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Arboricultural & Ecological Consultancy
Chartered Arboriculturalists & Environmentalists

Arboricultural Impact Assessment

For Trees On Land Adjacent To

5 Lawn Drive, West Boldon,

South Tyneside – Revision A



For

Mr S Lovely

Institute of Chartered Foresters Registered Consultant

Arboricultural Association Fellow Member

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Constructionline Part of Capita plc

Document Verification

Document Title	• Arboricultural Impact Assessment For Trees On Land Adjacent To 5 Lawn Drive, West Boldon, South Tyneside - Revision A • For Mr S Lovely
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Original AIA	
Issued 13th November 2013	Authorised - A Watson

Revision A	
Issued 7th August 2017	Authorised - A Watson

Revision	
-	-

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Appendices

1. Tree Survey

2. Glossary of Terms

3. Site Plans

   - Existing Trees Shown On Existing Layout (AIA EXI Rev A)
   - Retained Trees Shown On Proposed Layout With Protective Measures Indicated
     -Tree Protection Plan (AIA TPP Rev A)

1. Introduction

1.1 We are instructed by Mr S Lovely to provide an updated Arboricultural Impact Assessment (AIA) for the significant trees located at within a specified area adjacent to 5 Lawn Drive, West Boldon. This report is Revision A.

1.2 The plot has existing planning permission for a residential dwelling. This application seeks a slight increase in the building footprint. The developments juxtaposition with the existing trees is considered.

1.3 We were provided with the following documents:

- Existing plan in digital AutoCAD format
- Proposed development plans in digital AutoCAD format

1.4 This assessment is concerned with recording the species, size and condition of the trees. Recommendations are made where appropriate to establish acceptable levels of safety for the site and also to establish a higher level of arboricultural management.

1.5 The trees are also evaluated for the purposes of British Standard 5837–2012 Trees in relation to design, demolition & construction, with regard to their quality and value. The type and size of the root protection area is calculated and the position of the protective barriers is determined. The remaining contribution or safe useful life expectancy is estimated as an indication of the trees period of retention.

1.6 All observations were from ground level without detailed investigation.

1.7 Trees are living organisms whose health and condition may change rapidly and all observations are based on the status of the tree at the time of inspection.

2. Protected Status Of Trees

2.1 Trees may be legally protected, this may either be in the form of a Tree Preservation Order (TPO) or that the trees are located within a Conservation area.

2.2 Potentially large penalties may be enforced for illegally carrying out works on protected trees. It is recommended that checks are made before any works are undertaken and no work should commence until permission has been granted. Please note that there are a number of exemptions from the requirement to obtain a felling licence including land on which full

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planning permission has been granted by the local authority, however this exemption does not cover land where only outline planning permission has been granted, or on land which has been allocated for residential development within local authority urban and local development plans.

2.3 AllAboutTrees has been able to ascertain with South Tyneside Council (the Local Planning Authority) on Friday 6th August 2010 that there are restrictions protecting the trees on the site. The site is not within a Conservation area however there are TPOs imposed on some trees within the site. The TPOs are cited as TPO no 148:2007 and TPO no 8:1977. TPO no 8:1977 also covers the large beech tree located at no.4 Lawn Drive (T 23). It is an offence to carry out any tree work without giving the required notice or applications.

3. Site Visit & Description

Site location – N 54° 56' 24.51 W 01° 27' 27.03
O/S Grid reference- NZ 348 607 GB Grid

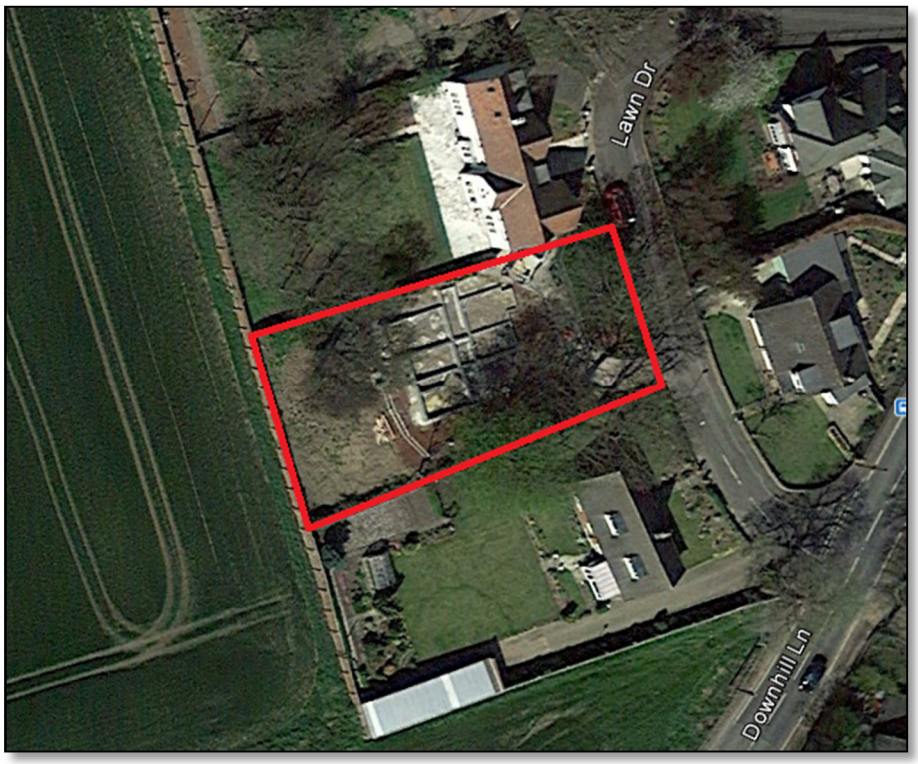


Figure 1 – The approximate study area is indicated by the red boundary line.

3.1 A site visit was undertaken on Thursday 17th October 2013 by Richard Bryson. Additional site visits were undertaken in August 2017 by Tim Archment to inform the updated report. The weather was fine with no visibility constraints on both occasions.

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3.2 The study area consists of the former garden space associated with no. 5 Lawn Drive, West Boldon. Following development of 5 Lawn Drive the garden has been divided and a new boundary fence installed.

3.3 The property is located within a small hamlet and is surrounded by agricultural fields. Access to Lawn Drive is via Downhill Lane.

3.4 The site has been partially developed. Pile foundations and ring beams have been installed. A small amount of blockwork has been built upon this. The site does not appear to have been operational for some time; consequently it is becoming overgrown and some small trees are beginning to establish.

3.5 There were no apparent drainage issues at the time of the survey.

4. Appraisal

4.1 The trees have been surveyed on site and plotted on the site plan. Their positions are considered accurate given the provision of a detailed topographical survey.

4.2 All significant trees have been inspected and some of the smaller specimens have been included for accuracy. Individual recommendations are included within Appendix 1 of this report.

4.3 Root Protection Areas (RPAs)

4.3.1 The British Standard Root Protection Areas (RPAs) are indicated by the red circles surrounding the trunk position of the trees on the associated plans. These indicative circles do not take into consideration site specific conditions such as the presence of buildings, roads, footpaths, topography, underground utility services etc. and are representative of typical root morphology where said structures are not encountered.

4.3.2 The root protection area of tree 1 has been modified (cyan polyline) to take account of the surrounding structures. It is also highly likely that the root protection areas of trees 3-5 have been restricted however due to the extent of the built structures it is difficult to predict where the roots would proliferate.

4.4 Tree Removals

4.4.1 The proposed development does not require the removal of any individual trees.

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4.4.2 Group 1 may be subject to modification pruning works however this would be as part of any landscaping scheme desirable for the plot. It has for the purpose of this report been indicated as retained and protected.

4.4.3 Tree 2 is a moribund tree and should be removed as part of the site management.

4.5 Retained Trees

4.5.1 Protective barriers as per section 5.1 of this report should be erected around all retained trees in the position indicated by the blue line on the Tree Protection Plan prior to any works on site. Signs should also be attached stating that the area is a protected zone and should not be entered.

4.6 Special 'Tree Friendly' Construction

4.6.1 There will be a requirement to connect the proposed garage to the existing driveway. It is important that no damage is caused to the rooting area, therefore special 'no-dig, tree friendly' methodology as described in section 5.2 of this report should be laid in the area indicated by the green hatching on the Tree Protection Plan (TPP). The exact alignment of the driveway has not been indicated on the proposed plan; as such the hatched green area is considered indicative only and is subject to change.

The above applies to the following trees;

- Trees 3-5

4.6.3 For this type of construction to be successful it should be installed following the manufacturer's instructions and under our supervision as we can advise and provide site specific details which will deal with addressing level changes and mitigating any existing or perceived compaction damage.

4.7 Ground Protection Measures

4.7.1 It will be necessary to have access within the root protection areas (RPAs) of some of the trees. To avoid compaction damage to the underlying roots during construction ground protection measures as per section 5.3 of this report will be required in the areas shown as hatched orange on the Tree Protection Plan (TPP) this will provide both a working area and space for scaffolding and allow access around the building. This methodology should be implemented at the time of barrier erection, remain in situ throughout the build and only removed when all construction activity has finished.

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4.7.2 The trees that require ground protection are:

- Trees 1, 3-5 & 7-9

4.8 Foundation Design

4.8.1 The proposed building will be built on an existing foundation (indicated on the TPP by purple hatching), with the exception of the garage area which will require new foundations (indicated on the TPP by magenta hatching). To avoid damage to the root plate of the adjacent trees it will be necessary to construct the building in a more tree friendly manner than in a conventional build (in accordance with section 7.5.5 of BS 5837: 2012). In essence this means that traditional strip footing foundations cannot be used as they would sever a proportion of the roots and instead the building should be constructed on piles with either a pier beam grid or a cast slab (either pre cast or cast in situ) placed on top of the piles. The grid or slab can be laid at or above ground level but cannot be ground bearing to avoid any compaction of the ground overlying the roots. It may be possible to install a lip on the structure to support the brickwork/ frame and camouflage the piled foundation.

4.8.2 The piles will be positioned some distance from the trunk meaning that the larger tension roots will have declined in diameter significantly, intimating that no large structural roots should be encountered.

4.8.3 Various piling rigs are available for sites with limited space (including overhead space below tree canopies). A tracked mini pile rig can generally be used in spaces with a 4m overhead clearance with rig weights of <5 tonnes. Advice would have to be taken from the pile engineers as to which rig would be most appropriate for this site. The machine should stand on steel plating (or similar- see section 5.2) laid on top of a layer of sand or compressible material such as woodchip to adequately spread the load.

4.8.4 Ground compaction will be absolutely minimal and gaseous exchange will continue to take place unimpeded. The root system of the tree is dynamic in nature producing a mass of new roots throughout the growing season which grow and survive to a varying extent. It is estimated that some species of hardwood trees lose up to 90% of the absorbing roots during winter and produce new rooting during the next season. As the shape and size of the root system is not immutable and is adventitious in form, the root system will adapt to the position of the new building over time and respond to the changing conditions without adversely affecting the tree.

4.9 Facilitative Pruning

4.9.1 The canopies of trees 1, 4 and 5 are close to the proposed dwelling and it is likely that some facilitative pruning will be required to enable the erection of scaffolding during the construction phase.

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4.9.2 The encroaching sections of the canopies should be carefully pruned back to achieve a 2.5-3m clearance between the canopy edge and the building. This should be achievable through a combination of branch reduction and crown lifting. To minimise the extent of the pruning, the tree works could be carried out whilst the scaffolding is erected, this would ensure only the required amount is removed.

4.9.3 It is not anticipated that this level of pruning would have a detrimental effect on either the physiological condition or amenity value of either tree.

4.9.4 All tree works must conform rigorously to BS 3998 (2010) 'Recommendations for Tree Work'.

4.10 Wildlife Habitats

4.10.1 As part of the survey the significant trees were inspected from ground level for signs of wildlife habitation, in particular birds and bats.

Bats

4.10.2 All UK bats and their roosts are protected by law. The legislation protecting bats are:

- The Wildlife & Countryside Act 1981 (WCA)
- Conservation of Habitats and Species Regulations 2010

4.10.3 For all countries of the UK, the legal protection for bats and their roosts may be summarised as follows:

You will be committing a criminal offence if you:

1. Deliberately* capture, injure or kill a bat
2. Intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats
3. Damage or destroy a bat roosting place (even if bats are not occupying the roost at the time)
4. Possess or advertise/sell/exchange a bat (dead or alive) or any part of a bat
5. Intentionally or recklessly obstruct access to a bat roost

**In a court, 'deliberately' will probably be interpreted as someone who, although not intending to capture/injure or kill a bat, performed the relevant action, being sufficiently informed and aware of the consequence his/her action will most likely have.)*

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4.10.4 Penalties on conviction - the maximum fine is £5,000 per incident or per bat (some roosts contain several hundred bats), up to six months in prison, and forfeiture of items used to commit the offence, e.g. vehicles, plant, machinery.

4.10.5 No visual signs were found to indicate the presence of bats in the surveyed trees though a number of the mature trees within the site display characteristics found favourable to bats and as such caution must be exercised.

4.10.6 When carrying out tree works it is essential that the contractor or other competent person carriers out a specific 'bats in trees risk assessment' which can be obtained from the 'Arboricultural Association' or the 'Bat Conservation Trust' (BCT). If evidence of bats is found work must stop immediately and Natural England Batline contacted (0845 1300 228). A further inspection may well be required by a licensed bat handler or roost visitor.

Birds

4.10.7 In the UK, all wild birds, their nests and their eggs are protected by law.

4.10.8 In England, Scotland and Wales the legislation that protects wild birds is:

- The Wildlife and Countryside Act 1981
- The Countryside (or CRoW) Act 2000

4.10.9 No nesting birds were seen at the time of inspection though given the scope of the site and the extent of vegetation potential exists for birds to nest and as such caution must be exercised.

4.10.10 As with bats the contractor has an obligation to carry out visual checks prior to works. Where possible tree works should be carried out in the period from August to the end of February in order to avoid the bird nesting season.

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5. Tree Protection Measures

5.1 Root Protection Area & Barrier Specification

5.1.1 Trees on development sites are prone to damage during the course of demolition and construction works. Retained trees need to be protected in line with British Standard 5837–2012 Trees in relation to design, demolition & construction.

5.1.2 This usually involves identifying a construction exclusion zone around the tree which should remain undisturbed with appropriate protective barriers preventing access to this Root Protection Area for the duration of the project.

5.1.3 The minimum root protection areas (measured in a radius from the centre of the tree to the protective barrier) are outlined for each individual tree and the barrier layout is indicated on the plan.

5.1.4 The exact root spread of an individual tree is difficult to quantify, but in general, the bulk of a trees roots are situated in the upper 600mm of the soil with the finer absorbing roots prevalent in the upper 250mm.

5.1.5 Dependant on soil conditions and the species of the tree, the root plate may extend radially for distances in excess of the height of the tree.

5.1.6 In the case of development sites, the root protection area is designed to prevent any significant long term damage to the tree by protecting the root plate and to some extent the lower branches of the tree.

5.1.7 The barriers should be erected prior to work commencing on site and should remain until construction activities have been completed. The root protection area should be considered essential and should not be removed or altered without prior recommendation by an Arboriculturalist and approval of the local planning authority.

5.1.8 The barrier should consist of a vertical and horizontal framework of scaffold tubing which is adequately braced to resist impacts. The vertical scaffold tubes need to be placed at a distance not exceeding 3m apart and driven securely into the ground for a minimum depth of 0.6m. Care should be taken when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid any structural roots. The weldmesh or Heras panels need to be a minimum 2.0m tall and are securely attached to the scaffold framework with wire or scaffold clamps. The wire or scaffold clamps should be secured on the inside of the barrier to avoid easy dismantling. Panels on rubber or concrete feet are not resistant to impact and should not be used.

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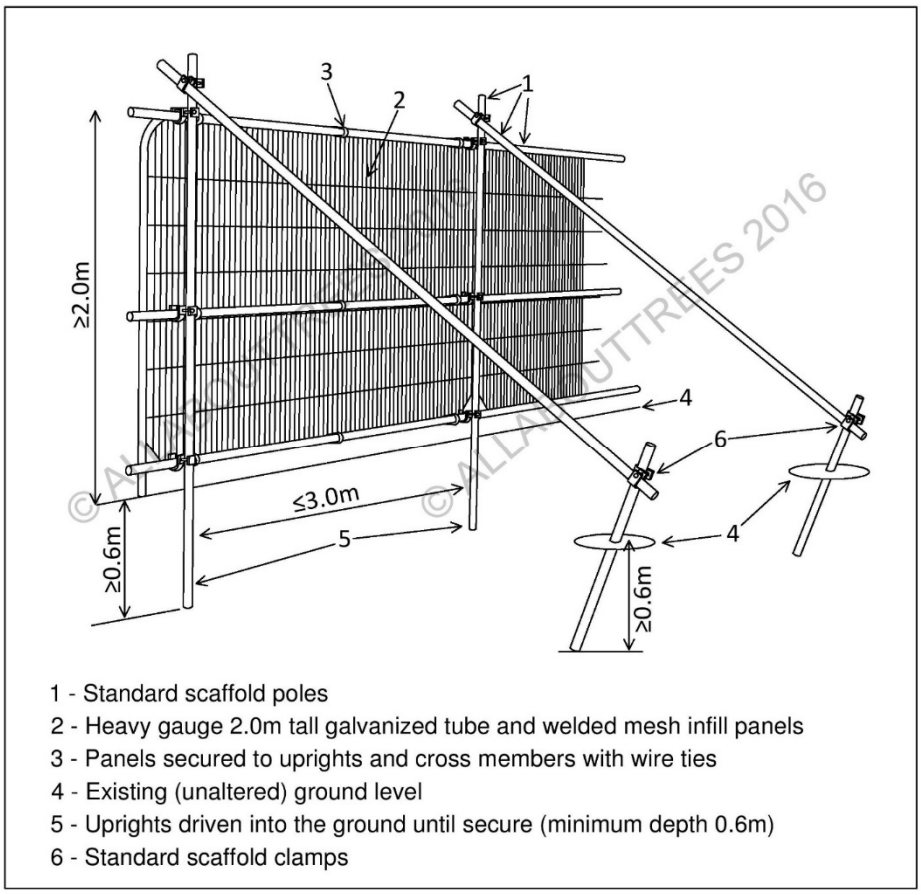


Figure 2 - Protective barrier specification



Figure 3 - Example of a barrier erected on a site

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5.1.9 No fixing shall be made to any tree and all possible care must be taken to prevent damage to tree roots when locating the posts.

5.1.10 All types of barriers must be firmly attached to prevent movement by site personnel or vehicles and all weather signs with the wording "Construction exclusion zone- keep out" should be attached.

5.2 Construction Methodology & Materials Near To Retained Trees

5.2.1 As the site contains a number of trees which will need to be retained as an integral part of the development, it is vital that the trees health and condition is maintained through protective measures and 'tree friendly' construction methods which avoid both short and long term damage to the trees. The areas which require this tree friendly construction are indicated as hatched green on the tree protection plan (TPP).

5.2.2 The construction method outlined below is suitable for the construction of permeable footpaths, roads and parking bays. It is not intended as a finished engineering solution but as an outline methodology to allow the construction of the above elements without damaging the nearby tree root system. We recommend the Cellweb system by Geosynthetics Ltd for this application as it has been thoroughly tested in the field and scientific data is available to support its use near to retained trees.

5.2.3 If the principles of the 'no dig' construction are followed, no significant permanent damage should occur to the retained trees.

5.2.4 The **principal rules of construction** are as follows:

1) No roots are to be severed (except for hand digging to remove rocks or protrusions taking care not to sever any roots over 2.5cm in diameter).

2) The soil must not be compacted

3) Oxygen and water must be able to diffuse into the soil beneath the engineered surface

4) The construction of the road, footpath or parking bay will have to be **above existing ground** level and at least 0.5m away from the trunks and buttress roots of the retained trees.

5) Dependent on the landform and underlying soil type, permeable surfacing can result in the soil moisture content remaining at or near field capacity for long periods. Where there is a risk of waterlogging appropriate land drainage should be incorporated into the design. If land drainage is required within the root protection area it must be designed to avoid damage to the tree and the soil structure, for

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example sand slitting formed by compressed soil displacement (soil pick or air spade) with the slits set radially to the tree.

6) If the permeable surface is to be used by construction traffic it must be protected with a temporary sacrificial surface laid onto a geotextile separator (Treetex T300) to ensure that the interstices do not become blocked and the surfaces permeability is maintained.

5.2.5 The method of construction is:

1) Ideally construction should be undertaken between the months of May and October when the ground is at its driest and less prone to compaction

2) Ground vegetation should be carefully removed with any organic material being removed from the line of the surfacing to prevent the build-up of anaerobic conditions beneath the surfacing which will damage the tree roots.

3) No digging should take place within the protective zone except for the careful removal of organic matter by hand tools. Any hollows must be filled with sharp sand, any digging to remove rocks or protrusions must be by hand taking care not to sever any roots over 2.5cm in diameter. Stumps should be ground out rather than excavated to prevent damage to the retained trees roots.



Figure 4- line of new road prior to the commencement of works

5.2.6 The method of providing a permeable surfacing is as follows:

1) Lay a Treetex T300 geotextile material directly on the existing subgrade. Overlap dry joints by 300mm

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Figure 5- laying of Fibretex material onto existing subgrade

2) Lay and expand the cellular confinement system, Cellweb by Geosynthetics Ltd, and anchor open during infilling. As a general indication only, a depth of at least 100mm is required for domestic traffic up to approximately 3 tons. A 200 mm depth should accommodate vehicles up to approximately 8 tons. Footpaths and cycle ways generally require a depth of 75mm. Geosynthetics Ltd provide a free consultation, design and advisory service to help specify the exact depth and construction of the Cellweb system.

3) The three dimensional cell structure is formed by ultrasonically welding polyethylene (perforated) strips and panels together to create a three dimensional network of interconnecting cells. A high degree of frictional interaction is developed between infill and cell wall, increasing the stiffness of the system. The use of cellular confinement reduces the bearing pressure on the subsoil by stabilising aggregate surfaces against rutting under wheel loads. Comparisons between cellular confinement and traditional aggregate and grid reinforced structures demonstrate a 50% reduction in construction thickness.

   Expand the Cellweb 2.56m wide panels to their full 8.1m length and pin with staking pins to anchor the cells open. Staple adjacent panels together to create a continuous mattress.

   Below are illustrations of the correct stapling procedure for joining both edges and ends of panels together.

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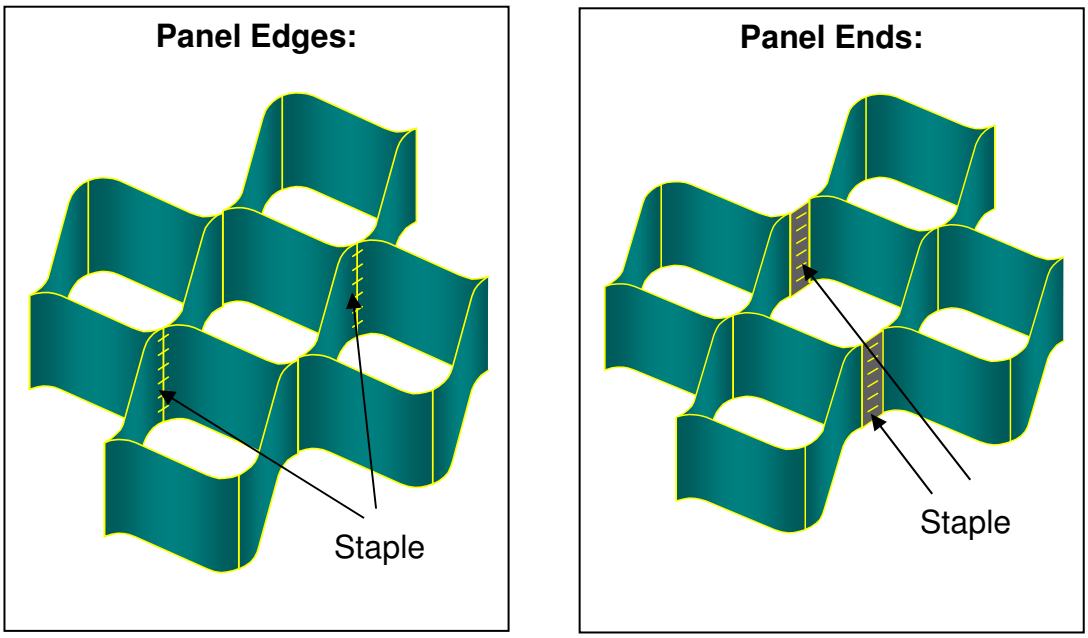




Figure 6 - expanding and filling the Cellweb system

4) Fill the cellular confinement system with aggregate (the amount is dependent on the depth of the Cellweb employed). The aggregate should not contain any fines and be of an inert type material such as whinstone chips rather than any lime based product. The angular particle dimensions should be 20-40mm. As most urban soils are already alkaline in nature, the use of dolomite, limestone or crushed concrete is not suitable for this application as it can react with rain water with the potential to change the soil pH and form impenetrable layers which impede water movement and gaseous exchange

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Figure 7 - once filled the system can support plant to carry aggregate to the fill area

5.2.7 Final surfacing options

- **Block paving or paving slabs –**will require the laying of a second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections. Then lay a sharp sand or coarse aggregate (no fines) bedding layer compacted with a vibro compaction plate to the recommended depth. Place paviors as per the manufacturer's instructions using the sand or coarse aggregate as the jointing material. The use of porous blocks such as 80mm Priora by Marshalls are particularly tree friendly and allow natural rainfall to reach the rooting area.

- **In-situ concrete –** in-situ concrete forms an impermeable surface therefore falls and openings need to be provided to allow air and water to enter the soil. The necessary liner can be penetrated through the falls and openings once the concrete has set.

  This can be achieved by forming 50mm diameter holes in the construction of a slab at regular spacing's of 300-600mm and backfilling the resultant holes with no fines gravel or aggregate

- **Porous tarmac and resin bonded gravels –** place 25mm surcharge of the granular material above the Cellweb system and lay either the bitumen base and wearing course or the resin bonded gravel layer

- **Loose Gravel-** Place a second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections. Place decorative aggregate to the required depth. A treated timber edge should be provided to restrict gravel movement

- **Grass blocks or gravel infilled blocks -** Lay a second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections. Lay Turfpave sub-surface paving system infilled with 50/50 rootzone mix. Seed as required. Alternatively the Turfpave blocks may be infilled with gravel

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5.2.8 It is important that the edging material used does not encroach into the protected area and the use of conventional kerbing is not possible as the depth of excavation required for their installation will sever the tree roots.

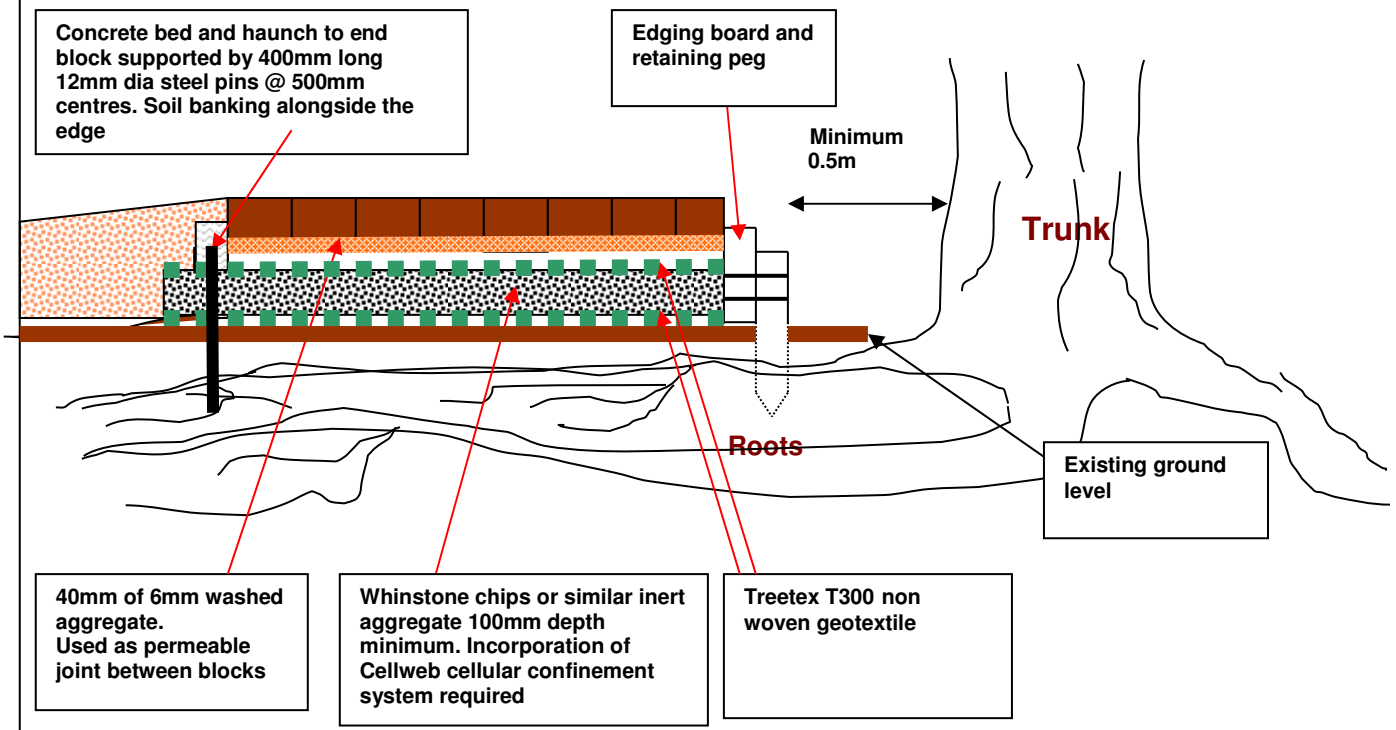
5.2.9 Edging supports such as angled steel section, pinned edges, sleepers (pinned in place) or gabions are advised although there are a number of varying kerbing options available which do not require any excavation and could be used above the existing ground level.



Figure 8- completed road using porous tarmac surfacing

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Figure 9 - Diagram of no-dig construction method for minimising root damage (not to scale). Alternative edging materials shown on either side of construction. Block paving surfacing option shown



5.2.10 Where the footpath, road or parking bay goes through a root protection area, it is not usually possible to erect the normal permanent protective barrier at the correct distance from the tree as access to construct the hard surfacing is a requirement. In this situation the permanent protective barrier is erected as per the TPP as near to the edge of the working area as possible.

5.2.11 This leaves a portion of the root protection area unfenced and unprotected until the surfacing is laid. Extreme care must be taken to avoid damage to these areas until the Cellweb and aggregate is laid and access must be prevented especially to vehicles and plant. This could be achieved by using temporary Heras fencing at distance indicated in the appraisal until such times as the surfacing is constructed.

5.3 Ground Protection Areas & Erection Of Scaffolding Within The Trees Root Protection Areas

5.3.1 In some cases it will be necessary to provide pedestrian access within the root protection area of the trees, or to create space for scaffolding and working areas. To prevent damage occurring to the trees, the following technique should be observed. The areas requiring this protection are marked in hatched orange on the tree protection plan. If the 'tree friendly' no dig, porous surfacing detailed in section 5.2 is not laid as part of the initial

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works it will be necessary to provide ground protection measures in the area shown by the green hatching on the TPP until the surfacing has been laid. A number of ground protection options are suitable dependant on the weight and type of access required.

5.3.2 The following diagrams visualise the layout requirements. By sufficiently protecting the rootplate of the tree, the pedestrian access, scaffolding and associated working area can be placed within the root protection area. There is no limitation as to the size of the ground protection area, but we would advise that it is at least 0.5m from the trunk of any tree.

5.3.3 A summary of the requirements for the erection of the scaffolding and working area are detailed below.

- Protective barriers should be erected onto a framework of scaffolding (as per the barrier drawing in section 5.1 to comply with the recommendations of BS 5837).

- The barrier is erected prior to the commencement of work at a suitable distance from the building to allow for the erection of the main scaffolding.

- A porous geotextile fabric should be laid onto the undisturbed ground surface and a layer of sand or compressible material such as woodchip applied to level the area.

- Boards should be laid onto the sand to protect the rootplate. Scaffold boards are usually adequate for pedestrian loads. Vehicle and plant access requires a more robust system.

- The ground protection must remain in situ until all construction works have been completed.

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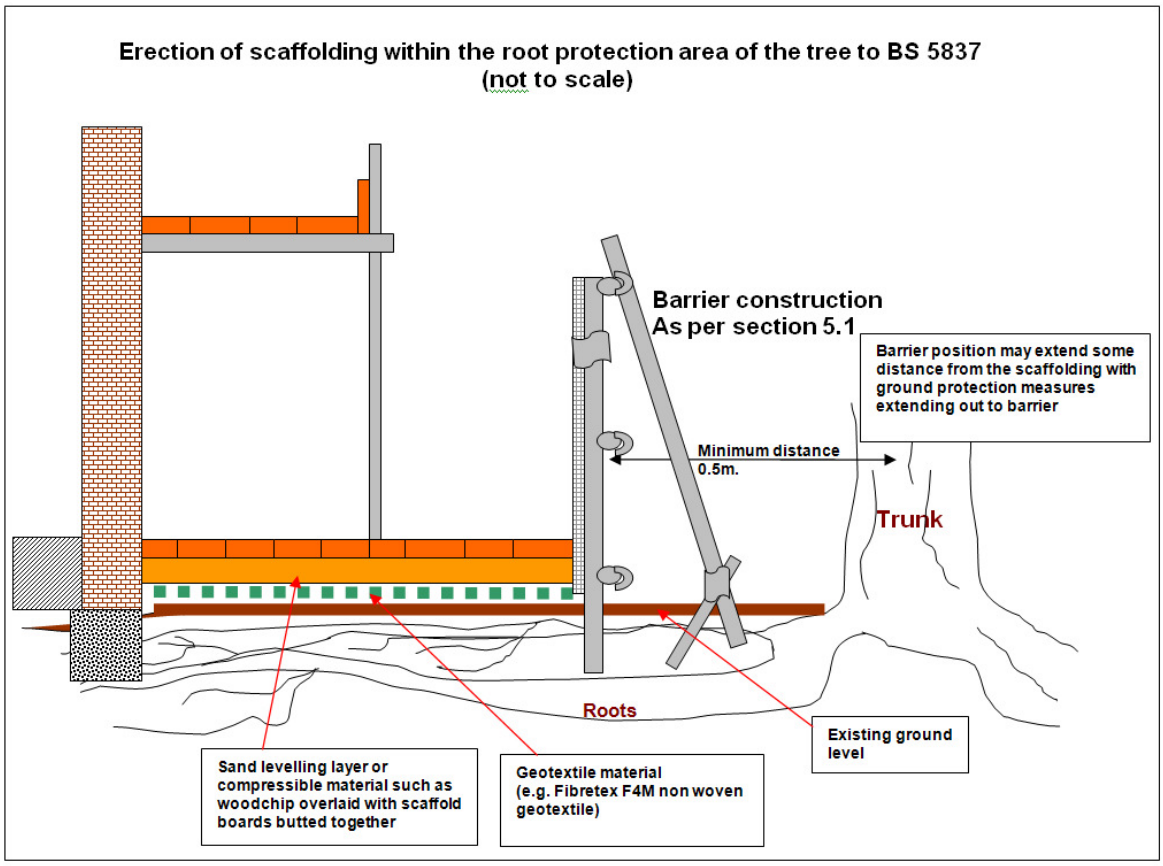


Figure 10 - Ground Protection Measures

5.3.4 As the building rises, additional scaffolding is erected within the area protected by the boards. The use of supplementary timber sole plates is advised.

5.3.5 Care will need to be taken not to compact or damage the rootplate of the trees when the footings are dug out and if the excavator is likely to be within the root protection area, steel plating must be laid on top of a layer of sand or compressible material such as woodchip to adequately spread the load.

5.3.6 Temporary ground protection should be tailored to the likely load it will be subjected to. The following diagrams indicate the acceptable techniques for:

- Pedestrian
- Plant and vehicle access up to 2 tons gross weight
- Plant and vehicle access up exceeding 2 tons gross weight

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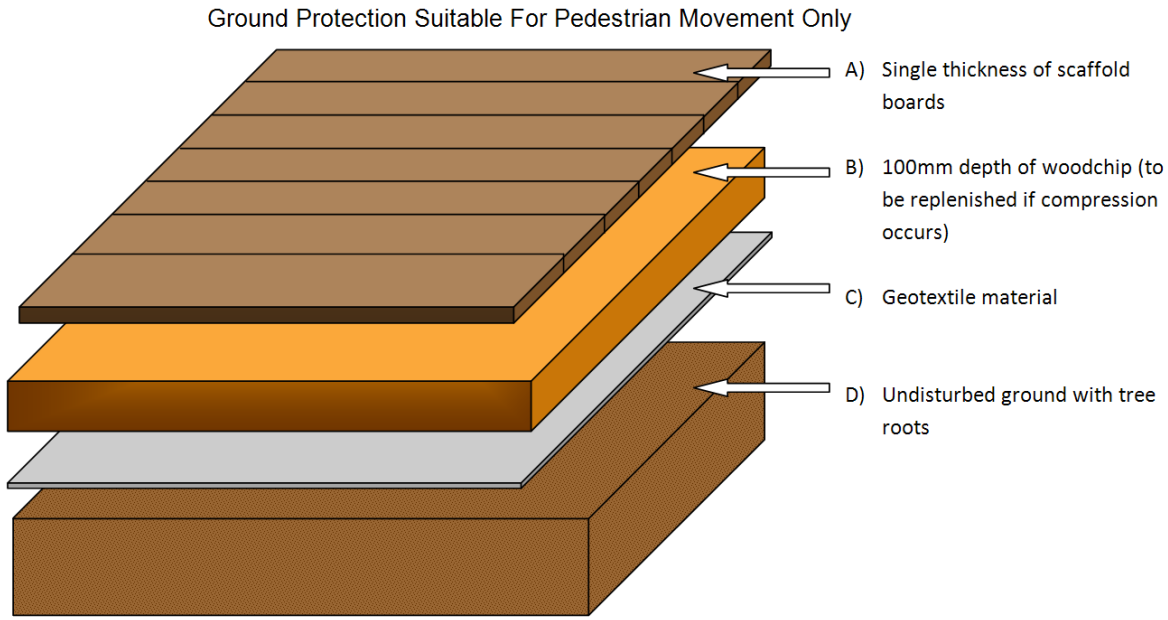


Figure 11

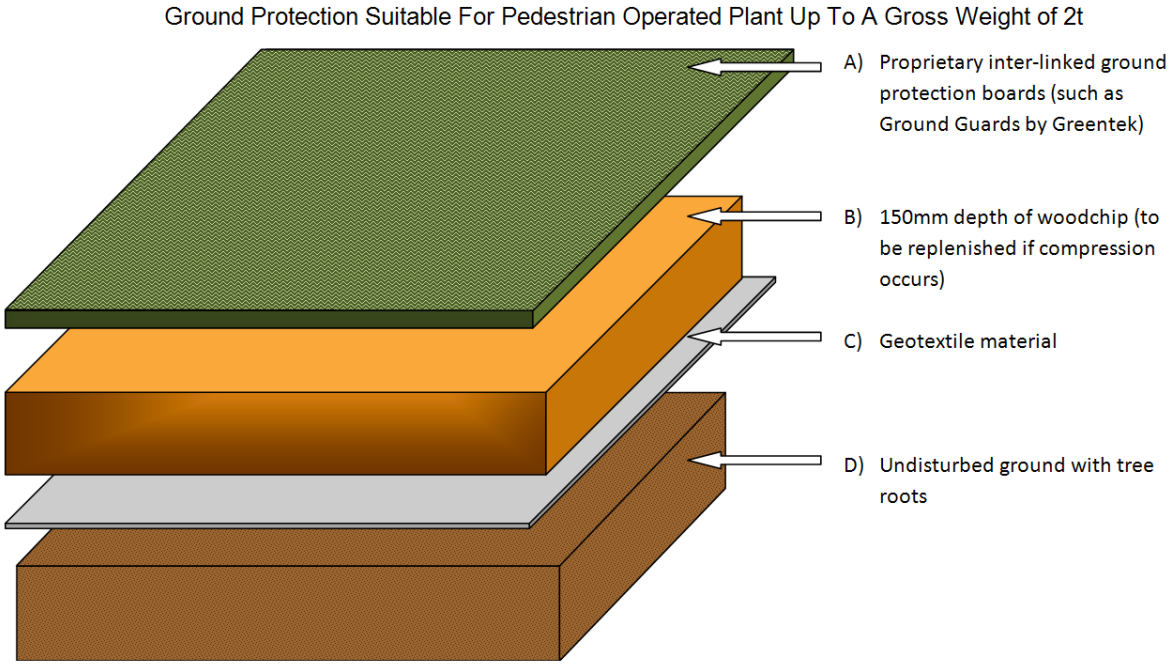


Figure 12

5.3.7 If the likely loading is to exceed 2t gross weight it will be necessary to produce an engineered solution with arboricultural advice to accommodate the likely load safely. One such example is shown below. In some cases it may be necessary to install a temporary road using a 3D cellular confinement system (such as Cellweb by Geosynthetics Ltd).

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Suitable For Wheeled Or Tracked Construction Traffic Exceeding 2t Gross Weight



1) 50mm X 50mm X 500mm timber stakes
2) 200mm x 50mm timber rails
3) Geotextile membrane
4) Base layer of Ground Guards by Greentek
5) Wood chippings or other compressible material
6) Interlinked Ground Guard plates

Figure 13

5.4 Service Runs

5.4.1 It is assumed that the existing service runs will be exploited where possible, but if new works are required it is important that they comply with the National Joint Utilities Group (NJUG) 'Guidelines for the planning, installation, and maintenance of utility services in proximity to trees' and BS 5837:2012. The excavation of open trenches by machine will be unacceptable within the protective zone of any of the retained trees.

5.4.2 Acceptable techniques (fuller details in the appendices) for the laying of services in order of preference are:

- **Trenchless-** by using thrust boring or similar techniques
- **Broken Trench-** to be dug by hand
- **Continuous trench-** to be dug by hand

5.4.3 Wherever possible, services should be routed outside of any retained trees RPA. When this is not possible apparatus should be routed together in a common duct and any inspection chambers sited outside the RPA.

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5.4.4 When underground apparatus is to pass within the RPA of a retained tree, trenchless insertion methods should be used (see table below) with entry and retrieval pits sited outside the RPA.

5.4.5 Shallow services runs may be dug with hand tools if appropriate and preferably by compressed air soil displacement. Roots, whilst exposed, should immediately be wrapped or covered to prevent desiccation and to protect them from rapid temperature changes. Any wrapping should be removed prior to backfilling, which should take place as soon as possible.

Trenchless Solutions For Installation Of Underground Services					
Method	**Accuracy (MM)**	**Bore (A) diameter (MM)**	**Maximum subterranean length (M)**	**Applications**	**Not suitable for**
Micro tunnelling	<20	100 to 300	40	Gravity-fall pipes, deep apparatus, watercourse/ roadway under crossings	Low-cost projects due to relative expense
Surface-launched directional drilling	≈100	25 to 1200	150	Pressure pipes, cables including fibre optic	Gravity fall pipes, e.g. drains and sewers (B)
Pipe ramming	≈150	150 to 2000	70	Any large-bore pipes and ducts	Rocky and other heavily obstructed soils
Impact moling (C)	≈50 (D)	30 to 180 (E)	40	Gas, water and cable connections, e.g. from street to property	Any application that requires accuracy over distances in excess of 5m.

(A) Dependent upon strata encountered
(B) Pit-launched directional drilling can be used for gravity fall pipes up to 20m in subterranean length
(C) Impact moling (also known as thrust-bore) generally requires soft, cohesive soils.
(D) Substantial inverse relationship between accuracy and distance
(E) Figures given relate to single pass: up to 300mm bore achievable with multiple passes

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6. Conclusion

6.1 As with any construction exercise near trees, there are potential areas of conflict where damage could be caused to retained trees.

6.2 By using the protective elements dictated by British Standard 5837, no significant damage should take place during the construction phase and the tree cover should flourish in the longer term.

6.3 It is anticipated that all of the retained trees can be incorporated into the site design; however, it is vital that the ultimate size and spread of the trees should be considered when retaining trees near to the building and that shading and light penetration should also be considered when positioning the windows in the building.

6.4 All tree works must conform rigorously to BS 3998 (2010) 'Tree Work - Recommendations'

For and on behalf of
AllAboutTrees Ltd

Andrew Watson FLS MICFor CBiol MRSB FArborA CEnv LCGI
-Chartered Arboriculturalist & Registered Consultant

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Appendix 1

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
1	Sycamore *Acer pseudoplatanus*	14.5	8.5	2.5	8.5	7.5	660	1	3.5	4 N	Mature	Fair	Fair	7.9	20-40	B-Moderate	Leans heavily to the east. Stem divides above 1.5m. The canopy is distorted and is heavily asymmetrical as a result of a dominating tree which was formerly growing to the south. Abuts against the drive. Ivy starting to climb stem.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. The extended driveway will need to be constructed using a no-dig methodology as detailed in section 5.2. This is required in the green hatched area. Facilitative pruning will be required to ensure a clearance of 2.5-3m is achieved between the canopy edge and the building.	None	22	20	A
2	Whitebeam *Sorbus aria*	5.0	1.5	2.0	2.0	1.0	320	1	2.0	2 E	Mature	Poor	Poor	3.8	<10	U-Unsuitable to retain	Moribund individual with negligible canopy.	Remove as part of site management.	None	12	10	A

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
3	Sycamore *Acer pseudoplatanus*	16.0	4.5	7.0	6.0	4.0	590	1	5.0	5 W	Mature	Fair	Fair	7.1	20-40	B-Moderate	Ivy starting to climb the stem. Previously lifted, wounds completely occluded. Possible previous reduction. Minor deadwood retained in canopy.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). The extended driveway will need to be constructed using a no-dig methodology as detailed in section 5.2. This is required in the green hatched area. Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. Sever ivy.	Low	22	20	C
4	Turkey Oak *Quercus cerris*	20.0	8.5	8.5	7.0	8.5	760	1	2.5	2 N	Mature	Fair	Fair	9.1	40+	B-Moderate	Ivy clad trunk. Torn stubs and deadwood are retained in the crown. Low branch over site in the northern section of the canopy. Deadwood Oversails neighbouring property.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be	None	20	20	A

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
																		required in the area indicated by orange hatching. The extended driveway will need to be constructed using a no-dig methodology as detailed in section 5.2. This is required in the green hatched area. Facilitative pruning will be required to ensure a clearance of 2.5-3m is achieved between the canopy edge and the building. Pile foundations required in the area indicated by the magenta hatching. Crown clean to remove the deadwood. Sever ivy. Remove lowest limb oversailing adjacent property to improve clearance.				
5	Horse Chestnut *Aesculus hippocastanum*	17	6.5	6.0	4.5	6.5	1090	1	2.0	2 NW	Mature	Fair	Fair	13.1	20-40	B-Moderate	Large specimen. Stem divides below 1.5m and above 1.5m. The	This tree is retainable and will be adequately protected by the position of the	Low	20	20	A

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
																	resulting fork unions are tight with some included bark. Minor/small diameter deadwood retained in canopy. Staining on lower scaffold limbs. Early indication of Bleeding Canker (*Pseudomonas syringae* pv *aesculi*) Dense crown.	protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. The extended driveway will need to be constructed using a no-dig methodology as detailed in section 5.2. This is required in the green hatched area. Pile foundations required in the area indicated by the magenta hatching. Existing pile foundations present in the area indicated by the purple hatching. Facilitative pruning will be required to ensure a clearance of 2.5-3m is achieved between the canopy edge and the building.				

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
6	Silver birch *Betula pendula*	10.0	3.5	4.0	2.5	2.0	290	1	2.0	2.5 N	Mature	Poor	Fair	3.5	10-20	B - Moderate	Leans to the southwest. Desiccated pruning wound. Minor/small diameter deadwood retained in canopy. Trunk has kinking form.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). No tree works required at the present time.	None	14	14	-
7	Sycamore *Acer pseudoplatanus*	13.0	4.5	4.5	5.5	5.0	540	1	1.5	2.5 SW	Mature	Fair	Fair	6.5	20-40	B-Moderate	Ivy on tree. Minor/small diameter deadwood retained in canopy.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. Sever ivy.	Low	22	20	C
8	Sycamore *Acer pseudoplatanus*	14.5	5.5	4.0	5.0	3.0	560	1	4.0	4 S	Mature	Fair	Fair	6.7	20-40	B-Moderate	Ivy on tree. Minor/small diameter deadwood retained in canopy. Asymmetric crown spread.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree	None	22	20	B

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
																		Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. Sever ivy. Crown clean to remove the deadwood.				
9	Sycamore *Acer pseudoplatanus*	11.0	5.0	2.5	5.5	3.0	550	1	3.0	4 W	Middle Aged	Fair	Fair	6.6	20-40	B-Moderate	Epicormic growth. Ivy starting to climb the stem. Stem divides above 1.5m. Deadwood. Slight lean towards the east. Located in adjacent property.	This tree is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). Ground protection measures as per 5.3 of this report will be required in the area indicated by orange hatching. No tree works required at the present time.	None	22	20	-
10	Sycamore *Acer*	11.5	1.5	3.0	1.5	3.5	350	1	2.0	4.5 SW	Middle Aged	Fair	Fair	4.2	20-40	B-Moderate	Asymmetric crown spread. Crown distorted due to group pressure.	This tree will be unaffected by the proposed	None	22	20	-

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
	pseudoplatanus																Ivy clad trunk. Deadwood. Located in adjacent property.	development. No tree works required at the present time.				
Hedges																						
1	*Griselinia littoralis*	<2.0	-	-	-	-	<100	m/s	0	-	Middle aged	Fair	Fair	<1.0	20-40	B-Moderate	This hedge forms the southern boundary of the site and is well kept.	This hedge is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). No works required at this time.	None	6	6	-
Groups																						
1	Cotoneaster, Fuchsia, Holly, Snowberry, Ribes, Yew, Elephant's Ears *Cotoneaster Spp. Fuchsia Spp., Ilex aquifolium, Symphoricarpus Spp., Ribes Spp., Taxus baccata, Begonia Spp*	<5.0	-	-	-	-	<200	m/s	0	-	Middle Aged	Fair	Fair	<2.4	20-40	C-Low	A garden area set to the south east of the existing building. Within the group are 3x large stumps from previously removed trees. Areas of the group are becoming overgrown with nettles.	This group is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). It is expected that the group layout and composition will be modified when it forms part of the new	None	12	10	-

Tree No.	Species Common Name *Latin Name*	Height (M)	Crown Spread (M) N	 S	 E	 W	Trunk Dia (MM)	No. Of Stems	Height Of Lower Canopy (M)	First Sign Branch (M) (Position)	Age	Physiol-ogical Condition	Structural Condition	Root Prot Area Radii (M)	Estimated Remaining Contribution (Years)	Tree Quality Assessment	Comments	Maintenance	Bat Roost Potential	Ultimate Size For Species (M) Height	 Spread	Priority
																		front garden layout. No works required at this time.				
2	Fuchsia, Dogwood *Fuchsia Spp., Cornus Spp.*	<2.0	-	-	-	-	<110	m/s	0	-	Middle Aged	Fair	Fair	<1.1	20-40	C-Low	This group consists of 5x shrubs which have been coppiced.	This group is retainable and will be adequately protected by the position of the protective barrier as indicated by the blue line on the Tree Protection Plan (TPP). No works are required at this time.	None	6	6	-

Appendix 2(1)

Glossary of Terms

1	**Reference number:**	An individual identifying number
2	**Species:**	Species identification is based on visual field observations and lists the common name. In some cases the botanical name will be used where there is no common alternative. On in-depth surveys the botanical name only may be used
3	**Height:**	Height is estimated to the nearest metre. On computerised surveys this may be within a range of heights. When measured height is required, a clinometer is used to measure to the nearest metre
4	**Diameter:**	Trunk diameter measured at 1.5 metres from ground level and recorded in millimetres. In some surveys this is indicated as a range
5	**Spread:**	Measurement of canopy from the trunk to the nearest metre in four directions, North, South, East, and West in metres
6	**Lower crown Clearance:**	Height in metres of crown clearance above adjacent ground level
7	**Age:**	Either an estimate (or statement if accurately known) of the age of the tree, classified as:
	Y	= Young tree, established tree usually up to one third of expected ultimate height & spread
	MA	= middle aged, usually between one third and two thirds of ultimate height & spread
	M	= Mature, more or less at full height but still increasing in girth & spread
	OM	= Over mature, grown to full size and becoming senescent,
	V	= Veteran tree, individuals surviving beyond the typical age range for the species
8	**Physiological Condition:**	Good = Healthy tree with good vitality, Fair = Moderate health and vitality normal or slightly less for species and age Poor = Poor shape or form - signs of decline in crown, may have structural weakness. Dead = dead or dying tree
9	**Structural Condition:**	Good = No visible structural defects Fair = Only minor structural defects Poor = Defects which may need to be rectified or regularly monitored Remove = Severe defects which may result in immanent failure or collapse
10	**Management Recommendations:**	General comments on the condition of the tree or group and any action required. potential for wildlife habitats
11	**Estimated Remaining Contribution:**	Safe Useful Life Expectancy (SULE): in some cases the age ranges are modified Short: 0 – 10years Medium: 10– 20 Years Intermediate: 20-40 Long: 40 + years
12	**Tree Quality:**	Assessment of tree quality see following cascade chart for details
13	**Priority:**	A - Works to achieve an acceptable level of safety or required to facilitate the development B - Works to achieve higher levels of arboricultural management. C - To improve the aesthetic appearance.
14	**Ultimate Size:**	Based on site specific features and the individual specimen in its surroundings. Measured to nearest metre (m)
15	**Root Protection Area:**	The distance at which the protective barrier should be erected measured in a radii from the centre of the trunk in metres.
16	**Pruning:**	Pruning shall be defined as the removal of living or dead parts of a plant by the Contractor. Such parts may be soft growth, twigs, branches, limbs or sections of the tree trunk. The cut material may vary from small to large in size.

17 Crown Cleaning: Cleaning out is defined as the removal of dead, dying or diseased branchwood, broken branches or stubs left from previous tree surgery operations (see also 16 Deadwooding) together with all unwanted objects, which may include ivy (if specified) and/or other climbing plants, nails, redundant cable bracing, rope swings, tree houses and windblown rubbish from the tree, and any such debris from any cavities within the tree.

18 Deadwood Removal: Dead-wooding shall be defined as the removal of all dead and dying branches and limbs from the tree.

19 Crown Lifting: Crown lifting shall be defined as the removal of all soft growth and branches or parts thereof which are below or which extend below the height specified in the tender documents. It is recognised that the resultant canopy base might not be one single level but might be stepped to allow for different clearances, for example where a tree overhangs both the footway and the road where different height clearances are required.

20 Crown Reduction: Crown reduction shall be defined as the reduction of the complete outline dimension of the canopy, from the tips of limbs and branches to the main trunk, by pruning growth to an acceptable branch, twig or but to leave a flowing silhouette.

Appendix 2(11) Cascade Chart For Assessing Tree Quality

Category and definition Trees to be considered for retention	Criteria – Subcategories 1. Mainly arboricultural values	2. Mainly landscape values	3. Mainly cultural values, including conservation	Identification on plan
Category High = 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 of 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)	Green
Category Moderate = 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 though 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 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 value	Blue
Category Low = 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 qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value, and/ or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural benefits	Yellow
	NOTE Whilst C category trees will usually not be retained where they would impose a significant constraint on development, young trees with a stem diameter of less than 150mm should be considered for relocation			
Category = U Trees unsuitable for retention Those of 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 trees suppressing adjacent trees of better quality • Habitat reinstatement may be appropriate (e.g. U category trees used as a bat roost- installation of bat box in nearby tree)			Red

Appendix 2(111)
Guidelines for the Planning, installation and Maintenance of utility services in proximity to trees- Based on information from National Joint Utilities Group (NJUG)

Ideally all services should be placed outside of the trees root protection area, but in some situations this is not feasible due to the confines of the site. If services must be laid within the root protection area acceptable techniques are detailed below in order of preference.

- **Trenchless-** by use of thrust boring or similar techniques. The pit excavations for starting and receiving the machinery should be located outside of the root protection area.
  To avoid root damage, the mole should run at a depth of at least 600mm.
  Use of external lubricants on the mole other than water (e.g. oil or bentinite) should be avoided.
- **Broken trench-** by using hand dug trench sections together with trenchless techniques. It should be limited to practical access and installation around or below the roots. The trench must be dug by hand (see following comments re continuous trenching) and only be long enough to allow access for linking to the next section. The open sections should be kept as short as possible.
- **Continuous trench-** the trench is excavated by hand and retains as many roots as possible. The surface layer is removed carefully and hand digging of the trench takes place. No roots over 2.5cm diameter or clumps of smaller roots (including fibrous) should be severed. The bark surrounding the roots must be maintained. Cutting of roots over 2.5cm diameter should not be attempted without the advice of a qualified Arboriculturalist.
  If roots have to be cut, a sharp tool (defined as spade, narrow spade, fork, breaker bar, secateurs, handsaw, post hole shoveller, hand trowel) should be used.

Backfilling

Reinstatement of street works must comply with the code of practice New Roads and Streetworks Act 1991 (Specification for the reinstatement of openings in highways), but where tree roots are involved backfilling should be carefully carried out to avoid direct damage to retained roots and excessive compaction of the soil around them.

The backfill should incorporate an inert granular material mixed with top soil or sharp sand (not builders sand) around the retained roots. This will allow a measure of compaction for resurfacing whilst creating an aerated zone around the roots.

Roots and in particular fine roots, are vulnerable to desiccation on exposure to air. The roots are at greatest risk when there are rapid fluctuations in the air temperature around them (especially winter diurnal temperatures). It is vitally important that the roots are covered with sacking whilst the trench is open. The sacking should be removed once the trench is backfilled.

Planning of services

When laying new or replacement services it is wise to plan ahead to prevent future direct damage to the services from root growth by placing the services within a duct.

If roots have grown into a drain or duct and proliferated to cause a blockage, removal of the root mass will only have a temporary affect and the root will regrow. The fault is in the pipe or duct, not the tree roots and the only answer is to repair or replace the damaged area. Particular problems occur with old salt glazed pipes where clay has been used to seal the joints and has subsequently dried out leaving a gap for the roots to infiltrate.

A popular myth has arisen that tree roots are attracted to water or nutrients within piped systems, this is not so. Roots are adventitious and grow in all directions proliferating in areas where moisture or nutrients are present. They tend to grow near to the pipe to make use of the condensation or moisture build up on the outside of the pipe but will enter the pipe through any crack or damaged joint. They are not capable of breaking into sound pipes.



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