

Arboricultural Report and Tree Condition Survey
for
Proposed Works at
The Gardener's Hut
Lincoln's Inn,
London.

Prepared for The Honourable Society of Lincoln's Inn



A trading name of RG Consultancy Ltd

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Our Ref 0822-100809
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Tree Survey Plan

Lincolns Inn Gardeners Hut Foundation / Ground Floor Details

Drawing by Fairhurst Structures

Arboricultural Report and Tree Condition Survey for Proposed Works at
The Gardener's Hut, Lincoln's Inn, London.

1.0 Introduction

- 1.1 This Arboricultural Report has been prepared to provide commentary on the tree related issues associated with the works proposed to the Gardeners Hut at Lincoln Inn, London.
- 1.2 The proposed works include two extensions to the eastern and western end of the existing Gardener's Hut and Glasshouse.
- 1.3 The Gardener's Hut and Glasshouse are located to the northern end of Lincolns Inn. The existing structures are located against the northern boundary wall. They are accessed from a gravel path that runs across the North Lawn, this path provides vehicle access to the Gardener's Hut and storage yard.
- 1.4 The proposed works involve extensions to both the eastern and western ends of the Gardener's Huts. The proposed extensions are single-storey timber framed structures to be built on pile and beam foundations in areas currently occupied by existing hardstanding.

2.0 Statutory Protection

- 2.1 The site is located in the Bloomsbury Conservation Area. Due to the Conservation Area status all the trees with a stem diameter in excess of 75mm are subject to protection under the Conservation Area legislation. Notwithstanding specific exemptions in general terms, a Conservation Area (CA) prevents the cutting down, uprooting, topping, lopping, wilful damage to or wilful destruction of trees without submitting 6 weeks prior notification to London Borough of Camden.
- 2.2 If on receipt of the treeworks notification the LPA wish to stop works from proceeding then a Tree Preservation Order (TPO) must be served, if 6 weeks pass from submission of the CA tree works notification then providing a TPO has not been served the treeworks can be undertaken subject to agreement from the tree owners.
- 2.3 The Conservation Area status does not preclude the presence of Tree Preservation Orders which may also serve to protect the trees. Conservation Area and Tree Preservation Order protection of trees covers wilful damage to both the above and below ground parts of the tree. Damage to the root system of a protected tree is a potential offence under the Conservation Area and Tree Preservation Order legislation.
- 2.4 Unless tree works are explicitly approved within the full planning consent or are exempt from this statutory protection, a CA Notification or TPO application for tree works will need to be submitted to the Local Planning Authority.
- 2.5 No tree works should be undertaken prior to obtaining full planning consent (if proposed tree works are permitted as part of the planning consent) or if required without obtaining the necessary tree works consent.

3.0 Arboricultural Background Information

- 3.1 For all trees but particularly those growing in urban areas, root growth is not predictable. Tree roots are opportunistic, they grow most prolifically in areas where conditions are favourable and will be deflected by natural features and man-made structures, and when hostile conditions are encountered root growth will be limited.
- 3.2 It is generally agreed that the majority of tree roots, even for a mature tree are found in the top 90cm of the soil and that these roots are vulnerable to sudden changes in the rooting environment. These roots absorb the moisture and nutrients needed for growth and contrary to popular belief mature trees in the UK do not have a deep taproot that obtains moisture from great depth.
- 3.3 In simple terms tree roots grow out from the parent tree, initially the roots are relatively large and few in number, these roots taper rapidly they grow faster and divide more producing smaller feeder roots where conditions are favourable and grow slower where conditions are less favourable. If conditions are uniform this would result in relatively even circular root system.
- 3.4 An ideal soil for tree root growth is about 50% pore space (in urban areas this is often significantly reduced), these pores, the spaces between soil particles, are filled with water and air. Roots grow within the air spaces in the soil and when they encounter stones or rocks, they are deflected, where conditions are hostile roots may stop growing or continue growing more slowly than in better conditions only dividing and proliferating if conditions improve. The main factor that impedes root growth is where the bulk density of the soil is too high, with an absence of gaps in the soil which are necessary to allow roots to penetrate.
- 3.5 Construction activity can compact the soil increasing the bulk density and can dramatically reduce the amount of pore space. This not only inhibits root growth and penetration but also decreases oxygen levels within the soil and reduces the available soil moisture that is essential to the growth and function of the existing roots.
- 3.6 For retained trees it is essential that the structurally important roots will remain undisturbed, these important larger roots radiate outwards from the trunk, they are characterised by being relatively few in number and tapering rapidly from the base of the tree. Even for mature trees they are only 2-3m in length, at this length they are likely to be 2-5cm in diameter and they have lost their rigidity and physical strength. (See Tree Root Systems AAIS 1995).

- 3.7 The two main possibilities for injury to trees during and following the construction process are from direct and indirect damage.
- Direct Damage can be defined as injury resulting from physical contact including contact with machinery or fire, and excavation of the root area.
 - Indirect Damage can be defined as injury resulting from activities that take place near the tree such as level changes, compaction of the soil, or contamination by chemical spillage in proximity to the root system.
- 3.8 The British Standards Institute published BS5837:2012 'Trees in relation to design, demolition and construction – Recommendations' this document gives clear and current best practice recommendations and guidance on the principles to be applied to achieve a satisfactory juxtaposition of trees with structures.
- 3.9 The BS5837 (2012) also provides information on the protection of trees during the development process. It includes a calculator for Root Protection Areas (RPA) which aims to ensure a sufficient volume of soil and proportion of the root system is protected to maintain the health and vigour and ensure the longevity of the trees.
- 3.10 The Root Protection Area is not related to the canopy spread of the tree, in simple terms it is an area calculated as a multiple of the trunk diameter. For trees with a trunk diameter in excess of 1250mm the Root Protection Area is capped at a total area of 707m².
- 3.11 The RPA is in effect a theoretical area that if all the soil and roots around the periphery of the circle were removed there would be sufficient area around the tree to maintain the tree in a healthy condition. The RPA does not show the expected extent of root growth but indicates an area of ground considered necessary to support the tree both at the time of surveying but into the future. Post development the tree will adapt to the changes in its rooting environment providing it has retained a sufficient proportion of its root system and a sufficient area/volume of soil area is available for the tree.
- 3.12 The relative sensitivity of different species of trees to development works is well known and acknowledged within BS5837 (2012) but the RPA formula in BS5837 does not give any weight to different tree species. The RPA is based on the trunk diameter and would be the same for trees of the same trunk size regardless of species. This results in RPAs which for trees which are tolerant to disturbance is very conservative but would be an appropriate size for the more sensitive tree species.

- 3.13 It is thought that a healthy tree will tolerate the removal of approximately one-third of its roots (Harris 1992, Helliwell 1985). Fraedrich and Smiley et al. (2002) proposed limits to trenching near the trunk: no closer than three times the trunk diameter. When researchers cut roots at this distance however, a significant reduction in health was not detected until roots on three or four sides of the tree were cut. Likewise Miller and Neely (1993) found reductions in tree growth only when linear trenches were closer than three times the trunk diameter.
- 3.14 Trees have a natural resilience to disturbance and root loss, so many fallen trees will continue to grow for many years, consider the recumbent mulberry tree, or fallen woodland and parkland trees (which if not removed) will continue to grow. The RPA is by its nature a conservative estimate of the area needed to support a healthy tree. In this case the proposed encroachment will be only on one side of the RPA and it is accepted that the root system can withstand the loss of a proportion of the root system.
- 3.15 British Standard 5837 Chapter 4.6.2 states "*Where pre-existing site conditions or other factors indicate that rooting has occurred asymmetrically, a polygon or equivalent area should be produced, Modifications to the shape of the RPA should reflect a soundly based arboricultural assessment of the likely root distribution*").
- 3.16 When adjusting the Root Protection Area of trees, the Arboricultural Consultant needs to consider a number of factors Paragraph 4.6.3 of BS5837 (2012) states that:
- Any deviation in the RPA from the simple circle should take full account of the following factors whilst still providing adequate protection for the root system:*
- a) *the morphology and disposition of the roots, when influenced by past or existing site conditions (e.g. the presence of roads, structures and underground apparatus);*
 - b) *topography and drainage;*
 - c) *the soil type and structure;*
 - d) *the likely tolerance of the tree to root disturbance or damage, based on factors such as species, age, condition and past management.*
- 3.17 The BS5837 (2012) gives specific advice on the construction of hardstanding within the Root Protection Areas of retained trees. .
- 7.4.1 *General Where permanent hard surfacing within the RPA is considered unavoidable, site-specific and specialist arboricultural and construction design advice should be sought to determine whether it is achievable without significant adverse impact on trees to be retained. NOTE Specialist arboricultural advice includes, for example, advice on the tolerance of a tree species to the installation of a permanent hard surface within the RPA or tolerance of salt damage (see 7.4.2.4).*

7.4.2 Design recommendations

7.4.2.1 *The design should not require excavation into the soil, including through lowering of levels and/or scraping, other than the removal, using hand tools, of any turf layer or other surface vegetation. If it is intended to use the new surface for construction access, it is essential that the extra loading and wear arising from this are taken into account during the design process.*

7.4.2.2 *New permanent hard surfacing should not exceed 20% of any existing unsurfaced ground within the RPA.*

7.4.2.3 *If the new surface is likely to be subject to de-icing salt application, an impermeable barrier should be incorporated to prevent contamination of the rooting area. Run-off should be directed away from the RPA (see also 8.6.5).*

7.4.2.4 *Where a permeable surface is to be used by vehicular traffic, a geotextile should be used at the base of construction to help prevent pollution contamination of the rooting area below.*

4.0 Arboricultural Impact Assessment

4.1 No trees are to be pruned or removed to facilitate the proposed works.

4.2 The site of the extension to the eastern end of the Gardener's Hut is beyond the Root Protection Area (RPA) of the retained trees and can therefore be undertaken without risk of significant damage to the root system of the retained trees. The extension to the western end of the Gardener's Hut is located within the area of hardstanding within the RPA of London plane trees located to the southern side of the existing Gardener's Hut.

4.2 The site of the western extension is occupied by concrete hardstanding that forms part of the Gardener's storage yard. This hardstanding is currently utilised for storage and for waste collection, skip lorries regularly access this area. To reduce the potential impact of the proposed works on the London plane trees it is proposed to construct the extension on a pile and beam foundation. See Lincolns Inn Gardeners Hut Foundation / Ground Floor Details Drawing by Fairhurst Structures (Drawing No. 132536(CC) SK01 in Appendix 1.

4.3 The proposed foundation design aims to reduce the amount of excavation and level changes required. The location of the proposed piles will be set out and can be moved 300mm in any direction in order to avoid any tree roots. Pile locations will be excavated to a depth of 1000mm with an 'air-spade' to supervised by the Arboricultural Consultant to establish final locations for the piles in order to avoid tree roots.

- 4.4 The level and excavation required for the ground beams will be dependent on the make-up of the existing hardstanding and the depth that roots are encountered. The design of the extension has included a void underneath the new floor slab. Some very limited excavations will be undertaken, this involves only the removal of the existing hardstanding and any inert sub-base. The excavations will stop as soon as any roots over 25mm in diameter are encountered. Excavations will be supervised on-site by the Arboricultural Consultant.
- 4.5 Once the concrete hardstanding has been removed there will be no access across the area of newly exposed open ground to the south of the proposed work. Temporary ground protection will be laid to allow pedestrian access within the building footprint. The Temporary Ground Protection can be a suitable sheet material such as plyboard, scaffold boards or heavy-duty purpose made high density polythene (HDPE) sheets such as 'Tuff Track' overlaid over the existing hardstanding. There will be no access across the open ground to the south of the proposed work. This area will be fenced-off to restrict the working area.
- 4.6 To prevent damage to the retained trees beyond the footprint of the extension we recommend the existing hardstanding is retained. If necessary depending on expected traffic this hardstanding can be further protected by use of temporary ground protection.
- 4.7 In addition to the temporary ground protection the trunk of the London plane trees will be protected by ply-board hoarding attached to a rigid timber frame which extends to a height of 3m. This plyboard hoarding should be installed to box of the trunk in and protect the exposed root. This hoarding and frame should not be attached to or be braced against the trunk of the tree.
- 4.8 Any new hardstanding associated with this project will be designed to avoid excavation beneath the depth of the existing hardstanding. The new hardstanding will be permeable and porous in construction both in terms of the surface finish and sub-base.
- 4.9 All the hard landscaping will be specified to be low impact 'No-Dig' design using a permeable and porous sub-base and a cellular confinement system to reduce the depth of sub-base and excavation and to prevent damage to the existing roots of the retained trees. The surface of the hardstanding will be designed to be permeable and porous or designed allow precipitation to run off into the nearby garden areas. With regard to the existing site set-up and the width of the proposed paths it is my opinion that either option would be acceptable and beneficial to the health of the trees.

- 4.9 Rainwater from the roof of the proposed structure will be collected in water butts or discharged directly on to open ground to the south of the hardstanding.
- 4.10 The proposed new fuel storage area to the western side of the extension will be constructed to contain any fuel spills.
- 4.11 With regard to the known species characteristics and based on experience of numerous construction projects in central London including the recently completed basement in Lincoln's Inn, it is my opinion that the proposed works will not impact on the health, longevity or stability of the London plane trees, this is supported by published research. Relative tolerance of London plane to development impacts is 'intermediate tolerance to construction damage' 'very tolerant in California'. (Trees and Development A Technical Guide to Preservation of Trees During Land Development by Matheny & Clark 1998).
- 4.12 To prevent damage to the root system and rooting environment of the retained trees a detailed specification and construction methodology for the proposed works will be prepared based on site investigations prior to works commencing on this site. This specification and construction methodology will be approved by the Arboricultural Consultant prior to works commencing.
- 4.13 Section 5 of this report gives an outline of the proposed Arboricultural Method Statement (AMS) a detailed AMS can be secured by use of Standard Planning Conditions.

5.0 Summary of Tree Protection Measures

5.1 As recommended in BS5837 (2012) it is proposed that subject to planning, the guidelines and parameters outlined in this section of the report will be revisited and addressed in detail as the works progress and where applicable on-site. This section aims to give the basic guidelines for the successful retention of the retained trees within the proposed development.

5.2 Post planning permission a detailed Arboricultural Method Statement will be prepared; this will address the tree protection measures during the enabling, groundworks, construction and landscape phases of the works including details of all temporary works and site facilities.

5.3 Arboricultural Site Supervision

5.4 To ensure that the construction process is undertaken with minimal disturbance to the retained tree stock, an Arboricultural Clerk of Works (ACoW) as recommended within BS5837 will be appointed to undertake regular inspections of the site. The Arboricultural Clerk of Works role shall be to:

- a. To supervise site investigations and excavations to determine the pile locations.
- b. To assess the specification and methodology of the proposed works and ensure these works have the minimum impact on the retained trees.
- c. To brief the workers on the necessity to protect the retained trees.
- d. To ensure the agreed methodology is followed by direct on-site supervision.
- e. To prune roots using clean sharp pruning tools during manual excavation (if necessary).
- f. To provide direction on tree protection issues as they arise.
- g. To monitor and photograph the works undertaken.

5.5 A pre-commencement site meeting will be held with the groundwork contractor and the arboricultural site supervisor. The purpose of this meeting is to brief the site agent on the arboricultural issues to be considered, agree programme of work and the location tree protection fencing.

5.6 All site operatives are briefed on the Tree Protection Issues as part of the induction process. Arboricultural monitoring site visits will be undertaken at regular intervals during the construction process.

5.7 During the construction works site the visits will be undertaken on a maximum of a fortnightly basis.

- 5.8 Within 5 days of the visit, the Local Authority tree officer will be notified by email of all visits undertaken.
- 5.9 To deal with any issues involving trees, the Arboricultural Clerk of Works will provide a contact number that will be answered during all the hours of works on site.
- 5.10 Tree Protection Measures**
- 5.11 To prevent the proposals impacting on the health, stability or longevity of the retained trees the main requirement is the installation of suitable tree protection hoarding to protect the trunks of the retained trees and Tree Protection Fencing to prevent access into the open ground. If the existing hardstanding is not deemed sufficient for the expected site traffic we recommend the installation of temporary ground protection to prevent compaction during construction works of the open ground within the Root Protection Areas of retained trees.
- 5.12 The Tree Protection Barriers and Temporary Ground Protection will be installed as per the Tree Protection Plan which will be agreed with the Local Authority Tree Officer prior to works commencing.
- 5.13 Tree protection measures must be installed prior to any enabling works, demolition, or ground-works commencing, and remain in place throughout construction works.
- 5.14 Within the fenced off Tree Protection Area;
- No excavation by any means.
 - No level changes + or -
 - No storage of plant or materials.
 - No storage or handling of any chemicals including cement washings.
 - No Pedestrian, Machinery or Vehicular Access.
 - Underground service routes will be located outside the fenced-off area.
- 5.15 Clear notices are to be fixed to the outside of the fencing with words such as 'TREE PROTECTION AREA – NO ACCESS OR WORKING WITHIN THIS AREA'. See Appendix 3.
- 5.16 The site agent, all contractors and other relevant personnel are to be informed of the role of the Tree Protection Measures and their importance. A copy of the Tree Protection Plan will be displayed on site at all times during the works.

5.18 The location of any site office, welfare facilities, storage area needs to be confirmed but this will be located on existing hardstanding. The Tree Protection Plan will be finalised when the site set-up /site logistics plan is available.

5.19 Within the RPA of retained trees the existing hardstanding will be broken up and carefully removed, by hand carefully pulling the hardstanding away from any retained trees, no spoil will be stored on the open ground within the RPA of retained trees. The pile locations will be hand dug using an air-spade to 1000mm below ground to check that the pile location is free from any significant roots. If roots over 25mm diameter are encountered the pile location will be moved.

5.20 **Airspade Excavation Guidelines**

- The airspade will be used by a suitably experienced and trained operator under direct supervision by the Arboricultural Clerk of Works (ACoW).
- The compressor for the airspade will be located within the existing hardstanding .
- The compressor will be fitted with airline filters to prevent contamination of the ground around root systems.
- A spill kit will be available throughout the excavation process
- The working area will be fenced off to prevent any debris flying beyond the working area.
- The airspade will be used in short bursts to loosen soil around roots. This soil will then be manually moved out of the hole.
- >25mm diameter tree roots will be retained. . Any roots that are exposed will be immediately wrapped or covered with damp hessian to prevent drying out.
- Root severance of roots <25mm diameter may only be undertaken by the Arboricultural Clerk of Works using either handsaw or secateurs.
- Once a suitable pile location has been found a marker post will be installed centrally within the hole and the hole will be back-filled with excavated soil.
- When the piling works are undertaken the ACoW will be present, any open ground where the piling rig will access will be protected by suitable temporary ground protection.
- Any exposed roots will be protected from contact with wet concrete by use of shuttering and a suitable polythene membrane.

- 5.21 To avoid damage to the root system of retained trees a detailed specification for the proposed works will be prepared prior to works commencing on this site. This specification will be approved by the Arboricultural Clerk of Works.
- 5.22 Dismantling the protection barriers around retained trees may be required to allow completion of landscaping works. The removal of the Tree Protection Fencing is not an opportunity for machinery to access the previously fenced off area.

6.0 Conclusion

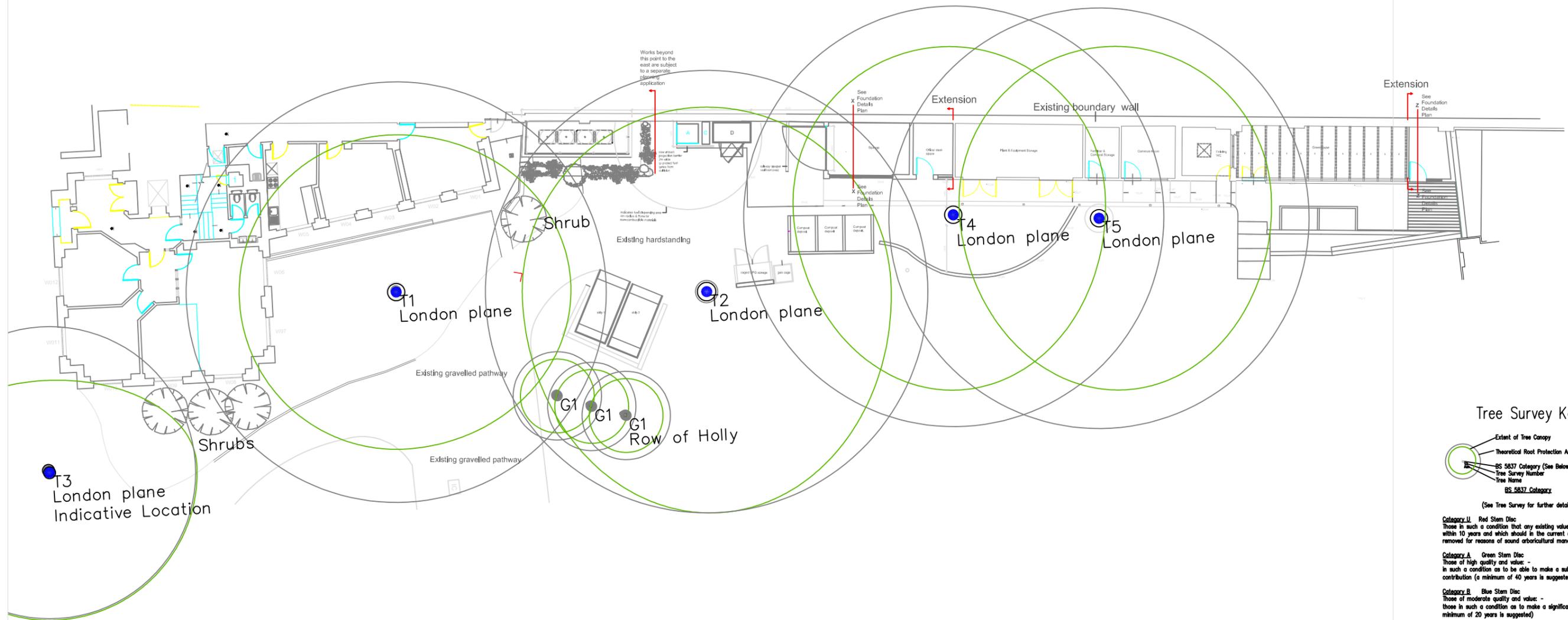
- 6.1 No trees are to be removed or pruned to facilitate the proposed works.
- 6.2 It is my opinion based on the information contained in BS5837 (2012), the limited amount of excavation, the area of ground beyond the proposed works that will be left undisturbed, the proposed location of mini-piles, the continued arboricultural supervision, and experience from other similar projects, that the proposed extension and associated works can be undertaken following a specification and methodology that will not impact on the health, stability or longevity of the lime trees.
- 6.3 The protection of retained trees during the proposed development works can be achieved by continuing to follow the recommendations in BS5837:2012, the guidance contained within this report, including the appointment of an Arboricultural Clerk of Works, and by use of standard planning conditions.

Prepared by
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Our Ref 0822-100809
August 2022

Appendix 1

Tree Survey Plan

**Lincolns Inn Gardeners Hut Foundation / Ground Floor Details Drawing
by Fairhurst Structures (Drawing No. 132536(CC) SK01**



Tree Survey Key

- Extent of Tree Canopy
- Theoretical Root Protection Area (BS5837)
- BS 5837 Category (See Below)
- Tree Survey Number
- Tree Name
- BS 5837 Category

(See Tree Survey for further details)

Category U - Red Stem Disc
Those in such a condition that any existing value would be lost within 10 years and which should in the current context, be removed for reasons of sound arboricultural management.

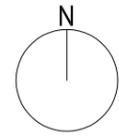
Category A - Green Stem Disc
Those of high quality and value - in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested).

Category B - Blue Stem Disc
Those of moderate quality and value - those in such a condition as to make a significant contribution (a minimum of 20 years is suggested)

Category C - Grey Stem Disc
Those of low quality and value - currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150 mm.

- Tree to be retained

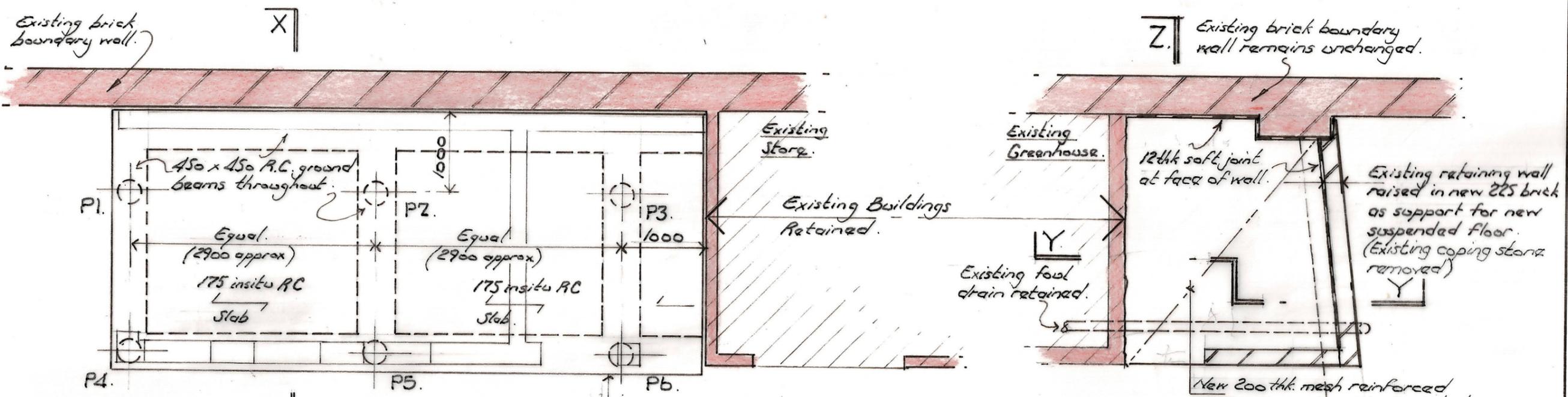
Scale



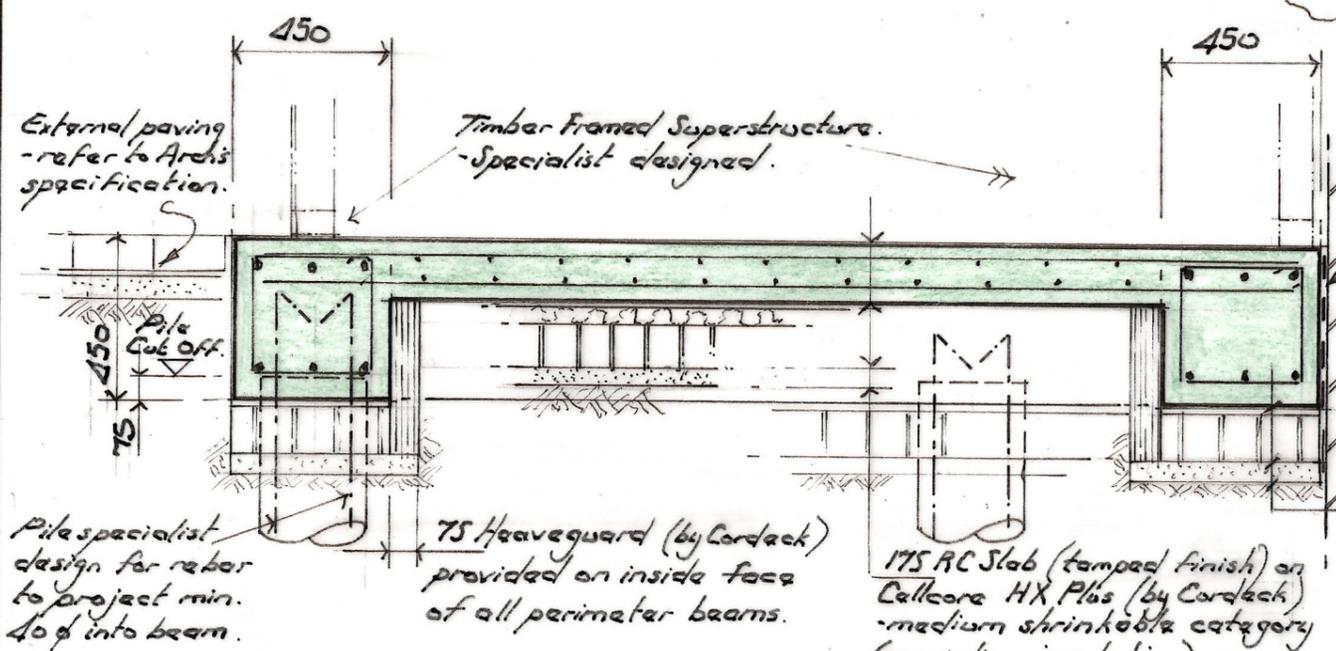
The Gardeners Hut Lincoln's Inn London,	
Tree Survey Plan Prepared for The Honourable Society of Lincoln's Inn	
Ruskins Tree Consultancy 01277 849990 info@ruskins-tree-consultancy.co.uk www.ruskins-tree-consultancy.co.uk	
Scale	See Scale Bar
Date	02/08/2022
Project No.	0822-100809
Dwg. No.	TSP 1
Drawn by	PW
Checked by	*

Tree Protection Hoarding Specification

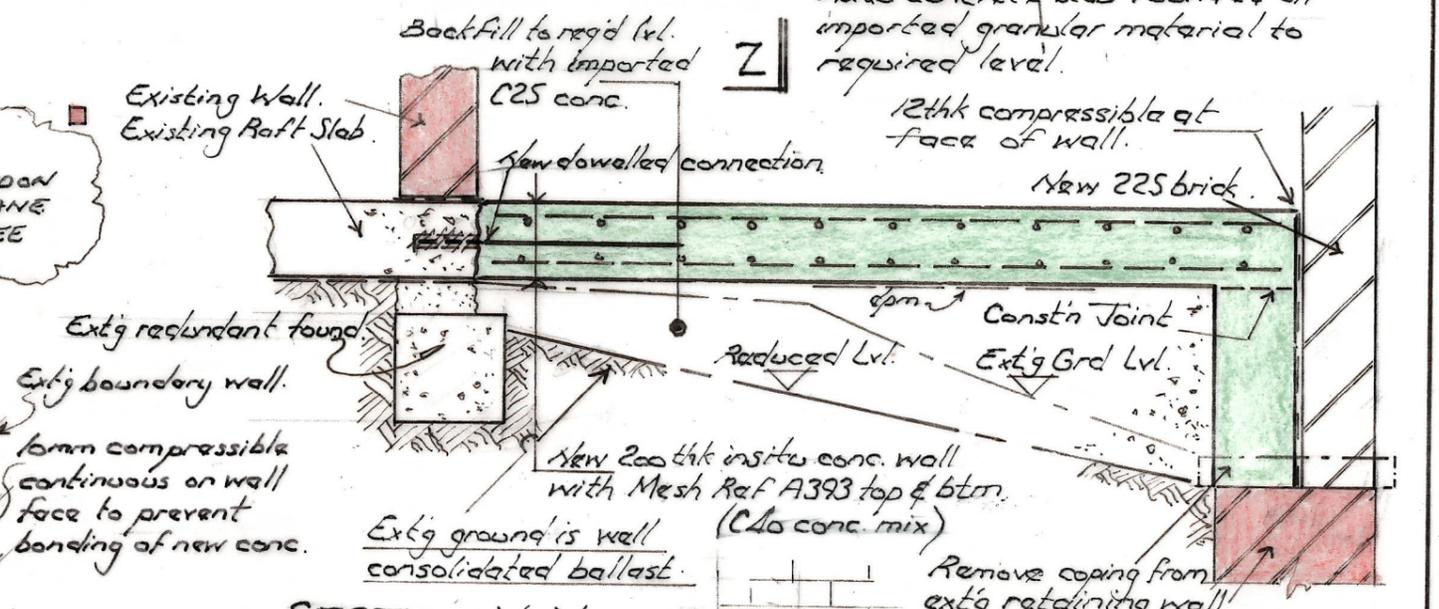
Tree Protection Notice



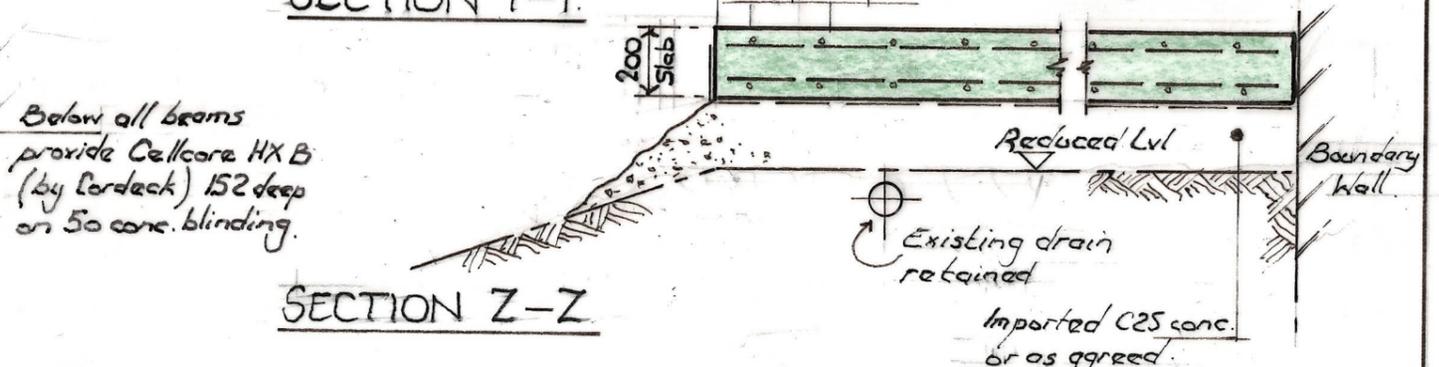
PLAN OF GROUND SLAB / FOUNDATIONS.



SECTION X-X



SECTION Y-Y



SECTION Z-Z

EXTENSION TO GARDENERS HUT - LINCOLNS INN.

FOUNDATION / GROUND FLOOR DETAILS.

DRG. No. 132536 (CC) SK01.
SCALE 1:50, 20

THE HONOURABLE SOCIETY OF LINCOLNS INN.

Tree Protection Hoarding Specification

<p>Tree Trunk Protective Hoarding Box</p>	<p>Tree Protective trunk hoarding will be required around T1 and T2. The surrounding ground will be protected by temporary ground protection throughout the development. The tree trunk will be boxed in with 20mm Plyboard within internal 2 x 1 support struts cut diagonally across the corners for re-enforcement.</p>  A photograph showing a tree trunk protected by a wooden box structure. The box is made of light-colored wood and is positioned around the base of the tree trunk. The tree trunk is visible above the box. The background shows green foliage and a paved area.
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TREE PROTECTION AREA



PLEASE KEEP OUT

The trees in this fenced-off area are protected by Statutory Protection and / or Planning Conditions. Any works in this area may result in damage to the above ground parts or root system of these trees. Damage to these trees may lead to enforcement action and / or a criminal prosecution.

Any works in this area must be undertaken as per the Arboricultural Method Statement or with permission from Local Planning Authority Tree Officer.

For further information contact info@ruskins-tree-consultancy.co.uk