# Tree survey and report

## 2nd Northwood Scout Group
## Pinner Road
## Northwood
## HA6 1QS

**Report number J 011 prepared by:**

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**Jonathan Hazell**
**Independent arboricultural consultancy**
**4 June 2019**

# 1 Report limitations

1.1 I am an experienced arboriculturist with no technical engineering competence.

1.2 My report represents the analysis of my arboricultural observations following an external assessment of the trees from ground level only.

1.3 Any assessment of tree health and condition was incidental to our assessment of their suitability for retention in the context of the proposed development.

1.4 The of soil type is not known, if a soil survey has taken place then it must be read in conjunction with the results of the tree survey.

1.5 The presumption is that this report will inform an application to develop the site, a more detailed study might be required to support any application that may subsequently be made.

1.6 My opinions, and any recommendations made in this report that arise from those opinions, may be subject to review upon receipt of new information.

1.7 My conclusions, and any recommendations flowing from those conclusions, relate to the conditions that were found at the time of the assessment, and are valid for

- no more than one year from the date of that assessment, or
- until such time as any work is carried out at the site, either in accordance with the remedial action prescribed or for other reasons which may be outside my control, or
- until the site is re-surveyed whichever is the sooner.

# 2 Introduction

2.1 The client for this report is Mike Harrison, Managing Director, BHM Architects Ltd, Unit P05, Old Power Station, 121 Mortlake High Street, London SW14 8SN.

2.2 The brief was to report upon a tree survey at Northwood Scout Hut, Pinner Road, as per your email and attachments of 8 May 2019.

2.3 I was instructed to proceed on 9 May 2019 and this report, reference J 011, is dated 4 June 2019.

2.4 Please refer to:

- **Appendix A** for a discussion of the ways in which trees may impose a constraint upon development,
- **Appendix B** for an explanation of the generic need for tree and ground protection measures, and
- **Appendix C** for a series of site photos.

2.5 The website of the local planning authority, LB Hillingdon, suggests that the property is not within a Conservation Area nor are there any TPOs on or near the site, see Figure 1 below:

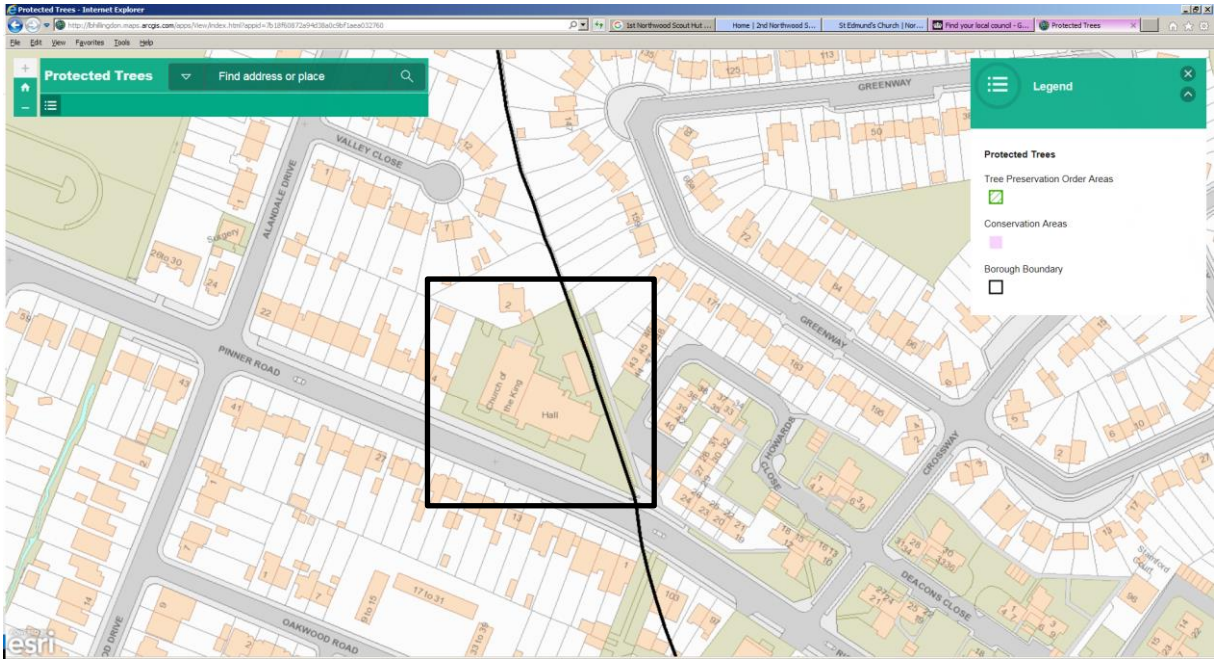



**Figure 1, location map with site highlighted, from LB Hillingdon's website**

# 3 The fieldwork

3.1 I visited the site on Friday 31 May 2019.

# 4 The proposed development

4.1 The proposal is for a new, larger hut on a concrete slab which will be similar to the existing, and as illustrated on the site drawings.

4.2 The slab is to be supported upon piles and so the necessity to break the ground for foundations will be kept to a minimum.

# 5 The findings

5.1 The apron to the current building is a concrete slab, see photo 1 for example, and there are a number of small diameter and low growing trees along the site boundary to the residential developments in Howards Close.

5.2 To the north of the building, and outside the site boundary, is a mature oak tree of interesting form and character. Inside the site the land falls away from the base of the tree to form a level play area, see photo 2.

5.3 The tree was estimated to have a stem diameter in excess of 1250 mm, the crown spread into the site was up to 9 m, and toward the current hut the crown radius was 12 m.

5.4 The tree carried a good furnish of leaves suggesting good vigour for its age, and there was minor dead wood throughout the crown but that is typical for the species and not an indication of any decline. There were no fungal fruiting bodies evident on the stem or in the crown.

5.5 Because of the tree's girth the radius of the root protection area, see B2 The root protection area, according to **BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations** (abbreviated here to BS 5837) was 15 m.

5.6 The water demand of oak is **Moderate** according to **Chapter 4.2** of the **NHBC Standards Building near trees**.

5.7 The cracking in the surface of the ground was a strong indication that the soil had a high clay content.

# 6 Discussion

6.1 It is probable that the footprint of the proposed building will encroach over the theoretical RPA of the neighbour's oak tree and so suitable control measures will be required to prevent avoidable harm.

6.1 Because the engineer's proposal is to support the slab on piles the necessity to break the ground for foundations will be minimised, and if a root should be encountered during the piling operation the position of the pile may be shifted, within given safety limits, to avoid root disruption or harm.

6.3 To prevent the leaching of toxic chemicals from the concrete used to support and encase the piles the excavations should be sleeved with an impenetrable membrane.

6.4 In this way it is hoped that the use of piles will prove to be a suitable control measure that will avoid the protection.

6.5 The consequence of the clay soil for root development is not clear and it is beyond my competence to state an opinion.

# 7 The arboricultural impact assessment

7.1 The impact of the development upon the mature oak tree should be neutral provided that the recommendations above are adopted.

# 8 Arboricultural method statement

8.1 The generic appendices to this report illustrate why trees are to be considered a constraint, and some of the control measures that might be adopted to protect a retained tree from harm, either to its canopy or to the soil volume that is presumed to contain its roots.

8.2 A site-specific arboricultural method statement will be prepared in due course, complete with the associated tree removal plan and tree protection plan, and will refer to the generic principles of Appendix A2 Site layout and design, and the range of control measures referred to in Appendix B – tree protection measures in general.

# Appendix A – trees as a constraint

## A1 Introduction

A1.1 All trees on or near to a development site are a material consideration in the planning process: **Section 197** of the **Town and Country Planning Act 1990** states:

> 197 Planning permission to include appropriate provision for preservation and planting of trees.
>
> It shall be the duty of the local planning authority—
>
> (a) to ensure, whenever it is appropriate, that in granting planning permission for any development adequate provision is made, by the imposition of conditions, for the preservation or planting of trees; and
>
> (b) to make such orders under section 198 as appear to the authority to be necessary in connection with the grant of such permission, whether for giving effect to such conditions or otherwise.

A1.2 The **Introduction** to **BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations** (abbreviated here to **BS 5837**) states:

> Existing trees are an important factor on construction sites, whether on or near the working areas, and trees are a material consideration in the UK planning system. This British Standard is intended to assist decision-making with regard to existing and proposed trees in the context of design, demolition and construction. Root systems, stems and canopies, with allowance for future movement and growth, need to be taken into account in all projects, including those that do not require planning permission. The space required for any proposed new trees to become established is an important consideration.
>
> During their lifetime, trees will be vulnerable to disturbance, injury, environmental changes, pests and diseases. Construction work often exerts pressures on existing trees, as do changes in their immediate environment following the construction. A tree that has taken many decades to reach maturity can be damaged irreparably in a few minutes by actions that might be unwitting, negligent or wilful (see Annex A). The early provision of physical protection from damage is therefore critical.
>
> Where tree retention or planting is proposed in conjunction with nearby construction, the objective should be to achieve a harmonious relationship between trees and structures that can be sustained in the long term. The good practice recommended in this British Standard is intended to assist in achieving this objective.

A1.3 The **Scope** of BS 5837 states:

> This British Standard gives recommendations and guidance on the relationship between trees and design, demolition and construction processes.
>
> It sets out the principles and procedures to be applied to achieve a harmonious and sustainable relationship between trees and structures.

## A2 Site layout and design

A2.1 The site layout and design of any scheme will need to give due consideration to the existing trees, on or near to the development site, and BS 5837 gives extensive advice and guidance under **5 Proposals: conception and design**, including at **5.1.1**:

> The constraints imposed by trees, both above and below ground should inform the site layout design, although it is recognized that the competing needs of development mean that trees are only one factor requiring consideration. Certain trees are of such importance and sensitivity as to be major constraints on development or to justify its substantial modification. However, care should be taken to avoid misplaced tree retention; attempts to retain too many or unsuitable trees on a site can result in excessive pressure on the trees during demolition or construction work, or post-completion demands for their removal.

A2.2 The below-ground constraint imposed by an existing tree can be simplistically represented upon a tree constraints plan as the tree's theoretical root protection area (abbreviated here to RPA), defined in BS 5837 at **3.7** as:

> layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority

A2.3 The RPA is not therefore an attempt to describe the complete extent of the tree's roots, simply the minimum area surrounding the tree that should be protected to try to prevent avoidable harm below-ground.0

A2.4 An indication of the shade that a tree might cast cannot be illustrated, but not shown accurately, on a tree constraints plan, because the crown is unlikely to be uniform. Other characteristics of the tree species are not so easily represented graphically, for example, is the tree evergreen or deciduous, how dense is the foliage, does it bear fruit that might lead to damage of some kind, is the species known to be susceptible to honeydew or to branch drop, etc.

A2.5 The technical and logistical demands of construction should be informed by a careful analysis of the trees on and near to the site, and BS 5837 provides advice and guidance on the tree-related factors to consider during the iterative design process at **5.2.3**:

a) the presence of tree preservation orders, conservation areas or other regulatory protection;

b) potential incompatibilities between the layout and trees proposed for retention;

c) the working and access space needed for the construction of the proposed development;

d) the effect that construction requirements might have on the amenity value of trees, both on and near the site, including the effects of pruning to facilitate access and working space;

e) the requirement to protect the overhanging canopies of trees where they could be damaged by machinery, vehicles, barriers or scaffolding, where it will be necessary to increase the extent of the tree protection barriers to contain the canopy;

f) infrastructure requirements in relation to trees, e.g. easements for underground or above-ground apparatus; highway safety and visibility splays; and other infrastructural provisions, such as substations, refuse stores, lighting, signage, solar collectors, satellite dishes and CCTV sightlines;

g) the proposed end use of the space adjacent to retained trees;

h) the potential for new planting to provide mitigation for any losses.

A2.6 The reasonable expectations and needs of the future owners or occupiers should also inform considerate design, and BS 5837 goes on to provide advice and guidance at **5.3.4**:

A realistic assessment of the probable impact of any proposed development on the trees and vice versa should take into account the characteristics and condition of the trees, with due allowance and space for their future growth and maintenance requirements. To maximize the probability of successful tree retention, the following factors should be taken into account during the design process.

a) **Shading**. Shading by trees affects buildings and open spaces.

1) Shading of buildings. Shading of buildings by trees can be a problem, particularly where there are rooms which require natural light. Proposed buildings should be designed to take account of existing trees, their ultimate size and density of foliage, and the effect that these will have on the availability of light.

2) Shading of open spaces. Open spaces such as gardens and sitting areas should be designed to meet the normal requirement for direct sunlight for at least a part of the day.

*NOTE 1 Shading can be desirable to reduce glare or excessive solar heating, or to provide for comfort during hot weather. The combination of shading, wind speed/turbulence reduction and evapo-transpiration effects of trees can be utilized in conjunction with the design of buildings and spaces to provide local microclimatic benefits.*

b) **Privacy and screening**. It might be highly desirable for trees to provide screening to a building, e.g. for internal privacy, to reduce overlooking by neighbours or to mitigate undesirable views, such as busy roads, railway lines or industrial premises. In order to achieve the desired outcome, account should be taken of the proposed orientation and aspect of the building, the type of building, its use and location relative to the tree, and the species attributes of the tree.

c) **Direct damage**. Below-ground damage to structures can occur as a result of incremental root and stem growth. Above-ground damage can occur to trees and structures by the continuous whipping of branches against the fabric of a building. Branch ends might have to be cut back periodically, possibly affecting the shape of the tree. Structures should therefore be designed and/or located with due consideration for a tree's ultimate growth, so as to reduce the need for frequent remedial pruning or other maintenance.

*NOTE 2 Exceptions might arise where this is a known and acceptable management outcome (e.g. cyclical maintenance of previously pollarded trees or where retention of desirable trees would otherwise not be feasible).*

d) **Future pressure for removal**. The relationship of buildings to large trees can cause apprehension to occupiers or users of nearby buildings or spaces, resulting in pressure for the removal of the trees. Buildings and other structures should be sited allowing adequate space for a tree's natural development, with due consideration given to its predicted height and canopy spread. However, this does not mean that trees should not be retained within any particular distance of a structure.

e) **Seasonal nuisance**. Trees are naturally growing and shedding organisms. Leaves of some species can cause problems, particularly in the autumn, by blocking gullies and gutters. Fruit can cause slippery patches, and accumulation of honeydew can be damaging to surfaces and vehicles. Buildings, footpaths and hard-standing areas should be designed with due consideration to the proximity of retained trees, especially in terms of their foliage, flowering and fruiting habits. Where conflicts might arise, detailed design should address these issues, e.g. use of non-slip paving; provision of leaf guards or grilles on gutters and gullies; provision of access and means of maintenance.

A2.7 Therefore, BS 5837 is saying that whilst it may be technically possible to build near to trees without causing them avoidable harm, careful thought needs to be given to the future interaction between the trees, the owners or occupiers and the structures.

## A3 Tree categorization method

A3.1 At **4.5** BS 5837 describes a method to identify the quality and value (in a non-fiscal sense) of the existing tree stock, allowing informed decisions to be made concerning which trees should be removed or retained in the event of development occurring. The criteria that are used in the assessment are tabulated below and referred to as **Table 1 – Cascade chart for tree quality assessment**:

| Category and definition | Criteria | | |
|---|---|---|---|
| **Category U**<br>Those 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 | Trees that have a serious, irredeemable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning)<br>Trees that are dead or are showing signs of immediate, and irreversible overall decline<br>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<br>*NOTE: Category U trees can have existing or potential conservation value which it might be desirable to preserve; see **4.5.7*** | | |
| | **1 Mainly arboricultural values** | **2 Mainly landscape values** | **3 Mainly cultural values, including conservation** |
| **Category A**<br>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) |
| **Category B**<br>Trees of moderate quality with an estimated remaining life expectancy of at least 20 years | Trees that might be included in the high category, 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 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 |
| **Category C**<br>Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm | 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 benefit | Trees with no material conservation or other cultural value |

# Appendix B – tree protection measures in general

## B1 Tree roots

B1.1 Tree roots are at risk of damage from work activity and will require protection throughout the term of the development because they serve two distinct purposes, and need to be alive to do so:

- they securely anchor the tree in the ground, and
- they take-up the moisture and the range of nutrients from the soil (generally dissolved or in suspension) that will allow the tree to grow.

B1.2 Tree roots respond to positive stimuli and grow where the soil environment is suitable; they are found at relatively shallow depths where they can access the oxygen and water held in the voids between the soil particles and take up the moisture and nutrients the tree requires.

B1.3 In consequence, soil compaction that closes the voids between the soil particles will have a negative impact as it will deny the roots the access to the oxygen and water that they need to survive and to allow the tree to thrive.

B1.4 Control measures may be required to prevent harm to a retained tree's roots, and the soil volumes they occupy, as damage may arise from a variety of causes, including:

- crushing or fracturing
- soil compaction
- the spillage of toxic substances
- the installation of hard surfacing.

B1.5 To establish whether control measures are necessary a trial trench or series of trial pits should be dug outside the alignment of the foundations of any proposed structure to ascertain the presence/absence of roots. The operation should be overseen by the project arboriculturist, and the local planning authority may be invited to attend the dig. The excavations should be initially carried out using hand tools, and the excavations should be to at least 900 mm deep. Photographs should be taken to record the presence or absence of tree roots, and the project arboriculturist should provide an analysis of the findings. If roots are revealed then control measures will be required, the absence of tree roots will generally mean that no control measures will be required.

## B2 The root protection area

B2.1 The root protection area (abbreviated here to **RPA**) is defined in BS 5837 at **3.7**:

> layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority

B2.2 The RPA is not therefore an attempt to describe the complete extent of the tree's roots, simply the minimum area surrounding the tree that should be protected to try to prevent avoidable harm below-ground.

B2.3 The RPA is an artificial construct that assumes that tree roots will radiate from the tree's base in all directions in a more or less uniform distribution: in reality the actual distribution will be dependent on, amongst other things, the availability of soil water and nutrients and the bulk density of the soil. Roots will grow where the environment is suitable, and it is almost impossible to predict where the structural roots or the active rooting volume of a particular tree might be found.

## B3 To prevent avoidable harm

B3.1 BS 5837 has a presumption in favour of preventing avoidable harm to retained trees, and states, at **5.3.1**:

> The default position should be that structures are located outside the RPAs of trees to be retained. However, where there is an overriding justification for construction within the RPA, technical solutions might be available that prevent damage to the tree(s). If operations within the RPA are proposed, the project arboriculturist should:
>
> a) demonstrate that the tree(s) can remain viable and that the area lost to encroachment can be compensated for elsewhere, contiguous with its RPA;
>
> b) propose a series of mitigation measures to improve the soil environment that is used by the tree for growth.

B3.2 Where avoidable harm can be prevented BS 5837 states, at **6.2.1.1**:

> Where all activity can be excluded from the root protection area, vertical barriers should be erected to create a construction exclusion zone. Where, due to site constraints, construction activity cannot be fully or permanently excluded in this manner from all or part of a tree's RPA, appropriate ground protection should be installed

B3.3 The generic control measures in common use to reduce the risk of harm to the soil structure within the RPA are

- exclusion, or
- temporary ground protection, or
- permanent ground protection.

## B3.1 Exclusion

B3.1.1 Exclusion involves the erection of a temporary barrier to create the construction exclusion zone (abbreviated here to CEZ) to deny access to those places where trees' roots may be found to prevent damage to the retained trees' roots and the soil volumes they occupy. In certain cases, existing features, such as boundary fences or walls, temporary site accommodation, site hoarding and so on may be incorporated into that protective barrier fencing.

B3.1.2 The default specification for a protective barrier fence is given in **6.2.2.2** of BS 5837:

> … a vertical and horizontal scaffold framework, well braced to resist impacts, as illustrated in Figure 2. The vertical tubes should be spaced at a maximum interval of 3 m and driven securely into the ground. Onto this framework, welded mesh panels should be securely fixed. … If the presence of underground services precludes the use of driven poles, an alternative specification should be prepared in conjunction with the project arboriculturist that provides an equal level of protection.

B3.1.3 An alternative specification, for use where the site circumstances and associated risk of damaging incursion into the RPA do not necessitate the default level of protection, is given in clause **6.2.2.3** of BS 5837:

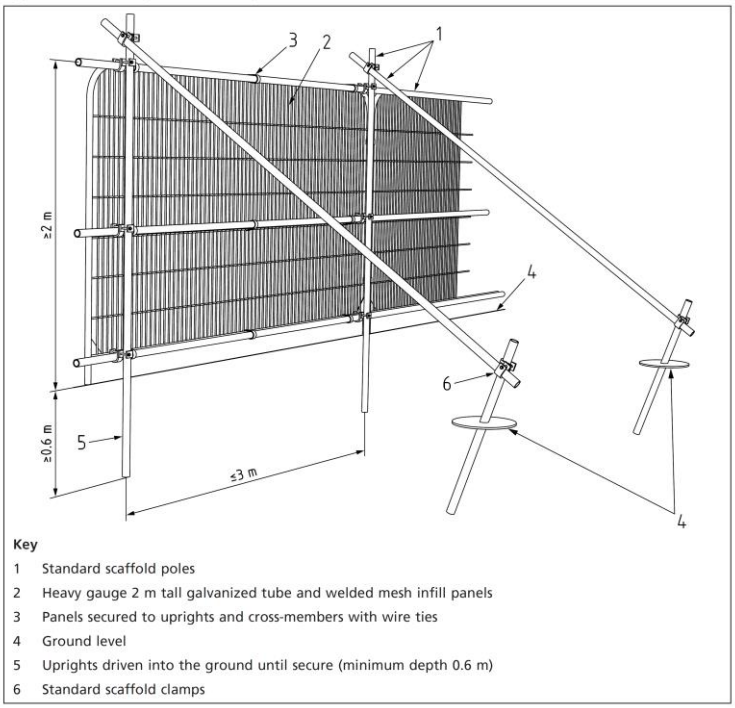
> … 2 m tall welded mesh panels on rubber or concrete feet …. joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence…. The panels should be supported on the inner side by stabilizer struts, which should normally be attached to a base plate secured with ground pins …

B3.1.4 The figures from BS 5837 are included overleaf.

B3.1.5 Tree protection fencing need only be "fit for purpose" – often at the domestic scale exclusion can be achieved by a simple barrier and that will be adequate, but on more intense or complicated sites then to exclude construction activity a more robust barrier will be required. Whatever barrier is used it must be maintained to ensure that it remains intact and complete for the duration of the necessary period to offer adequate protection to the retained trees.

B3.1.6 If a specification from BS 5837 is adopted it is likely that the barrier will be made up from 3.5 m panels and so will not follow the smooth flowing radii of the theoretical RPA. Often, it will be more practicable and resource-efficient to erect a single line of fencing, or a box, to protect several trees rather than discrete CEZs to protect individual trees.

Figure 2 **Default specification for protective barrier**

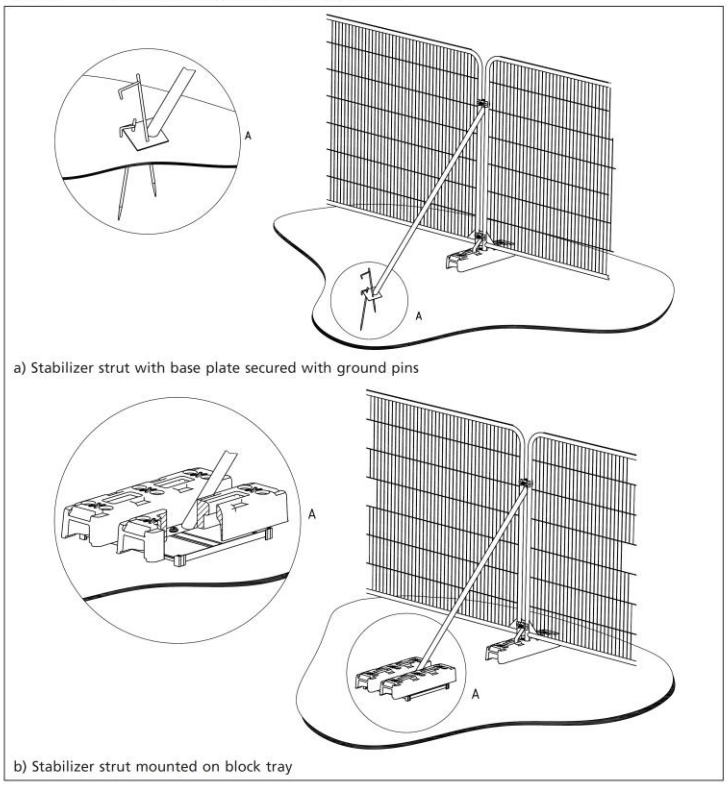



**Key**

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

## Figure 2 from BS 5837

Figure 3 **Examples of above-ground stabilizing systems**




## Figure 3 from BS 5837

B3.1.7 Information signs, like those shown below, should be displayed on the barrier at suitable intervals, usually on every other panel and at no more than 10 m centres: each individual sign should be A4 in size, laminated, hole punched and secured to the panel with cable ties:



B3.1.8 The alignment of the protective barrier fencing should give adequate working space for the required work activity that will allow the consent that has been granted to be implemented in full, for example 600 mm clearance from the outer face of the finished detail, be that a kerb edging, foundation or a wall, would be appropriate in many cases.

## B3.2 Temporary ground protection

B3.2.1 Temporary ground protection will prevent compaction by spreading the load from any site traffic (given the widest possible definition, to capture and embrace any traffic or vehicle movement associated with demolition, services, construction, delivery, storage or temporary office accommodation and so on) that may pass over the ground, and contain accidental spillages of toxic substances of those places where trees' roots may be found.

B3.2.2 For small areas of temporary ground protection from light loads, such as pedestrian movements, heavy-duty polythene sheeting can be laid on the ground (any hollows can be filled with wood chip for example to create a level surface) and then scaffold boards, close butted, can be laid upon the polythene. The polythene will prevent contamination seeping into the soil and possibly causing harm to the retained trees, the scaffold boards will spread any loads. At the conclusion of the development the temporary measures can be lifted and disposed of correctly.

B3.2.3 For areas that will be subject to heavier traffic an on-line search for "temporary ground protection" will reveal proprietary solutions, generally available for hire, that have been designed to a specification that will be sufficiently robust to withstand damage from the predicted vehicle movements. When the ground protection measures are no longer required at a particular location they may be lifted and relocated on site according to need or taken off-site.

## B3.3 Permanent ground protection using "no-dig" construction techniques

B3.3.1 If there are trees to be retained on the approach to, or in the vicinity of, the proposed development then permanent ground protection measures may be required: BS 5837 gives extensive advice and guidance under **6 Technical design**, including at **6.2.3.3**:

> New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.
>
> NOTE The ground protection might comprise one of the following:
>
> a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

B3.3.2 If the proposed development were to include a permanent hard surface, such as a surfaced path or car park, that encroached over the RPA of the retained trees where roots were found to be present, then "no-dig" principles should be followed, in other words:

- installation of the surface treatment must take place above existing ground level, and
- any covering of the ground must be permeable and porous to allow gaseous and aqueous exchange through the no-fines aggregate sub-base to the soil below, and so to the trees' roots.

B3.3.3 As with temporary ground protection measures, see B3.2 Temporary ground protection, there are several proprietary solutions available upon which a permanent surface may be overlaid, and adopting any one of these will allow development whilst causing no harm to the retained tree's roots and the soil volumes in which those roots might be expected to be found: an on-line search for "tree root protection" will reveal a number of options.

B3.3.4 A development may restrict the surface area and change the volume of soil available in which tree roots may be active and so it is important that the soil does not become a hostile environment because soil moisture is increased (because of soakaways for example) or decreased (perhaps because of required improvements to local surface water drainage), or because of localised pollution (from de-icing salt that may be applied to a car park surface for example).

B3.3.5 An alternative to a proprietary cellular confinement system for use where a temporary access were to become the route of a permanent access is to create an above-ground load-bearing reinforced concrete raft (that would be retained *in situ*, rather than broken out and removed) to be poured and used as part of the construction of the access into the site. I re-iterate that I have no technical engineering competence, but I have been advised that a raft that was at least 150 mm deep would be adequate spread the load of the typical fully-laden wagon that would be expected to make deliveries to, or to take a load from, a development site.

B3.3.6 To create the raft:

- a suitable membrane should be laid over the ground for the complete width and length of the proposed access,
- shuttering should be erected that will allow the concrete to be poured to form the access, the minimum depth of the raft should be determined by a competent engineer,
- reinforcing bar should be laid within the shuttering to the engineer's specification,
- within the footprint of the access a series of cardboard tubes, perhaps up to 100 mm in diameter, should be held upright on pins or canes,
- after the network of cardboard tubes has been set out the concrete may be poured, the specification to be determined by a competent engineer, and
- once the concrete has set the cardboard tubes can be removed, they will have created a series of holes in the raft, to be filled with 10 mm gravel that will allow for the passage of air and water through the raft to the soil below.

## B3.4 Construction within the RPA

B3.4.1 If the ground must be broken within the RPA of a retained tree then the topsoil must be excavated with care and precision in accordance with the guidance in **7.2.1** of BS 5837:

To avoid damage to tree roots, existing ground levels should be retained within the RPA. Intrusion into soil (other than for piling) within the RPA is generally not acceptable, and topsoil within it should be retained in situ. However, limited manual excavation within the RPA might be acceptable, subject to justification.

Such excavation should be undertaken carefully, using hand-held tools and preferably by compressed air soil displacement.

B3.4.2 The excavations should be initially carried out using hand tools to ascertain the presence/absence of retained tree roots: if no roots are found then machinery can be deployed on load-spreading mats to complete the excavation.

B3.4.3 Any tree roots that are exposed during the excavation should be treated in accordance with the following details from BS 5837:

**7.2.2** 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.

**7.2.3** Roots smaller than 25 mm diameter may be pruned back, making a clean cut with a suitable sharp tool (e.g. bypass secateurs or handsaw), except where they occur in clumps. Roots occurring in clumps or of 25 mm diameter and over should be severed only following consultation with an arboriculturist, as such roots might be essential to the tree's health and stability.

**7.2.4** Prior to backfilling, retained roots should be surrounded with topsoil or uncompacted sharp sand (builders' sand should not be used because of its high salt content, which is toxic to tree roots), or other loose inert granular fill, before soil or other suitable material is replaced. This material should be free of contaminants and other foreign objects potentially injurious to tree roots.

## B4 Integrity of control measures

B4.1 it is important that the integrity of any control measures that are required are not compromised by poor planning: at **5.5.6** BS 5837 states:

To avoid disturbance to the physical protection, it is essential to make allowance for, and plan, all construction operations which will be undertaken in the vicinity of trees. Factors that need to be considered include, but are not limited to:

a) site construction access;

b) the intensity and nature of the construction activity;

c) contractors' car parking;

d) phasing of construction works;

e) the space needed for foundation excavations and construction works;

f) the availability of special construction techniques;

g) the location and space needed for all temporary and permanent apparatus and service runs, including foul and surface water drains, land drains, soakaways, gas, oil, water, electricity, telephone, television or other communication cables;

h) all changes in ground level, including the location of retaining walls, steps and making adequate allowance for foundations of such walls and backfillings;

i) working space for cranes, plant, scaffolding and access during works;

j) space for site huts, temporary toilet facilities (including their drainage) and other temporary structures;

k) the type and extent of landscape works which will be needed within the protected areas, and the effects these will have on the root system;

l) space for storing (whether temporary or long-term) materials, spoil and fuel and the mixing of cement and concrete;

m) the effects of slope on the movement of potentially harmful liquid spillages towards or into protected areas.

B4.2 Before any equipment, materials or machinery are brought onto the site, and before the commencement of any activity on site (i.e. any activity associated with the proposed development, be that demolition,

construction, enabling works, laying or re-locating services, temporary works and so on), the local planning authority, the architect, the developer, the project arboriculturist and the project manager should be invited to a formal minuted site meeting to confirm the specification of the control measures to be used, and their location and alignment, to protect the retained trees.

## B5 The stem and crown

B5.1 Damage to the retained trees' stems and canopies may arise from accidental collisions with site traffic. Once the site has been fully set out (including the location of temporary site buildings, welfare facilities, storage areas, parking areas etc., scaffolding and working space, as well as the arc of any over-ground movement of materials by crane such as roof trusses), and the temporary tree protection measures installed, it would be prudent to consider the need for any tree pruning to lift the canopies or reduce the crown spreads to prevent any accidental damage during the work activity.

B5.2 The retained trees' crowns may encroach into the working space required to demolish an existing building or to carry out the proposed development and this conflict is another potential cause of harm that may be mitigated by pruning to lift the trees canopies or reduce their radial spread to prevent any accidental damage during the work activity.

B5.3 The temporary tree protection measures will have been designed to offer ground protection, and incidentally significant protection to the stems of the retained trees on site. However, if the detailed development proposals suggest that the stems of certain trees face an additional hazard from collision damage with heavy plant or machinery for example then additional control measures will be required.

B5.4 The stem may be protected by the construction of a timber box to surround the stems to prevent the risk of accidental damage. The protective box should be constructed from sheets of 20mm marine or exterior grade plywood on suitable bearers, such as 75 mm x 50 mm pressure treated softwood. The box should not come into contact with, or be secured in any way to, any part of the tree and the height of the box should be sufficient to ensure protection for as much of the tree's structure as possible from the local hazard. The sheets should be close butted so that there are no gaps, and it may be appropriate to incorporate a shock absorbing material between the tree's stem and the inner surface of the box, such as carefully placed second hand tyres.

B5.5 To protect the canopies of the retained trees from direct damage during the development, particularly from accidental collisions with plant or machinery for example, it may be necessary to initiate a programme of facilitation pruning prior to the commencement of the works, i.e. to seek to remove those limbs that might be at risk of damage from the development activity.

B5.6 Because the trees are likely to have been retained because they contribute toward the local amenity then their pruning should be to a good technical and aesthetic standard. Branch reduction or removal should not leave any stubs that may attract decay organisms. If branch length is being reduced the pruning wound should be at a suitable growth point, and the pruning should seek to result in a canopy of attractive and natural appearance with branches pruned where there is a lateral branch of appropriate diameter to maintain a flowing canopy.

B5.7 If required it would be appropriate to engage a competent arboricultural contractor, such as an Approved Contractor of the Arboricultural Association, (http://goo.gl/KRE0sN) to undertake this pruning against a specification prepared in accordance with **BS 3998:2010 Tree work – Recommendations** by a competent arboricultural consultant.

B5.8 Because tree work is inherently dangerous then it would be appropriate to engage a competent arboricultural contractor to safely undertake the work against a specification prepared by a competent arboricultural consultant. Evidence of training for the tasks being performed by the named members of staff should be requested from the contractor prior to awarding the work, and the evidence presented should be compared with, for example, the schedule of Level 3 competences available under the City and Guilds/NPTC scheme (see https://goo.gl/BcWfyQ).

B5.9 Once the development has been completed it may be necessary to initiate a programme of remediation pruning, i.e. to remove those limbs that may have been accidentally damaged during the work activity. As

noted above it would be appropriate to engage a competent arboricultural contractor to undertake this pruning against a specification prepared by a competent arboricultural consultant.

# Appendix C, a selection of site photos

**Photo 1: the apron to the current building**

**Photo 2: the oak tree to the rear**