Introduction to Arboricultural Survey BS5837: 2012

Survey for trees at site:	Section close to an area known locally as 'The shallows' at Worsbrough Reservoir, off of Haverlands Lane, Barnsley
Prepared for:	Omar Sharif on behalf of Align Property Partners.
Reference:	TreeSurvey **0264**
Date:	14/12/2021
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The following documents are attached separately and should be read with this report:

- BS5837 Tree Survey Table

The following maps are attached separately and should be read with this report:

- Tree Constraints Plan
- Tree Shade Map

1.0 Introduction

1.1 Omar Sharif on behalf of Align Property Partners engaged Selwyn Trees to carry out an Arboricultural Survey for the site close to an area known locally as 'The Shallows' at Worsbrough Reservoir, off of Haverlands Lane, Barnsley. The purpose of the survey was to advise on the conditions of any trees and report on any trees which may be affected by any planning proposals. The brief included drawing up these reports as per BS5837: 2012- 'Trees in relation to Design, Demolition and Construction - Recommendations' to ensure that trees to be retained are protected during future development.

1.2 An Arboricultural site visit was carried out on the 22nd November 2021 to assess the condition of any trees on the site and that may be affected by a proposal. The survey assessed the condition of the trees, categorised the trees and provided calculated RPA (Root Protection Area) information (where appropriate) in accordance with BS 5837:2012. The Arboricultural survey is found in the attached document '**BS5837 Survey Table'.**

1.3 We were provided with the following documents:

- 3539-01
- 3539-02
- 3539-04

1.4 The report was compiled by Rachel Selwyn, BSc (Hons) in Arboriculture and Urban Forestry, who has 6 years' experience working for Selwyn Trees and is a professional member of the Arboricultural Association; and was assisted by Richard Selwyn BA (Hons).

2.0 Scope of Report

2.1 The purpose of the survey was to advise on the conditions of any trees and report on any trees which may be affected by planning proposals. The brief included drawing up these reports as per BS5837: 2012- 'Trees in relation to Design, Demolition and Construction - Recommendations' to ensure that trees to be retained are protected during future development. If required, detailed information on the impacts of a specific proposal can be compiled in an Arboricultural Impact Assessment.

2.2 The purpose of an Arboricultural survey and an Arboricultural Impact Assessment is to allow and help the preservation of trees to be retained within a site, in respect to any future proposed developments. The Arboricultural Survey aims to include information on the trees present and their current status and contribution. General information and guidance on impacts of any proposed development may be given. An Arboricultural Impact Assessment aims to comment on the Arboricultural implications of a proposed development and set out

preservation guidelines including tree protection methods, working techniques and construction practices.

2.3 If the principles and guidelines set out in these reports are not followed, then there is a risk of damage or death being caused by construction activities to retained trees. Any damage caused to trees may result in a decline in health or complete tree failure.

2.4 For any development proposed, adhering to the guidelines set out is crucial for the success of the recommendations, which are to be approved and enforced by the Local Planning Authority (LPA). If the recommendations are acceptable then we recommend they should be controlled at key stages of the development.

3.0 Arboricultural Survey Scope and Limitations

3.1 The full Arboricultural Survey is found in the attached table **'BS5837 Survey Table'.** The findings and recommendations are limited to those trees shown in the Arboricultural survey and those being shown to be retained by the developer. This Arboricultural survey is valid for 12 months from the date of the survey.

4.0 Caveats and Limitations

4.1 The inspection was carried out from a ground level Visual Tree Assessment. The survey did not include any climbing or investigation beyond what was visible from accessible points. Digital Scanning Software and other decay detection methods were not available to detect internal decay.

4.2 This report includes an evaluation of the tree(s) on the day the site visits were made. Where access was limited, measurements were estimated. This report takes into account findings from these visits. Due to the large number of trees present, some trees were surveyed in groups and smaller trees were noted but not surveyed individually. Where smaller trees are present next to a large tree, the largest of the group was surveyed so that this RPA (Root Protection Area) would take into account the RPAs of the smaller trees nearby, and the smaller trees were not surveyed individually.

4.3 No soil samples were taken.

4.4 Any legal descriptions stated or given by the consultant are understood to be accurate.

4.5 Selwyn Trees will not assume responsibility for legal matters that arise from this survey, and will not be required to act as a legal witness to give testimony or attend court unless agreed arrangements are subsequently made.

4.6 The Arboricultural survey is valid only for typical weather conditions. Healthy trees, or parts of healthy trees, may fail at any time. Structural failures occur when the stresses due to the forces acting on a tree exceed the strength of the tree structure or the tree–soil connection supporting the tree. Even a structurally strong tree, free of defects, will fail when a load is applied that exceeds the load-carrying capacity of one or more of its parts. Most tree structural failures involve a combination of structural defects or conditions, such as the presence of decay or poor structure and an unusual or extreme loading event, such as strong wind. Every effort has been made to identify defects or hazards but no guarantee can be given for their individual safety. Healthy trees may fail in unusually high or unpredictable winds or violent storms and as the consequences of such weather phenomena are unforeseeable, Selwyn Trees cannot be held liable for any such failures.

4.7 Trees are changeable organisms; their health and condition can change rapidly due to the dynamic nature and other site conditions. Therefore, this report is only valid for the 12-month period from the date of the site survey.

4.8 Land managers are responsible for any work on surveyed trees or for carrying out any recommendations.

4.9 Where similar trees are growing in large groups, their height and diameters may be estimated. Trees were surveyed if they affected the site and if their diameters at 1.5m exceeded 150mm in a woodland setting (75mm for individual trees). Where trees are young in age their measurements may be denoted as 'young'.

5.0 Site Description

5.1 The site surveyed is close to an area known locally as 'The Shallows' at Worsbrough Reservoir, Barnsley. The survey was requested due to refurbishment works being required for a retaining wall that has failed along the northern embankment. We were instructed, in an onsite meeting, of the area required for surveying, which consisted of the area of trees on the embankment close to the failed retaining wall in this area. This was also the area shown in the topographical survey provided.

5.2 The embankment in the area surveyed is steep with a sharp incline to the north, and was possibly artificially created. Various trees are situated on this embankment, as well as understorey brambles (*Rubus futicosus*). The embankment appeared to have a couple of channels running from top to bottom, possible old paths or rain run-off trenches. This site

area has been used previously for fishing and it is possible that the area may continue to be used as a fishing embankment after the retaining wall has been repaired. The site area is currently fenced off from all use due to the failure of the retaining wall. The main access way to the site area is via the north from the road, Haverlands Lane, and then via public footpaths.

5.3 The ground level of the site generally slopes downwards from Rotherham Road south towards the existing dwelling. The proposed car port is proposed in an area of existing gravel.

5.4 According to the Cranfield Soil and Agrifood Institute (2021) the soil type in the area is freely draining lime-rich loamy soils

5.5 TPO and Conservation Area Status

5.5.1 We understand the site is not within a Conservation Area.

5.5.2 TPOs (Tree Preservation Orders)

5.5.3 We understand there are no Tree Preservation Orders (TPOs) amongst the trees surveyed.

6.0 Background

6.1 Any development work on the site may detrimentally affect trees to be retained if those trees do not receive protection. The risk of damage to trees both above and below ground needs to be controlled by a strong physical barrier. The ground beneath the trees might be used by traffic or for storage of materials or be excavated, all of these will potentially be detrimental to the root systems.

6.2 The majority of tree roots generally occur in the top 90cm of soil, as at lower depths there is less access to water and oxygen. Contrary to popular belief mature trees do not have large tap roots that obtain water from great depths, but rather lateral and spreading. Tree roots need to take up water, oxygen and minerals in order to survive. Therefore, any compromise to a tree's rooting area may affect a tree's stability, ability to function and survival.

6.3 Construction activity can significantly affect the rooting area by compacting soil around trees and thus reducing the pore spaces within the soil. Pores are very important in soil for holding water and oxygen. Compaction inhibits root growth and penetration as well as decreasing the oxygen in the soil that is essential for the growth and function of the roots.

6.4 Damage caused to rooting environments can disrupt the balance between the roots and crown established by a tree over many years, and this could be potentially detrimental to tree health or may compromise the structural integrity or the stability of the tree.

6.5 Possibilities of damage to trees during and following construction processes include direct and indirect damage. Direct damage involves the mechanical physical damage to trees or their roots or roots systems via machinery, soil excavation or hazards such as fire. Indirect damage involves injury that occurs to a tree by activities that take place near the tree, such as compaction, level changes, soil damage or chemical contamination near the root plate.

6.6 For trees to be retained, light tree surgery work such as crown lifting and/or other tree protection methods along with implemented construction methods can reduce the risk of damage.

6.7 For protecting trees that are to be retained BS 5837:2012 –'Trees in relation to Design, Demolition and Construction' gives guidance on how to manage trees close to proposed works. BS 5837:2012 gives guidance on calculating the Root Protection Area (RPA) around a tree which estimates the area of soil needed to ensure the survival of retained trees.

6.8 The RPA gives guidance on the rooting area needed in order for a tree to survive. Once the RPA around trees to be retained has been set, no entry into the RPA by machinery should be allowed, nor should the RPAs be used for any type of storage or access pathway. Encroaching into a trees RPA should only be undertaken if agreed by the Local Planning Authority (LPA). By adopting such measures, lasting damage to existing trees can be avoided and the amenity values can be preserved.

6.9 RPAs may be subject to a 20% offset, but on one side only, in certain circumstances. The offset must be accounted for on the remaining sides and must take into account the tree conditions and the context of the site.

6.10 By considering the RPAs and existing site features (including natural and man-made topography) and by adopting construction and tree protection techniques that minimise root disturbance, successful construction projects can be achieved.

7.0 Instructions and Brief

7.1 The brief was to undertake a tree survey in accordance with British Standard BS 5837:2012 'Trees in relation to design, demolition and construction: Recommendations'.

7.2 The survey is based on the conditions found on the day(s) and based on the findings of the visit. A site visit was made on the 8th November 2021. The weather on the day of the site visits was mostly dry. Where access was limited, measurements were estimated. This report takes into account findings from this visit. Quantitative data is provided on tree species, height, diameter, age class, crown spread, British Standard category, crown clearance and brief assessment on tree condition and future potential. Trees found to be structurally dangerous or in poor condition are identified.

7.3 With regards to British Standard BS 5837:2012 'Trees in relation to design, demolition and construction- Recommendations' a calculation has been made for the theoretical Root Protection Areas (RPA) in metres.

7.4 This survey should be regarded as an initial assessment and appraisal of the trees on the site and gives outlines of construction practices around trees to BS 5837:2012 'Trees in relation to design, demolition and construction- Recommendations'.

7.5 The location of the trees with their calculated RPAs is shown in the attached map plan.

7.6 The survey includes the information below:

Key:

Survey Reference number- Trees were tagged.

Species - Species identification is based on visual observation with the common English name given first and the botanical name give in italics. If the species was not identified it is marked with Unidentified.

Tree Heights – These were measured in metres using laser technology. Where access was limited or there was little visibility due to overcrowding, heights were estimated.

Stem Diameters – Measured using diameter tape in mm. In the case of grouped trees the largest diameter was recorded.

Crown Spread - The crown spread was measured in metres in the North, South, East and West directions. Where access was limited crown spread was estimated.

Crown Clearance - the height of the first significant branch was measured. Where access or visibility was limited this was estimated.

Age class – trees were recorded as young, semi-mature, early mature, mature, over mature as prescribed in BS 5837:2012.

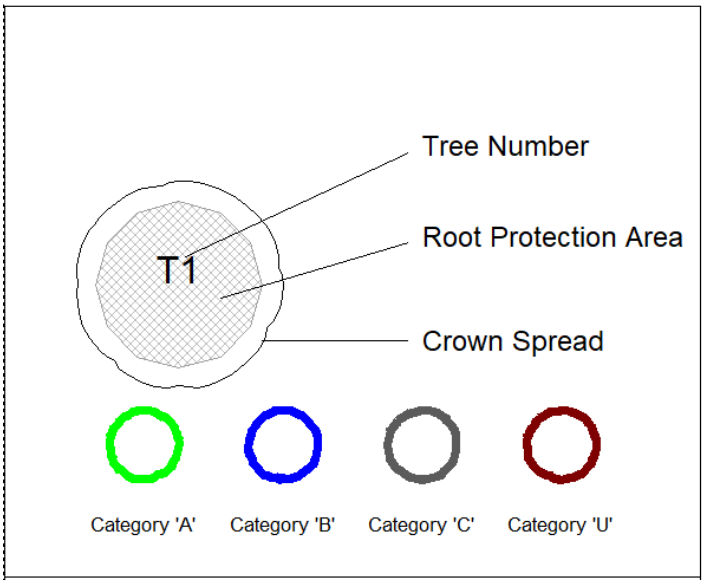
Condition – tree condition was recorded briefly particularly in respect to structural and/or physiological condition (eg. The presence of decay, physical defects and/or preliminary management recommendations)

Where trees are grouped or in case of woodlands, the condition stated will be typical of the feature. Groups of trees and woodlands are represented and the RPA will be included in the total area shown. The RPA will be calculated by taking an average measurement of stem diameter.

Estimated Remaining Contribution/ Life Expectancy – estimated (eg. Less than 10 years, 10-20 years, 20 – 40 years, 40+ years)

RPA (Root Protection Area) - The Root Protection Area for a tree is the minimum area required to meet the everyday needs of a normal healthy tree. The standard root protection area of a tree is described as a circle (with the tree at the centre) with a radius of 12 times the stem diameter, measured at 1.50m above ground level. The maximum radius for a root protection area (excluding ancient and veteran trees) is capped at 15.0m. BS:5837 recommends that there should be no excavation, no changes of soil level (either increases or decreases) and no compaction within the root protection area. The radius of the root protection area for ancient and veteran trees, based on the current Standing Advice, is 15 x stem diameter (measured at 1.50m above ground level) or 5.0m beyond the edge of the canopy, whichever is the greater. The RPAs are illustrated on the associated maps by grey hatched polygons. The RPA illustrated polygon is a design tool used to calculate the minimum area of soil a tree needs at its current size to survive. However, the true root spread may be different from the polygon design tool illustrated, depending on the site conditions and site features. Therefore, these are taken into account when assessing root spread and impacts of any development on roots.

The RPA Polygons and crowns spreads of the trees surveyed are illustrated on the map plans by the following key:



Retention Category- Corresponds with BS 5837:2012

A - Trees of high quality and value, including visual amenity (sub categories 1, 2, 3). It is usual for such trees to be retained unless the planning merits of a particular scheme or lay-out override.

B – Trees of moderate quality and value, including visual amenity value (sub categories 1, 2, 3). Such trees should be considered for retention

C – Trees of low quality and value including visual amenity (sub categories, 1, 2, 3)

U – Trees in such a condition that they cannot be realistically retained as living trees in the context of the current land use for longer than 10 years

Sub categories – trees in categories A to C will qualify under one or more of three sub categories (1, 2, 3). Sub categories 1, 2 and 3 are intended to reflect Arboricultural and landscape qualities, and cultural values, respectively. This is set out in Appendix 2.

The tree survey lists which sub category applies. Each sub category is intended to have equal weight such that, for example, an A1 tree has the same retention priority as an A2 tree. Some trees could qualify under more than 1 criterion.

Trees were surveyed if they had a stem diameter above 75mm as per the BS 5837: 2012 guidelines (150mm for woodland trees). Trees with stem diameters less than this are classed as too young to be significant.

For more information of tree categorisation, please see **Appendix 1 British Standard BS5837:2012**

Deadwood -

Minor deadwood- less than 25mm in diameter

Moderate deadwood- 25-50mm in diameter

Major deadwood – Greater than 50mm in diameter

Physiological condition-

Those trees marked 'Good' can generally be classed as having good overall structural and physiological condition. They usually contribute significantly to the local or site amenity.

Those trees marked 'Fair' can generally be classed as having reasonable structural and physiological condition. They may contain smaller areas of included bark within either major or minor fork junctions. They may be subject to single or multiple fungal invasions, bacterial or virus. They may be subject to minor crown dieback, unusually pale or smaller foliage or have been subjected to outside influences such as restriction of rooting spread, vandalism or mechanical damage, but should be viewed as in generally good overall condition.

Those trees marked 'Poor' can generally be classed as having poor overall structural or physiological condition. They may contain large areas of included bark either within major fork junctions. They may be subject to single or multiple fungal invasions, bacteria or virus. They may contain splits or cracks throughout the branching structure. They may be subject to significant crown dieback or

exhibit unusually pale or small foliage. They may be subject to outside influences such as restriction of rooting spread, vandalism or mechanical damage and costly to retain.

Root Protection Area (RPA) –All trees in retention categories A, B and C have their RPA calculated and the RPA figure given represents the radial distance, from the tree's trunk, at which barriers should be erected. The calculation for the RPA is as per section 4.6 of BS 5837:2012.

For single stem trees, the RPA should be calculated as an area equivalent to a circle with a radius 12 times the stem diameter. For trees with more than one stem, one of the two calculation methods below should be used. In all cases, the stem diameter(s) should be measured in accordance with Annex C, and the RPA should be determined from Annex D. The calculated RPA for each tree should be capped to 707 m2.

a) For trees with two to five stems, the combined stem diameter should be calculated as follows:

$$\sqrt{(Stem\ diameter\ 1)^2 + (Stem\ diameter\ 2)^2 \ldots + (Stem\ diameter\ 5)^2}$$

b) For trees with more than five stems (not illustrated in Annex C), the combined stem diameter should be calculated as follows:

$$\sqrt{(mean\ stem\ diameter)^2\ x\ number\ of\ stems}$$

N.B. Where all stem diameters were not accessible, this averaging formula has been adopted.

The RPA for each tree should initially be plotted as a circle centred on the base of the stem. Modifications to the shape of the RPA should reflect a soundly based Arboricultural assessment of likely root distribution.

Any deviation in the RPA from the original circular plot should take account of the following factors whilst still providing adequate protection for the root system: a) the morphology and disposition of the roots, when influenced by past or existing site conditions (e.g. the presence of roads, structures and underground apparatus); b) topography and drainage; c) the soil type and structure; d) the likely tolerance of the tree to root disturbance or damage, based on factors such as species, age, condition and past management.

8.0 Initial General Observations, Comments and Pictures

8.1 Please see the table in the attached document 'BS5837 Survey Table' attached, which provides details, measurements and comments regarding the trees surveyed. Trees were

plotted onto the Tree Constraints plan map using a topographical survey. Where trees were surveyed that were not indicated on the topographical survey, a GPS receiver was used. GPS has an accuracy of 1-3m.

8.2 The trees surveyed include species *Salix*, *Quercus* and *Crataegus monogyna.* Approx. 14 trees were surveyed plus a couple of groups. The trees are situated on and close to the northern embankment of Worsborough Reservoir. The measurements of the stem diameters taken on the site visited were used to calculated RPAs (Root Protection Areas) which have been plotted as grey hatched polygons on the attached Tree Constraints Plan. This RPA illustration is a design tool used to calculate the minimum area of soil a tree needs at its current size in order to survive. The true root spread may be different from the polygon design tool illustrated, depending on the site conditions and site features. Therefore, these are taken into account when assessing root spread and impacts of any development on roots.

Preliminary observations with regards to any future proposed works to the retaining wall of the northern embankment

8.3 The trees closest to the existing retaining wall are T708 (willow *Salix alba*) and T713 (Oak *Quercus robur*). These trees are also the amongst the largest in the area.

8.4 T708 was calculated to have an RPA spread radius of around 11.67m, measured from the centre of the tree trunk. Based on this and the position of the tree, it can be expected that the roots of this tree will be present up to the retaining wall, and it is likely roots are present spreading underneath into the reservoir. Willows (*Salix* spp.) tend to be moisture hungry and can develop very large spreading root systems. The roots can also be expected to spread along the embankment.

8.5 T713 (oak) is situated further back from the retaining wall of the northern embankment. The tree is situated approximately 3.8m from the edge of the reservoir. The tree was calculated to have an RPA spread radius of around 9.64m, measured from the centre of the tree trunk. Based on this and the position of the tree, it can be expected that the roots of this tree will be present up to the retaining wall, and it is possible roots are present spreading underneath into the reservoir. The RPA polygon design tool indicates the theoretical RPA of T713 may spread underneath the reservoir by around 60.11m².

8.6 However the root morphology of trees T708 and T713 may differ from the illustrated polygons on the Tree Constraints Plan map due to the reservoir. Generally, tree roots tend to be surface orientated with 90% of roots occurring within the top 1m of soil. This is because there is less oxygen and water at lower depths. Tree roots need oxygen in order to survive as they are porous.

8.7 Therefore whilst tree roots can survive for short periods of time submerged within water under anaerobic conditions, tree roots generally don't grow within water; they need soil and some aerobic conditions. Therefore, it is possible the tree roots extend underneath the reservoir. However, the anaerobic conditions here may limit their spread and the roots of these trees may in fact spread further east, west and north along the embankment, further than the basic grey hatched polygon design tool indicates on the Tree Constraints Plan.

8.8 The calculated RPAs (Root Protection Areas) of trees T709 (Oak), T710 (Willow), T711 (Hawthorn), T712 (Hawthorn), T714 (Hawthorn), and all other trees and groups surveyed, do not extend across into the footprint reservoir, accordingly to the Tree Constraints Plan map. The RPA of T709 would theoretically spread to approx. 2m from the retaining wall of the embankment.

Guidance for impacts on existing trees with the repair and rebuilding of the failed retaining wall of the northern embankment.

8.9 Under the BS587:2012 'Trees in relation to Design, Demolition and Construction-Recommendations' guidelines the following need to be observed in order to minimise impacts of development on trees and to ensure trees can be retained undamaged.

8.10 Guidance from BS5837: 2012 on protecting tree roots within RPAs states that for tree roots to be retained undamaged there must be no excavation, no soil stripping and no soil grading of the site within the Root Protection Area of retained trees i.e No digging. Root severing damages a root system and can cause the decline, instability and death of trees. Compaction reduces the pore spaces in the soil reducing the water and oxygen available for tree roots, which can cause roots to become asphyxiated and die.

Within Root Protection Areas the guidance follows that:

- Roots must not be severed, cut or broken – no digging
- Ground levels must not be changed- no digging, no soil raising
- Soil must not be compacted- no tracking of vehicles
- Oxygen must be able to diffuse into the soil beneath the engineered surface- no tracked vehicles

8.11 If permanent hard surfacing is proposed within RPAs of retained trees it must following no dig principles e.g. no excavation, it must be load-bearing and must be porous. Ground protection such as the Cellweb TRP system is one system that is compliant with BS5837:2012 for any new hard surfacing within RPAs (Root Protection Areas) of retained trees. Another

alternative would be to create raised platforms for walkways above the soil surface to minimise root severing and compaction within tree rooting areas.

8.12 The precise impacts on the roots of trees present, especially T708 and T713 will depend on the proposal for repairing the failed wall along the northern embankment. It may be that some damage to existing tree roots of T708 and T713 will be unavoidable in order to repair the retaining wall. The extent of damage would depend on the proposal and the methods used.

8.13 T708 (Willow) has significant hollowness in its main stem and has had numerous major breakouts. The tree provides unique habitat for wildlife within the hollowed area but is vulnerable to future failures. Therefore, if the tree is retained it is strongly recommended that its target zone needs to be kept free of pedestrians. If pedestrians are to regularly be present within the target zone, pruning work needs to be considered to reduce the risk of failure, or tree removal needs to be considered. From an Arboricultural perspective the tree has wildlife value and therefore should be retained if possible.

8.14 Removing the existing failed retaining wall would likely result in some root loss of tree T708 and T713. T708 would likely be most affected, and if significant, removal of this tree may need to be considered. T713 (Oak) is a large tree with good value that should be retained. It is likely removing the retaining wall and repairing (which may involve excavating some of the embankment) would result in some root loss of T713. This tree is mature and mature trees generally struggle to cope with stresses to their root systems compared to younger trees. It is possible that if significant root damage occurs, tree T713 could decline, in which case pruning, or in the most severe case tree removal, may need to be considered to lower the risk of harm due to a tree failure.

General guidance on planting opportunities

8.15 There is opportunity for new planting to be carried out on the embankment in the survey area, particularly towards the eastern side. Significant brambles are currently present on the embankment, which will smother any new trees planted. Therefore, if tree planting is to take place, the brambles present will require removing and the area maintained free of weeds and other ground vegetation to prevent competition with new trees and present new trees being smothered.

8.16 A group of 2 young oak (*Quercus robur)* trees and 1 young hawthorn (*Crataegus monogyna)* are present on the embankment, referenced as T715, T715a and T716 on the map. These are young trees at present and are growing very close together. The oak trees have the potential to form massive spreading trees (20m+ in height). Their position has been approximately illustrated on the Tree Constraints Plan. These young trees are situated relatively close to the public footpath.

8.17 Future management will likely be required for these trees. One of the oak trees may require removing to allow the remaining oak sufficient space to grow. Oak is very slow growing species. However, the client may choose to remove both young oak trees and replant with an alternative species that has a smaller mature height, due to oak trees having a large ultimate size.

8.18 New tree planting can be carried out on the banking and the roots would help bind the soil together to lessen soil erosion. The ultimate height of trees planted should be taken into consideration when species are chosen. As a general guide, planting a variety of species will help diversify the Arboricultural value of the local area. It is beneficial to plant British native species, and to choose species that fit in within the existing Arboricultural area. In the site and surrounding areas, the common tree species present are Oaks (*Quercus* spp.), Hawthorn (*Crataegus monogyna*), willows (*Salix* spp.), birch (*Betula* spp.), Hazel (*Corylus avellana*) and Ash (*Fraxinus excelsior*).

8.19 Other British native species, that have a small to medium in ultimate size include:

- Dog rose (*Rosa canina),*
- Alder buckthorn (*Frangula alnus),*
- Guelder rose (*Viburnum opulus)*
- Dogwood (*Cornus sanguinea)*
- Holly (*Ilex aquifolium),*
- Blackthorn (*Prunus spinsosa)*
- Yew (*Taxus baccata)*
- Field maple *(Acer campestre)*
- Rowan *(Sorbus aucuparia)*
- Whitebeam *(Sorbus aria)*

8.20 General guidance on planting can be found in Appendix 4.

Pictures

8.21 Please see general pictures of the site below:



Photo 1: Looking west towards T708



Photo 2: Cavity and hollowness in main stem of T708



Photo 3: Looking northeast towards T714



Photo 4: Looking west towards T708, with broken limbs visible in crown



Photo 5: Looking northwest towards trees T715, T715a, T716. These are young trees growing very close together and surrounded by brambles.



Photo 6: Looking west towards tree T713 (oak). The main stem of T713 is approximately 3.8m from the edge of the reservoir



Photo 7: Looking northeast towards tree T713



Photo 8: Looking east towards G1 and G2. These are both stumps which have resprouted.



Photo 9: Looking west along the northern embankment towards trees T708, T713 and others further up the embankment. Areas of heavy brambles are present on this embankment, shown to the right in the above photo. Small woody plants are also growing out of the retaining wall, such as Corylus avellana



Photo 10: Looking west from the existing public pathway towards tree T718. The northern embankment is to the left in this picture and tree T713 (oak) is visible.



Photo 11: Looking north from public footpath towards tree T718. Please see the table BS5837 Tree Survey for details and recommendations regarding this tree.



Photo 12: Looking north from public footpath towards Tree T719.



Photo 13: Looking northwest from public footpath towards Tree T718.

9.0 Conclusions

9.1 The attached document 'BS5837 Tree Survey Table' provides details regarding the trees surveyed.

9.2 Some tree work recommendations have been provided regardless of whether development occurs on site. It is recommended that all trees close to targets are inspected regularly. More details can be provided on the precise impacts and any protective measures, once a specific development is proposed. Overall, some degree of damage can realistically be expected to occur to the roots of T708 and T713 when the retaining wall is repaired, as excavation may be required to remove the failed wall, and roots may be present within these areas. If significant root damage occurs to the roots of T708 and T713, the trees may decline. T708 is already in decline and therefore action may be required for this tree regardless of development. Carrying out any excavation work sensitively would help lessen the impacts on tree roots. For any new surfaces, using no dig construction methods or raised platforms would also lessen the impacts on existing tree roots.

9.3 A **Tree Constraints Plan** is attached, plus a **Tree Shade Map**, showing the positions of the trees, the RPA spreads, the crown spreads and the shade cast by the trees surveyed. The RPA measurements and other tree measurements, are shown in the document 'BS5837 Survey Table', attached.

9.4 The following appendices give some further general information including tree categorisation, protective fencing and ground root protection for trees within RPAs.

Appendix 1

British Standard BS 5837:2012 Table 1

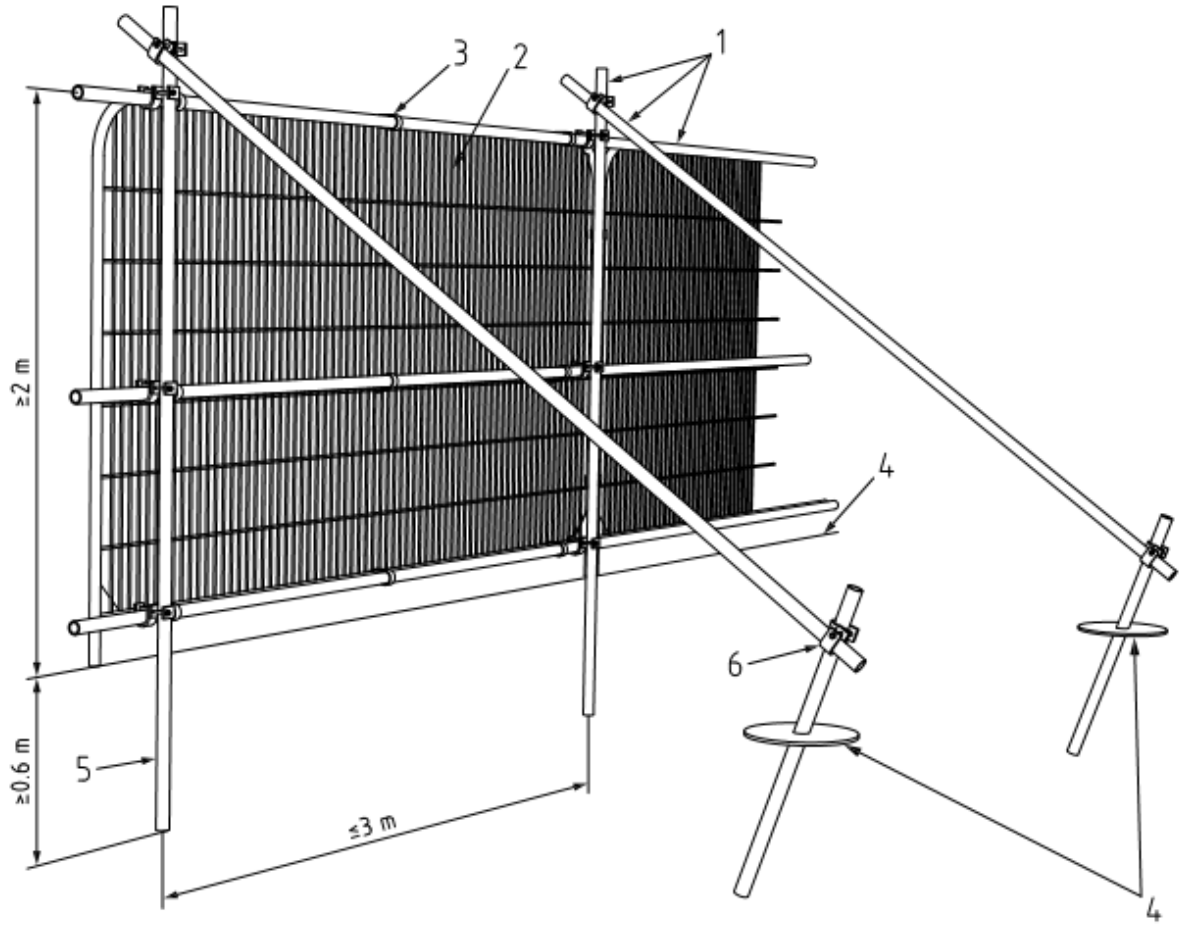
Appendix 1 British Standard BS 5837:2012 Table 1 Cascade chart for Tree Quality Assessment

Trees for Removal			
Category and definition	**Criteria**		
Category U Those in such a condition that 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 or other U category trees (e.g 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, or very low quality trees suppressing adjacent trees of better quality. *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve*		
Trees to be considered for retention			
Category and definition	**Criteria- sub categories**		
	1 Mainly Arboricultural Values	**2 Mainly landscape values**	**3 Mainly Cultural values**
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 area essential components of groups, or of formal or semi-formal Arboricultural features (e.g. the dominant and/ or principle trees within an avenue)	Trees, groups or woodlands of particular visual importance and /or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (eg. Veteran trees or woodland pasture)
Category B Trees of moderate quality with an estimated remaining life contribution of at least 20 years	Trees that might be included in the high category but are downgraded because off impaired condition (e.g. presence of remedial defects including unsympathetic management and storm damage), such that they are unlikely to be beyond retention for beyond 40 years; or trees lacking the special quality necessary to merit the Category A designation	Trees present in numbers usually growing as 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 benefits
Category C Those of low quality and value 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 qualify 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 screening benefit	Trees with no material conservation or other cultural benefits

Appendix 2

Tree Protection, Protective Fencing Detail, and Ground Protection Detail

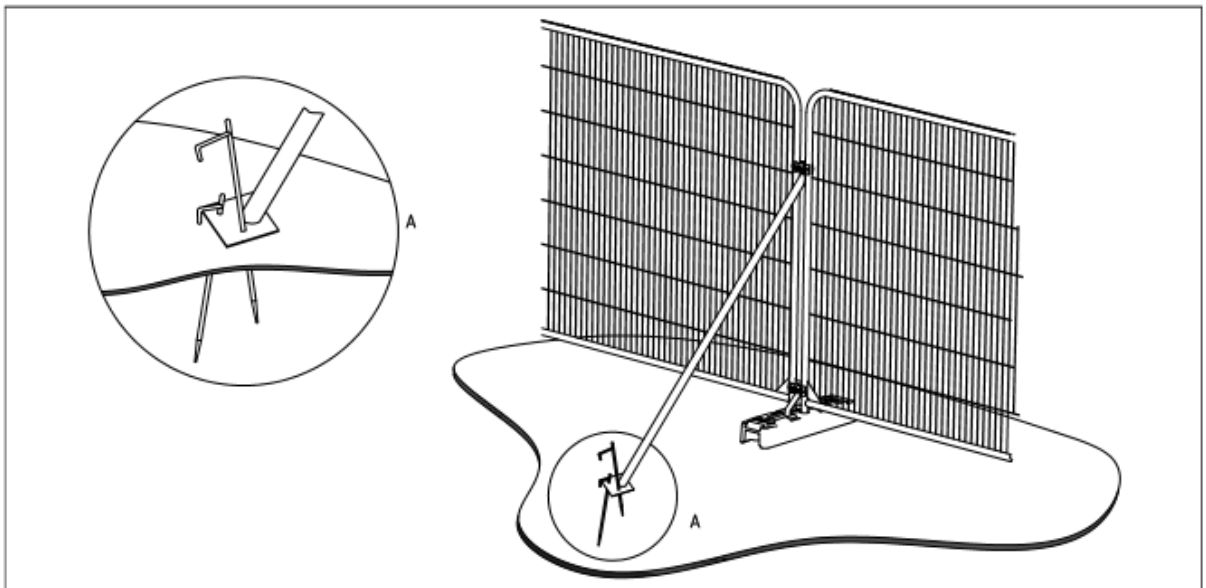
Default specification for protective barrier BS 5837:2012 –Trees in relation to Design, Demolition and Construction



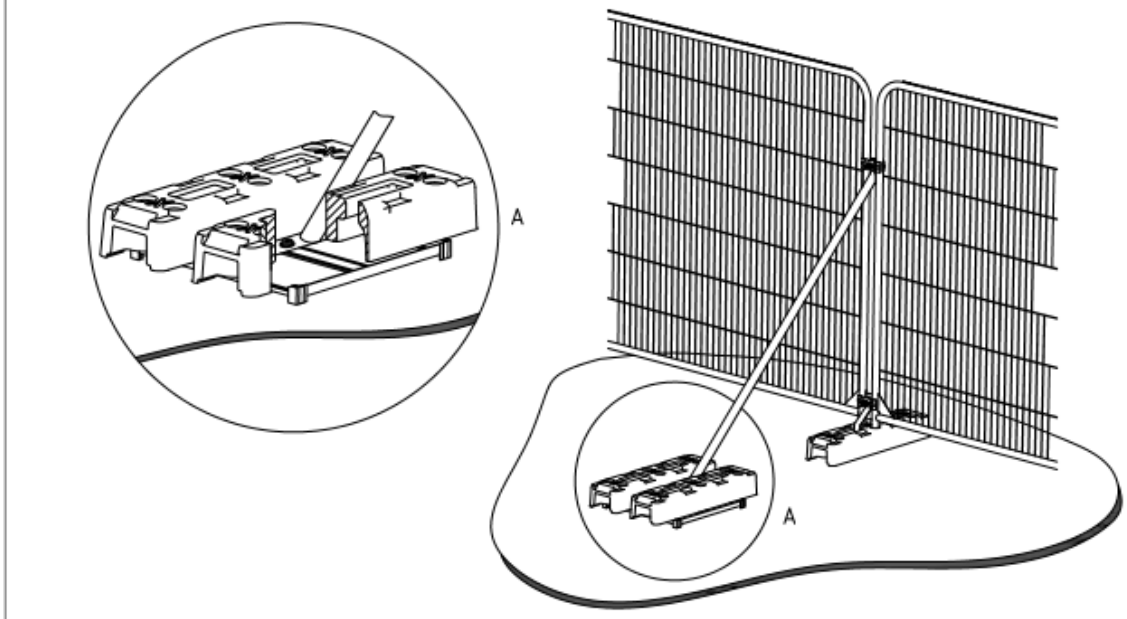
Key

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

Examples of above ground stabilizing systems BS 5837:2012 –Trees in relation to Design, Demolition and Construction



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

Example of Ground Protection for Plant Access and surfaces within RPAs

Ground Protection and effective site access systems can be achieved using products such as Cellweb, specifically designed for protecting ground for areas within RPAs and compliant with BS5837:2012.

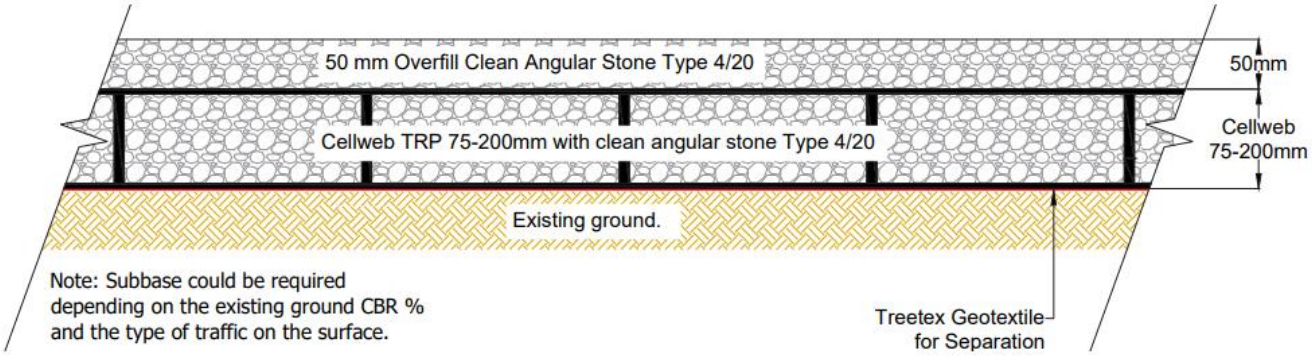


Figure 3: Indicative Cellweb TRP no dig ground protection system, with overfill

Cellweb® Tree Root Protection

Cellweb® Tree Root Protection System provides a flexible and permeable solution for protecting tree roots whilst creating a robust and stable platform when creating vehicular or pedestrian access paths.

Cellweb®TRP has a unique cellular structure and perforated cell walls which reduces the vertical load pressure on sub soils to tree roots, therefore preventing damage. With clean granular materials as infill, air and moisture can reach the roots to encourage healthy prolonged growth.

With no-dig solutions being the preferred option, Cellweb®TRP is ideal as only the surface vegetation need be removed. As well as avoiding disruption to the roots, this reduces construction times and costs.

By using the Cellweb®TRP, sub base depths can be reduced significantly, in most cases by as much as 50%, providing further cost savings. The use of Cellweb®TRP also prevents surface rutting; increasing the long-term performance and aesthetics of the final surface.

Geosynthetics Limited provides a full engineering service, including the provision of surveys, structural designs, CAD drawings and installation supervision at no cost to the client.

Benefits of using Cellweb®TRP:

- No dig solution
- Prevents compaction of sub soils
- Only guaranteed system on the market
- Complies with BS:5837:2012
- 100% success rate
- Full technical support from our Tree Root Protection Team
- Technical Recommendations from qualified Civil Engineers
- Provides moisture and air paths
- Reduces sub base depths
- Independently tested
- Environmentally friendly
- Simple to install
- Extensive bank of case studies
- Educational Seminars Find out more

If you would like more information or for site specific project design information please call our sales department on 01455 617139

Downloads

Cellweb® Tree Root Protection
Click here for downloads

Case Studies



Fountaindale School - Cellweb TRP

Roehampton Downshire - Cellweb TRP

Gibside National Trust - Cellweb TRP

Castle Gardens - Cellweb TRP

Calke Abbey Ancient Tree - Cellweb TRP

Parkside School - Cellweb TRP

Enquire about this product

Name *

Email *

Telephone *

Message *



Photo 28: Photo showing an example Cellweb TRP installation for a new driveway

Construction using No-Dig methods and ground protection (taken from Arboricultural Practice Note 12, *Through the Trees to Development*, The Tree Advice Trust, 2007)

Construction should incorporate two main components:

- A synthetic load spreading material
- A no-fines aggregate sub-base

'Load spreading' materials, are synthetic grids/webs designed to support roads on soft ground by distributing the load of a wheel over a larger area than would normally occur. They may be 2- or 3-dimensional.

When placed on a 2-dimensional grid, appropriate, no-fines granular sub-base material penetrates the mesh, but is unable to pass through it, forming a positive interlock. This interlock between aggregate and grid provides a reinforced platform and efficient load spread into the underlying ground over a wider area than the footprint of the wheel on the surface. A suitable geogrid/aggregate combination constructed with the grid under tension should prevent rutting of the ground beneath construction.

The 3- dimensional load spreading products (Cellular confinement system) creates cells into which the sub base material is placed. Such a construction does not support the sub-base material, it confines the material in discrete cells. Manufactures recommend, therefore, that a geotextile is

placed between the ground and the load spreader to prevent the cell- contained mineral material being pressed down into the underlying soil.

A no-dig construction will need to be contained to prevent outward creep under the weight of vehicles. This may be achieved with an edging support provided its construction does not require excavation. A suitable material may be long-life timbers pinned through the load spreader into the underlying soil. This could add strength to the structure because the pressure of vehicles forcing the sub-base downwards and onwards will tend to increase the tension on the grid and any tendency to rutting.

The granular sub base material should have a no 'fines' content which means that even when it is compacted it should be freely draining and will allow oxygen to diffuse into, and damaging gases (e.g. carbon dioxide and methane) out of the soil. The minimum distance from the tree should be 0.5m.

Further information should be sought from the manufacturer.

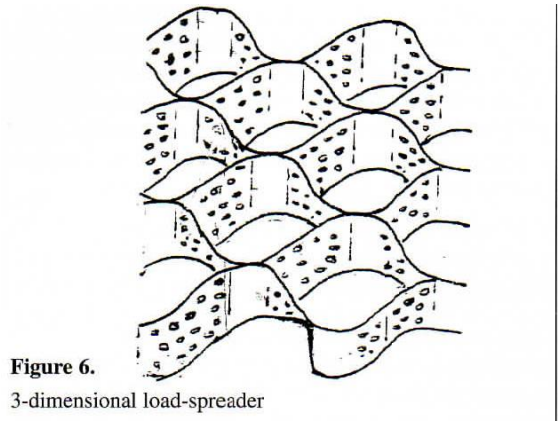


Figure 6.
3-dimensional load-spreader

Diagram of 3-dimensional load spreader, from Arboricultural Practice Note 12, (2007)

Within the Root Protection Areas:

- Roots must not be severed, cut or broken – no digging
- Ground levels must not be changed- no digging, no soil raising
- Soil must not be compacted- no tracking of vehicles
- Oxygen must be able to diffuse into the soil beneath the engineered surface- no tracked vehicles

A system compliant under BS5837:2012 is the Cellweb TRP system with a Treetex Geotextile (manufacturer Geosynthetics Ltd.). Other systems are available.

A 'No-Dig Construction' ground protection system should incorporate the following main components:

- A **geotextile separation layer (e.g. Treetex Geotextile**) laid onto top of the existing ground and top soil, separating the system above from the soil and rooting environment below.

- A **synthetic 3D cellular confinement grid (e.g. Cellweb TRP)** laid onto of the geotextile separation layer. This is a load spreading material that is designed as a grid/web to support driveways and roads by distributing load.

- The **3D synthetic cellular confinement grid (eg. Cellweb TRP)** infilled with a 4-20mm clean angular stone. The confined angular stone locks together to produce a rigid stone mattress, while maintaining air pockets for continuous water permeation and gas exchange. A porous surface can then be laid on top.

This information provided is specific for the Cellweb TRP system of ground protection. For the Cellweb system, the cellular confinement grid is provided in different depths, and the depth required is dependent on the proposed traffic loadings and existing site ground conditions.

For domestic traffic (cars), a cellular confinement depth of 100mm is usually sufficient (Geosynthetics Ltd). The manufacturer can provide technical specifications from a topographical survey

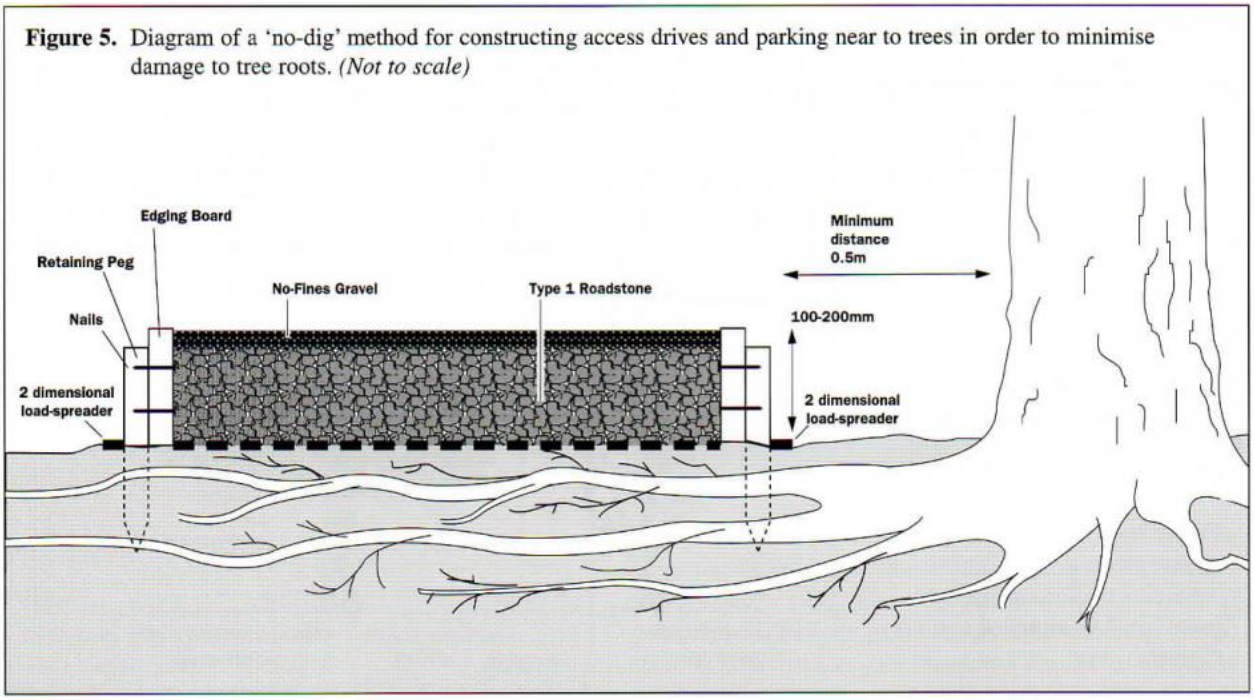


Figure 5. Diagram of a 'no-dig' method for constructing access drives and parking near to trees in order to minimise damage to tree roots. *(Not to scale)*

Figure 5 is taken from the Arboricultural Practice Note 12- 'Through the trees to development'.

Appendix 3

Tree Protection Site Notice and Arboricultural Monitoring Schedule

Tree Protection Site Notice





Arboricultural Supervision Schedule

Activity	Arboricultural supervision require, and by whom?	Date action undertaken
Undertaking of suggested tree work	Yes by appointed contractor	
Erection of protective fencing	Yes by Arboriculturist and site supervisor	
Installation of temporary ground protection (if deemed necessary)	Yes by Arboriculturist and site supervisor	
Dismantling of protective measures	Yes by site supervisor	

Appendix 4- General Information on Planting

1.1 Information on tree planting has been provided below.

1.2 New planting helps safeguard the long-term amenity value of the area. Such a policy will provide for a more effective long-term safeguarding of the local urban forest and the Arboricultural amenity value of the area.

1.3 New tree planting will need to take ultimate size of the trees and shading into account. New planting will take into account ultimate size and position to minimise future shading conflicts, and direct pruning conflicts.

How to plant a tree

1.4 The following information on how to plant a tree successfully is taken from the International Society of Arboriculture (2019) and the BS 8545:2014 Trees: from nursery to independence in the landscape.

1. Locate all underground utilities prior to digging.

2. Identify the trunk flare. The trunk flare is where the trunk expands at the base of the tree. This point should be partially visible after the tree has been planted.

3. Dig a tree pit. Holes should be no deeper than the existing rootball or container depth and have a diameter at least 75mm greater than that of the root system. During excavation of the tree pit, the soil dug should be placed to one side separating topsoil and subsoil as far as is practical.

4. Remove the containers or cut away the wire basket. Inspect container tree root balls for circling roots. Straighten, cut, or remove them. The tree's root system should be wetted prior to planting

5. Place the tree at the proper height. Take care to dig the hole to the proper depth – and no more. If the tree is planted too deep, new roots will have difficulty developing because of a lack of oxygen. The tree should be planted at the correct depth taking into account the position of the root flare and the finished level. Allowance should be made for settling of the soil after planting.

6. Straighten the tree in the hole. Before backfilling, have someone view the tree from several directions to confirm it is straight.

7. Fill the hole gently, but firmly. Pack soil around the base of the root ball to stabilize it. Fill the remainder of the hole, firmly packing the soil to eliminate air pockets that may dry out roots. Further reduce air pockets by watering periodically while backfilling. Avoid adding fertilizer at the time of planting. Backfill should be added gradually in layers of 150mm to 230mm depth ensuring the tree is held up right. At each stage the fill should be firmed in to eliminate all air pockets under and around the root system, but with care being taken not to excessively compact the soil.

8. Use a support system (stake), if necessary. Studies have shown that trees establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. Therefore, staking should be carried out if it is deemed necessary.

9. Mulch the base of the tree. Mulch is organic matter spread around the base of a tree to hold moisture, moderate soil temperature extremes, and reduce grass and weed competition.

10. Immediately after planting, the tree should be saturated to field capacity.

11. Provide follow-up care. Keep the soil moist, but not water-logged. Water trees at least once a week, barring rain, and more frequently during hot, windy weather. Formative pruning.

New positions for tree planting

1.5 Trees will be positioned to allow them to reach their mature size without being impeded or risk causing conflict in feature (e.g. "*the right tree in the right place").* The crown habitat of the species and ultimate size is therefore very important for tree species selection for new planting.

1.6 Figure 4 illustrates how best to plant a tree to help it establish in a new location. The figure below has been sourced from Nichol's Garden Group Ltd. (2019)

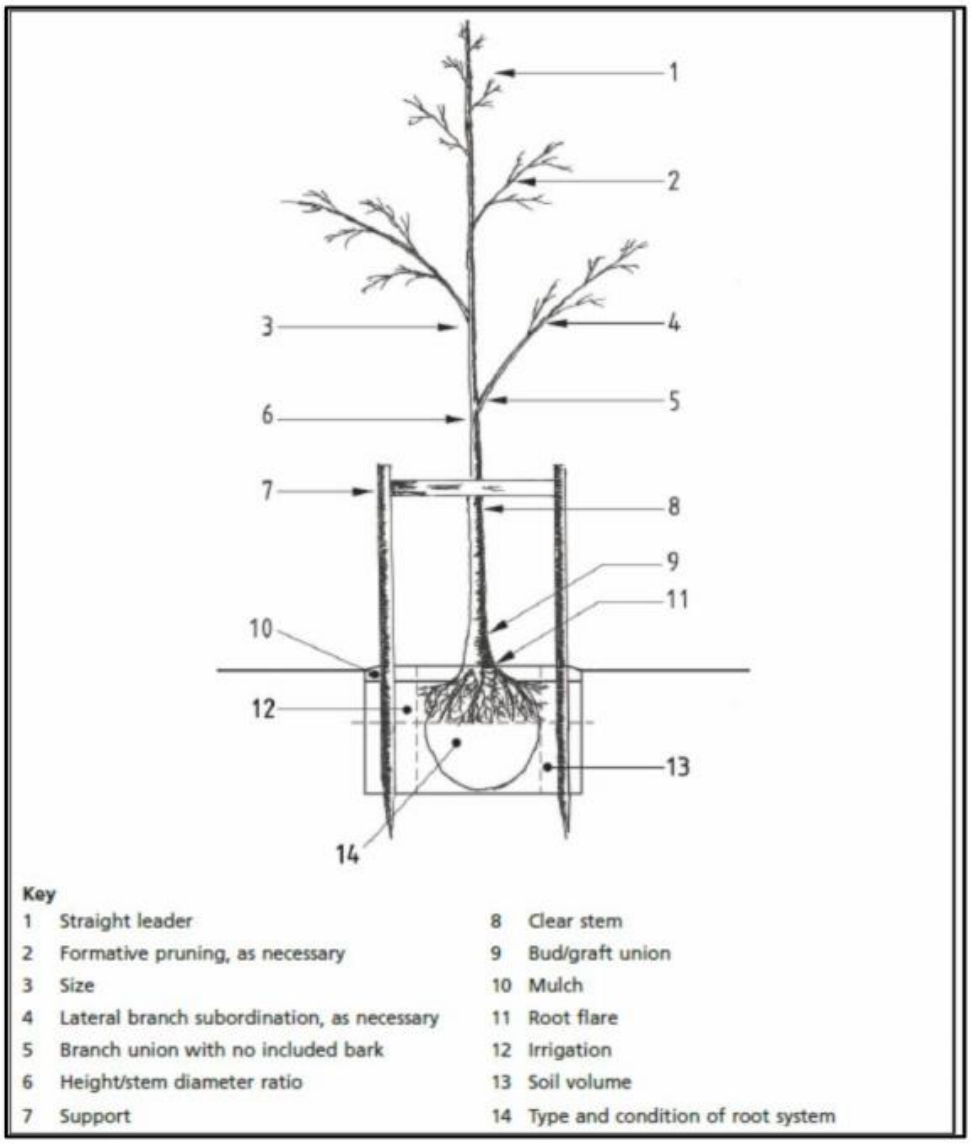


Figure 1.2 Factors involved with tree planting © BS 8545:2014

Fig. 4: Diagram credit to BS8545: 2014

Where and When to Plant

1.7 Ideally trees will be planted in the dormant season, when weather conditions are cool which allow plants to establish roots in the new location before spring rains and sun warmth stimulate growth.

1.8 Trees will be suited to the soil type in the area and take into account the nature of the site; i.e exposed, sheltered, full sun, shade, general weather and presence of nearby structures. The ultimate size of the tree should be taken into account when choosing species.

Minimising future conflict with roads, buildings and driveways when a tree reaches maturity, is a very important factor is sustainable tree planting

1.9 Trees will ideally be positioned at least 1.5-2m from pavements and roads, to minimise future conflict, and ideally at least 1m from boundaries.

Tree Stock

1.10 The tree stock chosen for new planting should suit the area.

1.11 All new trees will require watering regularly during the first 5 years. For small hedging type stock, the trees can be smaller. Generally, younger plants and trees can establish better than older trees due to them experiencing less transplanting stress.

Watering

1.12 Watering is very important in the first years of a tree's life to help it establish. It is important that trees are watered regularly for the first years, especially during the summer months. Formative or corrective pruning can also be part of long-term tree maintenance.

1.13 Any tree that fails to establish within 5 years after planting this should be replanted.

Maintenance and management of grass and weeds around trees

1.14 Without weed and grass management, trees will struggle to compete and become overcrowded ultimately affecting their long-term future. Grass should be kept away from the base of trees, at least 40-50cm, to prevent lawn mower and strimmer damage. Stimming should not be carried out around trees as it can cause serious damage. Grass ad weeds guards may be helpful in reducing competition from weeds and to protect from animals.

Mulch

1.15 Mulch can be applied around the base of trees to help prevent grass and weeds growing around the tree. It will be kept at least 10cm away from the bark at the base of the tree. Mulch will help suppress grass and weeds to some extent. However, removing weeds by hand would also be an important part of general upkeep and maintenance of newly planted trees, to prevent resorting to chemical weed killers as a control.

1.16 Reapplying mulch, manually removing weeds and manually ensuring grass is kept approx. 40-50cm away from the bases of trees are imperative parts of a successful landscaping scheme. Grass and weeds grow the most during the growing season, from approximately

March-October. Regular maintenance in these months is therefore crucial for successful establishment.

Staking

1.17 Double stake:- This is the standard method of staking container-grown and rootballed trees. Two or three stakes can be inserted opposite each other, or equally spaced around the tree outside the root ball, and secured to the trunk by long ties or a timber crossbar and tie. This method is also useful on windy sites (RHS, 2020). The stakes should be as low as practically possible to allow some movement in the main stem and allow stem taper to develop, to allow the tree to build adaptive strength in the main stem.

1.18 Special tree ties are available made of durable, long-lasting plastic, with buckles for fastening and adjustment. These ties can be loosened as the tree girth expands. Use spacers to prevent the stem and stake rubbing against each other. Make a figure of eight to hold the tree to the stake, with the spacer in between the tree and the stake, and secure the tie to the stake with a nail. (RHS, 2020). Biodegradable ties such as degradable hessian, can also be used. These ties will require loosening when required to prevent them damaging the young stems.

1.19 Problems with staking:- Most problems with staking come from the stakes being too high and the ties becoming too tight or from damage after storms. Check the ties regularly for rubbing and adjust if necessary. Constriction of the stem by ties happens very quickly, so fast-growing trees need frequent checking. After bad weather, check for abrasion and snapped stakes or ties (RHS, 2020).

Strimmer damage

1.20 Strimmer damage can cause major damage to the stems of young tree. Some trees never recover from such damage. Therefore, it is recommended that grass guards are installed around trees to prevent strimmer damage. Mulch around the base of the tree, but not piled up against the stem, can also help suppress weeds and grass, limiting strimmer damage.