Landmark Trees

ARBORICULTURAL IMPACT ASSESSMENT REPORT:

41 Frognal

London

NW3 6YD

REPORT PREPARED FOR:

KSR Architects LLP

14 Greenland Street

London NW1 0ND

REPORT PREPARED BY

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MSc ARB MICFor FArbor A MRICS C Env

Ref: AKN/41F/AIA/01c

Date: 23rd March 2015

APPENDICES

Caveats

This report is primarily an arboricultural report. Whilst comments relating to matters involving built structures or soil data may appear, any opinion thus expressed should be viewed as qualified, and confirmation from an appropriately qualified professional sought. Such points are usually clearly identified within the body of the report. It is not a full safety survey or subsidence risk assessment survey. These services can be provided but a further fee would be payable. Where matters of tree condition with a safety implication are noted during a survey they will of course appear in the report.

A tree survey is generally considered invalid in planning terms after 2 years, but changes in tree condition may occur at any time, particularly after acute (e.g. storm events) or prolonged (e.g. drought) environmental stresses or injuries (e.g. root severance). Routine surveys at different times of the year and within two - three years of each other (subject to the incidence of the above stresses) are recommended for the health and safety management of trees remote from highways or busy access routes. Annual surveys are recommended for the latter.

Tree works recommendations are found in the Appendices to this report. It is assumed, unless otherwise stated ("ASAP" or "Option to") that all husbandry recommendations will be carried out within 6 months of the report's first issue. Clearly, works required to facilitate development will not be required if the application is shelved or refused. However, necessary husbandry work should not be shelved with the application and should be brought to the attention of the person responsible, by the applicant, if different. Under the Occupiers Liability Act of 1957, the owner (or his agent) of a tree is charged with the due care of protecting persons and property from foreseeable damage and injury.' He is responsible for damage and/or nuisance arising from all parts of the tree, including roots and branches, regardless of the property on which they occur. He also has a duty under The Health and Safety at Work Act 1974 to provide a safe place of work, during construction. Tree works should only be carried out with local authority consent, where applicable.

Inherent in a tree survey is assessment of the risk associated with trees close to people and their property. Most human activities involve a degree of risk, such risks being commonly accepted if the associated benefits are perceived to be commensurate.

Risks associated with trees tend to increase with the age of the trees concerned, but so do many of the benefits. It will be appreciated, and deemed to be accepted by the client, that the formulation of recommendations for all management of trees will be guided by the cost-benefit analysis (in terms of amenity), of tree work that would remove all risk of tree related damage.

Prior to the commencement of any tree works, an ecological assessment of specific trees may be required to ascertain whether protected species (e.g. bats, badgers and invertebrates etc.) may be affected.

Tree Constraints & Protection Overview

Client:	c/o KSR Architects	**Case Ref:**	AKN/41F/AIA/01b
Local Authority:	LB Camden	**Date:**	22/03/2015
Site Address: 41 Frognal, London NW3 6YD			
Proposal: Extension of an existing family house including basement			

Report Checklist	**Y/N**		**Y/N**
Arboricultural constraints on site	Y	Trees removal proposed	Y
Tree Survey	Y	Topographical Survey	Y
BS5837 Report	Y	Conservation Area	Y
Tree Preservation Orders	N/k		
Tree Protection Plan:	N	(include In future method statement)	
Tree Constraints Plan:	Y		
Arboricultural Impact Assessment:	Y		

Site Layout				
Site Visit	Y	Date: 24/07/12 & 25/11/14	Access Full/Partial/None	F
Trees on Site	Y		Off-site Trees	Y
Trees affected by development	Y		O/s trees affected by development	N
Tree replacement proposed:	Y		On or off-site trees indirectly affected by development	N

Trees with the potential to be affected

Low impacts to Category B Trees T8 & T9, as confirmed by trial pits.
Low impact from felling of 1 category C tree T42 (replacement planting proposed)

Comments

T16, T17, T18, T20, T32 & T33 removed under a 5-day notice/S211 CA notice for removal.

Recommendations

1	Proposal will mean the loss of important trees (TPO/CA)	N
2	Proposal has sufficient amelioration for tree loss	Y
3	Proposals provide adequate tree protection measures	Y
4	Proposal will mean retained trees are too close to buildings	N
5	Specialist demolition / construction techniques required	Y
6	The Proposal will result in significant root damage to retained trees	N
7	Further investigation of tree condition recommended	Y

RPA= Root Protection Area
TPP= Tree Protection Plan
AMS= Arboricultural Method Statement
AIA = Arboricultural Implication Assessment
BS5837: 2012 'Trees in relation to design, demolition and construction – Recommendations'

1. SUMMARY

1.1 This report comprises an arboricultural impact assessment of the proposals for 41 Frognal, London NW3 6YD, reviewing any conflicts between the current proposals and material tree constraints identified in our survey. The proposals that form part of the pre-application have been developed by considering a number of factors including the root protection areas, the change in levels and the south facing garden.

1.2 Of the 36 surveyed trees on and around the site 3 are category 'A' (High Quality), 10 are 'B' category (Moderate Quality), 1 is a 'C/b' category tree (Low/moderate quality) and 22 are 'C' category (Low Quality) trees. The trees T16, T17, T18, T20, T32 & T33 have been removed under a 5-day notice / S211 CA notice. In theory, only moderate quality trees and above are significant material constraints on development. Such low quality trees would comprise a constraint in aggregate, in terms of at least, replacement planting.

1.3 The proposals have evolved to observe the material tree constraints on development. The principal primary impacts in the current proposals are low, and represent a significant scaling down of the initial conception. The most significant impact relates (only) to the (theoretical) RPA encroachment of category B plane tree T9, by both the proposed basement and ground floor elevation. Whilst the encroachment is theoretically medium, all of the excavation lies below the existing building and within areas of existing hardstandings. Whilst we cannot rule out the presence of secondary roots below the built footprint, we can be sceptical about the need to protect them within a notional RPA: the RPA need not be coextensive with the root system: the RPA, in whatever form, is defined (in BS5837: 2012 para. 3.7) as a 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. The preservation of roots below building foundations is, for obvious reason, not generally treated as a priority.

1.4 Furthermore, the trial pit evidence indicates that there would be not roots in the relevant areas, below the existing tarmac hardstanding, where basement excavation is proposed. The tree would require minor crown-lifting to facilitate development, but this is rated as a low impact, affecting the small diameter branch wood only. There is also a low theoretical impact to the category B tree T8, which also occurs under areas covered by the existing building/hard standings with trial pit evidence containing no roots.

1.5 Accordingly, precautionary mitigation requiring the manual excavation of the top 750mm of the proposed basement line within the RPA has been recommended, with pre-emptive pruning under arboricultural supervision if required.

1.6	Other primary impacts from the main proposal comprise the felling of the category C tree T42, which is rated as a low impact, and was agreed as acceptable in principle with the LB Camden. I met with LB Camden Tree Officer on 4th July 2014 to review the trial pit investigations by Arboraeration (presented here at Appendix 4), pending tree works applications and (without prejudice) the material constraints on future development. The removal of this tree will be mitigated with replacement planting.
1.7	The current proposal retains the existing drive. If it is to be resurfaced, then the current sub-base should be preserved for replacement hard surfaces. There are potential benefits to the RPAs through improved porosity, providing the existing tarmac surface is removed with care.
1.8	There will always be marginal secondary impacts of litter deposition and partial shade on this site, regardless of development. The status quo is unlikely to change with further development, which is the salient point for planning to consider. Thus, the secondary impacts of development are minimal.
1.9	The site has potential for development without impacting significantly on the wider tree population or local landscape. Thus, with suitable mitigation and supervision the scheme is recommended to planning.

* BSi: Trees in relation to design, demolition and construction BS 5837: 2012 HMSO, London

2. INTRODUCTION

2.1 Terms of reference

2.1.1 LANDMARK TREES were asked by KSR Architects to undertake an arboricultural planning survey of the site: 41 Frognal, London NW3 6YD. The report is to accompany a pre-application proposal.

2.1.2 The proposals are for the extension of the existing family house, including a basement. This report will assess the impact on the trees and their constraints, identified in our survey. Although the proposals were known at the time of the survey, Landmark Trees endeavour to survey each site blind, working from a topographical survey, wherever possible, with the constraints plan informing their evolution.

2.1.3 I am a Registered Consultant and Fellow of the Arboricultural Association and a Chartered Forester, with a Masters Degree in Arboriculture and 25 years experience of the landscape industry - including the Forestry Commission and Agricultural Development and Advisory Service. I am a UK Registered Expert Witness, trained in single joint expert witness duties. I am also Chairman of the UK & I Regional Plant Appraisal Committee, inaugurated to promote international standards of valuation in arboriculture.

2.2 Drawings supplied

2.2.1 The drawings supplied by the client and relied upon by Landmark Trees in the formulation of our survey plans are:

Existing site survey: 1674_Site

Proposals: 14044-Sheet - P002 - SITE PLAN LOWER GROUND

2.3 Scope of survey

2.3.1 As Landmark Trees' (LT) arboricultural consultant, James Bell surveyed the trees on site on 27th July 2012, recording relevant qualitative data in order to assess both their suitability for retention and their constraints upon the site, in accordance with British Standard 5837:2012 Trees in relation to design, demolition and construction – Recommendations [BS5837:2012]. I have since visited the site in November 2014.

2.3.2 Our survey of the trees, the soils and any other factors, is of a preliminary nature. The trees were SURVEYED on the basis of the Visual Tree Assessment method expounded by Mattheck and Breloer (The Body Language of Trees, DoE booklet Research for Amenity Trees No. 4, 1994). LT have not taken any samples for analysis and the trees were not climbed, but inspected from ground level.

2.3.3	A tree survey is generally considered invalid in planning terms after 2 years, but changes in tree condition may occur at any time, particularly after acute (e.g. storm events) or prolonged (e.g. drought) environmental stresses or injuries (e.g. root severance). Routine surveys at different times of the year and within two - three years of each other (subject to the incidence of the above stresses) are recommended for the health and safety management of trees remote from highways or busy access routes. Annual surveys are recommended for the latter.
2.3.4	The survey does not cover the arrangements that may be required in connection with the laying or removal of underground services.

2.4 Survey data & report layout

2.4.1	Detailed records of individual trees are given in the survey schedule in Appendix 1 to this report.
2.4.2	A site plan identifying the surveyed trees, based on the client's drawings / topographical survey is provided in Appendix 6.
2.4.3	This plan also serves as the Tree Constraints Plan with the theoretical Recommended Protection Areas (RPA's), tree canopies and shade constraints, (from BS5837: 2012) overlain onto it. These constraints are then overlain in turn onto the client's proposals to create an Arboricultural Impact Assessment Plan in Appendix 7. General observations and discussion follow, below.

3.0 OBSERVATIONS

3.1 Site description

Photograph 1: Views of 41 Frognal (Source: Pre-Application Document by KSR Architects)

3.1.1	The site is a two storey residential property of contemporary design set within very spacious grounds on the western flank of Frognal in Hampstead. The site is oriented on an approximate west/east axis and slopes from a high point on the western boundary down to the entrance onto Frognal with landscaped level lawns and a parking forecourt to west and east of the dwelling itself. The property is accessed via a single driveway that takes an attractive curved route up through the grove of trees standing in the frontage.
3.1.2	The existing topography slopes toward the road to the east and south with the highest point at the northwest corner.
3.1.3	In terms of the British Geological Survey, the site overlies the London Clay Formation (see indicated location on Fig.1 plan extract below). The associated soils are generally, highly shrinkable clay; e.g. slowly permeable seasonally waterlogged fine loam over clay. Such highly plastic soils are prone to movement: subsidence and heave. The actual distribution of the soil series are not as clearly defined on the ground as on plan and there may be anomalies in the actual composition of clay, silt and sand content.
3.1.4	Clay soils are prone to compaction during development with damage to soil structure potentially having a serious impact on tree health. The design of foundations near problematic tree species will also need to take into consideration subsidence risk. Further advice from the relevant experts on the specific soil properties can be sought as necessary.

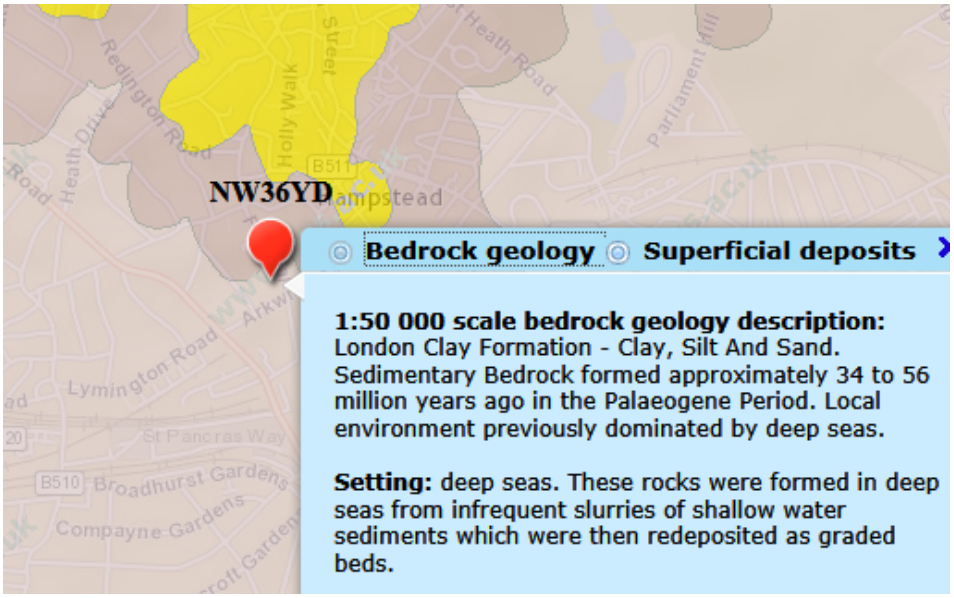


Figure 1: Extract from the BGS Geology of Britain Viewer

3.2 Subject trees

3.2.1	Of the 36 retained trees 3 are category 'A' (High Quality), 10 are 'B' category (Moderate Quality), 1 is a 'C/b' category tree (Low/moderate quality) and 22 are 'C' category (Low Quality) trees. The trees T16, T17, T18, T20, T32 & T33 were removed under a 5-day notice / S211 CA notice.
3.2.2	In terms of age demographics, there is a relatively even range of tree ages in the population from young to mature.

3.2.3	The surveyed trees stand principally around the periphery of the site: trees T1, T2, T2a & T10 stand beside Frognal on the frontage. Trees T3-9, T41 & T42 stand on the northern flank of the site and trees T13, T14 & T19-23 stand on the southern flank of the site. Trees 25 to 40 stand as a group on the western boundary of the site and T15 stands centrally in the front garden wooded area between the dwelling and Frognal. This is a site with a very attractive extent of tree cover. Several high quality specimens are present and there are also several trees present with major defects that dictate that they cannot reasonably be considered to be constraints to development. High quality ('A' category) trees with likely long (>40 years) useful life expectancies are a mature London plane (T1), a mature copper beech (T15) and a mature common beech (T26). Two old pollard mature London planes (T8 & T9) are very close to high quality specimens. Trees T5, T10, T14, T28, T35-38 & T41 are of moderate quality with useful life expectancies of twenty plus years.

3.2.4	The surveyed trees make a very significant amenity contribution to the Frognal frontage. Trees on the southern and northern flanks are imposing and provide screening to adjoining properties, to the north in particular. Trees on the western boundary provide an attractive wooded backdrop to the area of lawn to the rear of the dwelling and effectively block sightlines to the large properties to the west. Trees 41 and 42 similarly serve to screen the adjoining property to the north.
3.2.5	See Appendix 1 for detail of surveyed trees.

3.3 Planning Status

3.3.1	We are not aware of the existence of any Tree Preservation Orders, but understand the site stands within a Conservation Area (Redington Frognal), which will affect the subject trees: it is a criminal offence to prune, damage or fell such trees without permission from the local authority.
3.3.2	I met with LB Camden Tree Officer on 4th July 2014 to review the trial pit investigations by Arboraeration (presented here at Appendix 4), pending tree works applications and the material constraints on future development. The latter considerations were of course, at Mr Bell's discretion and discussed without prejudice. Mr Bell acknowledged that the trial pit evidence was as presented in the Arboraeration report and that there were hazardous trees on site that could not reasonably be left to recommended works within an eventual planning application. He also accepted in principle that light pruning / crown lifting of the plane tree(s) could be acceptable, subject to specification / compliance with bet practice. He did not regard T42 goat willow, a significant material constraint on development, but would wish to see T42 sycamore preserved.
3.3.3	The trees T18, T20, T32 & T33 were / are to be removed under a 5-day notice registered on 26/11/14, with T16 & T17 subject to S211 CA notice for removal also registered on 26/11/14.

4.0 DEVELOPMENT CONSTRAINTS

4.1 Primary constraints

4.1.1	BS5837: 2012 gives Recommended Protection Areas (RPA's) for any given tree size. The individual RPA's are calculated in the Tree Schedule in Appendix 1 to this report, or rather the notional radius of that RPA, based on a circular protection zone. The prescribed radius is 12-x stem diameter at 1.5m above ground level, except where composite formulae are used in the case of multi-stemmed trees.
4.1.2	Circular RPA's are appropriate for individual specimen trees grown freely, but where there is ground disturbance, the morphology of the RPA can be modified to an alternative polygon, as shown in the diagram below (Figure 2). Alternatively, one need principally remember that RPA's are area-based and not linear – notional rather than fixed entities. **No modifications have been made in this instance (please see overleaf), although 9 trial pits were undertaken to inform the design process (see Table 2 below and Appendix 4), and there appears to be little rooting below the tarmac drive.**

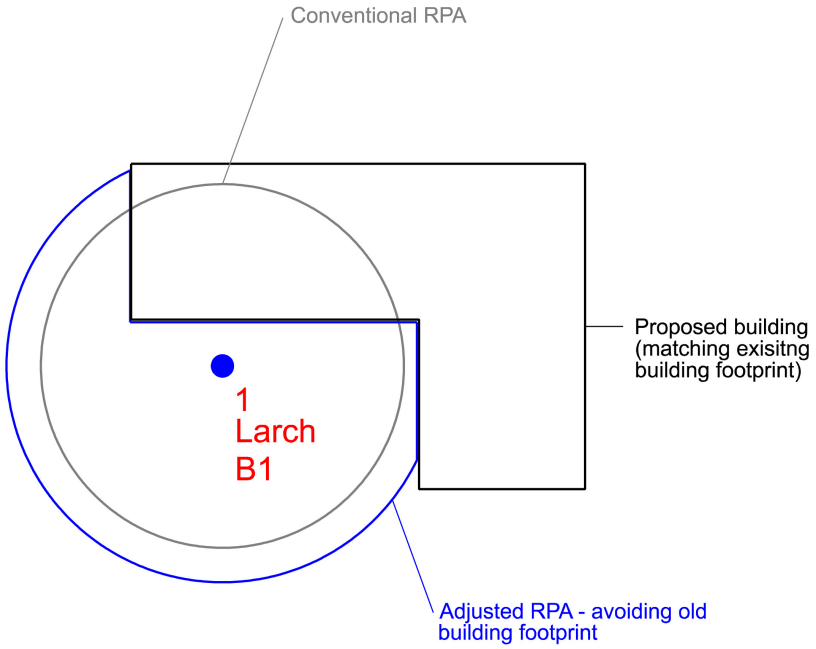
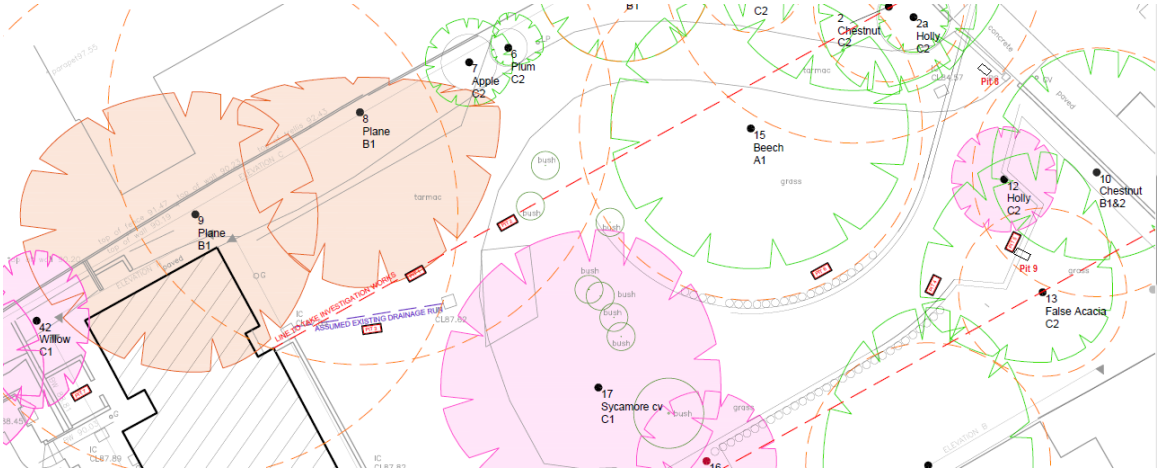


Figure 2 – Generic BS 5837 RPA Adjustments



Extract 1: Location of Trial Pits (Note: extract relates to previous, superseded proposals)

Table 2: Results From Trial Pits
(Source: Root Excavation Report by Arboraeration 01/07/14 & 02/07/2014)

Trial Pit 1	Within driveway in front of T8 100cm long, 40cm wide, 70cm deep No Roots found
Trial Pit 2	To the east of TP1, on the edge of the lawn 100cm long, 40cm wide 1 large 50mm root
Trial Pit 3	Within driveway behind drainage line 100cm long, 40cm wide, 70cm deep No Roots found
Trial Pit 4	In the lawn in front of T13 and T14 100cm Long, 40cm Wide 1 x 25mm root 1 x 20mm root Some <15mm roots
Trial Pit 5	In the lawn between T13 and T2 100cm long, 40cm wide 1 x 25mm root A number of 15-20mm roots
Trial Pit 6	In the lawn between T14 and T15 100cm long, 40cm wide, 70cm deep No Roots found
Trial Pit 7	In the rear of the property 100cm long, 40cm wide, 70cm deep No Roots found
Trial Pit 8	In the lawn, between T2, T10 and the road 100cm long, 40cm wide 1 x 50mm root
Trial Pit 9	In the lawn, 90° to TP5 100cm long, 40cm wide 1 x 25mm root 2 x 20mm roots

4.1.3 In BS5837, paragraph 4.6.2 states that RPA's should reflect the morphology and disposition of the roots; where pre-existing site conditions or other factors indicate that rooting has occurred asymmetrically, a polygon of equivalent area should be produced. Modifications to the shape of the RPA should reflect a soundly based arboricultural assessment of likely root distribution. Not infrequently, LT are requested by LPA Tree Officers to modify the RPA's to reflect their assumptions that e.g. a road will have drastically limited root growth.

4.1.4 LT favour the neutrality of a circular RPA, because in a difference of opinion, the tree officer will always have the prerogative to dictate the final modification of shape. With the best will in the world, the free allowance of modifications will tend to lead to inequitable outcomes, prejudicing the applicant and the practice is in our view, best avoided. The neutral circle dispenses with this inequity.

4.1.5 Ultimately, the point of the circular RPA is to illustrate areas of concern. The purpose of this report is to consider areas of concern (not to modify them to suit our argument or findings). Therefore, no modifications are made here to the RPA's, regardless of roads and trial pit results.

4.1.6 The quality of trees will also be a consideration: U Category trees are discounted from the planning process in view of their limited service life. Again, Category-C trees would not normally constrain development individually, unless they provide some external screening function.

4.1.7 At paragraph 5.1.1. BS5837: 2012 notes that "Care should be exercised over misplaced tree preservation; attempts to retain too many or unsuitable trees on a site are liable to result in excessive pressure on the trees during demolition or construction work, or post-completion demands on their removal."

4.1.10 In theory, only moderate quality trees and above are significant material constraints on development. However, the low quality trees will comprise a constraint in aggregate, in terms of at least, replacement planting.

4.1.11 In this instance, there are potentially significant primary constraints upon development, as 30% of the trees surveyed are category A and B. These trees are situated both internally and on the site boundaries, although many of the relevant RPA's currently contain built development or hard standings. The results from the trial pits can be used to clarify the impacts where development encroaches the circular RPAs.

4.2 Secondary Constraints

4.2.1 The second type of constraint produced by trees that are to be retained is that the proximity of the proposed development to the trees should not threaten their future with ever increasing demands for tree surgery or felling to remove nuisance shading (Figure 3), honeydew deposition or perceived risk of harm.

Figure 3 – Generic Shading Constraints

4.2.2 The shading constraints are crudely determined from BS5837 by drawing an arc from northwest to east of the stem base at a distance equal to the height of the tree, as shown in the diagram opposite. Shade is less of a constraint on non-residential developments, particularly where rooms are only ever temporarily occupied.

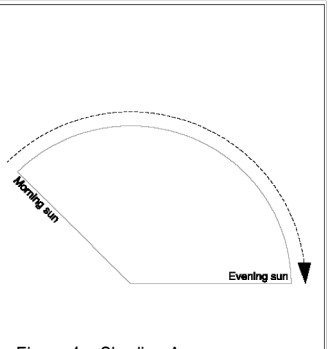


Figure 4 – Shading Arc

4.2.3 This arc (see Figure 4) represents the effects that a tree will have on layout through shade, based on shadow patterns of 1x tree height for a period May to Sept inclusive 10.00-18.00 hrs daily.

4.2.4 The removal of the decayed/dangerous trees on site has reduced the potential for shading constraints, with leaf deposition and honey-dew likely to be as it is today.

Note: Sections 5 & 6 will now assess the impacts upon constraints identified in Section 4. Table 1 in Section 5 presents the impacts in tabular form (drawing upon survey data presented in Appendices 1 & 2). Impacts are presented in terms of whole tree removal and the effect on the landscape or partial encroachment (% of RPA) and its effect on individual tree health. Section 6 discusses the table data, elaborating upon the impacts' significance and mitigation.

5.0 Table 1: Arboricultural Impact Assessment for Retained Trees

Hide irrelevant | Show All Trees

(Impacts assessed prior to mitigation and rated with reference to From Matheny & Clark (1998))

Ref: AKN/41F/AIA

B.S. Cat.	Tree No.	Species	Impact	Tree / RPA Affected	Age	Growth Vitality	Species Tolerance	Impact on Tree Rating	Impact on Site Rating	Mitigation
A	1	Plane, London	Drive resurfacing	m^2 N/A %	Mature	Normal	Good	Positive	N/A	No-dig construction using existing sub-base and porous replacement surfaces
C	2	Chestnut, Sweet	Drive resurfacing	m^2 N/A %	Early Mature	Normal	Moderate	Positive	N/A	No-dig construction using existing sub-base and porous replacement surfaces
B	5	Sycamore	Drive resurfacing	m^2 N/A %	Early Mature	Normal	Moderate	Positive	N/A	No-dig construction using existing sub-base and porous replacement surfaces
B	8	Plane, London	Basement construction within RPA Note: All existing house/hardstandings and and no roots in trial pits	46.5 m^2 7.14 %	Mature	Normal	Good	Low	N/A	Manual excavation of top 750mm of basement line
B	9	Plane, London	Basement Construction within RPA Building construction within RPA/Canopy	171 m^2 19.28 %	Mature	Normal	Good	Low	N/A	Remedial tree works & manual excavation of top 750mm of basement line Note: All existing house/hardstandings and and no roots in trial pits

5.0 Table 1: Arboricultural Impact Assessment for Retained Trees

Hide irrelevant | Show All Trees

(Impacts assessed prior to mitigation and rated with reference to From Matheny & Clark (1998))

Ref: AKN/41F/AIA

B.S. Cat.	Tree No.	Species	Impact	Tree / RPA Affected	Age	Growth Vitality	Species Tolerance	Impact on Tree Rating	Impact on Site Rating	Mitigation
A	15	Beech, Copper	Drive resurfacing	m^2 N/A %	Mature	Normal	Moderate/poor	Positive	N/A	No-dig construction using existing sub-base and porous replacement surfaces
C	42	Willow, Sallow	Felled to Facilitate Development	m^2 N/A %	Mature	Normal	N/A	N/A	Low	New planting / landscaping

6.0 DISCUSSION

6.1 Rating of Primary Impacts

6.1.1 The proposals have evolved to observe the material tree constraints on development. The principal primary impacts in the current proposals are low, and represent a significant scaling down of the initial conception. The most significant impact relates (only) to the (theoretical) RPA encroachment of category B plane tree T9, by both the proposed basement and ground floor elevation. Whilst the encroachment is theoretically medium, all of the excavation lies below the existing building and within areas of existing hardstandings. Whilst we cannot rule out the presence of secondary roots below the built footprint, we can be sceptical about the need to protect them within a notional RPA: the RPA need not be coextensive with the root system: the RPA, in whatever form, is defined (in BS5837: 2012 para. 3.7) as a 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. The preservation of roots below building foundations is, for obvious reason, not generally treated as a priority

6.1.2 Furthermore, the trial pit evidence indicates that there would be not roots in the relevant areas, below the existing tarmac hardstanding, where basement excavation is proposed. The tree would require minor crown-lifting to facilitate development, but this is rated as a low impact, affecting the small diameter branch wood only. There is also a low theoretical impact to the category B tree T8, which also occurs under areas covered by the existing building/hard standings with trial pit evidence containing no roots.

6.1.3 Accordingly, precautionary mitigation requiring the manual excavation of the top 750mm of the proposed basement line within the RPA has been recommended, with pre-emptive pruning under arboricultural supervision if required.

6.1.4 Other primary impacts from the main proposal comprise the felling of the category C tree T42, which was agreed in principle with LB Camden Tree Officer, Nick Bell, as a low impact. This removal would be mitigated with new planting and the impact is rated low.

6.1.5 The current proposal retains the existing drive. If it is to be resurfaced, then the current sub-base should be preserved for replacement hard surfaces. There are potential benefits to the RPAs through improved porosity, providing the existing tarmac surface is removed with care.

6.1.6 The principal of RPA encroachment is established within BS5837:2012 and supported by the source document, National Joint Utilities Guidelines 10 / Vol. 4 1995 / 2010. NJUG introduced the x12 diameter *Precautionary Zone* for supervised working and *Prohibited Zone* at a universal 1m from the base of the tree. RPA's are frequently confused with the NJUG Prohibited Zone, when they clearly correlate with the NJUG Precautionary Zone.

6.1.7 An RPA encroachment of <20% of RPA may be considered as low impact, given the permissive references to 20% RPA relocation and impermeable paving within BS5837:2012 and other published references to healthy trees tolerating up to 30-50% root severance (Coder, Helliwell and Watson in CEH 2006). The trees in question are healthy specimens of species with a good resistance to development impacts, and quite capable of tolerating these low impacts.

6.1.8 "**In practice 50% of roots can sometimes be removed with little problem**, provided there are vigorous roots elsewhere. Inevitably, this degree of root loss will temporarily slow canopy growth and even lead to some dieback" (Thomas 2000). LT do not recommend annexing such high proportions of the root system; rather that within the context of the published science, planning should not be unduly concerned by impacts that are well below the subcritical threshold – *tree health is not at stake.*

6.2 Rating of Secondary impacts

6.2.1 There will always be marginal secondary impacts of litter deposition and partial shade on this site, regardless of development. The status quo is unlikely to change with further development, which is the salient point for planning to consider. Thus, the secondary impacts of development are minimal.

6.3 Mitigation of Impacts

6.3.1 The path of foundations through RPAs will be manually excavated to 750mm depth under arboricultural supervision; any roots encountered within the trenches / pits will be cleanly pruned back to an appropriate junction with a sharp pruning saw or secateurs back to a junction. Roots larger than 25mm diameter may only be cut in consultation with an arboriculturalist.

6.3.2 Hard surfacing can be lifted with caution by a skilled machine operator working away from the trees.

6.3.3	The immediate canopy encroachment can be avoided with a crown lift of lower limbs, affecting a 5-6m ground clearance.
6.3.4	Nuisance deposition can be mitigated with the proposed green roof construction.
6.3.5	The landscape impact of tree losses can be offset by the landscape proposals, ideally involving new planting of ornamental varieties of native species, and where appropriate with columnar or compact form. A selection of columnar tree species cultivars for constricted sites is provided in Appendix 5.

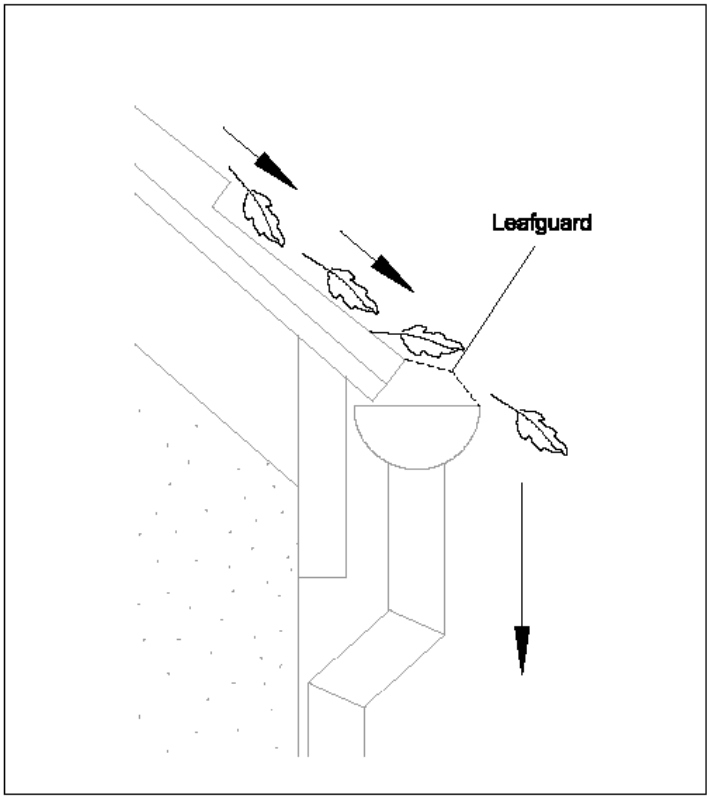


Figure 5: Filtration traps, as shown above, could be fitted on the gutters which can easily be maintained at 2-3m above ground.

6.3.8	The potential root damage from the construction impacts (drive and piling excavation) can be partly mitigated by soil treatment and light pruning (crown cleaning). The former involves soil fertiliser injection / root inoculation and decompaction: a suitable low nitrate, low phosphorous fertilizer and mycorrhizal spores are introduced to the soil profile through compressed air injection (see Figure 6). The spores are mixed with a stimulant, which helps them colonise the roots. A combination of these treatments can relieve the immediate effects of construction damage / disturbance and compaction, though long term environmental deficiencies should be addressed culturally. The case for short-term mitigation through fertiliser application and light pruning is more proven (CEH 2006) than that of the other treatments, which remain anecdotal. Soil injection is not necessarily more effective at delivering fertilizer than broadcast application, but becomes cost-effective where already recommended for decompaction treatments.

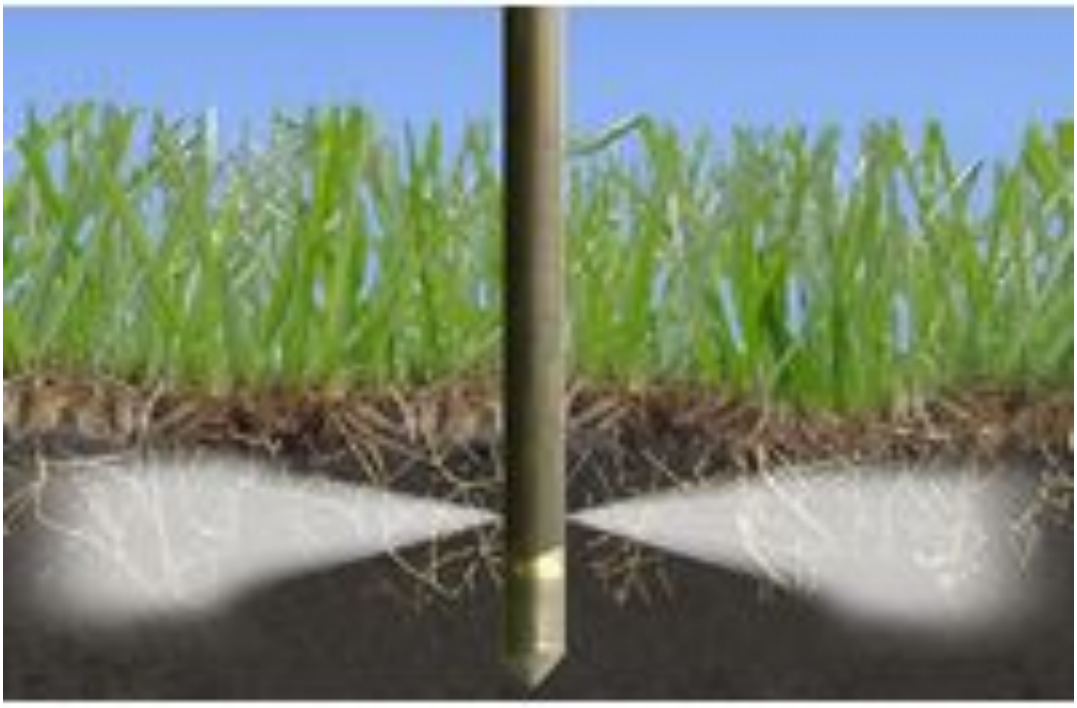


Figure 6: Soil fertiliser Injection

7.0 CONCLUSION

7.1	The iterative design and trial pits have ensured that potential impacts of development are all relatively low in terms of both quality of trees removed and also RPA encroachments of trees retained.
7.2	The full potential of the impacts can be largely mitigated through design and precautionary measures. These measures can be elaborated in Method Statements in the discharge of planning conditions.
7.3	The species affected are generally tolerant of root disturbance / crown reduction and the retained trees are generally in good health and capable of sustaining these reduced impacts.
7.4	The tree that is recommended for felling is of little individual significance, such that its loss will not affect the visual character of the area.
7.5	Therefore, the proposals will not have any significant impact on either the retained trees or wider landscape.

8.0 RECOMMENDATIONS

8.1 Specific Recommendations

8.1.1 Tree works recommendations are found in Appendix 2 to this report, with a selection of columnar tree species cultivars for constricted sites provided in Appendix 5. Any tree removals recommended within this report should only be carried out with local authority consent.

8.1.2 Excavation and construction impacts within the RPA's of trees identified in Table 1 above, will need to be controlled by method statements specifying mitigation methods suggested in para 6.3 above and by consultant supervision as necessary. These method statements can be provided as part of the discharge of conditions.

8.1.3 Replace felled tree with native nursery stock under current best practice; i.e. conforming to and planted in accordance with the following:

- BS 3936:1980 Nursery Stock;
- BS 4043:1966 Transplanting Semi-Mature Trees; and
- BS 5236:1975 Cultivation and Planting of Trees in the Advanced Nursery Stock Category.
- All replacement stock should be planted and maintained as detailed in BS 4428:1989 (Section 7): Recommendations for General Landscape Operations.

8.2 General Recommendations

8.2.1 Any trees which are in close proximity to the proposed development should be protected with a Tree Protection Barrier (TPB). Protective barrier fencing should be installed immediately following the completion of the tree works, remaining in situ for the entire duration of the development unless otherwise agreed in writing by the council. It should be appropriate for the intensity and proximity of the development, usually comprising steel, mesh panels 2.4m in height ('Heras') and should be mounted on a scaffolding frame (shown in Fig 2 of BS5837:2012). The position of the TPB can be shown on plan as part of the discharge of conditions, once the lay out is agreed with the planning authority. The TPB should be erected prior to commencement of works, remain in its original form on-site for the duration of works and removed only upon full completion of works.

8.2.2 A TPB may no longer be required during soft landscaping work but a full arboricultural assessment must be performed prior to the undertaking of any excavations within the RPA of a tree. This will inform a decision about the requirement of protection measures. It is important that all TPBs have permanent, weatherproof notices denying access to the RPA.

8.2.3 The necessary machinery should be located above the existing grade level and work away from any retained trees. This will ensure that any spoil is removed from the RPAs. It is vital that the original soil level is not lowered as this is likely to cause damage to the shallow root systems.

8.2.4 Any pruning works must be in accordance with British Standard 3998:2010 Tree work [BS3998].

8.2.5 Where sections of hard surfacing are proposed in close proximity to trees, it is recommended that "No-Dig" surfacing be employed in accordance with BS5837:2012 and 'The Principles of Arboricultural Practice: Note 1, Driveways Close to Trees, AAIS 1996 [APN1]'.

8.2.6 If the RPA of a tree is encroached by underground service routes then BS5837:2012 and NJUG VOLUME 4 provisions should be employed. If it is deemed necessary, further arboricultural advice must be sought.

8.2.7 Numerous site activities are potentially damaging to trees e.g. parking, material storage, the use of plant machinery and all other sources of soil compaction. In operating plant, particular care is required to ensure that the operational arcs of excavation and lifting machinery, including their loads, do not physically damage trees when in use.

8.2.8 To enable the successful integration of the proposal with the retained trees, the following points will need to be taken into account:

1) Plan of underground services.
2) Schedule of tree protection measures, including the management of harmful substances.
3) Method statements for constructional variations regarding tree proximity (e.g. foundations, surfacing and scaffolding).
4) Site logistics plan to include storage, plant parking/stationing and materials handling.
5) Tree works: felling, required pruning and new planting. All works must be carried out by a competent arborist in accordance with BS3998.
6) Site supervision: the Site Agent must be nominated to be responsible for all arboricultural matters on site. This person must:
   - be present on site for the majority of the time;
   - be aware of the arboricultural responsibilities;
   - have the authority to stop work that is causing, or may cause harm to any tree;
   - ensure all site operatives are aware of their responsibilities to the trees on site and the consequences of a failure to observe these responsibilities;

- make immediate contact with the local authority and/or a retained arboriculturalist in the event of any tree related problems occurring.

8.2.9 These points can be resolved and approved through consultation with the planning authority via their Arboricultural Officer.

8.2.10 The sequence of works should be as follows:

i) initial tree works: felling, stump grinding and pruning for working clearances;

ii) installation of TPB for demolition & construction;

iii) installation of underground services;

iv) installation of ground protection;

v) main construction;

vi) removal of TPB;

vii) soft landscaping;

9.0 REFERENCES

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APPENDIX 1

TREE SCHEDULE

Notes for Guidance:

1. Height describes the approximate height of the tree measured in metres from ground level.
2. The Crown Spread refers to the crown radius in meters from the stem centre and is expressed as an average of NSEW aspect if symmetrical.
3. Ground Clearance is the height in metres of crown clearance above adjacent ground level.
4. Stem Diameter (Dm) is the diameter of the stem measured in millimetres at 1.5m from ground level for single stemmed trees. BS 5837:2012 formula (Section 4.6) used to calculate diameter of multi-stemmed trees. Stem Diameter may be estimated where access is restricted and denoted by '#'.
5. Protection Multiplier is 12 and is the number used to calculate the tree's protection radius and area
6. Protection Radius is a radial distance measured from the trunk centre.
7. Growth Vitality - Normal growth, Moderate (below normal), Poor (sparse/weak), Dead (dead or dying tree).
8. Structural Condition - Good (no or only minor defects), Fair (remediable defects), Poor - Major defects present.
9. Landscape Contribution - High (prominent landscape feature), Medium (visible in landscape), Low (secluded/among other trees).
10. B.S. Cat refers to (British Standard 5837:2012 section 4.5) and refers to tree/group quality and value; 'A' – High, 'B' - Moderate, 'C' - Low, 'U' - Unsuitable for retention. The following colouring has been used on the site plans:
    - High Quality (A) (Green),
    - Moderate Quality (B) (Blue),
    - Low Quality (C) (Grey),
    - Unsuitable for Retention (U) (Red)
11. Sub Cat refers to the retention criteria values where 1 is Arboricultural, 2 is Landscape and 3 is Cultural including Conservational, Historic and Commemorative.
12. Useful Life is the tree's estimated remaining contribution in years.