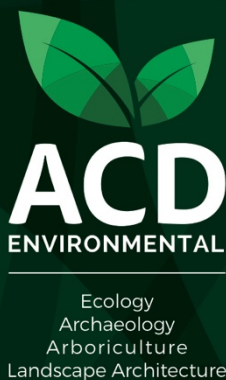


CHURCHVIEW ROAD
TWICKENHAM

ARBORICULTURAL
IMPACT
ASSESSMENT
&
METHOD
STATEMENT



UK & EUROPEAN
PROPERTY
DEVELOPMENTS
LTD

Written by:	M Welby
Checked by:	RA
Date:	30/05/2017
Ref:	PRI21193aia-ams
Revision:	A: 14/02/2019

Table of Contents

1.0	Executive Summary	3
2.0	Introduction	4
3.0	Scope and Method of Survey	5
4.0	Arboricultural Impact Assessment	6
4.1.	Overview of proposed development.....	6
4.2.	Tree Preservation Orders	6
4.3.	Previous planning applications and consents	6
4.4.	Trees proposed for removal	7
4.5.	Demolition, site clearance & archaeology	7
4.6.	Construction within RPAs	8
4.7.	Permanent hard surfaces within RPAs.....	8
4.8.	Protection fencing.....	8
4.9.	Shade and future pressure to prune.....	8
4.10.	Services.....	9
5.0	Arboricultural Method Statement	9
5.1.	Phasing of operations & site supervision	9
5.2.	Construction exclusions zone.....	10
5.3.	Tree protection barriers	11
5.4.	Ground protection.....	14
5.5.	Site storage, parking, welfare facilities, etc	17
5.6.	Tree surgery and removal	17
5.7.	Soft landscaping	18
5.8.	Installation of underground services.....	19
5.9.	No-dig cycle store construction	21
5.10.	Installation of boundary fencing within protected areas	23
5.11.	Installation of 'no-dig' surface	24
	Appendix 1: Tree Categories Explained	27
	Appendix 2: Tree Survey Schedule	28
	Appendix 3: Tree Protection Plan	31

1.0 Executive Summary

- 1.1. ACD was initially instructed, to carry out a tree survey, and present constraints details in accordance with BS5837:2012 *Trees in relation to design, demolition and construction*. This was to identify the quality and value of existing trees on the site, allowing decisions to be made as to the retention or removal of trees during development. Subsequently, the subject layout has been produced and is in line with recommendations of the British Standard. Adequate protection can be provided to ensure all retained trees are protected throughout development.
- 1.2. The existing garage block is to be replaced with a row of terraced dwellings. Trees to be removed only include those of low or poor quality.
- 1.3. The parking area to the north-east will be retained and reused, hence no tree protection proposed in that area.
- 1.4. Some site supervision will be required during the installation of the no-dig cycle store and parking bays close to trees.
- 1.5. The relationship between the building and retained trees is sustainable and is not likely to result in any pressure to prune requests from future occupants.
- 1.6. The arboricultural method statement and tree protection plan include details of all tree protection measures required.
- 1.7. The tree protection must be erected after tree removals and surgery but before any demolition or construction contractor enter the site, and before any soil stripping takes place.
- 1.8. There will be no changes in levels, service routeing, machine activity, storage of materials or site hut positioning within areas to be protected, and the protective fencing shall remain in position for the duration of the construction process.

2.0 Introduction

- 2.1. UK & European Property Developments Ltd instructed ACD Environmental in April 2017 to prepare the following impact assessment.
- 2.2. Following the recommendations of the British Standard¹, this report includes the necessary information to support a planning application. It demonstrates that the impact, both direct and indirect, of the proposed development within the site, has been assessed and where appropriate, mitigation and tree protection proposed.
- 2.3. The implementation of the protection methods recommended within this report is critical for ensuring the retained trees are successfully protected through the construction process and must be implemented prior to any work on the site.
- 2.4. This assessment is based on the supplied layout drawing, ref: 144-(PL)900.
- 2.5. The controlling authority is London Borough of Richmond upon Thames Council who can be contacted at: Civic Centre, 44 York Street, Twickenham, TW1 3BZ, Tel: 020 8891 1411.
- 2.6. This assessment considers the impact of the development on the constraints posed by the retained trees (both beneath ground: the root protection area (RPA), and above ground: the canopy).
- 2.7. Direct impact from development comes in six main forms: 1) Surface installation within RPAs, 2) Root loss from excavation for foundations, drainage and other utilities within RPAs, 3) Soil stripping, removal and level changes within RPAs, 4) Excessive access facilitation pruning to retained trees, 5) Soil compaction from storage and vehicle movements within RPAs, 6) Soil contamination.
- 2.8. Indirect impact can come from changes to the site hydrology, future pressure to prune or fell, failure of trees exposed by removal of neighbouring trees, and other environmental changes which can take several years to manifest.

¹ *BS5837:2012 Trees in relation to design, demolition and construction- Recommendations*, London: British Standards Institute

2.9. The RPA for each tree represents a minimum area in m² that should be left undisturbed around each retained tree. This is initially represented by a circle but is often adjusted to account for constraints to root growth within the site (primarily highways and buildings). It is, therefore, important to ensure the protection of trees both above and below ground. Recommendations are provided in the British Standard as to the protection of existing trees before, during and after development. This is achieved by ensuring the tree protection plan and arboricultural method statement are implemented before any commencement on site.

3.0 Scope and Method of Survey

- 3.1. The survey schedule can be found at Appendix 2.
- 3.2. The survey has been carried out following the recommendations of The British Standard and the trees are assessed objectively and without reference to any site layout proposals. Categories are based on each tree's health and condition, together with an assessment of its life expectancy if its surroundings were to be unchanged.
- 3.3. No discussions took place between the surveyor and any other party.
- 3.4. The reference numbers of surveyed trees and groups of trees are shown on the tree reference plan, which is appended to this report and based on the supplied survey drawing. The prefix G has been used to indicate a group of trees. Stem locations within groups may be estimated, and indicative of canopy only.
- 3.5. The tree survey was carried out from ground level only, with the aid of binoculars as necessary, following the VTA tree assessment method².
- 3.6. Where trees are located on neighbouring land an estimated appraisal has been made of their quality and dimensions. All estimated dimensions are noted in the schedule comments.

² Mattheck, C. & Breloer, H., 1998. *The Body Language of Trees: A Handbook for Failure Analysis*. London:H.M.S.O.

- 3.7. Where stems or branches are obscured by ivy or other materials a full assessment of those parts will not be possible.
- 3.8. Tree heights were measured with a clinometer or estimated in relation to those measured with the clinometer. If individual tree heights are of particular concern, for example in shading calculations, then they are measured using a clinometer.
- 3.9. Trunk diameters were measured or, where inaccessible, estimated. Single stemmed trees are measured at 1.5m above ground level.
- 3.10. Tree canopies, where markedly asymmetrical, were measured (or estimated by pacing) in four directions using a laser measure. Symmetrical canopies are measured in one direction only, with dimensions in the remaining directions assumed to be similar. For the canopies of groups of trees, the maximum radius for each compass point is measured (more complicated groups will have further notes taken and an accurate representation will be shown on the plan).

4.0 Arboricultural Impact Assessment

4.1. Overview of proposed development

- 4.1.1. The existing garage block is to be replaced with a row of terraced dwellings.

4.2. Tree Preservation Orders

- 4.2.1. There are no Tree Preservation Orders (TPOs) present on any trees on, or adjacent to the site, nor is the site within a Conservation Area.

4.3. Previous planning applications and consents

- 4.3.1. There are no relevant past applications or extant planning consents for this site.

4.4. Trees proposed for removal

4.4.1. The following trees are proposed for removal:

- Category U (poor quality): T9, 11, 12, 13 & 15.

4.4.2. In relation to the conception and design of development proposals, BS5837:2012 section 5.1.1 states: The constraints imposed by trees, both above and below ground should inform the site layout design, although it is recognised that the competing needs of development mean that trees are only one factor requiring consideration. Certain trees are of such importance and sensitivity as to be major constraints on development or to justify its substantial modification. However, care should be taken to avoid misplaced tree retention; attempts to retain too many or unsuitable trees on a site can result in excessive pressure on the trees during demolition or construction work, or post-completion demands for their removal.

4.4.3. It is therefore deemed acceptable to remove the trees listed and, as part of the detailed landscape design for the scheme, include suitable and sustainable replacements as and where appropriate. This will more than mitigate any loss that may be felt from tree removals, by providing robust long-term tree cover in keeping with the proposal and surrounding properties.

4.5. Demolition, site clearance & archaeology

4.5.1. To ensure damage does not occur to trees highlighted for retention, tree protection fencing must be erected before ANY plant/vehicles entering site whatsoever. This should be subject to a pre-commencement site meeting between the developer and the project arboriculturist.

4.5.2. No special demolition procedures need be observed on this site, other than respecting the tree protection fencing.

4.6. Construction within RPAs

4.6.1. The construction of all buildings is proposed outside the RPAs of retained trees.

4.6.2. The cycle store is proposed within the RPA of the ash T10. To avoid detriment to underlying roots, a no-dig approach to construction will be used.

4.7. Permanent hard surfaces within RPAs

4.7.1. In section 7.4 of the British Standard, permanent hard surfacing within the RPAs of retained trees is addressed, and recommendations made.

4.7.2. New bays are proposed within the RPAs of T1-4. To minimise impact upon these trees, a no-dig style surface will be used and laid above ground.

4.7.3. The existing parking bays are to be retained within the RPA of T10 & T16. Hence no tree protection provisions are made for these areas.

4.8. Protection fencing

4.8.1. Figure 2 of the British Standard recommends a standard fencing design for tree protection. This is a weld mesh panel design, mounted upon a well-braced scaffold framework. This is perfectly adequate for this site and all the retained trees can be suitably protected by its erection before any works start on site whatsoever.

4.9. Shade and future pressure to prune

4.9.1. ACD have worked with the design team from the start of this project and we feel that the resulting proposed layout is both sustainable and results in juxtapositions between trees and buildings which will not bring future requests for excessive pruning and/or tree removal.

4.10. Services

4.10.1. Full details of the service and utility provisions for the site remain to be finalised. However, there is adequate space for utility trenches to access the site whilst avoiding RPAs and exclusion zones.

5.0 Arboricultural Method Statement

TO BE READ IN CONJUNCTION WITH THE APPENDED TREE PROTECTION PLAN REF: PRI21193-03

5.1. Phasing of operations & site supervision

5.1.1. The tree protection and other arboricultural works must be carried out in the following order:

	Operation	Present	Notes
1	Tree removals & surgery	Tree contractor	See Tree Protection Plan for trees to be removed
2	Protection barriers erected	Fencing contractor	See Tree Protection Plan for position and type of barriers
3	No-dig cycle store installation	ACD, groundwork contractor, site manager	Groundwork staff to receive toolbox-talk from project arboriculturist. See method statement
4	No-dig cycle store installation	ACD, groundwork contractor, site manager	Groundwork staff to receive toolbox-talk from project arboriculturist. See method statement
5	Removal of protection barriers and landscape work	ACD, landscape contractor, site manager	See method statement

5.1.2. Supervision is required should any unplanned access and/or work be required in the construction exclusion zone.

5.1.3. Supervision will require the arboriculturist to be present throughout the task, to ensure all the arboricultural objectives are met. If the task is to take a long period of time, provided the arboriculturist is satisfied, and after an initial 'tool-box talk', the supervision may be reduced to telephone contact between the site foreman/contractor and arboriculturist.

5.2. Construction exclusions zone

5.2.1. Barriers and/or ground protection must be used to protect all retained trees before any machinery or materials are brought onto the site, and before any demolition, development or stripping of soil commences.

5.2.2. Where all activity can be excluded from the RPA, vertical barriers must be erected to create the construction exclusion zone (CEZ). The default position of which is shown on the appended Tree Protection Plan.

5.2.3. Where, due to site constraints, construction activity cannot be fully or permanently excluded from all, or part of a tree's RPA, appropriate ground protection can be installed.

5.2.4. It is the responsibility of everyone engaged in the construction process to respect the tree protection measures and observe the necessary precautions within and adjacent to them.

5.2.5. Inside the exclusion zone, the following shall apply:

- No mechanical excavation whatsoever.
- No excavation by any other means without arboricultural site supervision.
- No hand digging without a written method statement having first been approved by the project arboriculturist.
- No lowering of levels for any purpose (except removal of grass sward using hand tools).
- No storage of plant or materials.
- No storage or handling of any chemical including cement washings.

- No vehicular access.
- No fire lighting.

5.2.6. In addition to the above, further precautions are necessary adjacent to trees:

- No substances injurious to tree health, including fuels, oil, bitumen, cement (including cement washings), builders sand, concrete mixing and other chemicals shall be stored or used within or directly adjacent to the protection area of retained trees.
- No fire shall be lit such that flames come within 5m of tree foliage.

5.3. Tree protection barriers

5.3.1. The construction exclusion zone will be protected as per the appended tree protection plan that shows the default alignment of the tree protection barriers, to be installed prior to any of the following taking place:

- Archaeology
- Demolition
- Plant and material delivery
- Soil stripping
- Utility installation
- Construction works
- Landscaping

5.3.2. Stages of installation of barriers:

- 1) Hand clearance of any vegetation to allow clear working access.
- 2) Setting out of node points
- 3) Barriers erected
- 4) Site meeting with project arboriculturist to 'sign-off' tree protection fencing.
- 5) Site accessible to demolition/construction traffic

5.3.3. Once erected, all barriers will be regarded as sacrosanct, and will not be removed or altered without prior recommendation by the project arboriculturist and approval of the local planning authority.

5.3.4. The default barrier construction is suitable for areas of high-intensity development and shall comprise of interlocking weld-mesh panels, well braced to resist impacts by attachment to a scaffold framework that is set firmly into the ground. A detailed specification can be found on the TPP.

5.3.5. The images below are alternative barrier designs that have been successfully used on site and that ACD are happy to support if a variation from the default style is required. If such a variation is necessary, the approval of the project arboriculturist will be obtained prior to any implementation on site.

5.3.6. Once barriers and/or ground protection have protected the exclusion zone, construction work can commence.

5.3.7. All weather notices should be erected on the barriers (for example see figure below).



Tree protection sign (download from <http://www.acdenvironmental.co.uk>)



Weld-mesh panels on scaffold uprights



Weld-mesh panels on wooden posts



Chain-link on angle-iron uprights

5.4. Ground protection

5.4.1. If required (or as shown on the appended tree protection plan), ground protection is to be installed as follows. It must be capable of supporting the expected loads and avoiding rutting, compaction and damage to the soil: as advised in section 6.2.3 of the British Standard.

5.4.2. Stages of ground protection installation:

- 1) No plant machinery to be used in the area of ground protection for whatever reason
- 2) Dismantle primary TPF and re-erect in secondary location as shown on TPP (if required) OR erect fencing to protect any newly exposed CEZ not to be covered by ground protection.
- 3) Any shrubs, saplings or trees to be removed, are to be cut or ground out to just below ground level rather than grubbed or winched out, which can damage roots of retained trees.
- 4) Lay woven geotextile over existing ground surface by hand

- 5) Cover the area with compressible layer, woodchip, for example, using hand tools only
- 6) Cover compressible layer with side butting scaffold boards or plywood boards
- 7) Confirm surface is acceptable for use with project arboriculturist
- 8) Area ready for construction access

5.4.3. Any scaffolding required within the area will be erected with the uprights placed on spreader boards.

5.4.4. The boarding will be left in place until the construction works are finished.

5.4.5. A single thickness of boarding laid on the soil surface will provide sufficient protection for pedestrian loads. However, for wheeled or tracked construction traffic movements within the RPA, ground protection will involve the use of temporary cellular confinement systems, reinforced concrete slabs or track-board systems details of which are to be specified by the project engineer and approved for use by the project arboriculturist and local authority before construction commences.

5.4.6. Track-boards can be sourced from Trakmats Europe Ltd, 0845 6435388, www.trakmatseurope.com, or groundguards.com

5.4.7. There is to be no excavation within ground protection area whatsoever. This includes installation of services and associated utilities.



Scaffold board pedestrian ground protection



Vehicular ground protection trackway

5.5. Site storage, parking, welfare facilities, etc.

5.5.1. The site will require provision for; site storage, contractor parking, welfare facilities, temporary services/drainage, material drop off points, etc.

5.5.2. It is acceptable to place site cabins and walkways within the CEZ provided they are installed sensitively:

- Cabins must be placed on sleepers (or similar) to spread the load, avoiding point loading and associated soil compaction.
- The delivery of cabins should ensure that any unloading via 'hi-ab' crane can be carried out without impact on the crowns of retained trees.
- Walkways, if required, should be installed as per the ground protection specification.
- Any utilities for site compounds must be run above ground. For example, WC foul pipes/drainage and temporary electrical connections.

5.5.3. It is imperative that if cabins and walkways are installed, that fencing is erected to limit access to the protected areas. If amendments are made, the project arboriculturist should sign off the proposals prior to their implementation.

5.5.4. Contractor parking and storage areas should be sited outside the CEZ.

5.6. Tree surgery and removal

5.6.1. The following surgery works are to be carried out:

- Cut back the overhanging canopy of off-site group G6 as required.

5.6.2. All trees to be removed are indicated on the TPP.

5.6.3. If any further surgery work is proposed, details will be submitted to, and approved by, the council, before being carried out.

5.6.4. All work will be carried out in accordance with BS3998³ industry best practice and in line with any works already agreed with the council.

5.6.5. The tree surgeon shall ideally be chosen from The Arboricultural Association's Approved Contractor list. All work shall be undertaken at the appropriate time and with the consent and approval of the site agent.

5.6.6. The statutory protection^{4 5} will be adhered to. If further advice is required, particularly if bats are discovered during tree work, it will be obtained from Natural England or other competent persons and recommendations adhered to.

5.6.7. The stumps of any trees removed from within the Construction Exclusion Zone or the RPAs of retained trees will be either cut flush to ground level and left in situ or ground out using a stump grinder. They will not be winched out.

5.6.8. All operations shall be carefully carried out to avoid damage to the trees being treated or neighbouring trees. No trees to be retained shall be used for anchorage or winching purposes.

5.7. Soft landscaping

5.7.1. All landscaping and associated ground preparation within exclusion zones will be carried out sensitively to ensure root damage is minimised as much as is practicable.

5.7.2. At no time is any heavy plant to be used within any protected area.

5.7.3. Removal of existing vegetation (including turf) will be carried out with hand tools only.

5.7.4. Should the soil be compacted or have a poor structure that may hinder the development of any new planting, soil decompaction techniques may be used upon consultation with the project arboriculturist.

³ *BS3998:2010- Recommendations for Tree Work*. London: British Standards Institute

⁴ *Wildlife and Countryside Act*. (1981) London: HMSO.

⁵ *Countryside and Rights of Way Act*. (2000) London: HMSO.

5.7.5. Tree protection barriers may be removed to allow access and then replaced as required/per approved documents (in liaison with the arboricultural clerk of works)

5.7.6. Levels (high spots) will not be reduced or excavated in any way. Use good quality topsoil to level any low-lying areas and hollows, and provide a fine tilth to lay turf on. This imported soil must not result in a level increase of more than 100mm in any area.

5.7.7. Import materials by hand in wheelbarrow or using a digger sited outside the sensitive area.

5.7.8. Any excavation for planting pits must be dug using hand tools only.

5.7.9. No works will be carried out within any protected areas if the soil moisture is at a level likely to allow compaction to occur.

5.8. Installation of underground services

5.8.1. Mechanical trenching for the installation of underground apparatus and drainage severs any roots present and can change the local soil hydrology in a way that adversely affects the health of the tree. For this reason, particular care should be taken in the routeing and methods of installation of all underground apparatus. Wherever possible, apparatus should be routed outside RPAs. Where this is not possible, it is preferable to keep apparatus together in common ducts. Inspection chambers should be sited outside the RPA.

5.8.2. Where underground apparatus is to pass within the RPA, detailed plans showing the proposed routeing should be drawn up in conjunction with the project arboriculturist. In such cases, trenchless insertion methods should be used: Microtunnelling, Surface-launched directional drilling, Pipe ramming or Impact moling (see BS5837:2012 Table 3), with entry and retrieval pits being sited outside the RPA. Provided that roots can be retained and protected, excavation using hand-held tools might be acceptable for shallow service runs. If this is case, the following methodology must be followed:

5.8.3. Stages for installing services by hand within tree protection areas:

No plant machinery to be used in the area for whatever reason

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work.
- 2) Remove just enough tree protection fencing to allow access to area and facilitate trenching.
- 3) Remove any surface vegetation or existing hard surfaces using hand tools.
- 4) Using an air-pick excavate the trench, keeping to minimum dimensions required.
- 5) Roots occurring in clumps of 25 mm diameter and over are encountered they will be retained and kept damp by covering with hessian (re-wetted as required). If required, these should be severed only following consultation with an arboriculturist; as such roots might be essential to the tree's health and stability.
- 6) Feed in services.
- 7) Backfill trench with 200-300mm depth of excavated soil, or a mixture of excavated and imported topsoil to BS3882 (BSI, 2007), firming down with heels.
- 8) Repeat step 7 until trench is filled.
- 9) Re-erect tree protection fencing as per approved plan.

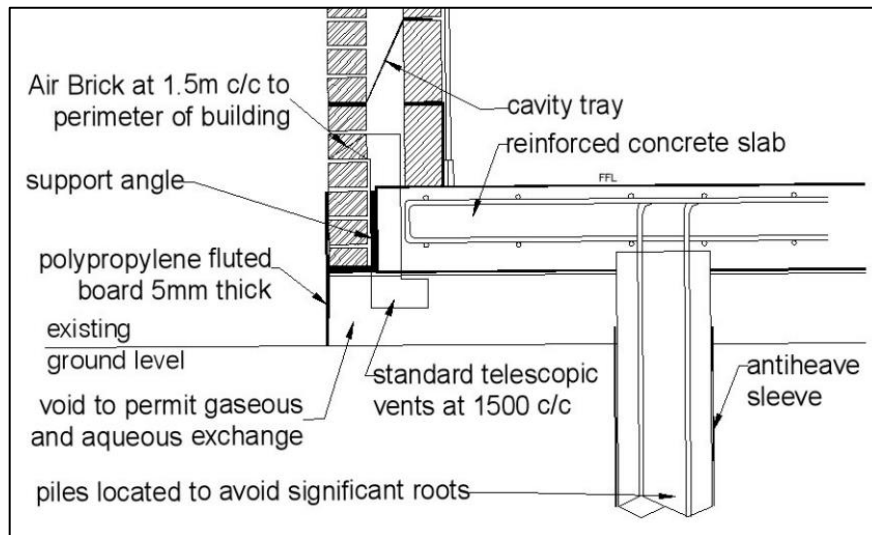
5.8.4. The method of excavation above, for trenching within RPAs, is using air excavation. This tool utilises compressed air to remove soil from around tree roots causing minimal damage and can be run off a typical site compressor. ACD can provide details of contractors supplying air excavation services if required.

5.8.5. Alternatively, trenchless technology, such as thrust boring can be used in some instances and is particularly effective as it can pass directly under the tree, at a depth which is likely to avoid almost all impact on roots of the subject tree. As no access/thrust pits will be located within the RPAs of the subject trees, the need for arboricultural supervision is limited.

5.8.6. Reference can be made to NJUG Vol 4⁶ for guidance, but any approach must be approved by the project arboriculturist and brought to the attention of the local authority tree officer.

5.9. No-dig cycle store construction

5.9.1. Structure to be installed as per engineers approved specification.



Indicative section of no-dig construction

5.9.2. Stages of construction:

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 2) Dismantle TPF and re-erect in secondary location as shown on TPP
- 3) TPF to be taken down only when commencement of work is imminent
- 4) Grass sward to be removed as necessary using hand tools or low ground-pressure plant (e.g. Bobcat or similar).
- 5) Excavation to establish root free sites for piles or pads. To be carried out by hand or with an air excavation tool.
- 6) Piles installed using mini-rig with very low ground pressure: rig must be approved for use by project arboriculturist.
- 7) Void form material installed.

⁶ National Joint Utilities Group. (2010). *Volume 4: NJUG Guidelines For The Planning, Installation And Maintenance Of Utility Apparatus In Proximity To Trees (Issue 2) – Operatives Handbook*. NJUG.

- 8) Slab base cast onto void form material.
- 9) Void form material removed to create void under slab
- 10) Remaining construction built on slab with no further excavation.
- 11) TPF to be re-erected in secondary position.

5.9.3. This specification must be designed to meet the following performance criteria:

- Construction will be above current ground (removal of grass sward/leaf litter by hand only).
- It will provide adequate resistance to applied loads, avoiding compaction of the soil.
- Provision will also be made for resistance to or tolerance of deformation by tree roots
- Allowance will be made for oxygen diffusion according to seasonal demand
- Water throughput to meet seasonal demand will also be possible (can be achieved by redirection of captured rainwater into hand dug land drains)

5.9.4. Any supports (such as a pile and beam construction may require) will be sited around any significant root masses. Sensitive air excavation prior to design will identify ideal locations.

5.9.5. Such techniques, for example pile and beam foundations, must be designed to cause minimal impact to the trees root system. This will include building above the current soil grade and using floating or cantilevered floors within the structure.

5.9.6. No plant machinery can be sited within the RPA. The use of back-acters or diggers to deposit construction materials within the area is acceptable, provided this can be achieved without causing damage to the trees canopy, and only under arboricultural supervision. The exception to this rule is when the use of piling rigs is required. In most cases it will not be possible to site a normal sized rig under the trees canopy and a 'mini-rig' will be required. To facilitate use of such a rig within the RPA without causing soil compaction, ground protection must be used. This can be

in the form of large metal plates or trackway placed on a substantial compressible layer (for example woodchips).

5.9.7. Contamination of the soil by fuel and lubricant leaks must be avoided at all cost. If such a situation arises the project arboriculturist must be notified to assess the situation and prescribe remedial measures.

5.10. Installation of boundary fencing within protected areas

5.10.1. Stages for installing wooden fence posts:

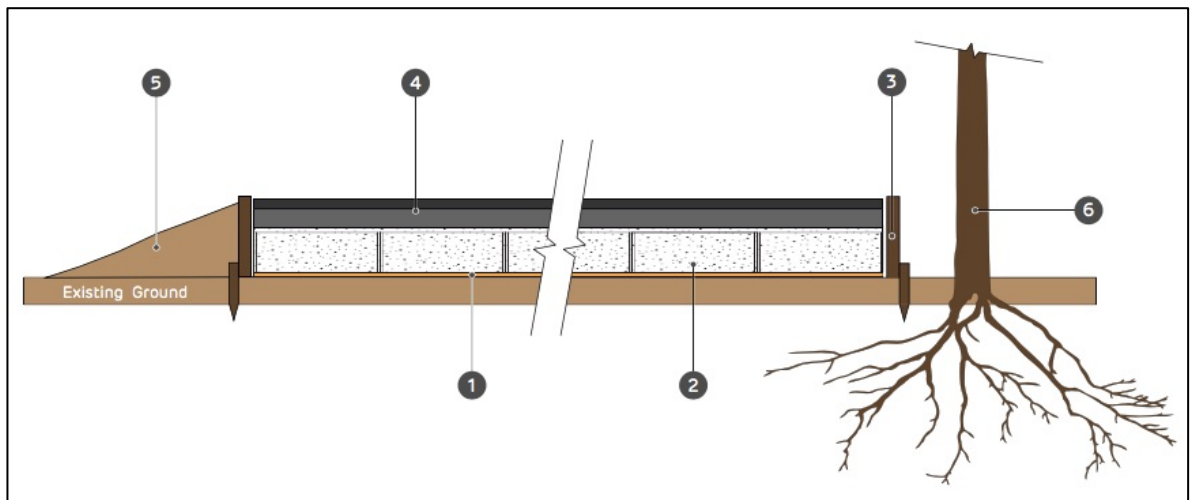
No plant machinery to be used in the area for whatever reason

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work.
- 2) Remove TPF to allow access to area.
- 3) Dig postholes using hand tools, avoiding damage to the protective bark covering larger roots. Roots smaller than 25mm diameter may be pruned back using either secateurs or a hand saw, leaving a clean cut.
- 4) Damage or severance of roots above 25mm diameter must be avoided. If roots of this size are discovered, the hole should be relocated. If there are a large number of such roots it may be necessary to relocate the hole by half a fence panels length and adjust the fence panels accordingly.
- 5) Line hole with non-porous lining, for example, durable polyethene bag.
- 6) Insert post and fill post-hole with concrete to just below ground level.
- 7) Trim polyethene to ground level and fill with clean topsoil.

5.11. Installation of 'no-dig' surface

5.11.1. To ensure that tree roots, within the ground under this proposed surface, continue to survive during and after construction a cellular confinement system (CCS) such a ProtectaWeb⁷ of 75-200mm depth is to be used.

5.11.2. The following example CCS spec is courtesy of Wrekin Products and shows an asphalt finish. Other surfaces can be used, and similar CCS are available from other suppliers.



- 1 Root-tex 30 geotextile
- 2 70-200mm deep ProtectaWeb tree root protection system infilled with 4/20 clean angular stone to BS EN 13242 / EN 12620
- 3 Treated timber edging (or other edging detail acceptable)
- 4 Asphalt surface to engineer's details
- 5 Soil graded to edging (if required)
- 6 Existing tree

5.11.3. Stages for Installation of the cellular confinement surface:

- 8) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 9) Dismantle TPF and re-erect in secondary location as shown on TPP
- 10) Remove existing vegetation by using a specific herbicide (as advised by a specialist) or manual removal with hand tools only. Agreed

⁷ Wrekin Products, www.wrekinproducts.com, 01543 440440.

removal of shrubs, saplings or trees, within the protected areas of retained trees are to be cut or ground out to just below ground level rather than grubbed or winched out, which can damage roots of retained trees.

- 11) Retain all original ground levels after vegetation removal. No excavation whatsoever.
- 12) Remove any existing hard surfaces (paving, tarmac etc.) Hand tools should be used if possible. If machinery is required for this operation, it must be used only on existing surfaces or outside the protection areas and tree canopies (approval from project arboriculturist must be sought before using machinery). The sub base of existing surfaces or foundations should be left in situ where possible to avoid unnecessary root disturbance and provide a base for the new surface.
- 13) Install a non-woven geotextile (such as Root-tex 30) directly over soil grade level (levelled where necessary, by non-compacted washed sand) and fix in place.
- 14) Lay the cellular system over the geotextile, which is secured open under tension during the infill process with steel staples or wooden pegs.
- 15) Install kerbs and edgings directly on top of existing soil grade level. For light structures, a treated peg and board may be acceptable. For more substantial structures, railway sleepers, haunched concrete with road pins, drilled kerbstones, gabions or cast in situ kerbs will be appropriate.
- 16) Fill the cellular system ensuring any machinery works only on already filled areas. Typical infill consists of no fines angular granular material 20-40mm, which will remain uncompacted.
- 17) Cover with a non-woven geotextile (Root-tex 30 or similar).
- 18) Install porous wearing surface.

5.11.4. Any variation to the above specification must meet the following design criteria for low-invasive surfaces to provide the conditions for continued tree survival and growth:

- Maintain oxygen diffusion through new surface to rooting area (5-12% by volume⁸)
- Maintain sufficient passage of water to the rooting area (12-40% by volume⁹)
- Avoid compaction by maintaining a soil structure sufficient to sustain root growth (soil bulk density below 1.4g/cc¹⁰).

5.11.5. Site analysis of the soil type and its structural characteristics will be required prior to determining the specific depth of products to be adopted for example, footpaths normally require a depth of 75mm and, 100mm to 200mm depths are used for residential driveways, while greater depths may be required for the passage of heavier traffic such as for construction access and delivery vehicles.

5.11.6. If ground levels are to be raised more than 150mm this should be achieved by the use of a granular material, which does not inhibit vertical gaseous diffusion. For example no-fines gravel, washed aggregate, structural soil (min. 20% sand content) or cobbles.

LIMITATIONS OF USE AND COPYRIGHT

All rights in this report are reserved. No part of it may be reproduced or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, or stored in any retrieval system of any nature, without our written permission. Its content and format are for the exclusive use of the addressee in dealing with Churchview Road, Twickenham. Until all invoices rendered by ACD Environmental to the Client have been paid in full, the copyright of any documents, forms, statements, maps, plans and other such material will remain vested in ACD Environmental and no unauthorised use of such material may be made by the Client or any person purporting to be acting on his/her behalf. It may not be sold, lent, hired out or divulged to any third party not directly involved in this site without the written consent of ACD Environmental ©

⁸ Smith, R. J. (2006). *Tree Roots in the Built Environment*. HSO

⁹ Coder, D. K. (2000). *Tree Root Growth Requirements*. University of Georgia

¹⁰ Harris, C. M. (2004). *Arboriculture, Tree Management of Shade Trees and Vines*.

Appendix 1: Tree Categories Explained

BS5837:2012 Table 1 - Cascade chart for tree quality assessment			
Category and definition	Criteria (including subcategories where appropriate)		
Trees unsuitable for retention (see Note)			
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	*Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) *Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline *Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality <i>NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.</i>		
	1 Mainly arboricultural qualities	2 Mainly landscape qualities	3 Mainly cultural values, including conservation
Trees to be considered for retention			
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value

Appendix 2: Tree Survey Schedule

Tree Survey Schedule

No.	Name	Ht (crown)	Dia (stems)	Crown spread (NESW)	Life stage	ERC	Comments & preliminary recommendations	BS Cat
T1	Ilex aquifolium (Holly)	4.5(1)	150(1)	2, 2, 2, 2	EM	10+	Small with limited current landscape value.	C1
T2	Ligustrum lucidum (Chinese Privet)	3(0)	60(2)	1, 1, 1, 1	EM	10+	Small with limited current landscape value.	C1
T3	X Cupressocyparis leylandii (Leyland Cypress)	4(2)	320(1)	3, 3, 3, 3	EM	10+	Small with limited current landscape value. Heavily crown reduced.	C1
T4	Corylus avellana (Hazel)	6(2)	80(6)	3, 3, 3, 3	M	10+	Plotted by eye on plan. No obvious significant defects. Off-site and inaccessible: diameter estimated.	C1
T5	Prunus avium (Wild Cherry)	9(1)	250(1)	3.5, 3.5, 3.5, 3.5	M	20+	No obvious significant defects. Moderate quality and value. Off-site and inaccessible: diameter estimated.	B1
G6	Crataegus monogyna (Hawthorn), Corylus avellana (Hazel), Acer campestre (Field Maple)	6(1)	200(1)	As shown on plan	M	20+	Off-site and inaccessible: diameter estimated. off-site group	B2
T7	Fraxinus excelsior (Ash)	19(3)	300(1)	6, 6, 6, 6	M	20+	Moderate quality and value. Unable to inspect stem due to Ivy. Ivy in crown. Off-site and inaccessible: diameter estimated.	B1
T8	Quercus robur (Common Oak)	8(0)	400(1)	5.5, 5.5, 5.5, 5.5	EM	20+	Diameter is estimated average.	B1
T9	Crataegus monogyna (Hawthorn)	4(2)	250(1)	2, 2, 2, 2	M	<10	Diameter measured over ivy. Heavily ivy clad Recommendations: Remove tree prior to development.	U
T10	Fraxinus excelsior (Ash)	16(2)	550(1)	5, 5, 5, 5	M	20+	No obvious significant defects. Unable to inspect stem due to Ivy. Ivy in crown. Off-site and inaccessible: diameter estimated.	B1

Notes: Dia (stems): trunk diameter in mm at 1.5m above ground level (number of stems) | **HT (crown)**: Tree height (crown clearance) | Life stage: Y: Young (obviously planted within the last three years (unless as a heavy or extra-heavy standard)). SM: Semi-mature (recently planted and yet to attain mature stature; up to 25% of attainable age.). EM: Early mature (almost full height, crown still developing and seed bearing; up to 50% of attainable age.). M: Mature (full height, crown spread, seed-bearing; over 50% of attainable age.). OM: Over mature (full size, die-back, small leaf size, poor growth extension.). | **FSB**: First significant branch (& compass bearing) | ERC: Expected remaining contribution in years- <10, 10+, 20+, 40+ (assuming that there will be no physical changes to its immediate environment.) | BS Category: Refer to appendix 1 of this report or BS5837:2012 Table 1 for detailed descriptions.

No.	Name	Ht (crown)	Dia (stems)	Crown spread (NESW)	Life stage	ERC	Comments & preliminary recommendations	BS Cat
T11	Crataegus monogyna (Hawthorn)	4(2)	250(1)	2, 2, 2, 2	M	<10	Diameter measured over ivy. Heavily ivy clad Recommendations: Remove tree prior to development.	U
T12	Crataegus monogyna (Hawthorn)	4(2)	250(1)	2, 2, 2, 2	M	<10	Diameter measured over ivy. Heavily ivy clad Recommendations: Remove tree prior to development.	U
T13	Crataegus monogyna (Hawthorn)	4(2)	250(1)	2, 2, 2, 2	M	<10	Diameter measured over ivy. Heavily ivy clad Recommendations: Remove tree prior to development.	U
G14	Fraxinus excelsior (Ash)	8(2)	130(1)	3.5, 3.5, 3.5, 3.5	SM	10+	No obvious significant defects. Small with limited current landscape value. Off-site and inaccessible: diameter estimated.	C2
T15	Fraxinus excelsior (Ash)	7(3.5)	800(1)	1.5, 1.5, 1.5, 1.5	M	10+	Diameter measured over ivy. Monolith stump Recommendations: Remove tree prior to development.	U
T16	Chamaecyparis lawsoniana (Lawson Cypress)	10(3.5)	430(1)	2.5, 2.5, 2.5, 2.5	M	20+	No obvious significant defects. Moderate quality and value.	B1
T17	Crataegus monogyna (Hawthorn)	7(1)	250(1)	3.5, 3, 3, 3	M	10+	No obvious significant defects. Moderate quality and value. Ivy on stem. Diameter estimated due to undergrowth.	C1

Notes: Dia (stems): trunk diameter in mm at 1.5m above ground level (number of stems) | **HT (crown)**: Tree height (crown clearance) | Life stage: Y: Young (obviously planted within the last three years (unless as a heavy or extra-heavy standard)). SM: Semi-mature (recently planted and yet to attain mature stature; up to 25% of attainable age.). EM: Early mature (almost full height, crown still developing and seed bearing; up to 50% of attainable age.). M: Mature (full height, crown spread, seed-bearing; over 50% of attainable age.). OM: Over mature (full size, die-back, small leaf size, poor growth extension.). | **FSB**: First significant branch (& compass bearing) | ERC: Expected remaining contribution in years- <10, 10+, 20+, 40+ (assuming that there will be no physical changes to its immediate environment.) | BS Category: Refer to appendix 1 of this report or BS5837:2012 Table 1 for detailed descriptions.

Appendix 3: Tree Protection Plan

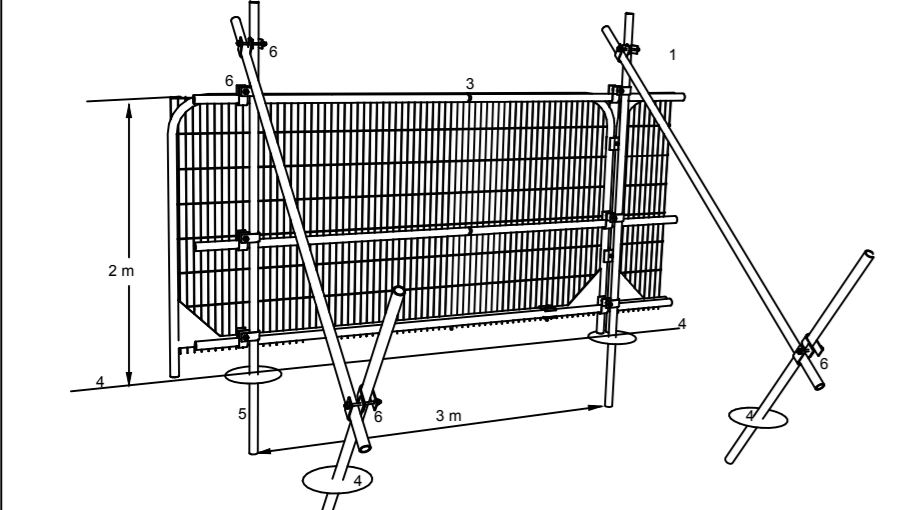
PRI21193-03A

CONSTRUCTION EXCLUSION ZONE
 Root protection areas (RPA) of retained trees within which all construction activity is restricted.

All trees that are being retained on site must be protected by barriers and/or ground protection before any materials or machinery are brought onto the site, and before any demolition, development or stripping of soil commences. Where all activity can be excluded from the RPA, vertical barriers must be erected to create a construction exclusion zone. Where, due to site constraints, construction activity cannot be fully or permanently excluded in this manner from all or part of a tree's RPA, appropriate ground protection can be installed.

DEFAULT POSITION FOR THE TREE PROTECTION BARRIERS.

BS5837:2012 Figure 2- barrier specification

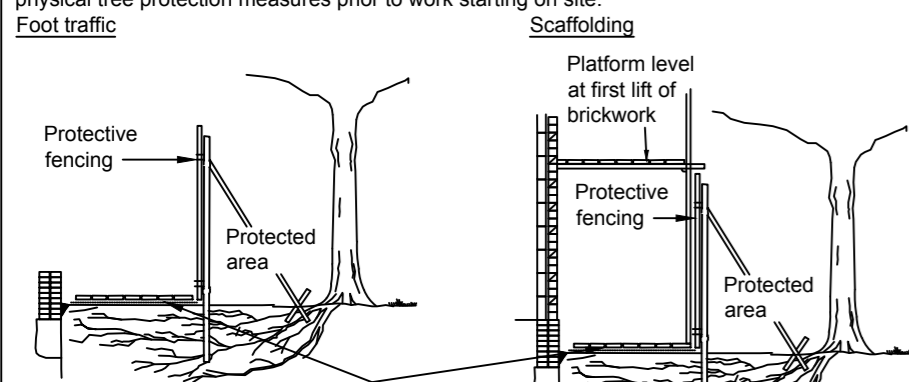


Examples of alternative barrier designs can be found in the method statement. Should an alternative design be more viable and appropriate, it must be agreed with the project arboriculturist before its implementation.

GROUND PROTECTION
 Where the set-back of the tree protection barrier would expose unmade ground to construction damage, new temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site.

Foot traffic
 Protective fencing
 Protected area

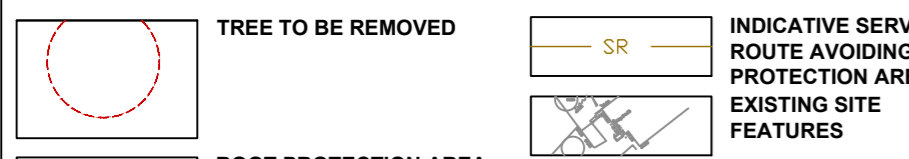
Scaffolding
 Platform level at first lift of brickwork
 Protective fencing
 Protected area



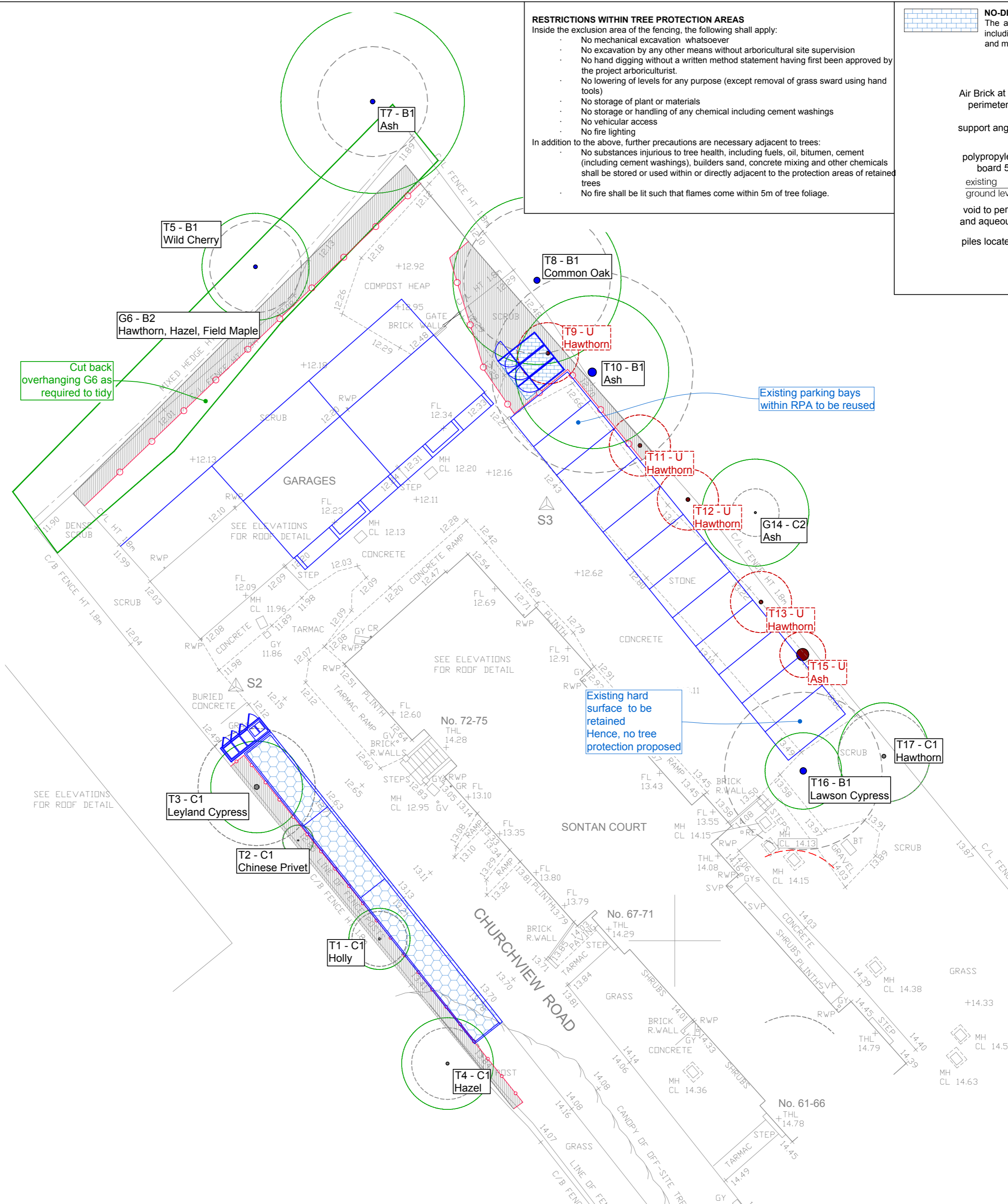
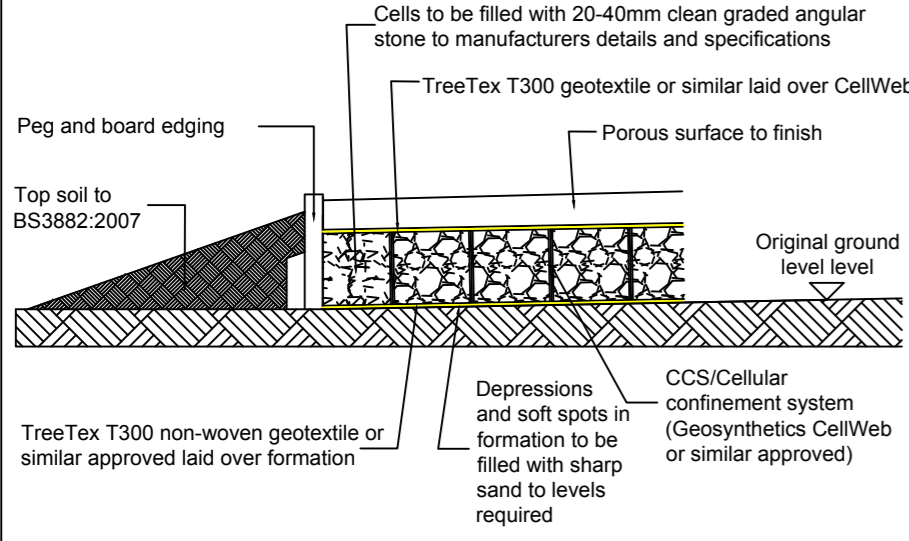
For pedestrian movements only, a single thickness of scaffold boards should be placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile.

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

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



NO-DIG SURFACE
 Cellular confinement system (CCS) to be used to create this area of hard surface, above the existing ground level. Topsoil to be retained. Depth of CCS to be 50-75mm for pedestrian surfaces and 100-200 for vehicular surfaces. Surface to be porous to approved details and specifications. To be installed under arboricultural supervision. All specifications subject to engineering design.

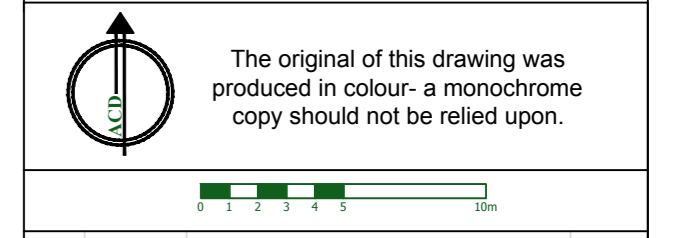
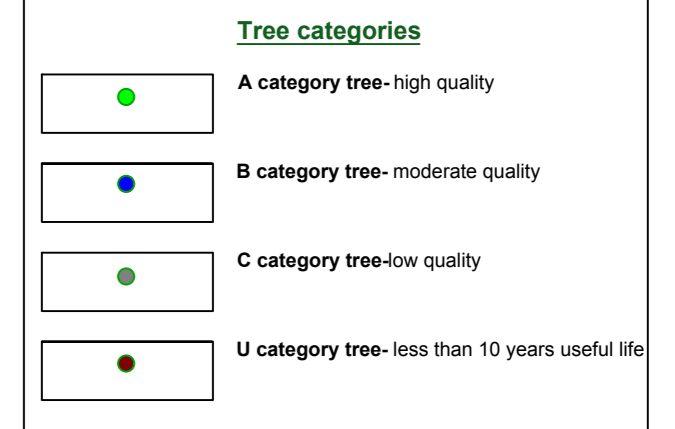
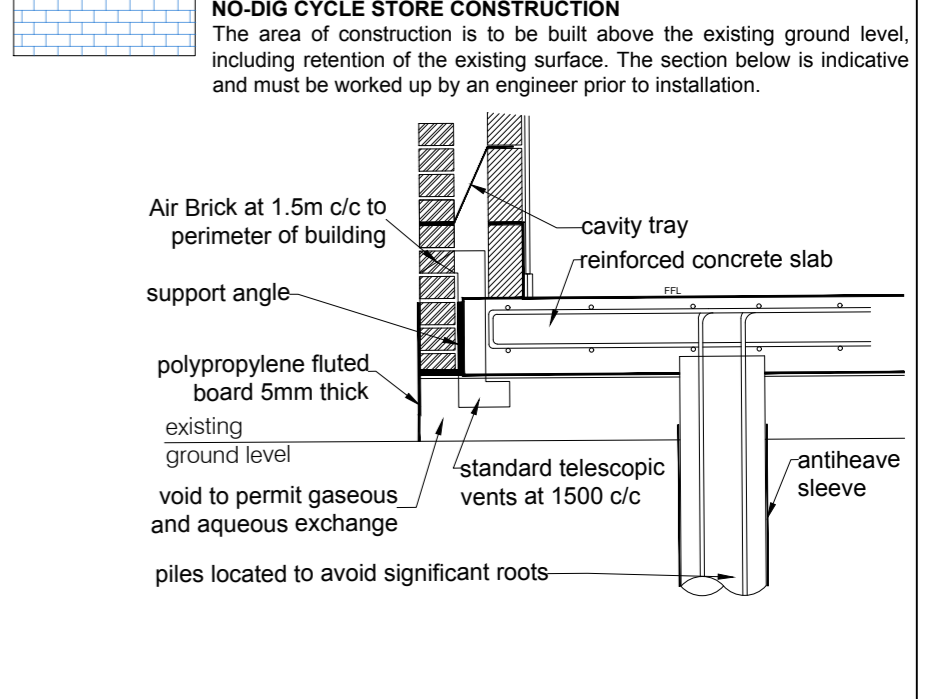


RESTRICTIONS WITHIN TREE PROTECTION AREAS
 Inside the exclusion area of the fencing, the following shall apply:

- No mechanical excavation whatsoever
- No excavation by any other means without arboricultural site supervision
- No hand digging without a written method statement having first been approved by the project arboriculturist.
- No lowering of levels for any purpose (except removal of grass sward using hand tools)
- No storage of plant or materials
- No storage or handling of any chemical including cement washings
- No vehicular access
- No fire lighting

In addition to the above, further precautions are necessary adjacent to trees:

- No substances injurious to tree health, including fuels, oil, bitumen, cement (including cement washings), builders sand, concrete mixing and other chemicals shall be stored or used within or directly adjacent to the protection areas of retained trees
- No fire shall be lit such that flames come within 5m of tree foliage.



Rev	Date	Details	Drawn
A	14.02.2019	Layout revision	MW

ACD ENVIRONMENTAL

HEAD OFFICE
 Rodbourne Rail Business Centre, Grange Lane,
 Malmesbury, SN16 0ES
 Tel: 01666 825646

Courtyard House, Mill Lane, Godalming, GU7 1EY
 Tel: 01483 425714

Suite 6, Crescent House, Yonge Close, Eastleigh, SO50 9SX
 Tel: 02382 026300

9 Brownlow Road, Cambridge, CB4 3NG
 Tel: 07825 868654

Copyright of ACD. All rights described in Chapter IV of the Copyright, Designs and Patents Act 1988 have been generally asserted. 2017. Copyright of this plan remains with ACD until all fees have been paid in full.

scheme: Churchview Road
 Twickenham
 client: UK & European Property
 Developments Ltd
 drawing: Tree Protection Plan
 date: May 2017
 scale: 1:200@A2
 dwg no: PRI21193-03A
 drawn: MW checked: RA



Head Office

Rodbourne Rail Business Centre
Grange Lane
Malmesbury
SN16 0ES
Tel: 01666 825646

Surrey Office

Courtyard House
Mill Lane
Godalming
GU7 1EY
Tel: 01483 425714

Hampshire Office

Suite 6
Crescent House
Yonge Close
Eastleigh
SO50 9SX
Tel: 02382 026 300

Cambridgeshire Office

9 Brownlow Road
Cambridge
CB4 3NG
Tel: 07825 868654

Email: mail@acdenv.co.uk

Website: www.acdenvironmental.co.uk

**ECOLOGICAL SURVEYS * PROTECTED SPECIES LICENSING * MITIGATION * IMPACT ASSESSMENT
ARBORICULTURAL SITE MONITORING AND SUPERVISION * ARCHAEOLOGY
LANDSCAPE & VISUAL IMPACT ASSESSMENT * LANDSCAPE AUDIT * PROJECT MANAGEMENT
EXPERT WITNESS* LANDSCAPE DESIGN & PLANNING LANDSCAPE MANAGEMENT**