near to trees and hedgerows, the smallest practical pile diameter should be used as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. Sheathed piles protect the soil and adjacent tree roots from the potentially toxic effects of concrete.

8.6 Scaffolding within the RPA

Whilst BS5837: 2012 does not specify the procedures to be adopted when erecting scaffolding within the RPA, the guidelines within BS5837: 2005 provide a best practice approach and the detail can be found in Appendix 7.

8.7 Landscaping

Landscaping (planting, turfing, fencing etc.) around retained trees may only be carried out once all tree protection measures have been removed.

All excavations within the Root Protection Areas shall be undertaken by hand and without reducing current ground levels. At no time is the use of a rotator permitted within the RPAs of retained tree.

Any tree roots discovered will be left in-situ and shall not be cut or otherwise damaged. Where possible, the soil structure within the Root Protection area shall be preserved.

8.8 Surfacing within RPA

In the event that the area within the RPA is to be resurfaced, the area of resurfacing must not exceed 20% of the current hard surface and where possible the surface within the RPA should be permeable material such as block paving laid on sand over stone aggregate. This surfacing will allow the necessary access of water and nutrients to the roots and promote gaseous exchange thus providing good growing conditions for any trees affected.

8.9 Further Constraints within the Root Protection Area

Prior to and throughout the building works the RPA is to remain protected and within the area:

- No materials should be stored
- Mechanical cultivation should not take place
- Soil levels should not be raised or lowered
- Cement should not be mixed either in a protected area or in a place where dust or run off could compromise a protected area

- no vehicular access or parking of vehicles unless provision has been made in the form of adequate ground cover which provides protection to the underlying soil structure.
- Oil, bitumen, cement or other materials likely to cause damage to the trees must not be stacked or discharged within 10m of tree stems or within the root protection areas.
- Concrete mixing and washing will not be carried out within 10m of the trees.
- Fires will not be lit beneath the foliage or in a position where the flames could extent to within 5m of the foliage, branches or trunks. If the fire is large then this may necessitate a distance of at least 20m.
- Trees will not be used as anchorage for equipment.
- Notice boards, telephone cables or other services will not be attached to any part of the trees.
- Care should be taken when using cranes or other equipment near the canopy of the trees.

8.10 Site management

The site manager will be responsible for briefing all personnel who will be working within or adjacent to canopies or RPAs of retained trees and provide or make available to them a copy of the method statement and tree protection plan. This includes all operations for example the movement / operation of plant, excavations, unloading deliveries, mixing / pouring cement and concrete, all enabling and construction operations.

The site manager shall designate another person to be in charge of briefing new site personnel or visitors in his absence.

No equipment, vehicles or plant shall operate beyond the tree protection fencing. Booms, hoists and rigs should be kept as far away from the canopies of retained trees at all times. Where it is necessary to operate within 5m of a tree canopy, it will be done with the utmost caution and under the control of a banks man. Damage to trees will be considered a breach of this tree protection plan, which in turn could be a breach of planning permission.

9 Tree Protection Plan and Arboricultural Method Statement

9.1 Tree Protection Plan

The Tree Protection Plan (Appendix 3) and method statement detail the timeline of operations to ensure protection of the trees including their roots.

9.2 Arboricultural Method Statement

The Method Statement recommends all development within influencing distant of the tree is carried out in accordance with BS5837: 2012 Guide for Trees in Relation to Design, Demolition and Construction.

Developers should enforce the methods of protection identified within the method statement. All contactors must be provided with a copy of the guidelines and must also agree to them. Any failure to comply with them must be dealt with by the developer.

The Method Statement should be read in conjunction with the architect's submissions.

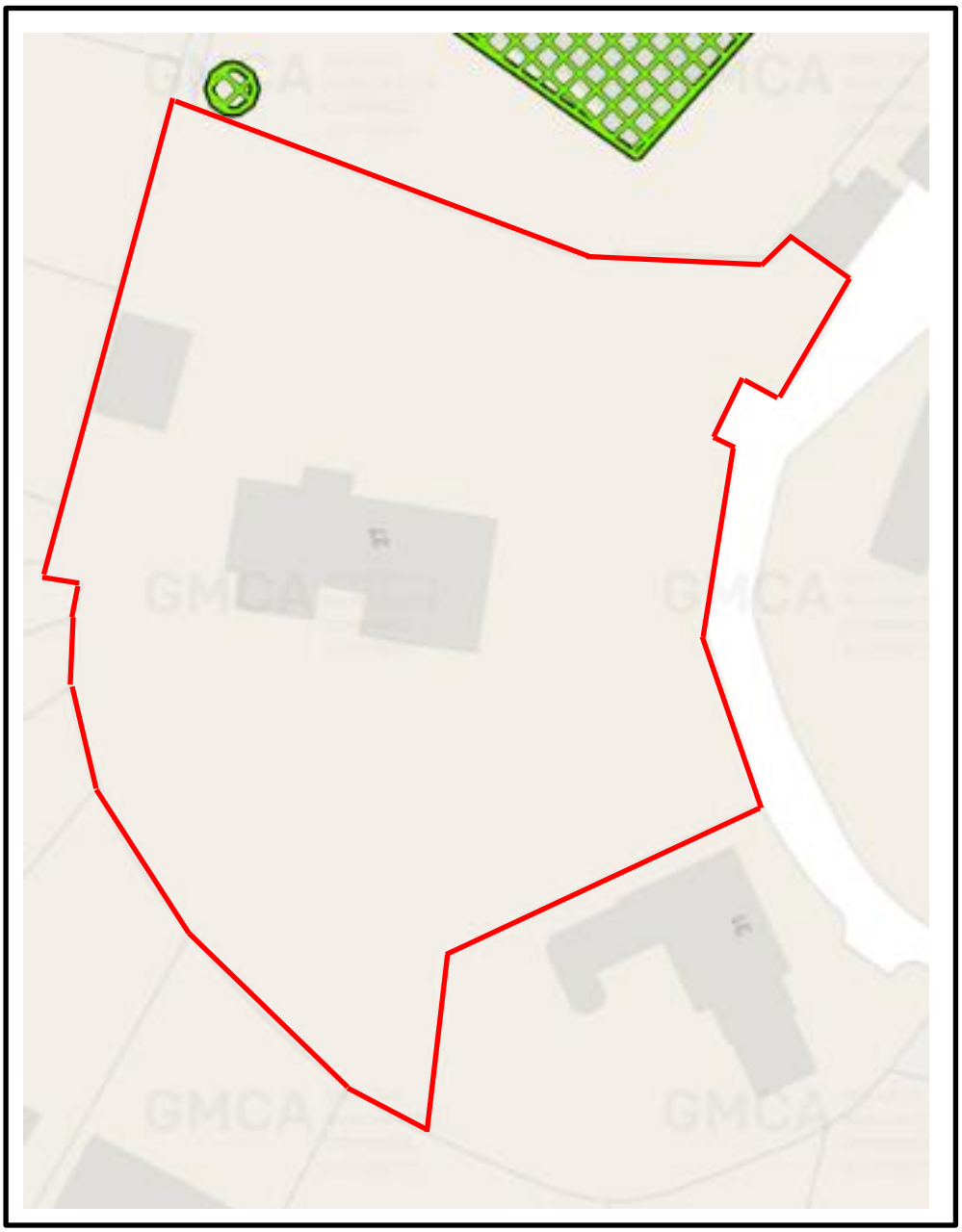
No demolition, site clearance, building work or delivery of materials should occur until the protective measures are in position in accordance with this method statement and the Tree Protection Plan (Appendix 3).

The tree protection measures shall be phased as follows:

Step	Action	Responsible
1	Reduce length of H2 and remove T4	Arboriculturist
2	Install the protective measures in accordance with the recommended protection methods (ie protective fencing and ground protection)	Developer
3	Undertaken site clearance works and excavation where necessary by hand to avoid damage to roots	Developer
4	Undertake and complete construction	Developer
5	Undertake external landscape works to areas outside of construction exclusion zones (ie outside of the protective fencing area)	Developer
6	Remove protective measures	Developer
7	Undertake external landscape works to areas inside of the root protection area being mindful of the requirement to protect the tree roots by adopting hand digging methods of landscaping where possible	Developer

Table 3 Arboricultural Method Statement

Appendix 1
Approximate property boundary



Appendix 2

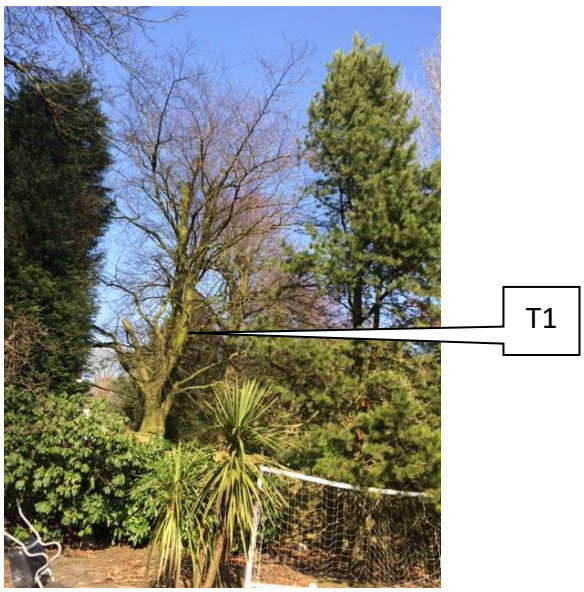


Image of T1

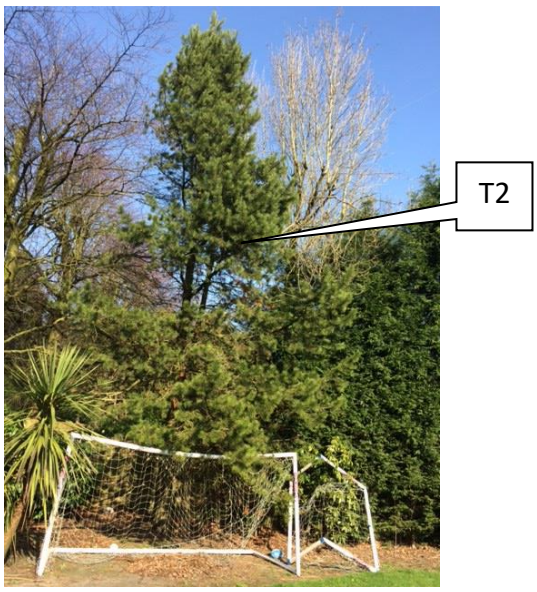


Image of T2

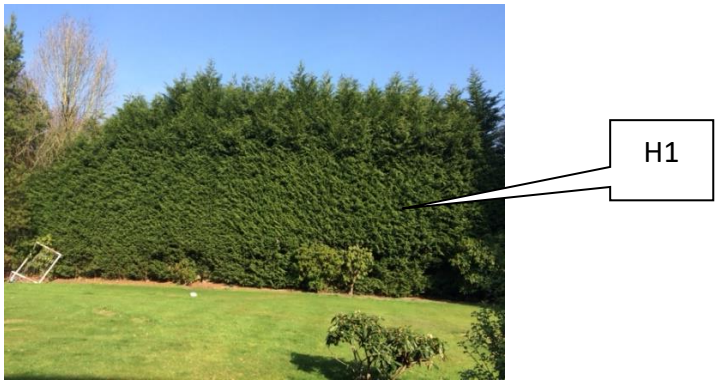


Image of H1

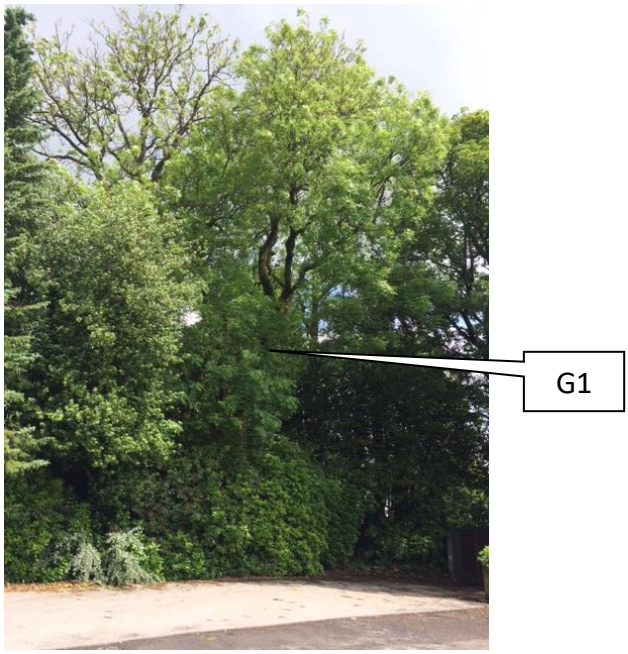


Image of G1

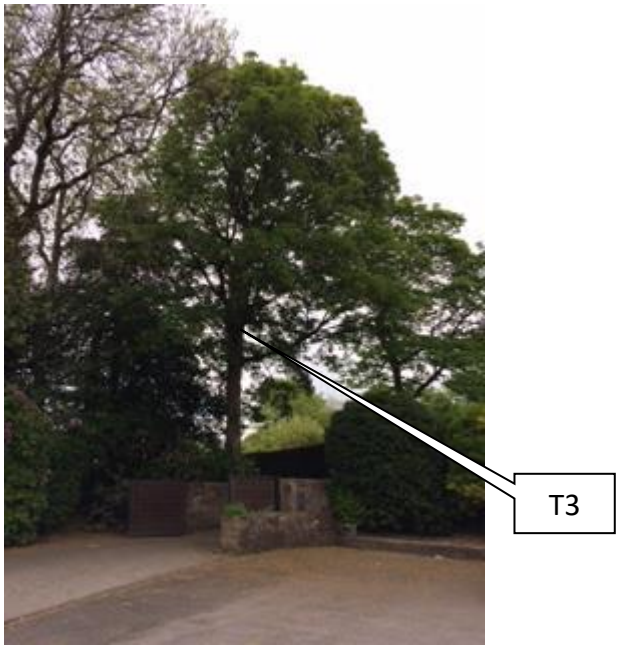


Image of T3

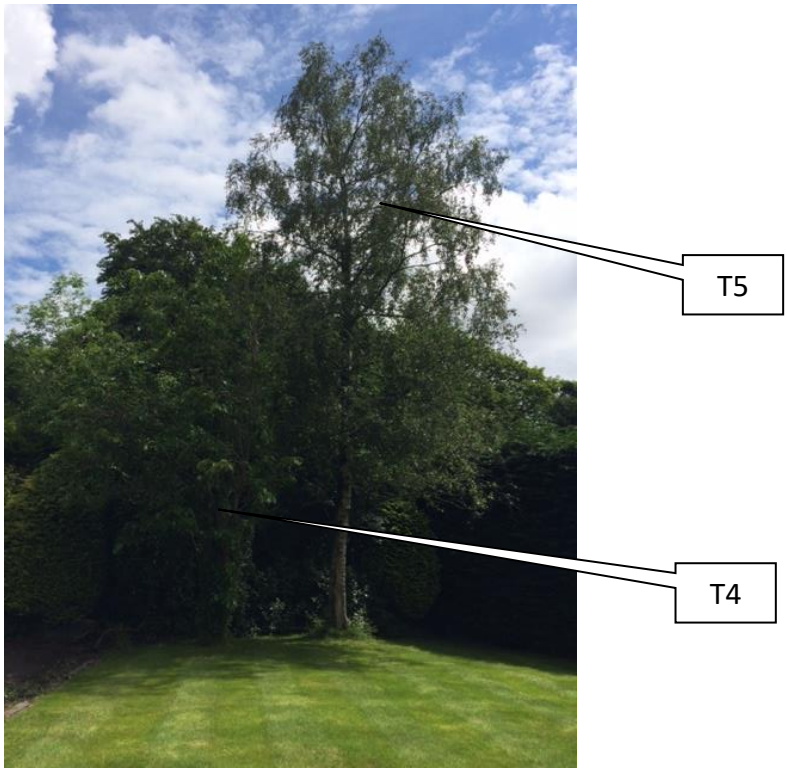


Image of T4 and T5

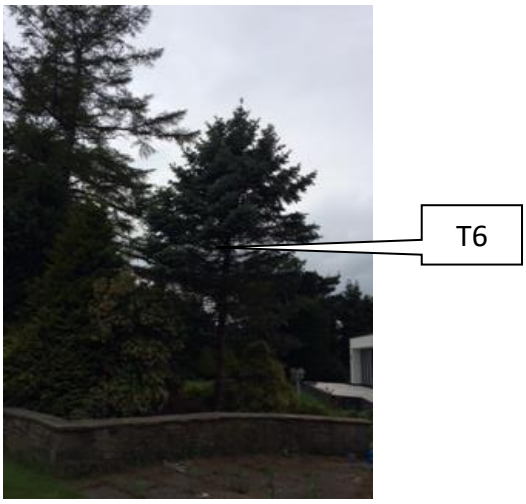


Image of T6



Image of T7

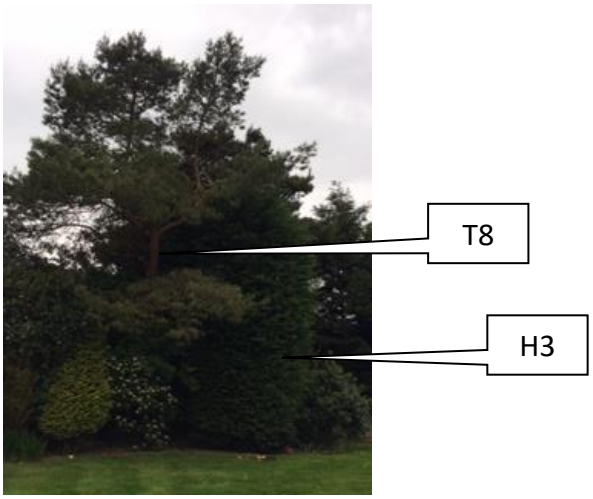


Image of H3, T8 and T9

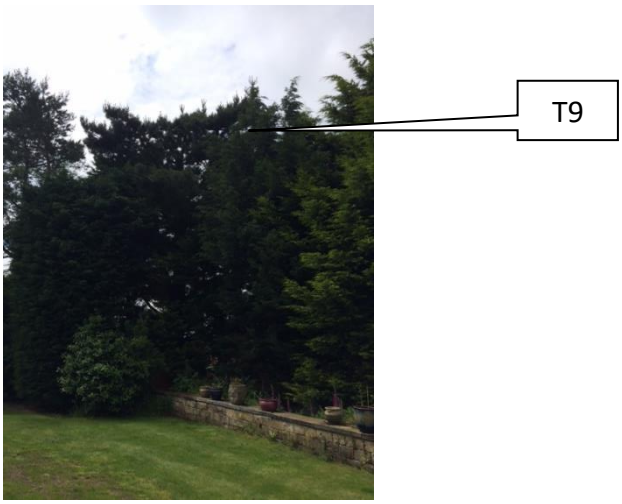
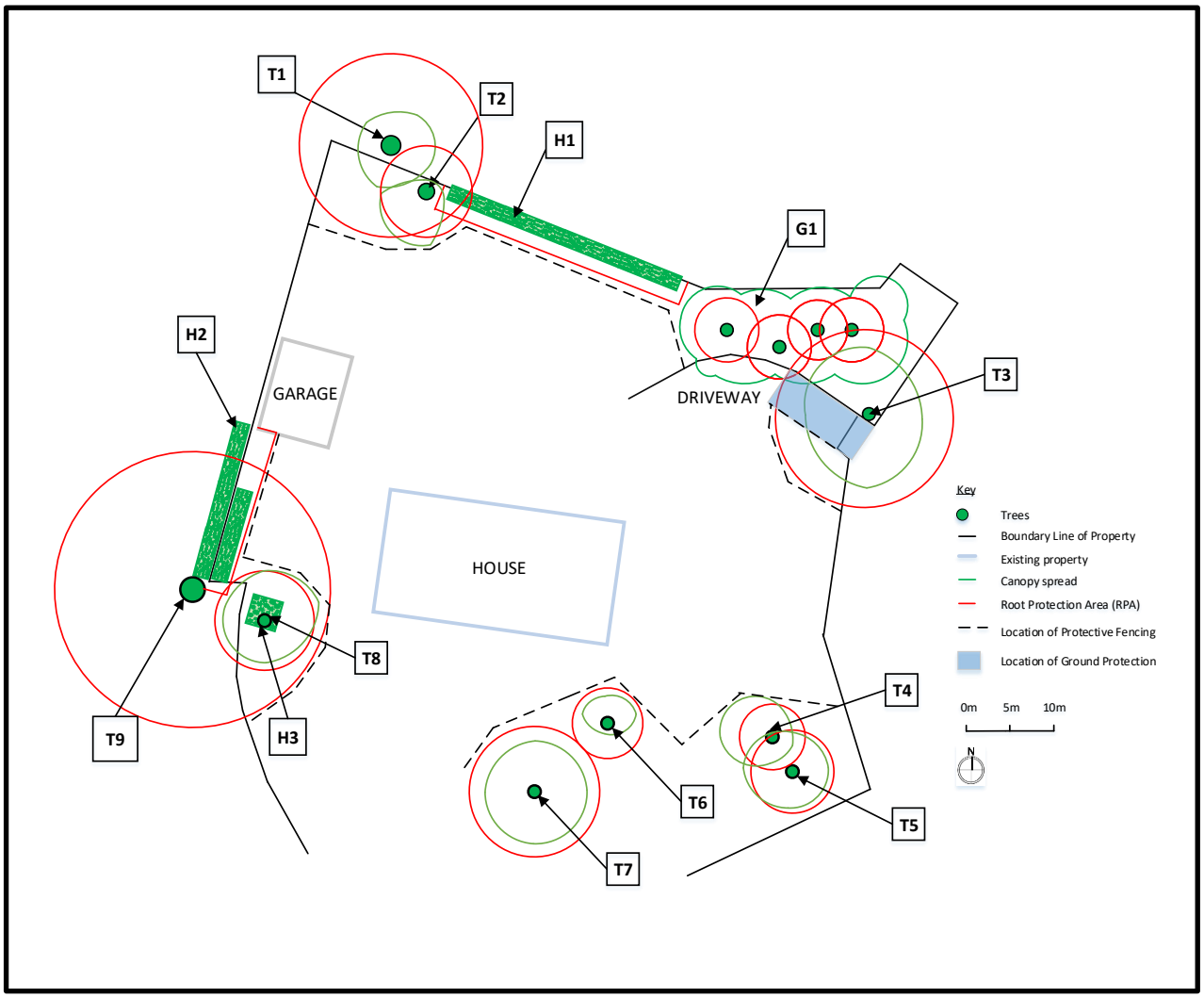


Image of T9



Image of H2

Appendix 3 Tree Protection Plan/Root Protection Area



Appendix 4

Tree Survey Data Explanatory Notes

This section explains the terms that may be used in the Tree Survey Data within Section 5.

A1.1 General Observations

A1.1.1 Numbering system: Each item of vegetation has its own unique number prefixed by a letter such that T1 = Tree 1, G2 = Group 2, H3 = Hedge 3, W4 = Woodland 4, S5 = Shrub 5

A1.1.2 Age Categories:

Young	Usually less than 10 years old.
Semi-Mature	Significant future growth to be expected, both in height and crown spread (typically below 30% of life expectancy).
Early Mature	Full height almost attained. Significant growth may be expected in terms of crown spread (typically 30 – 60% of life expectancy).
Mature	Full height attained. Crown spread will increase but growth increments will be slight (typically 60% or more of life expectancy).
Veteran	A level of maturity whereby significant management may be required in order to keep the tree in a safe condition.
Over Mature	As for veteran trees except management is not considered worthwhile.

A1.1.3 Species: Common names and Latin names are given.

A1.1.4 Height: Measured from ground level to the top of the crown.

A1.1.5 Stem Diameter: Taken at 1.37 m above ground level where possible. On multi-stemmed trees this measurement may be taken at ground level, though usually an indication of the number of stems and average diameter is given e.g. 3 x 30cm.

A1.1.6 Crown Spread: Measured N,E,S & W taken from the centre of the stem and usually rounded up to the nearest meter.

A1.1.7 Observations: If a tree's position is considered to be relevant it will be commented upon (e.g. overhanging a children's play area). Tree form and pruning history are also recorded along with an account of any significant defects. Defects and descriptive terms are dealt with in more details at the end of this section.

A1.1.8 Recommendations: Usually based on any defects observed and intended to ensure that the tree is in an acceptable condition.

A1.1.9 Priority Scale: Depending upon the threat posed by the tree, and the likelihood of failure, recommendations should be carried out according to the following priority scale:

Urgent	To be carried out as soon as possible
Very High	To be carried out within 1 month
High	To be carried out within 3 months
Moderate	To be carried out within 1 year
Low	To be carried out within 3 years

A1.1.10 Inspection Frequency: An interval of 6 months, 1 year, 1.5 years or 3 years is allocated before the next inspection is due. Wherever practical, consideration should be given to seasonal changes so that deciduous trees are not always surveyed in winter when they have no leaves, or in summer when leaves may obscure branches within the upper crown.

A1.1.11 Vigour: An indication of growth rate and the tree's ability to cope with stresses;

High	Having above average vigour
Moderate	Having average vigour
Low	Having below average vigour
Very Low	Tree is struggling to survive and may be dying

A1.1.12 Physiological Condition

Good	Health and no symptoms of significant disease
Fair	Disease present or vigour is impaired
Poor	Significant disease present or vigour is extremely low
Very Poor	Tree is dying

A1.1.13 Structural Condition:

Good	Having no significant structural defects
Fair	Some defects observed though no high priority works are required
Poor	Significant defects found. Tree requires monitoring or remedial works.
Very Poor	Major defects which will usually require significant remedial works or tree removal

A1.1.14 Amenity Value:

Very High	Exceptional specimen, observable by a large number of people
High	Attractive specimen, observable by a significant number of people
Moderate	One of the above factors is not applicable
Low	Unattractive specimen or largely hidden from view

A1.1.15 Life Expectancy: The estimated number of years before the tree may require removal. Classified as (<10), (10 – 20), (20 – 40), or (40+)

A1.1.16 Retention Category:
These are explained in detail in Cascade chart for tree quality assessment on the following page which is taken from BS5837.

A1.1.17 Ownership Category:

O	Within property boundary
3	3rd Party
LA	Local Authority
U	Unknown

A1.2 Evaluation of Defects

A1.2.1 Cavities, wounds, deadwood etc are all evaluated as follows:

Major	Such that structural integrity is, or will become, compromised and the tree is, or will inevitably become, hazardous.
Significant	A defect that may over time become a major defect, though not necessarily so. This will depend on the vigour of the tree and its ability to deal with decay etc.
Minor	A defect that is not likely to compromise the tree's structural integrity.

Cascade chart for tree quality assessment

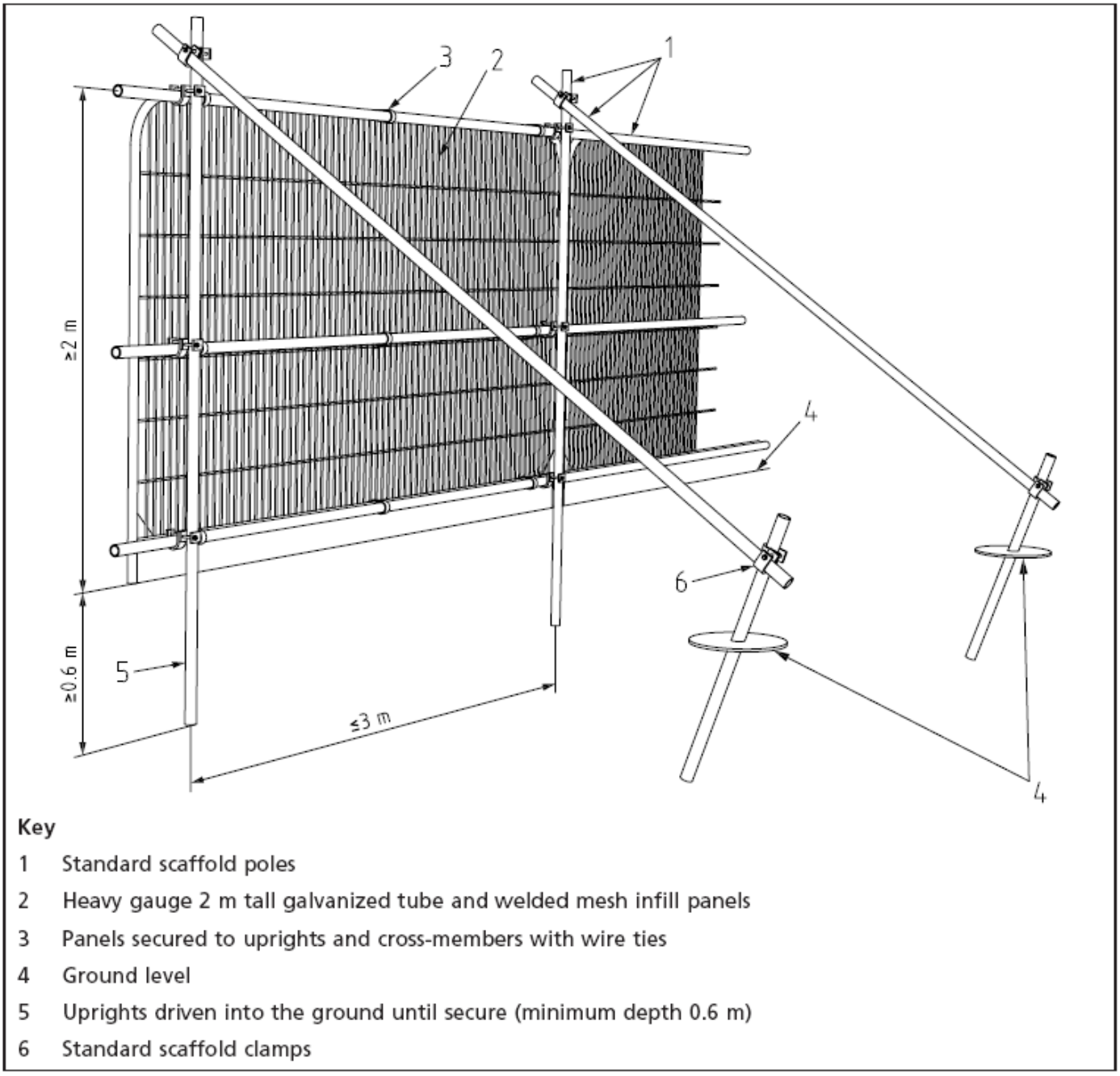
Category and definition	Criteria (including subcategories where appropriate)	Identification on plan
TREES UNSUITABLE FOR RETENTION *see Note*		
Category R Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other U category trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning); • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline; • Trees infected with pathogens of significance to the health and/or safety of other trees nearby (e.g. Dutch elm disease or very low quality tree suppressing adjacent trees of better quality. NOTE Habitat reinstatement may be appropriate (e.g. R category tree used as a bat roost: installation of bat box in nearby tree).	DARK RED

TREES TO BE CONSIDERED FOR RETENTION				
Category and definition	Criteria			Identification on plan
	1 Mainly arboricultural values	2 Mainly landscape values	3 Mainly cultural values, including conservation	
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups, or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant but remediable defects including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing in groups or woodlands, such that they attract a higher collective rating than they might as individuals, or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	MID BLUE
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualifying in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value; and/or trees offering low or only temporary screen benefits	Trees with no material conservation or other cultural benefits	GREY

Taken from BS5837:2012 Trees in relation to design, demolition and construction – Recommendations

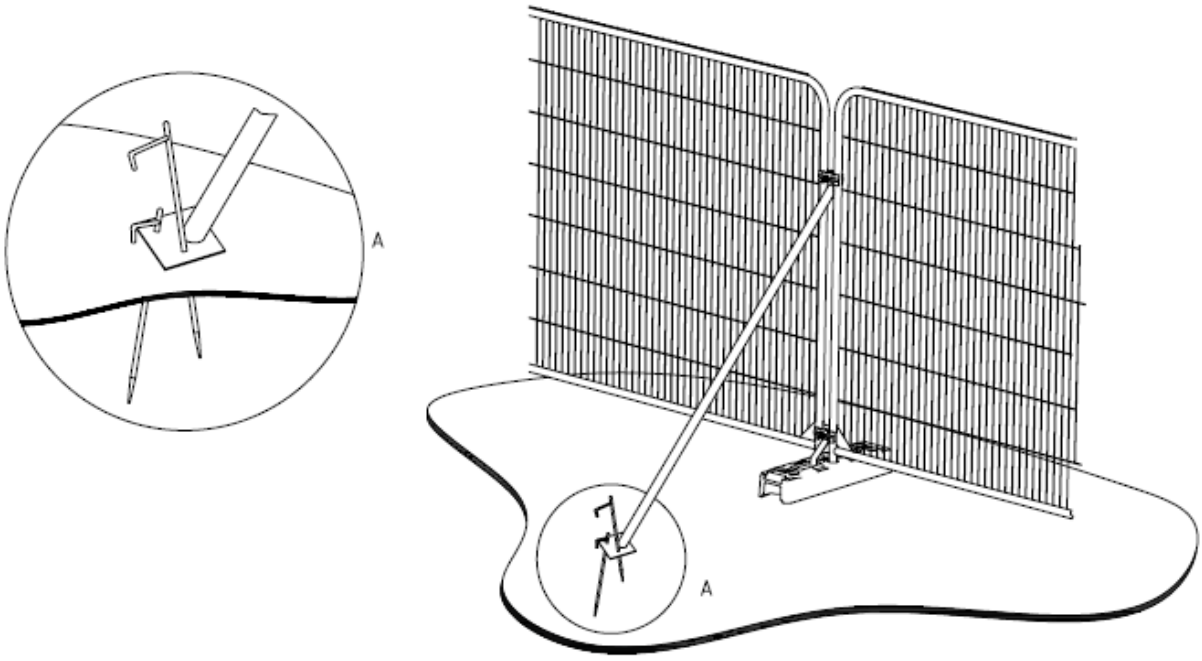
Appendix 5

Protective Fencing Specification

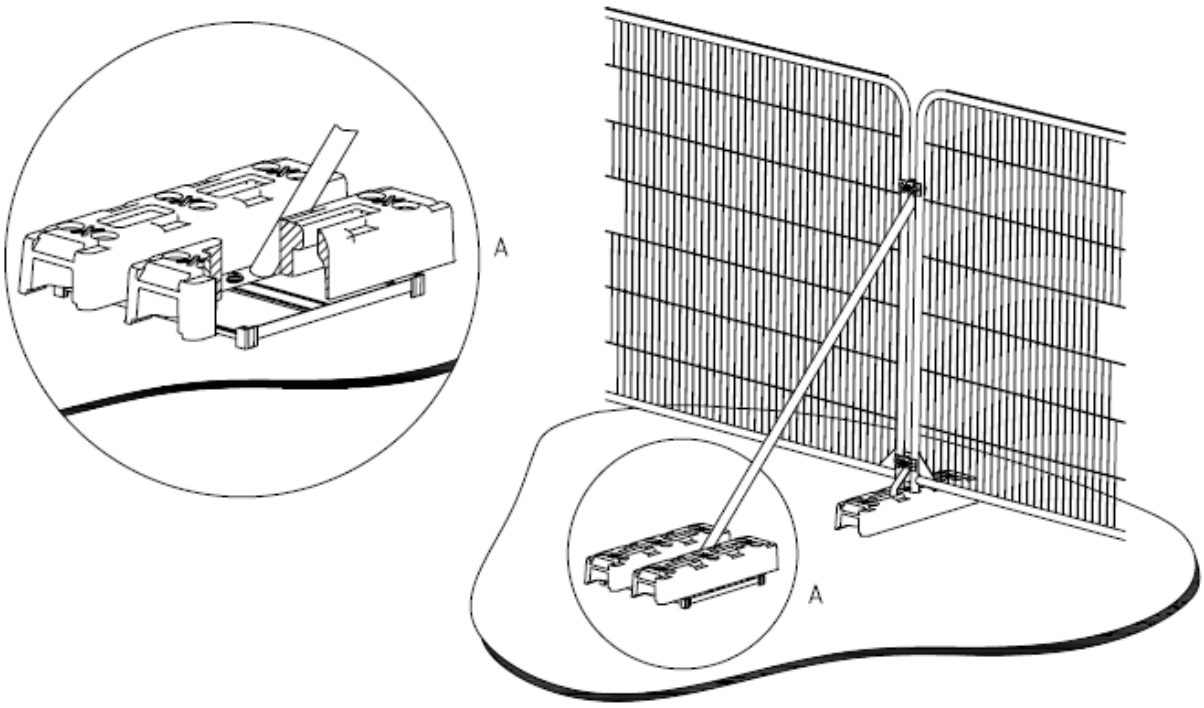


Key

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

Appendix 6

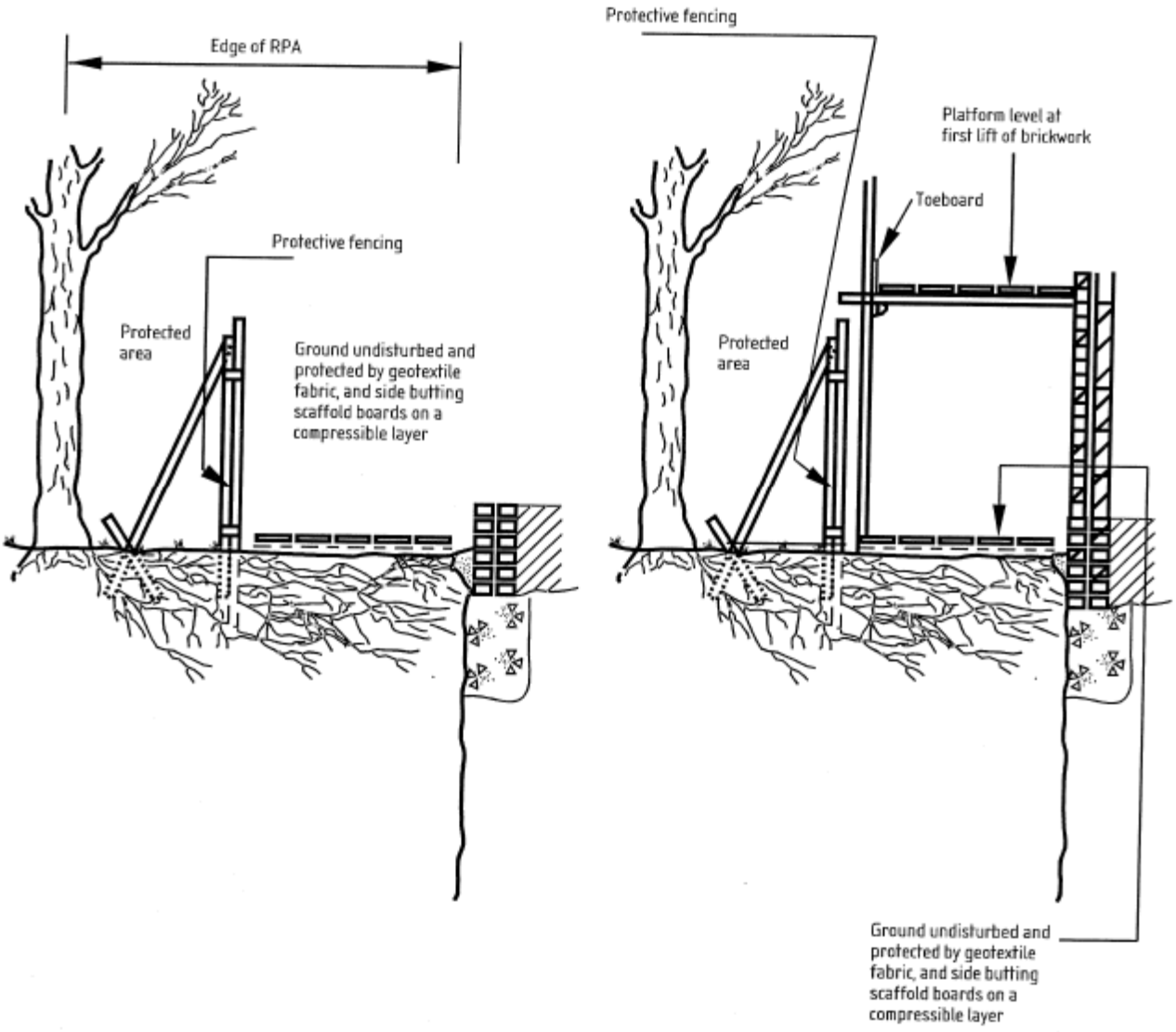
Ground Protection to avoid ground compaction



Temporary plated ground protection for site entrance and along driveway to prevent damage to tree roots and soil structure beneath existing driveway.

Appendix 7

Scaffolding within the root protection area with protective fencing



Adapted from BS5837: 2005