

# Trevor Heaps

## Arboricultural Consultancy Ltd.

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### Arboricultural Impact Assessment & Method Statement (to BS:5837 2012)

For  
58 West End Lane, London  
NW6 2NE

Prepared for: ASB Architects

Prepared by: **Trevor Heaps** BSc, MICFor, M.Arbor.A,

Date: 27<sup>th</sup> September 2016

Ref: TH 1308

## **Validation details for Local Planning Authority (LPA)**

This report demonstrates that due consideration has been given to trees on and adjacent to this site. It will allow the LPA to properly assess the impact of the proposals on the arboreal character of the local area.

Subsequently, this report provides the following information:

- A tree survey, carried out by a suitably qualified and experienced arboriculturist, in accordance with the requirements of BS 5837:2012;
- A site plan (with north arrow) showing the tree survey information;
- An assessment of the arboricultural implications of development, showing trees to be retained, trees to be removed, mitigation planting details; and protective measures;
- An arboricultural method statement explaining how and when the various protective measures will be implemented.

## **Summary of conclusions and recommendations**

A proposed extension is to be built in the vicinity of a line of mature Lime trees.

The two western-most Lime trees in the line will need to be removed to facilitate development; however, their loss will go barely un-noticed in the public real because it is only the end tree that is visible (when looking to the side of the property).

Recommendations have been made to protect the remaining Lime trees where construction occurs within or close to their root protection areas.

The line of Limes are outgrown pollards and therefore it is sensible to re-introduce a cyclical pruning regime to lightly reduce their crowns.

The relationship between the proposals and the retained trees is sustainable and does not result in any situations that may result in unreasonable pressure to severely prune or remove important trees from future occupants.

Subject to the implementation of the proposed scheme in accordance with the recommendations set out in this report, the landscape and important trees will not be adversely affected.

## **1.0 Introduction**

I am Trevor Heaps, Director of Trevor Heaps Arboricultural Consultancy Ltd. I have qualifications and experience in the field of Arboriculture, which are provided in Appendix 1.

## **2.0 Brief**

I am instructed to prepare an Arboricultural Impact Assessment (AIA) and Arboricultural Method Statement (AMS) that will assess the requirements for, and then make recommendations for, the protection of trees during development - against British Standard 5837:2012 '*Trees in relation to design, demolition and construction – Recommendations*' (hereafter referred to as BS5837).

The tree protection recommendations will be commensurate and appropriate to the scale of development.

This report is to be read in conjunction with the supporting Tree Protection Plan (TPP), which must be read / printed off in colour) at the correct scale (as shown).

## **3.0 Limitations**

The site was surveyed by me, Trevor Heaps, on the 26<sup>th</sup> September 2016. I was unaccompanied. The weather was rainy, but visibility was good.

I surveyed the tree/s from within the site at ground level. Climbed inspections were not carried out and root/soil analysis was not undertaken. Tree heights, crown spreads and stem diameters were estimated.

This report is designed to accompany a planning application for development, and its purpose is to assist and inform the planning process; it is not a tree risk assessment report (however, dangerous trees will be reported highlighted).

The Tree Protection Plan has been prepared based on the information provided (drawings, scales, measurements etc.) and so must only be used for assessing tree-related matters.

This report comprises Stages 3 & 4 of a 5-Stage Arboricultural process relating to planning. Stage 5 is the implementation, supervision and on-going monitoring of tree protection during development.

I have not been involved in any of the previous stages.

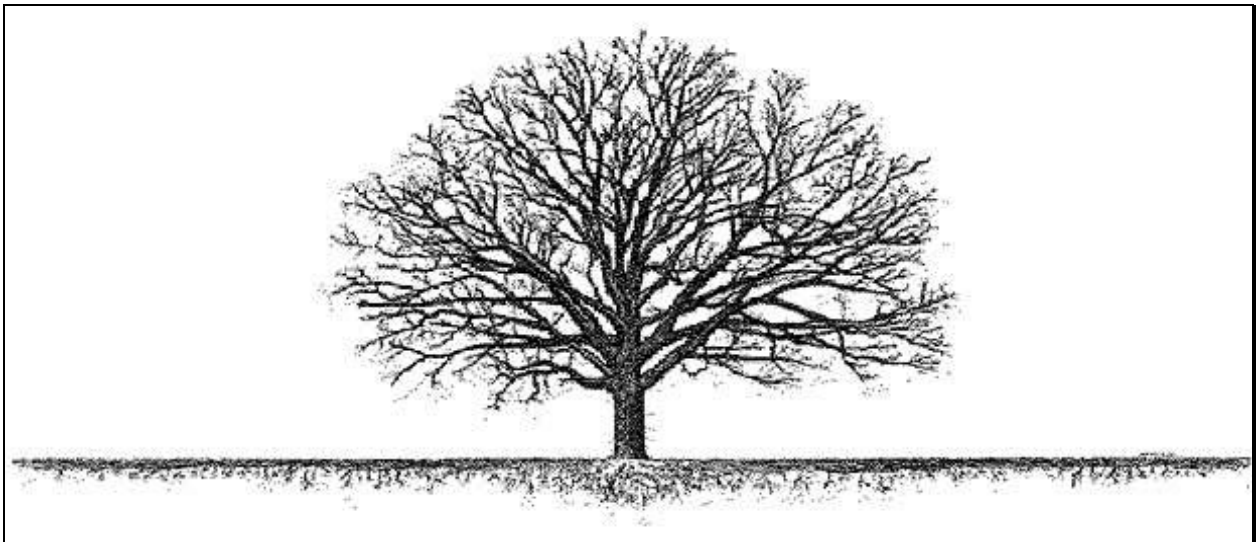
#### 4.0 Drawings provided

The following document/s was used in the preparation of this report:

- Proposed lower and upper ground floor plan – Ref. 308/A1/40/J – Dated March 2016

#### 5.0 The need for Tree Protection

The two main functions of tree roots are: (a) physical support and (b) the supply of water and nutrients from the soil. Roots will grow wherever conditions are favourable (i.e. where there is an adequate supply of air, water and nutrients) and so most tend to grow in the upper 600 mm of soil (see diagram below). It is for this reason that even shallow excavations or minor level changes can be harmful to trees.



**Diagram 1:** The relative depth & extent of a mature tree's rooting system. Roots do not mirror the crown's shape, as is often believed (<http://blog.bartlett.com/wp-content/uploads/roots-diagram.jpg>)

In fact, a single traverse over a root protection area (RPA) by a mechanical excavator can cause significant and irreversible damage (due to soil compaction). Construction near trees can also be indirectly harmful; this may be through spillage of toxic materials such as diesel and cement (see also diagram 2 in Appendix 5 for further details).

Guidelines within BS5837 specify measures to avoid or minimise construction damage to trees. The most important measure is that root protection areas (RPA's) are established around retained trees, so that no construction work takes places within them (unless special measures are taken).

RPA's are usually fenced off and/or covered with ground protection to exclude construction access.

## 6.0 Relevant background information

13 trees were assessed. Further information can be found in Appendix 2; explanatory notes are provided in Appendix 3.

## 7.0 Arboricultural Impact Assessment

Table 1 below summaries the main potential impact on trees due to various construction-related activities. All relevant potential impacts are considered in more detail below.

Construction-related activity	High quality tree/s affected	Moderate quality tree/s affected	Low quality tree/s affected
<b>Tree/s to be removed to facilitate development</b>		T4, T5	
Foundations within RPA of retained tree/s			
<b>Soil compaction around retained tree/s</b>		T6 - T8, T10 - T13	T1 - T3, T9
New surfaces to be laid within RPA of retained tree/s			
Alteration of ground levels around retained tree/s			
Demolition of existing structure/s			
Underground services near retained tree/s			

**Table 1:** Potential impact on tree/s due to various construction-related activities

### 7.1 Tree/s to be removed to facilitate development

The two western-most Lime trees (T4 & T5) in the line will need to be removed to facilitate development; however, their loss will go barely un-noticed in the public real because it is only the end tree that is visible (when looking to the side of the property).

### 7.1.1 Mitigation Planting

To mitigate the proposed removal of Limes (T4 & T5) a new tree will be planted in the south-western corner of the front garden. In this case, it is appropriate to deal with this matter by way of a suitably worded condition (as part of a post-development landscaping scheme). However, the following details can be confirmed at this stage:

- The new tree will be a large-growing, upright species of tree such as a Fastigate Oak (*Quercus robur* 'Koster'); see Photograph 1 below:
- The new tree will be of semi-mature size.
- Tree planting will be carried out in full accordance with current British Standards (BS 8545: From Nursery to Independence in the Landscape).
- The applicant is also happy to enter into a section 106 agreement to fund the planting of several street trees within the surrounding roads.



**Photograph 1:** An example of a maturing Fastigate Oak

## 7.2 Soil compaction around retained tree/s

The roots of all of the remaining / retained tree are potentially vulnerable to damage through the compaction of soil (due to various construction-related activities such as storage of materials and the use of heavy machinery). To ensure that soil compaction is minimised, a mixture of ground protection and protective fencing will be used to separate the trees from the working area. This also applies to the front garden area that will be planted with the new tree.

## 8.o Arboricultural Method Statement (AMS)

Effective tree protection relies on following a logical sequence of events AND arboricultural supervision.

This AMS lays down the methodology for all demolition and/or construction works that may have an effect upon trees on and adjacent to this site. It also recommends when arboricultural supervision is required (highlighted yellow). Supervision is usually needed where work occurs within the RPA's of retained trees and also when some aspects of tree protection are dependent on variables (*i.e. the ground protection specification is optional on whether there is machinery access or not*). Without supervision there is no guidance on the correct option in different parts of the site by someone who understand the risk to trees and is not influenced by practicality or cost.

Following each site visit, a site monitoring report will be prepared (template at end of report). The report will state the condition of tree protection measures and outline any actions required (where necessary) in the event of any digressions. The site monitoring reports will be made available to the LPA's arboricultural department on request.

Should accidental tree damage occur during development, a logical procedure to follow has also been appended to the end of this report.

It is essential within the scope of any contracts (related to this development) that this AMS is observed and adhered to.

If this AMS is not adhered to, the Council may issue a STOP notice, until all recommended tree protection is installed.

It is recommended that this document forms part of the work schedule and that specifications are issued to the building contractor(s) and these must be used to form part of their contract.

A copy of this AMS must be permanently made available on-site during the duration of development.



**8.1 At this site, operations are to occur in the following sequence:**

(yellow highlighting indicates that arboricultural supervision is recommended)

- 1) Carry out any recommended / facilitative tree work operations specified in the tree data schedule (highlighted yellow in Appendix 2 if applicable). All tree works are to be carried out by a competent and experienced arborist to current British Standards (see Appendix 5.9 for assistance finding a reputable arborist).
- 2) Hold pre-commencement site meeting with project arboriculturist, building contractors and arboricultural officer (if required by the LPA) prior to the commencement of any development work commencing on site. The purpose of this meeting is to ensure that the contractors are fully briefed and understand the requirements of (and reasons for) this AMS. During the initial meeting a site supervisor will be appointed to take responsibility for tree protection and to be given the duty of reporting any damage to trees or deviation from the AMS to the project arboriculturist. All contractors will be required to read and sign the induction form (included at the end of this report).
- 3) Install ground protection within the areas shown by the diagonal blue lines on the TPP (see Appendix 4.1 further details). If the location/s for the ground protection is impractical for any reason, it can be located further away from the retained tree/s. The furthest extent of the ground protection must not be located closer to the retained tree/s without the agreement of the project arboriculturist / LPA arboricultural officer.
- 4) Erect protective fencing in the positions shown by the solid red line/s on the TPP (see Appendix 4.2 for further details). If the location/s for the protective fencing is impractical for any reason, it can be located further away from the retained tree/s. The fencing must not be located closer to the retained tree/s without the agreement of the project arboriculturist / LPA arboricultural officer.
- 5) Photograph all tree and ground protection measures and forward to the LPA arboricultural officer for their approval. This will demonstrate that the tree and ground protection measures have been implemented in accordance with this report and the supporting Tree Protection Plan.
- 6) After the LPA arboricultural officer has confirmed that the tree and ground protection measures have been adequately installed, then construction can commence taking extra care with excavations within or close to the Root Protection Areas (RPA's) of retained trees (see Appendix 4.3 for further details).
- 7) Carry out final landscaping works (see Appendix 4.8 for further details).

**9.0 Signature**

This report represents a true and factual account of the potential arboricultural impacts, and recommended protective measures, at the subject property.

**Signed**



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**Trevor Heaps**

Chartered Arboriculturist

**BSc (Hons), MArborA, MICFor**

**Dated**

27<sup>th</sup> September 2016

## **Appendix 1 - Professional Résumé**

I am Trevor Heaps, director of Trevor Heaps Arboricultural Consultancy Ltd.

I have been working within the Arboricultural industry since 1995. I spent the first seven years working as a climber and groundsman in the U.K. and Australia. Following this, I spent another seven years working for several local authorities as a tree inspector and tree officer dealing with Council-owned trees situated on highways, parks, housing and education land.

Since 2009, I have worked in a Planning Department for a London Borough assessing tree reports that support planning applications and also applications to work on protected trees.

I am a Chartered Arboriculturist, a Professional Member of the Arboricultural Association (AA) and hold a First Class Honours Degree in Arboriculture.

### **Professional Training**

- Tree Science (Arboricultural Association) – June 2016
- OPM (Oak Processionary Moth) Training (Forestry Commission) – May 2016
- Visual Tree Assessment (Arboricultural Association) - October 2015
- Trees and the Law (Dr Charles Mynors) - June 2015
- Mortgage (Home Buyers) Report Writing (LANTRA / CAS) - February 2015
- Tree Preservation Orders - effective application (LANTRA / CAS) - November 2014
- Professional Tree Inspection 3-day course (LANTRA / AA) - July 2014
- Arboricultural Consultancy Course (AA) - May 2014
- Further down the subsidence trail 1-day course (AA) - April 2013
- Getting to grips with subsidence 1-day course (AA) - November 2012

## Appendix 2 - Tree Data Schedule

Ref	Name	Age	DBH (mm)	Hgt. (m)	Can. hgt. (m)	Can N (m)	Can E (m)	Can S (m)	Can W (m)	Physio cond.	Struct cond.	Life Exp.	Ret Cat	Comments	Rec's
T1	Crataegus monogyna (Hawthorn)	M	400	6	2	2.5	2.5	2.5	2.5	Fair	Normal	20+	C1	Front garden tree in fair condition	No works required at present
T2	Chamaecyparis lawsoniana (Lawson Cypress)	M	200	8	1.5	1.5	1.5	1.5	1.5	Normal	Normal	40+	C2	Growing tight against front, side boundary wall; causing slight damage to top of wall	No works required at present, but consider removal if wall damage considered significant
T3	Prunus avium (Wild Cherry)	M	300	8	2.5	3	3	3	3	Fair	Poor	10+	C2	Twin-stemmed tree with tight forks growing tight against front, side boundary wall. May cause damage in the future; tight growing stems may also fail	No works required at present. Inspect close-growing stems on a regular basis (about every 18 months)
T4	Tilia X europaea (Common Lime)	M	440	15	5	5	5	5	5	Normal	Fair	40+	RB	Lapsed pollard; forms part of a line of boundary trees	Remove to facilitate development
T5	Tilia X europaea (Common Lime)	M	450	15	5	5	5	5	5	Normal	Fair	40+	RB	Lapsed pollard; forms part of a line of boundary trees	Remove to facilitate development
T6	Tilia X europaea (Common Lime)	M	470	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a line of boundary trees	Reduce crown by 5m in height and 4m in width; crown lift to 6m by tip reducing low hanging branches; remove basal and epicormic growth
T7	Tilia X europaea (Common Lime)	M	330	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a line of boundary trees	Reduce crown by 4m in height and 3m in width; crown lift to 6m by tip reducing low hanging branches; remove basal and epicormic growth
T8	Tilia X europaea (Common Lime)	M	370	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a line of boundary trees	No works required at present
T9	Tilia X europaea (Common Lime)	M	320	15	5	5	2	1	2	Normal	Fair	40+	C2	Lapsed pollard; forms part of a line of boundary trees; slight lean into the garden	No works required at present
T10	Tilia X europaea (Common Lime)	M	400	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a line of boundary trees	No works required at present
T11	Tilia X europaea (Common Lime)	M	690	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a pair of rear boundary trees	No works required at present
T12	Tilia X europaea (Common Lime)	M	500	15	5	5	5	5	5	Normal	Fair	40+	B2	Lapsed pollard; forms part of a pair of rear boundary trees	No works required at present
T13	Chamaecyparis lawsoniana (Lawson Cypress)	M	400	12	0.5	3	3	3	3	Normal	Normal	40+	B1	No comments	No works required at present

## Appendix 3 - Tree Survey Schedule Explanatory Notes

This section explains the terms used in the **Tree Data Schedule**.

**Ref:** Each item of vegetation has its own unique number prefixed by a letter such that:

**T**<sub>1</sub>=Tree      **S**<sub>2</sub>=Shrub or stump      **G**<sub>3</sub>=Group      **H**<sub>4</sub>=Hedge      **W**<sub>5</sub>=Woodland

**Species:** Common and Latin names are given.

**Age:**

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

**DBH (mm):** Stem diameter, measured in mm, taken at 1.5m above ground level where possible. On trees with two to five stems, the combined stem diameter is calculated as follows:

$$\sqrt{(\text{stem diameter } 1)^2 + (\text{stem diameter } 2)^2 \dots + (\text{stem diameter } 5)^2}$$

For trees with more than five stems, the combined stem diameter is calculated as follows:

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

**Hgt (m): Height:** Measured from ground level to the top of the crown in metres.

**Can Hgt (m): Crown Height:** Measured from ground level to the height at which the main crown begins in metres. Where the crown is unbalanced it is measured on the side deemed to be most relevant. This is usually the side facing the area of anticipated development.

**Can: - Canopy Extents N, E, S, W:**

Radial crown spread approximately measured to the four cardinal points (for individual trees only)

**Physio cond:** Indicates the physiological condition of the tree as one of the following categories:

- **Normal** - Healthy tree with no symptoms of significant disease
- **Fair** - Tree with early signs of disease, small defects, decreased life expectancy, or evidence of less-than-average vigour for the species
- **Poor** - Significant disease present, limited life expectancy, or with very low vigour for the species and evidence of physiological stress
- **Very poor** - Tree is in advanced stages of physiological failure and is dying
- **Dead** - No leaves or signs of life

**Struct cond:** Indicates the structural condition of the tree as one of the following categories:

- **Normal** - No significant structural defects noted
- **Fair** - Some structural defects noted but remedial action not required at present
- **Poor** - Significant defects noted resulting in a tree that requires regular monitoring or remedial action
- **Very poor** - Major defects noted that compromise the safety of the tree. Remedial works or tree removal is likely to be required.
- **Dead** - No leaves or signs of life

**Life Exp: Life Expectancy:** The estimated number of years before the tree may require removal.

Classified as (<10), (10 – 20), (20 – 40), or (40+).

**Ret. Cat.:** - **Retention Category:** BS5837:2012 Category where:

- **U = Trees unsuitable for retention.** Trees in such a condition that cannot realistically be retained as living trees in the context of the current land use for longer than 10 years. These trees are shown on the tree plans with red centres.
- **A = Trees of high quality.** Trees of high quality with an estimated remaining life expectancy of at least 40 years. These trees are shown on the tree plans with green centres.
- **B = Trees of moderate quality.** Trees of moderate quality with an estimated remaining life expectancy of at least 20 years. These trees are shown on the tree plans with blue centres.
- **C = Trees of low quality.** Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm. These trees are shown on the tree plans with grey centres.

Trees of notable quality are graded as Category A or Category B. These trees are sometimes divided further into sub-categories:

- Sub-category 1 is allocated where it has been assessed that the tree has mainly arboricultural qualities.
- Sub-category 2 is allocated where it is assessed that the tree has mainly landscape qualities.
- Subcategory 3 is allocated where it is assessed that the tree has mainly cultural qualities, including conservation.

Trees may be allocated more than one sub-category. All sub-categories carry equal weight, with for example an A3 tree being of the same importance and priority as an A1 tree.

**Comments:** Tree form and pruning history are also recorded along with an account of any significant defects. Defects and descriptive terms are dealt with in more detail at the end of this section.

**Rec's - Recommendations:** Usually based on any defects observed and intended to ensure that the tree is in an acceptable condition.

## Appendix 4 – Specifications for tree protective measures

### 4.1 Ground Protection

Ground protection will be used within the areas shown with blue diagonal lines on the TPP. In some cases, existing hard surfaces (such as concrete paths and driveways) provide an adequate level of ground protection. Any hard surfaces that are to be used as ground protection must remain in situ throughout the duration of development. Where there are no hard surfaces, or if the hard surfaces require supplementary protection, the following guidance shall be followed:

Unless specified otherwise, the temporary ground protection shall comprise a geotextile membrane (e.g. Terram -<http://www.terram.com/products/geotextiles/weedguard.html>), topped with a **minimum** depth of 100mm compressible fill (such as wood chip); these are the base layers.

**4.1.1** For the main, top layer: In the event that only pedestrian access is required over the protected areas, then exterior grade (marine) ply boards shall be used (usually 2.4 x 1.2m in size).

**4.1.2** If vehicular access is required, proprietary ground protection such as Greentek 'ground guards' (<http://www.ground-guards.co.uk/products/multitrack/>) shall be used. These ground protection mats range in sizes from 2.4 x 1.2m down to 1.8 x 0.6m.

The temporary ground protection shall remain 'fit for purpose' throughout the duration of development and so the compressible fill layer may need topping up on occasion. An example of this specification is shown in Figure 1.



**Figure 1:** An example of ground protection to protect against vehicular access



**4.1.3** If temporary ground protection is required close to an excavated area (i.e. basements or deep foundations) or on sloping ground, then a site-specific scaffold framework shall be constructed to provide a ‘floating walkway’. This is to avoid the protected area subsiding into the excavated area (see Figure 2 for an example).



**Figure 2:** An example of ‘floating’ ground protection

## **4.2 Protective Fencing**

**Before** the commencement of any demolition / construction work on-site, protective fencing is to be erected in the positions shown by the solid red line/s on the TPP. The position of the protective fencing is determined using recommendations set out in BS5837.

Durable, all-weather signs are to be attached to the fencing (a sign has been included at the end of this report). This shall be printed, laminated and attached to every third fence panel.

Once erected, the protective fencing is to be regarded as sacrosanct. There is to be no access by pedestrians into the area protected by the fencing and no works whatsoever shall be carried out in this zone; this includes: storage of materials; any form of excavation or changes in ground levels.

The protective fencing is to be maintained in good order so that it is fit for purpose throughout the construction process. The fencing will not be altered in any way, or prematurely removed without prior consent of the project arboriculturist and/or (if necessary) the Local Planning Authority (LPA).

Unless specified otherwise, the protective fencing is to be constructed of 2.2 metre height weld-mesh (Heras type) panels, as set out on the insert on the TPP (see link below).

<http://www.herasreadyfence.co.uk/original-heras-fencing-panel>

The panels are to be fixed to a scaffold framework either with wire ties or with scaffold clamps. The scaffolding shall comprise a vertical and horizontal framework, well-braced to resist impacts, with vertical tubes spaced at a maximum of 3 metres or alternatively at panel width, and driven into the ground by 0.6 metres (if this is impractical due to existing hard surfaces, it may be necessary to place the vertical tubes in rubber or concrete 'boots'). An example specification is shown in Figure 3.



**Figure 3:** An example of protective fencing erected to the correct specification

#### **4.3 Excavations within or close to the Root Protection Areas (RPA's) of retained trees**

To minimise root damage to tolerable levels during construction, the following guidance should be followed (see also Appendix 6 for further useful information):

The RPA of the affected tree/s will be clearly marked on the ground with biodegradable marker paint. The affected area/s within or close to the trees' RPA will be excavated by hand (using hand tools such as a fork, spade, trowel, stiff brush or an air spade).



**Figure 4:** An example of an air spade excavation to determine the location of roots

If roots below 25mm in diameter are uncovered, they will be severed cleanly back to a suitable growth point with sharp secateurs or a sharp pull saw. If roots over 25mm in diameter are uncovered, they will be bent / relocated (horizontally if possible) as best as possible. If this is not possible, then they will be severed cleanly back to a suitable point with sharp secateurs or a sharp pull saw.

Once excavated, the sides of the excavated area will be covered with damp hessian to protect any retained roots from desiccation and maintain soil moisture.

All spoil from the above process shall be removed from site using a wheelbarrow.

#### **4.4 Non-invasive foundation designs**

To minimise root damage to tolerable levels during construction, the foundations will be of pile and beam (or similar non-invasive) design and the following guidance should be followed (see also Appendix 6 for further useful information):

The RPA of the affected tree/s will be clearly marked on the ground with biodegradable marker paint.

Working off either suitable ground protection or an existing hard surface, the optimal location for the piles will be determined by hand-dug excavations (using tools such as a fork, spade, trowel, stiff brush or an air spade). If working off an existing hard surface such as paving slabs or block paving, the minimal number of individual slabs will be removed to facilitate this exploratory process. If working off a concrete surface, a jack hammer can be used to break through to the soft surface below.

If roots below 25mm in diameter are uncovered, they will be severed cleanly back to a suitable point with sharp secateurs or a sharp pull saw. If roots over 25mm in diameter are uncovered, they will be bent / relocated as best as possible. If this is not possible, then the process to determine the optimal location for the piles will be repeated until successful.

Once the locations are determined, the pile holes will be as small as is practically possible and the piling rig shall again be situated on top of either suitable ground protection or a pre-existing hard surface.

All spoil from the piling process shall be removed from site using a wheelbarrow.

The lowest part of the proposed extension will sit on top of the highest level of the trees' RPA's (i.e. there will no significant alteration of ground levels)

If required, it is also possible to use engineering methods to direct moisture to the underlying tree roots (by inserting a gravel filter medium above ground and below the foundations).

See below for a very rough estimate of foundation costs - for a building measuring 7m x 10m on a level surface:

- 1.2m deep x 600mm wide Deep Strip Foundations - £4,150
- 1.2m deep x 600mm wide Trench Fill Foundations - £6,350
- 2m deep x 600mm wide Trench Fill Foundations - £11,500
- Pile and Beam Foundations - between £8,000 and £12,000

**It is usually appropriate for the final foundation design to be agreed either by way of a suitably worded condition or separately by a structural engineer / local building control department.**

#### **4.5 Demolition of existing buildings**

Any existing buildings to be removed shall be demolished with care using the 'top down, pull back' method. This must proceed in a manner pulling the structure back into itself, working away from the retained tree/s.

Any machinery used during the demolition and clearance of existing buildings must work from a position outside of the RPA's of any retained trees; or situated on suitable ground protection (as described in section 4.1).

The foundations of any demolished buildings within in the RPA of retained trees shall be either be left in place, or shall be excavated and removed by hand (using hand tools such as a fork, spade, trowel, stiff brush or an air spade) under arboricultural supervision.

#### **4.6 Removal of existing hard surfaces**

Working off either existing hard surfaces or supplementary ground protection (see 4.12), machinery can be used to carefully peel back and remove existing tarmac or concrete. Other surfaces, such as block paving, will be removed by hand. Sub-bases can be removed if they are not likely to contain roots (this must be approved by the arboricultural consultant). Underlying (soft) ground levels must be retained and will not be excavated.

All newly exposed soil and exposed roots will be covered with up to 100 mm of topsoil. Machinery can be used to move the topsoil close to the exposed area, but the topsoil itself will be spread by hand.

Machinery will not be sited on any exposed rooting area.

#### **4.7 Installation of no-dig surface**

The site will be carefully prepared by removing all debris and the existing turf layer using hand tools. An even surface profile will be achieved by filling in any localised depressions with sharp sand (not builder's sand, which has a high salt content). The area will not be 'rolled' or consolidated in any way.

Timber edging boards (or similar) will be installed along the perimeter of the no-dig area. Fixing posts and pegs will be installed carefully to avoid damaging to tree roots.

A layer of Geotextile Fabric will be laid across the area, overlapping adjacent rolls by a minimum of 150mm. It may be necessary to lightly pin the Geotextile in place until the overlying layers are installed.

Open out and lay a 100mm deep cellular confinement system (such as *Terram Geocell* – see link below) and pin in place between the edging boards (it may be necessary to cut the cellular confinement system to size using a sharp knife or it can be left uncut and folded up against the edgings if preferred).

<http://www.terram.com/products/geocells/tree-root-protection-geocell.html>

The cellular confinement system will be pinned in place using steel fixing pins to keep it open and fully expanded position whilst the cells are being filled and also to stop the structure from being pushed up by migrating aggregate during the filling process. The fixing pins will be driven in so that they are just touching the top of the cells but do not compress the fabric.

The cellular confinement system will be filled with clean, open graded angular aggregate, normally in the particle size range of 5mm - 45mm, working toward the tree/s from the furthest point away and using the filled sections as a platform (See Figure 5).



**Figure 5:** An example of a no-dig driveway under construction

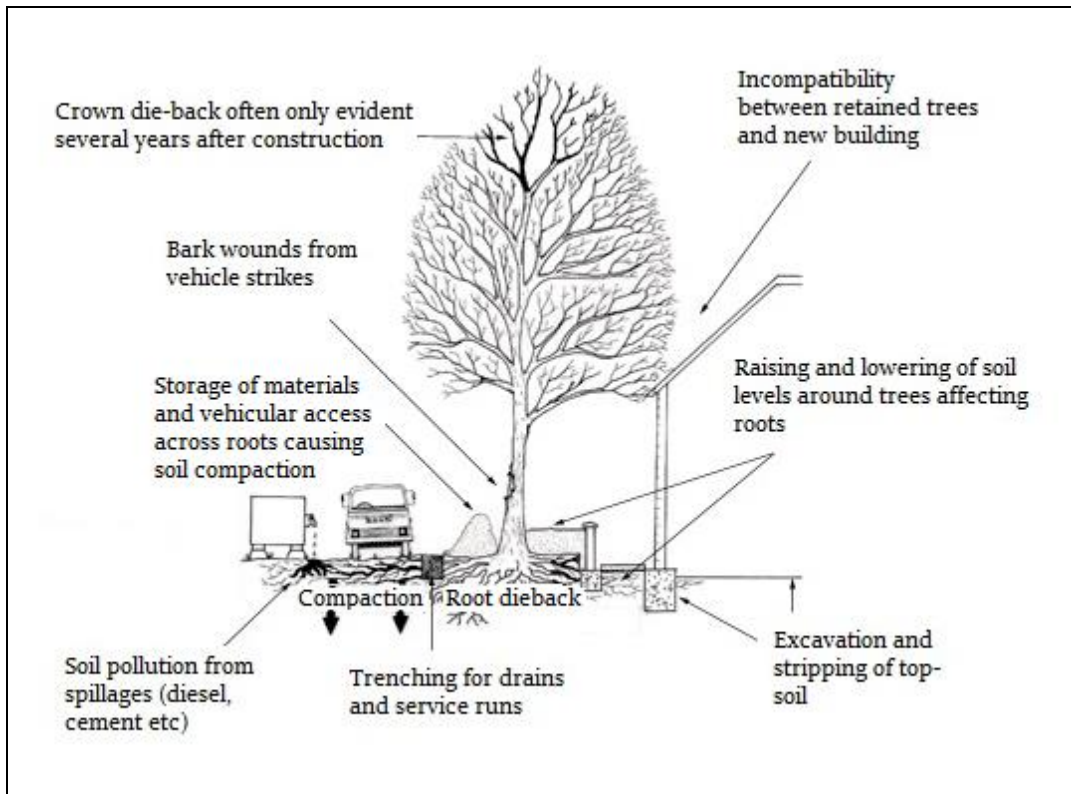
A light vibratory compaction plate (whacker) will be used to settle the stone into the cells and the permeable surface will then be installed on top of the filled, cellular confinement system.

#### **4.8 Soft landscaping within or close to the Root Protection Areas (RPA's) of retained trees**

Some precautions will be necessary to avoid damage to trees where activities are to take place within the RPAs of retained trees:

- Ground levels will not be changed
- Imported soil must be good quality and should be free of contaminants and other foreign objects potentially injurious to tree roots. The topsoil used must satisfy the requirements of multipurpose compost as described within BS3882:200
- No machinery that may compact the soil may be operated within the RPA in the installation of soft landscaping (e.g. mechanical rotavation
- Unwanted vegetation shall be removed manually or by using systemic herbicide that cannot damage the roots of the trees
- No fuels or chemicals shall be used or stored within these areas
- No irrigation or drainage pipes shall be installed within the RPA's

## Appendix 5 – General precautions and further information



**Diagram 2:** Common problems for trees on development sites  
([http://www.leics.gov.uk/highway\\_req\\_development\\_part7\\_appendix\\_f](http://www.leics.gov.uk/highway_req_development_part7_appendix_f))

### 5.1 Services and drainage:

Surface run-off water shall be sent to soakaways located outside the RPA/s of retained tree/s. If it becomes apparent that trenching is required within the RPA of retained trees to provide routes for services, this work shall be undertaken using mole boring and / or hand digging in accordance with guidelines set out in National Joint Utilities Group (NJUG) Volume 4 (2007) under supervision by the project arboriculturist. A shortened version of this document can be found in Appendix 6; the whole document can be downloaded at no charge using the link below:

<http://www.njug.org.uk/document-download/?URL=http://www.njug.org.uk/wp-content/uploads/V4-Trees-Issue-2-16-11-2007.pdf>

**5.2 Storage of materials:** No materials or spoil are to be stored within the area/s protected by protective fencing and/or ground protection. The same applies for existing hard surfaces that are being used as ground protection.

**5.3 Spillages:** If any cement residues fall within root protection areas, it shall be swept up, bagged and removed from site – it shall NOT be washed away with water.



**5.4 Demolition:** Where any existing structures are to be demolished, they will be done so inwardly (away from root protection areas / retained soil).

**5.5 Levels:** There is to be no alteration of ground levels within the area protected by protective fencing and/or ground protection, unless previously specified and agreed upon. The same applies for existing hard surfaces that are being used as ground protection.

**5.6 Fires:** No fires are to be lit within 20 metres of the stems of retained trees.

**5.7 Above ground damage to trees:** Care must be taken in planning the location and operation of machinery to avoid above ground damage to trees. BS5837 (2012) Section 6.2.4.1 states *'Planning of site operations should take sufficient account of wide loads, tall loads and plant with booms, jibs and counterweights (including drilling rigs) in order that they can operate without coming into contact with retained trees. Such contact can result in serious damage to trees and might make their safe retention impossible. Consequently, any transit or traverse of plant in proximity to trees should be conducted under the supervision of a banksman, to ensure that adequate clearance of trees is maintained at all times. Access facilitation pruning should be undertaken where necessary to maintain this clearance.'*

**5.8 Remedial works and soil improvement:** Exposed soils are easily compacted resulting in loss of water and gaseous exchange; this can lead to root death (and subsequently tree death).

To relieve ground compaction, which may have resulted from the use of vehicles or by the storage of materials, the soils should be broken up to allow air to penetrate and for the soil structure to be restored. There are various methods to achieve this, such as: auguring the soil by hand / fork or pneumatic excavation (e.g. with an air spade); both should be combined with soil structure improvements:

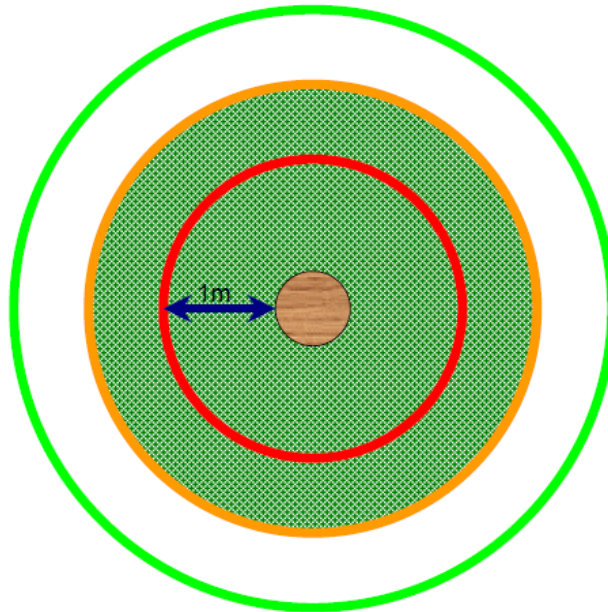
The soil structure can be improved by incorporating a compost or mulch within the topsoil, of 75-100mm in depth. This can be spread over the surface and gently forked into the soil. If bark chip is used as mulch, NPK fertilizer should be added to counteract the nitrogen depletion of the soil. There is also the option of adding mycorrhizal fungal which may also improve root function.

**5.9 Choosing an arborist:** When appointing a tree works contractor, please only use properly qualified and experienced companies who comply with current British Standards (3998) and always check that they carry Public Liability Insurance within a minimum of £2,000,000 cover, and the relevant Employers Liability Insurance. A list of contractors approved by the Arboricultural Association can be found at [www.trees.org.uk](http://www.trees.org.uk) or by calling 01242 522 152.

## Appendix 6 – NJUG Guidelines



NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2



### TREE PROTECTION ZONE

#### Key to Diagram



Trunk of Tree



Spread of canopy or branches



**PROHIBITED ZONE – 1m from trunk.** Excavations of any kind must not be undertaken within this zone unless full consultation with Local Authority Tree Officer is undertaken. Materials, plant and spoil must not be stored within this zone.



**PRECAUTIONARY ZONE – 4 x tree circumference.** Where excavations must be undertaken within this zone the use of mechanical excavation plant should be prohibited. Precautions should be undertaken to protect any exposed roots. Materials, plant and spoil should not be stored within this zone. Consult with Local Authority Tree Officer if in any doubt.



**PERMITTED ZONE – outside of precautionary zone.** Excavation works may be undertaken within this zone however caution must be applied and the use of mechanical plant limited. Any exposed roots should be protected.



## NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2

### DAMAGE TO TREES

Tree roots keep a tree healthy and upright. Most roots are found in the top 600mm of soil and often grow out further than the tree's height. The majority of these roots are very fine; even close to a tree few will be thicker than a pencil. Most street tree roots grow under the footway but may also extend under the carriageway. If roots are damaged the tree may suffer irreversible harm and eventually die.

### PROTECTING ROOTS - DO'S and DON'TS

There are three designated zones around a tree each of which has its own criteria for working practices.

#### THE PROHIBITED ZONE

- Don't** excavate within this zone.
- Don't** use any form of mechanical plant within this zone
- Don't** store materials, plant or equipment within this zone.
- Don't** move plant or vehicles within this zone.
- Don't** lean materials against, or chain plant to, the trunk.
- Do** contact the local authority tree officer or owner of the tree if excavation within this zone is unavoidable.
- Do** protect any exposed roots uncovered within this zone with dry sacking.
- Do** backfill with a suitable inert granular and top soil material mix as soon as possible on completion of works.
- Do** notify the local authority tree officer or the tree's owner of any damage.

#### THE PRECAUTIONARY ZONE

- Don't** excavate with machinery. Where excavation is unavoidable within this zone excavate only by hand or use trenchless techniques.
- Don't** cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.
- Don't** repeatedly move / use heavy mechanical plant except on hard standing.
- Don't** store spoil or building material, including chemicals and fuels, within this zone.
- Do** prune roots which have to be removed using a sharp tool (e.g. secateurs or handsaw). Make a clean cut and leave as small a wound as possible.
- Do** backfill the trench with an inert granular material and top soil mix. Compact the backfill with care around the retained roots. On non highway sites backfill only with excavated soil.
- Do** protect any exposed roots with dry sacking ensuring this is removed before backfilling.
- Do** notify the local authority tree officer or the tree's owner of any damage.

#### THE PERMITTED ZONE

- Don't** cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.
- Do** use caution if it is absolutely necessary to operate mechanical plant within this zone.
- Do** prune roots which have to be removed using a sharp tool (e.g. secateurs or handsaw). Make a clean cut and leave as small a wound as possible.
- Do** protect any exposed roots with dry sacking ensuring this is removed before backfilling.
- Do** notify the local authority tree officer or the tree's owner of any damage.

# TREE PROTECTION FENCING

## **KEEP OUT**

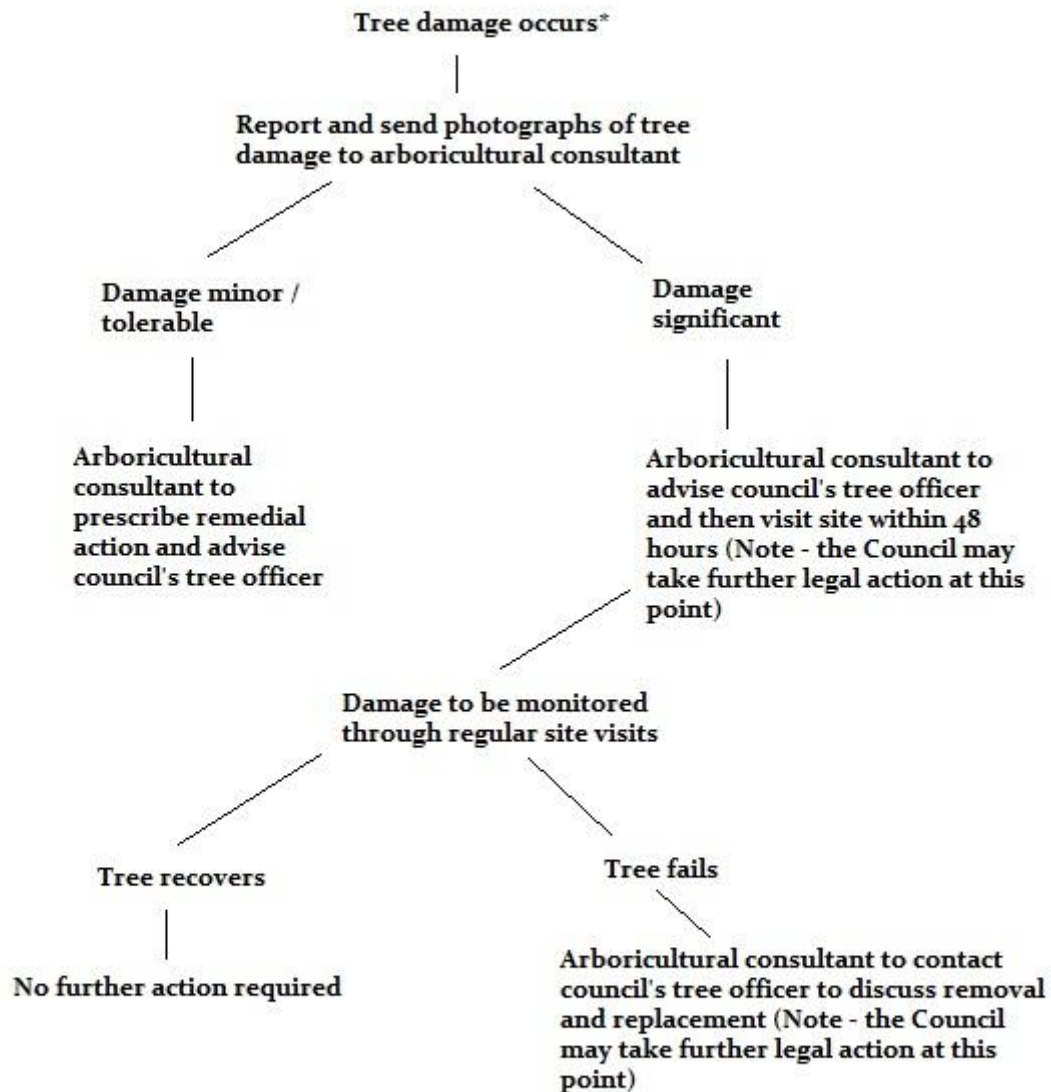
This fencing must not be removed  
or altered in any way without prior  
consultation with the project  
Arboriculturist!

Please report any damage to trees  
and/or fencing to the site manager  
or the project Arboriculturist

Trevor Heaps

07957 763 53

## Procedure to follow in case of damage to retained trees



\* Tree damage could include: unauthorised branch / root pruning; accidental damage to roots, branches or crown; damaged bark due to vehicle / machinery contact; spillage of toxic materials within root protection area (RPA)

## Induction Form for all site personnel:

**Site name:** .....

- I have had explained to me by the Site Manager the key implications of the Arboricultural Method Statement relating to the development at the above site.
- I am aware that trees have shallow roots and any excavation works beneath the canopy could cause irreparable damage.
- I am aware that the tree protective fencing / ground protection must remain in its original position and must not be moved without the approval of the appointed Arboricultural Consultant.
- I understand that certain operations must be supervised by the appointed Arboricultural Consultant and that these operations must not start until the consultant is present and has given approval.
- I confirm that I will bring any concerns about potential damage to trees to the attention of the Site Manager.
- I am aware that I must not cause damage to any of the retained trees on or adjacent to the site. Damage may be caused by direct means (i.e. physical damage caused to roots or the trunk/branches of the tree) or by indirect means (e.g. by fire or toxic materials entering the rooting environment of the tree).

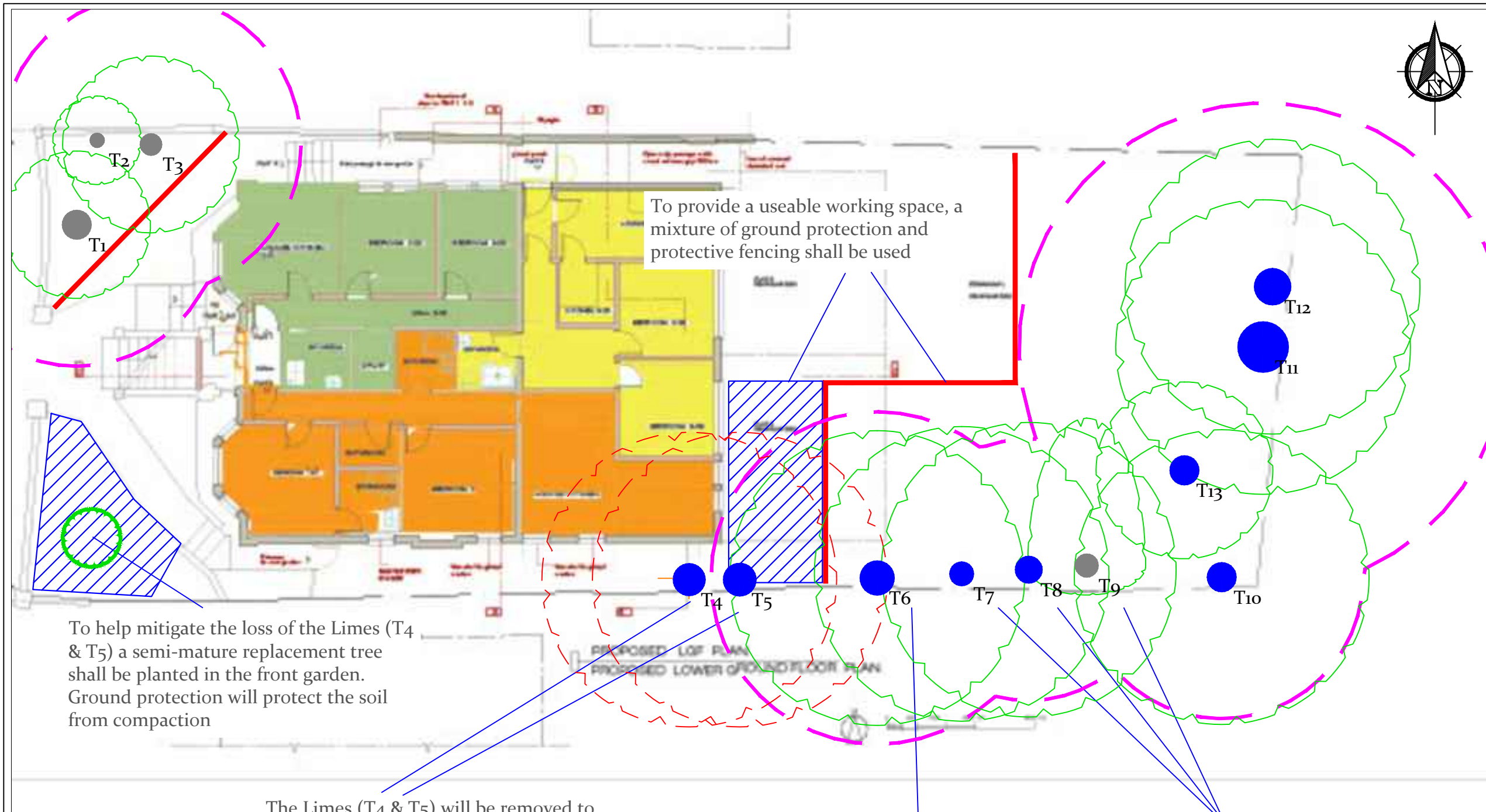
**Print Name:** .....

**Sign Name:** .....

**Date:** .....

## Site Inspection Record

Site:	Planning Application Ref:		
Date:	Time:		
Those present in addition to Arboriculturist:			
Client/Agent <input type="checkbox"/>	Project Manager <input type="checkbox"/>	Site Manager <input type="checkbox"/>	
LPA Officer <input type="checkbox"/>	Specify:		
Other <input type="checkbox"/>	Specify:		
	Yes	No	Action Required? (See notes below)
Tree protection measures in place in accordance with TPP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any disturbance within construction exclusion zone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any materials stored within construction exclusion zone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any evidence of damage to tree roots, stems or canopies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Following discussion with site personnel are any works programmed before next planned visit that may affect retained trees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Notes / action to be taken (continue on reverse if necessary):</u>			
Photograph reference numbers (if appropriate):			
Additional site visit required to ensure compliance with any required action as a result of this inspection? (Y/N)	<input type="checkbox"/>	Proposed date:	
Signed:	Date:		



To provide a useable working space, a mixture of ground protection and protective fencing shall be used

To help mitigate the loss of the Limes (T4 & T5) a semi-mature replacement tree shall be planted in the front garden. Ground protection will protect the soil from compaction

The Limes (T4 & T5) will be removed to facilitate development. Because the only public view of this line of trees is by looking between 58 and 56, this view will not significantly change.

The Lime (T6) will be left slightly un-balanced by the removal of T4 & T5 and so will be crown reduced by about 5m in height and 3m in width

The Limes (T7, 8 & 9) will be crown reduced by about 4m in height and 3m in width - to allow more light into the communal garden/s



The reason for Tree Protection

The relative depth and extent of a typical mature tree's roots. Due to their shallow nature, a single traverse by a mechanical digger can cause significant and irreversible damage (due to soil compaction)

**Note:** The line of Limes T4 - T10 and T11 - T12 are all lapsed pollards that have been allowed to re-grow full crowns. Limes have soft heartwood and there may be decay within / beneath the old pollard points. Given their historic (lapsed) management, to reduce the potential risk of branch / stem failure the trees should ideally be managed. The re-grown pollard stems are too large to allow re-pollarding, as large wounds would be left. Instead, the trees should be sympathetically crown reduced on a regular (every 3-5 year) basis.

### Tree Protection Plan

- Tree to be retained
- Tree to be removed
- Category A Tree
- Category B Tree
- Category C Tree
- Category U Tree
- Root Protection Area (RPA)
- Location of protective fencing\*
- Area/s where ground protection will be used
- Location of new tree planting

\* See supporting report

Scale: 1:150 @ A3  
1:150 @ A3

Site Address: 58 West End Lane  
London, NW6 2NE

Client: ASB Architects  
Drawing No: TH/A3/1308/TPP

Job Ref: TH/1308  
Date: 27th September 2016

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