Landmark Trees

ARBORICULTURAL IMPACT ASSESSMENT REPORT:

Brabourne House
63 Frognal
Hampstead
London
NW3 6YA

REPORT PREPARED FOR:

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REPORT PREPARED BY

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Ref: GPA/63F/AIA/01b

Date: 21st January 2013

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 an inspection they will of course appear in the report.

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 tree inspection 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:	Gregory Phillips Architects	**Case Ref:**	GPA/63F/AIA/01b
Local Authority:	LB Camden	**Date:**	21st January 2013
Site Address: Brabourne House, 63 Frognal, Hampstead, London NW3 6YA			
Proposal: Demolition of existing extensions and garage, with the construction of a new basement and contemporary extension onto the main dwelling house.			

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

Site Layout				
Site Visit	Y	Date: 22/11/12	Access Full/Partial/None	F
Trees on Site		Y	Off-site Trees	Y
Trees affected by development		N	O/s trees affected by development	Y
Tree replacement proposed:		N/a	On or off-site trees indirectly affected by development	Y

Trees with the potential to be affected

All off-site trees: T5 (landscaping only), T8 (13.8% low/medium impact of basement), T12 (low impact of basement and trial pits for further investigation of root distribution where levels to be changed) & T14 (low impact from driveway resurfacing).

Landscaping to rear boundary: T2, 2a,3 & 4; level variation between neighbouring land and site; future mitigation possible; off-site low quality trees with good tolerance to disturbance. Similar scheme permitted (ref:2006/5828/P)

Comments

No arboricultural works recommended for existing tree population

Recommendations

1	Proposal will mean the loss of important trees (TPO/CA)	N
2	Proposal has sufficient amelioration for tree loss	N/a
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	N

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 Brabourne House, 63 Frognal, Hampstead, London NW3 6YA, reviewing any conflicts between the proposals and material tree constraints identified in our survey.

1.2 Of the 15 surveyed trees T12 is a 'B' category (Moderate Quality) tree, with the remaining 14 comprising 'C' category (Low Quality) trees. 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.

1.3 The principal primary impacts of the current proposals all affect off-site trees; the proposed basement will have a gross 5.8% impact on the theoretical RPA of the category 'B' tree T12, in addition to a 13.8% low/medium impact on the RPA of the category 'C' T8. Around 2.5% of the RPA of T12 will also be affected by the level reduction (1150mm); however it is likely that the net rooting distribution is minimal due to the presence of the existing building, if not the hard landscaping/level changes. Net of the existing building, the impacts to T's8 & 12 would be 0% and 2.5% RPA, respectively. These impacts are rated *de minimus*.

1.4 Further potential impacts to off-site trees (all C category) occur from the proposed excavation of the garden and driveway. The garden excavation to resolve level differences will result in RPA encroachment of T2, 2a, 3 and 4. It is important to note that a previous planning application was made on the site to carry out similar works and was granted planning permission under planning ref:2006/5828/P, therefore suggesting that mitigation of potential impacts is possible. The proposed driveway excavation could have a gross 34% (medium impact) on the theoretical RPA of T14 plum; but since it essentially resurfaces the existing slab driveway, should have no negative impact, if the soil beneath the section is left undisturbed and protected. Indeed, the installation of a new porous surface should have a positive impact on the tree's health.

1.5 Secondary impacts from the new terrace from T5 & T7 comprise minor shading and organic deposition. However, they are both low growing and low quality trees, that are typically pruned / clipped within routine garden maintenance and the impact is therefore, negligible.

1.6 Thus, with suitable mitigation and supervision the scheme is viable.

* British Standards Institute: 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 Gregory Philips Architects to provide a survey and an arboricultural impact assessment of proposals for the site: Brabourne House, 63 Frognal, Hampstead NW3 6YA. The report is to accompany a planning application.

2.1.2 The proposals are for the demolition of existing extensions and garage, with the construction of a new basement and contemporary extension onto the existing dwelling. 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: 17618_01-04_PES_Rev0

Proposals: 63 FROGNAL – SECTION, 000 GA Proposed Basement & 000 GA Proposed Ground Floor Plan

2.3 Scope of survey

2.3.1	As Landmark Trees' (LT) arboricultural consultant, James Bell surveyed the trees on site on 22nd November 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].
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	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 2.
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 3. General observations and discussion follow, below.

3.0 OBSERVATIONS

3.1 Site description

Photograph 1: View of existing house looking westwards from Church Row (Source: Google Maps)

3.1.1 The site is a spacious, brick built, detached double fronted house over three floors with 7 bedrooms and a detached (gated) double garage to the south with off road parking for four cars. Number 63 stands opposite the entrance to Church Row on the western flank of Frognal, some meters back from the main road and elevated above the road surface. The frontage is largely laid down to grass, whilst the rear garden is secluded and landscaped with a mixture of paved patio areas near the house and larger grassed areas with peripheral flower beds. The building footprint and its immediate surrounds are level, however properties to the west and north are markedly more elevated; these level changes are effected on the northern and western boundaries of Number 63. There is a particularly marked level change on the boundary of 63 with the property to the north; the garage to the south is also markedly lower than the main building level.

3.1.2 In terms of the British Geological Survey, the site overlies the Claygate Member / Beds (see dark area on Figure 1 plan extract overleaf). As the youngest part of the London Clay, they form a transition between the clay and the sandier Bagshot Beds above (shown in yellow). Unlike the Bagshot Beds, more typical of Hampstead Heath, 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.

3.1.4	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. 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.

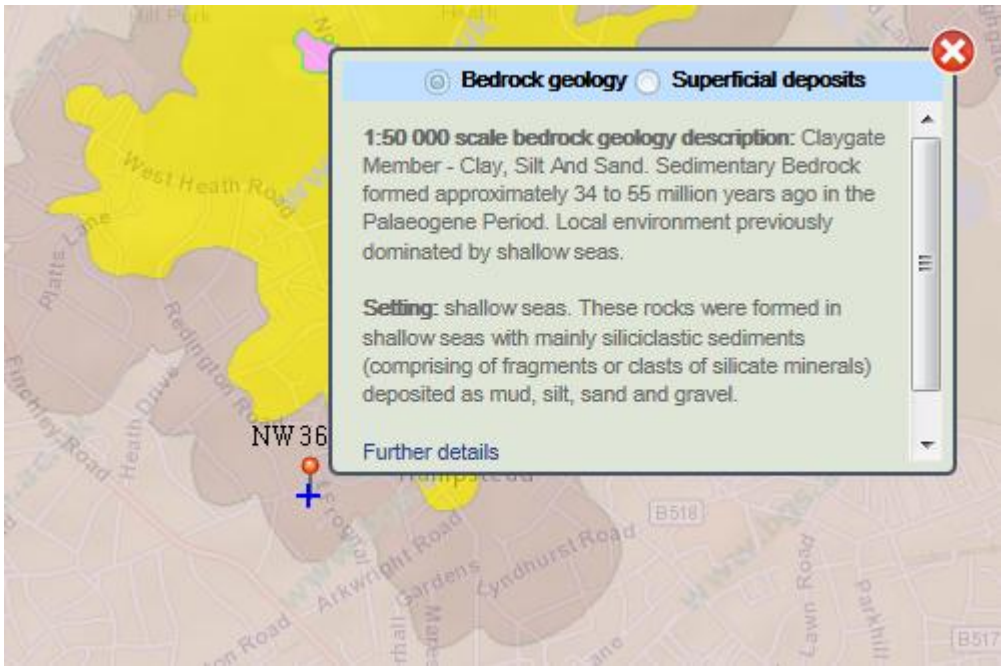

Figure 1: Extract from the BGS Geology of Britain Viewer

3.2 Subject trees

3.2.1	Of the 15 surveyed trees T12 is a 'B' category (Moderate Quality) tree, with the remaining 14 comprising 'C' category (Low Quality) trees.
3.2.2	In terms of age demographics there is a preponderance of mature trees on the site with few younger, replacement trees in the population.

3.2.3	The surveyed trees stand peripherally and are generally offsite being within the gardens of properties to the north (trees 8 to 11), to the south (trees 5 to 7 & 14) and to the west (trees 2, 2a, 3 & 4). Trees 12 & 13 stand in the pavement on the frontage and thus only small shrubs stand within the rear garden and only one larger shrub (T1) has been surveyed. The surveyed trees are all of low quality individually excepting tree 12, but do serve to define the boundary and on the southern flank contribute an element of screening.

3.2.4	Tree 12 is an approximately 20m tall mature, moderate quality old pollard lime that has an estimated crown spread of 4m and a stem diameter at 1.5m of 66cm. The tree appears to have no obvious major defects and has been routinely pruned back to well established knuckles. Given its location the tree is presumed to be London Borough of Camden managed and has a useful life expectancy of twenty plus years.
3.2.4	The surveyed trees provide a measure of amenity to the northern, western and southern flanks of the site. The principal arboricultural feature of the site is the mature lime (T12) standing on the frontage. This tree has an undeniable presence on the frontage but the form is arguably of limited aesthetic value, given the heavy pruning that it has experienced. Limes such as this tree frequently appear to be distinctly unattractive when out of leaf but this is a subjective opinion and the tree is equally likely to be valued by local residents and the London Borough of Camden. It is also the case that the amenity value of the tree will be markedly improved when in leaf. On balance the tree can be considered to make a significant amenity contribution to the vicinity.
3.2.5	There are no recommended works to trees under the owner's control.
3.2.6	Further details are contained in Appendix 1 of this report.

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 the Hampstead Conservation Area, which will affect the subject trees: it is a criminal offence to prune, damage or fell such trees without permission from the local authority.

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).**

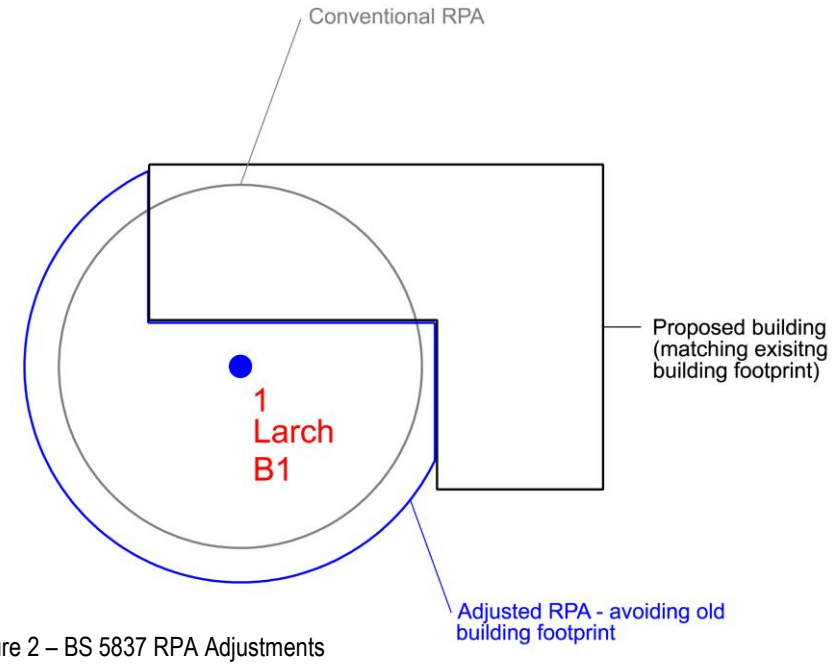

Figure 2 – BS 5837 RPA Adjustments

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 Such assumptions cannot be proved without prior site investigations / trial pits. Where it is not always possible to conduct site investigations (e.g. below busy roads), we can always look to the published science. There seems little support for the popular myth that roads and services will curb root growth: research for the International Society of Arboriculture by Kopinga J (ISA 1994), found that "a constant high moisture content of the soil directly underneath the pavement surface can be considered as a major soil factor in attracting the trees' roots to develop there." By contrast, grass in lawns may actively antagonise tree roots with natural pathogens. Similarly, Professor F Miller (ISA 1994) found that service trenches at > 3m distances from trees had minimal impact on growth or crown shape.

4.1.5 A key misunderstanding, even among professionals, is that we conflate the RPA with the actual root system: RPA's are *prima facie* a notion / convention / treaty and almost entirely theoretical, but readily calculable. Conversely roots are a "known unknown," spatial entity that we predict at our folly. Yet, many are quick to do so.

4.1.6 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.

4.1.7 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 etc.

4.1.8 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. As discrete, internal trees, their removal will not affect the wooded envelope that encloses much of the site.

4.1.9 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 is only one internal site tree/shrub and therefore few significant primary constraints within the site itself upon development. However, the theoretical RPA's and canopies of the off-site trees do encroach the site, with potential constraints provided in particular by the category 'B' T12. In terms of development that occurs within the footprint of the existing house, the off-site category 'C' trees T8 and T10 may also provide some more limited constraints.

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.

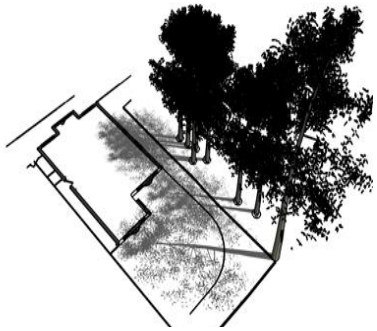

Figure 3 – Shading Constraints

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.

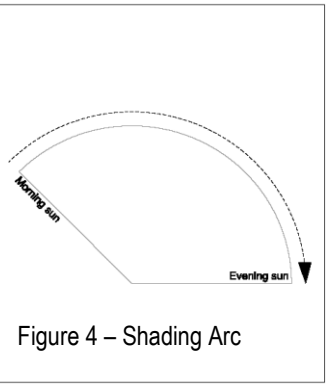

Figure 4 – Shading Arc

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 off-site trees have the potential to provide a variety of secondary constraints, including shading, organic deposition and the potential need to maintain crown clearance in the future. The significance of these constraints will vary depending on the location and proximity to the proposed re-development.

5.0 Table 1: Arboricultural Impact Assessment

Hide irrelevant | Show All Trees

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

Ref: GPA/63F/AIA/01b

B.S. Cat.	Tree No.	Species	Impact	Tree / RPA Affected	Age	Growth Vitality	Species Tolerance	Impact on Tree Rating	Impact on Site Rating	Mitigation
C	8	Holly	Basement: 2.5m2 (all existing building)	2.5 m^2 13.81 %	Early Mature	Normal	Good	Low/ Med	N/A	Manual excavation with pre-emptive root pruning of roots >25mm
B	12	Lime, Common	Basement: 11.5m2 of which 7m2 is existing building Approx. 1150mm level reduction - 5m2 (2.5%)	11.5 m^2 5.84 %	Mature	Normal	Moderate/good	Low	N/A	Manual excavation with pre-emptive root pruning of roots >25mm
C	14	Plum,Cerasifera	Existing Driveway to be resurfaced -	14.9 m^2 34.27 %	Mature	Normal	Moderate	Low	N/A	Ground protection Porous surfacing

6.0 DISCUSSION

6.1 Rating of Primary Impacts

6.1.1 The principal primary impacts of the current proposals all affect off-site trees; the proposed basement will have a gross 5.8% impact on the theoretical RPA of the category 'B' tree T12, in addition to a 13.8% low/medium impact on the RPA of the category 'C' T8. Around 2.5% of the RPA of T12 will also be affected by the level reduction (1150mm); however it is likely that the net rooting distribution is minimal due to the presence of the existing building, if not the hard landscaping/level changes. Net of the existing building, the impacts to T's8 & 12 would be 0% and 2.5% RPA, respectively. These impacts are rated *de minimus*.

6.1.2 Further potential impacts to off-site trees (all C category) occur from the proposed excavation of the garden and driveway. The garden excavation to resolve level differences will result in RPA encroachment of T2, 2a, 3 and 4. However, it is important to note that a previous planning application was made on the site to carry out similar works and was granted planning permission under planning ref:2006/5828/P, therefore suggesting that mitigation of potential impacts is possible. The proposed driveway excavation could have a gross 34% (medium impact) on the theoretical RPA of T14 plum; but since it essentially resurfaces the existing slab driveway, should have no negative impact, if the soil beneath the section is left undisturbed and protected. Indeed, the installation of a new porous surface should have a positive impact on the tree's health.

6.1.3 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.

6.1.4 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.

6.1.5 "**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 Secondary impacts comprise minor shading impacts and organic deposition from T6 & T7 across the new terrace. However, they are both low growing and low quality trees, that are typically pruned / clipped within routine garden maintenance and the impact is therefore, negligible.

6.3 Mitigation of Impacts

6.3.1 All plant and vehicles engaged in demolition/excavation works should either operate outside the RPAs, or should run on a temporary surface designed to protect the underlying soil structure. Hard surfacing can be lifted with caution by a skilled machine operator again working away from the tree.

6.3.2 RPA piling encroachments will be pre-emptively excavated by hand or with an Airspade under arboricultural supervision. Roots smaller then 25mm diameter may be cut cleanly with a sharp pruning saw or secateurs back to a junction. Roots larger then 25mm diameter may only be cut in consultation with an arboriculturalist.

6.3.3 The driveway replacement will require that the sub-base be retained and / or the soil beneath be left protected. A porous section, using a cellular confinement system with no fines aggregate for the sub-base might be considered: The potential degree of encroachment (>20% of RPA, subject to investigations) means that at least a permeable paving surface (e.g. gravel or block paving) is required. A full 'Cellweb' finished section, if employed, would be c. 150mm above grade, depending on final specification, which would need to be factored into the overall finished site levels. The cellular confinement system with a temporary hard surface (e.g. road stone) can be used for site access during construction and the surface material replaced on completion of construction.

7.0 CONCLUSION

7.1 The potential impacts of the proposed basement, terrace building and the demolition of part of the existing dwelling built are all relatively low in terms of the RPA encroachments of the off-site trees.

7.2 The impacts to T12 from the reduction in levels and excavation works will need pre-emptive manual excavation. The mitigation of the impacts of the proposed level changes in the rear garden have not yet been identified, although the previous consent for a similar scheme suggests that an excavation scheme in this area can be implemented.

7.3 Overall, 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.

7.4 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.

7.5 Therefore, the built development proposals will not have any significant impact on either the retained trees or wider landscape. Further investigation of the impact of the excavation works is required.

8.0 RECOMMENDATIONS

8.1 Specific Recommendations

8.1.1	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.

8.2 General Recommendations

8.2.1	Any trees not protected by existing boundary fencing, which are in close proximity to structures proposed for demolition, should be protected with a Tree Protection Barrier (TPB). This TPB should comprise 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 use of heavy plant machinery for building demolition, removal of imported materials and grading of surfaces should take place in one operation. 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;

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APPENDIX 1

TREE SCHEDULE - Notes for Guidance

Dm -	is the diameter of the trunk in millimetres at 1.5m above ground level.
Spread -	is in metres at the points of the compass relevant to the woodland boundary
Class/Colour -	refers to the retention classifications in Section 4.5 BS5837: 2012 and colouring on the site map: ● High Quality (A) (Green), ● Moderate Quality (B) (Blue), ● Low Quality (C) (Grey), ● Unsuitable for Retention (U) (Red)

Landmark Trees Ltd
Tel: 0207 851 4544

BS5837 Tree Constraints Survey Schedule

Site: Brabourne House, 63 Frognal, Hampstead, London NW3 6YA

Surveyor(s): James Bell

Date: 22nd November 2012

Ref: GPA/63F/AIA/01b

Tree No.	English Name	Height	Crown Spread	Ground Clearance	Age Class	Stem Diameter	Protection Multiplier	Protection Radius	Growth Vitality	Structural Condition	Landscape Contribution	B.S. Cat	Sub Cat	Useful Life	Observations
1	Unknown ornamental	5	1.5	1	Mature	146	12	1.8	Normal	Good	Low	C	1	20-40	Garden ornamental Irrelevant ; SD 90 x 2 & 50 x 2
2	Cypress, Lawson	13	2	1.7	Semi-mature	250e	12	3.0	Normal	Good	Medium	C	1	20-40	Offsite;1m from boundary;base estimated 40-50cm higher than garden level inside fence
2a	Cypress, Lawson	9	1.5	1.7	Young	130e	12	1.6	Normal	Good	Medium	C	1	20-40	Offsite;1m from boundary;base estimated 40-50cm higher than garden level inside fence
3	Philadelphus spp	8	3/5/2.5/3	2	Mature	155	12	1.9	Normal	Good	Low	C	1	10-20	Shrub Multiple stem >15 av SD=40;offsite
4	Holly	9	2252	1.5	Early Mature	240	12	2.9	Normal	Good	Low	C	1	20-40	Multi stem - 6 SD= 140,140,130 & 60 x 3; growing 2m from boundary
5	Cherry, Wild (Gean)	10	4	2.5	Early Mature	250e	12	3.0	Normal	Good	Medium	C	1	20-40	Offsite; estimated 30-50 from boundary
6	Bay	6	1322	1.5	Early Mature	139	12	1.7	Normal	Good	Low	C	1	10-20	Multi stem -4 SD=30,60,70 & 100; offsite 40cm e from boundary

Notes:

1. Height describes the approximate height of the tree measured in meters 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 meters of crown clearance above adjacent ground level.
4. Stem Diameter is the diameter of the stem measured in millimeters at 1.5m from ground level for single stemmed trees. See section 4.6 for detail of treatment for multistems.
5. Protection Radius is a radial distance measured from the trunk centre.
6. Growth Vitality - Normal growth, Moderate (below normal), Poor (sparse/weak), Dead (dead or dying tree).
7. Structural Condition - Good (no or only minor defects), Fair (remediable defects), Poor - Major defects present.
8. Landscape Contribution - High (prominent landscape feature), Medium (visible in landscape), Low (secluded/among other trees).

9. B.S. Cat refers to (British Standard 5837:2012 Table 1) and refers to tree/group quality and value; 'A' - High, 'B' - Moderate, 'C' - Low, 'U' - Unsuitable for Retention.

11. Sub Cat refers to the retention criteria values where 1 is mainly arboricultural qualities, 2 ismainly landscape qualities and 3 is mainly cultural values including conservation.

12. Useful Life is the tree's estimated remaining contribution in years.

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BS5837 Tree Constraints Survey Schedule

Site: Brabourne House, 63 Frognal, Hampstead, London NW3 6YA

Surveyor(s): James Bell

Date: 22nd November 2012

Ref: GPA/63F/AIA/01b

Tree No.	English Name	Height	Crown Spread	Ground Clearance	Age Class	Stem Diameter	Protection Multiplier	Protection Radius	Growth Vitality	Structural Condition	Landscape Contribution	B.S. Cat	Sub Cat	Useful Life	Observations
7	Cherry, Wild (Gean)	10	4	3	Semi-mature	150e	12	1.8	Normal	Good	Low	C	1	20-40	1.7m estimate from boundary
8	Holly	8	2.5/1.5/ 1.5/1.5	7	Early Mature	200e	12	2.4	Normal	Good	Low	C	1	10-20	Offsite;cut back to boundary ;est 2m level change up to N
9	Holly, variegated	7	2	1.5	Early Mature	200e	12	2.4	Normal	Good	Low	C	1	20-40	Offsite;remote survey;no sight of base;est 2-2.5m from boundary
10	False Acacia	14	4544	4	Early Mature	208	12	2.5	Normal	Fair?	Low	C	1	20-40	Twin stem SD=170 & 120 e; Offsite;remote survey;no view of base; 30cm estimate from boundary
11	Holly	7	3222	2	Early Mature	170	12	2.0	Normal	Fair	Low	C	1	10-20	Twin stem Offsite; no view of base;remote survey;est 1.5m from boundary l SD-120x2
12	Lime, Common	20	4	4.5	Mature	660	12	7.9	Normal	Good	Medium	B	1	20-40	Pollard (Old) Routinely pruned back to well established knuckles; forks at 4.5m
13	Lime, Common	4.5	2	2	Young	90	12	1.1	Normal	Good	Low	C	1	20-40	Street tree; lost leader

Notes:

1. Height describes the approximate height of the tree measured in meters 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 meters of crown clearance above adjacent ground level.
4. Stem Diameter is the diameter of the stem measured in millimeters at 1.5m from ground level for single stemmed trees. See section 4.6 for detail of treatment for multistems.
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6. Growth Vitality - Normal growth, Moderate (below normal), Poor (sparse/weak), Dead (dead or dying tree).
7. Structural Condition - Good (no or only minor defects), Fair (remediable defects), Poor - Major defects present.
8. Landscape Contribution - High (prominent landscape feature), Medium (visible in landscape), Low (secluded/among other trees).
9. B.S. Cat refers to (British Standard 5837:2012 Table 1) and refers to tree/group quality and value; 'A' - High, 'B' - Moderate, 'C' - Low, 'U' - Unsuitable for Retention.
11. Sub Cat refers to the retention criteria values where 1 is mainly arboricultural qualities, 2 ismainly landscape qualities and 3 is mainly cultural values including conservation.
12. Useful Life is the tree's estimated remaining contribution in years.

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Tel: 0207 851 4544

BS5837 Tree Constraints Survey Schedule

Site: Brabourne House, 63 Frognal, Hampstead, London NW3 6YA

Surveyor(s): James Bell

Date: 22nd November 2012

Ref: GPA/63F/AIA/01b

Tree No.	English Name	Height	Crown Spread	Ground Clearance	Age Class	Stem Diameter	Protection Multiplier	Protection Radius	Growth Vitality	Structural Condition	Landscape Contribution	B.S. Cat	Sub Cat	Useful Life	Observations
14	Plum,Cerasifera	8	2344	2	Mature	310	12	3.7	Normal	Fair	Low	C	1	20-40	Multi stem - 15e Offsite; SD=80 av

Notes:

1. Height describes the approximate height of the tree measured in meters 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 meters of crown clearance above adjacent ground level.
4. Stem Diameter is the diameter of the stem measured in millimeters at 1.5m from ground level for single stemmed trees. See section 4.6 for detail of treatment for multistems.
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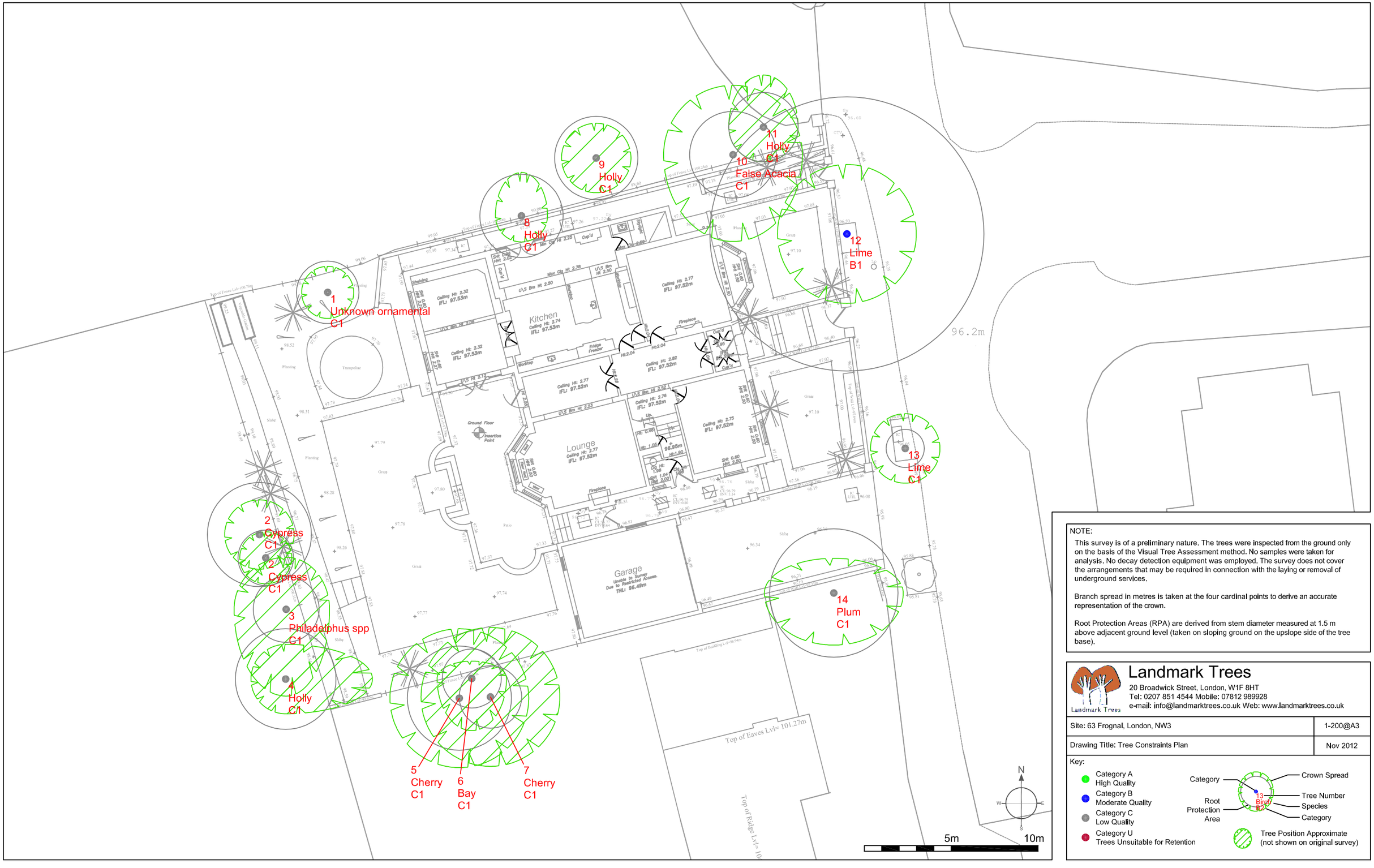
11. Sub Cat refers to the retention criteria values where 1 is mainly arboricultural qualities, 2 ismainly landscape qualities and 3 is mainly cultural values including conservation.

12. Useful Life is the tree's estimated remaining contribution in years.

APPENDIX 2

TREE CONSTRAINTS PLAN



NOTE:

This survey is of a preliminary nature. The trees were inspected from the ground only on the basis of the Visual Tree Assessment method. No samples were taken for analysis. No decay detection equipment was employed. The survey does not cover the arrangements that may be required in connection with the laying or removal of underground services.

Branch spread in metres is taken at the four cardinal points to derive an accurate representation of the crown.

Root Protection Areas (RPA) are derived from stem diameter measured at 1.5 m above adjacent ground level (taken on sloping ground on the upslope side of the tree base).

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Site: 63 Frognal, London, NW3	1-200@A3
Drawing Title: Tree Constraints Plan	Nov 2012

Key:

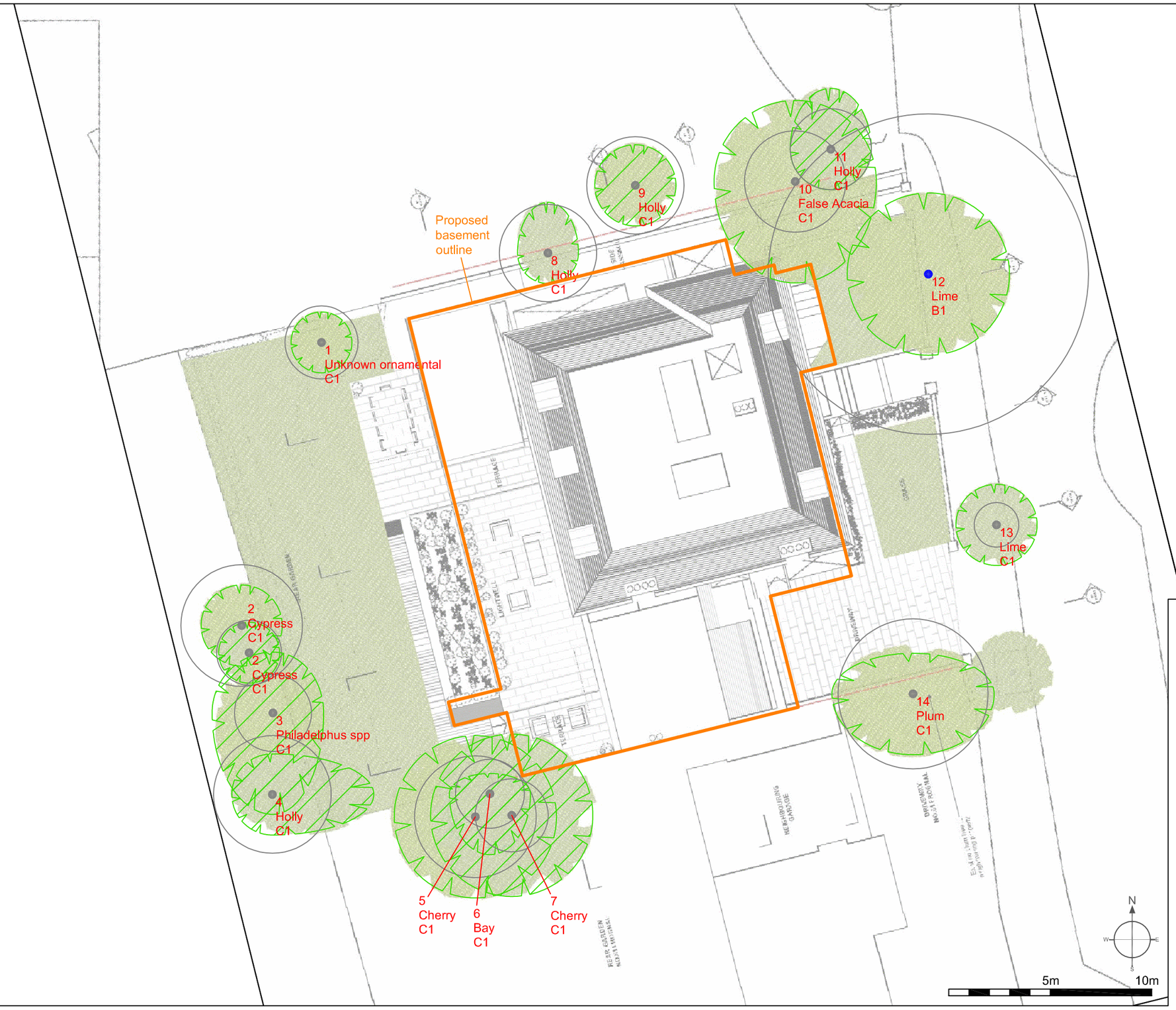
- Category A High Quality
- Category B Moderate Quality
- Category C Low Quality
- Category U Trees Unsuitable for Retention

Category
Root Protection Area
13 Birch B2
Crown Spread
Tree Number
Species
Category

Tree Position Approximate (not shown on original survey)

APPENDIX 3

ARBORICULTURAL IMPACT ASSESSMENT PLAN



NOTE:

This survey is of a preliminary nature. The trees were inspected from the ground only on the basis of the Visual Tree Assessment method. No samples were taken for analysis. No decay detection equipment was employed. The survey does not cover the arrangements that may be required in connection with the laying or removal of underground services.

Branch spread in metres is taken at the four cardinal points to derive an accurate representation of the crown.

Root Protection Areas (RPA) are derived from stem diameter measured at 1.5 m above adjacent ground level (taken on sloping ground on the upslope side of the tree base).

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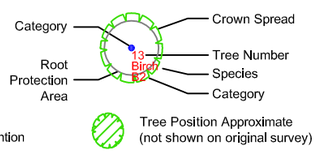
Site: 63 Frognal, London, NW3	1-200@A3
Drawing Title: Arboricultural Impact Assessment	Jan 2013

Key:

- Category A High Quality
- Category B Moderate Quality
- Category C Low Quality
- Category U Trees Unsuitable for Retention



Tree Position Approximate (not shown on original survey)