

**ARBORICULTURAL IMPACT ASSESSMENT
LAND AT REAR OF 18 DENMARK STREET,
LONDON N17 0JL.
JUNE 2022**



ARBORICULTURAL CONSULTANTS

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SUMMARY

The purpose of this report is to provide a consideration of the arboricultural implications of the construction of a new residential development comprising six homes and associated open space. Trees considered to be within the influencing distance of the development have been assessed in accordance with BS5837:2012 "Trees in relation to design, demolition and construction – Recommendations". I have inspected all the trees on and near the site that could potentially be affected by the development and list their details in Appendix A. The implications of the proposal are:

1. There are no tree removals required to facilitate the development.
2. Tree 4 within the rear garden of 10 Denmark Street and one stem of tree 5 within the rear garden of 11 Denmark Street are dead and will require removal regardless of the proposed development.
3. There are some construction works required within the circular representation of the root protection area of tree 1 (Sycamore). Once the layout of the development is agreed a tree protection plan and construction method statement can be produced.
4. The trees will be protected in accordance with BS 5837:2012 specifications throughout the development.

1. Introduction

1.1. Instructions

1.1.1. We are instructed inspect and report on trees growing in the vicinity of the application site. We are to report on their current condition, amenity value, suitability for retention and comment on any potential impacts on the trees from proposed development and provide guidance on any necessary tree protection.

1.2. Drawings and Documents

1.2.1. We can confirm sight of the following documents and drawings:

- Site Survey. Drawing number 8180978/4101 Rev A at scale 1:100@A1 dated January 2019.
- Satish Jassal Architects Planning Documents.

2. Report on site visit

2.1. General

2.1.1. The site was inspected on 10th June 2022 by F. Critchley of Arboricultural Solutions LLP. All arboricultural data contained in this report was recorded at that time.

2.1.2. The relevant data was recorded to assess the condition of the tree, its potential constraints on the proposed development and the protection and construction measures required to ensure its long-term retention.

2.1.3. Information is given on condition, size and indicative positions in accordance with British Standard 5837:2012 *Trees in relation to design, demolition and construction – Recommendations*.

3. Tree inspection and methodology

3.1. Inspection

3.1.1. Trees likely to be affected by the development were identified and inspected from ground level only. The trees were inspected based on the Visual Tree Assessment (VTA) method as proposed by Mattheck and Breloer (1994) and were not climbed. No invasive examination technique (such as increment boring, or internal decay detection) was carried out. As the inspection was visual only, no guarantee, either expressed or implied, of the internal condition of the wood of these trees can be given.

3.2. Marking

3.2.1. The site survey provided was converted for use in Arbortrail tree data collection software. Crown measurements were taken using a laser rangefinder (Leica Disto D510). The

trees surveyed were referenced with a number corresponding to the particular tree on the site plan.

3.2.2. Each reference number refers to a survey sheet entry completed on site to show the following data:

- Sequential tree reference number (recorded on tree survey plan).
- Species - Common name followed by the Latin name for the first entry of each different species.
- Height in metres.
- Trunk diameter in millimetres, measured in accordance with Annex C of BS 5837:2012.
- Crown radius measured at the four cardinal points – where only one measurement is given, the crown is symmetrical.
- First significant branch height and direction of growth.
- Crown clearance above ground level.
- Life stage (young, semi-mature, early mature, mature, over-mature, veteran).
- General observations, particularly of structural and/or physiological condition, and/or preliminary management recommendations.
- Estimated remaining contribution in years (less than 10, 10+, 20+, more than 40).
- Category U or A to C grading, to be recorded on the tree survey plan.

3.2.3. Survey sheet entries are shown at Appendix A of this report.

3.3. Tree categorisation

3.3.1. Trees vary in, size, age, and landscape importance. All trees were categorised in accordance with the British Standard Trees in relation to design, demolition and construction - recommendations BS 5837: 2012. BS Categories have been entered in the tree schedule and are as follows:

U – Trees unsuitable for retention - Trees 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.

A - High Category - Trees of high quality with an estimated remaining life expectancy of at least 40 years.

B - Moderate Category - Trees of moderate quality with an estimated remaining life expectancy of at least 20 years.

C - Low Category - Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm.

3.3.2. The existing site plan was edited to produce a Tree Constraints Plan (TCP_18DENMARKST_1 Rev A) showing the constraints on the existing site layout. Once the layout of the development is finalised this information can be overlaid on the proposed layout and a tree protection plan produced.

3.3.3. The root protection areas (RPA) have been calculated using Trees in Relation to Design, Demolition and Construction - recommendations BS 5837: 2012 (refer to Appendix A). The RPAs of trees implicated in the design proposal have not been adjusted in shape to take into account the existing or past site conditions such as the presence of buildings, boundary

walls or hard surfacing. Whilst the presence of boundary walls and buildings may restrict root spread, hard surfaces such as tarmac/paved footpaths are likely to have roots present beneath them but at a reduced volume. In this case, the trees are growing within the rear gardens of the neighbouring properties close to hard surfacing and buildings. The full RPAs have been retained to show the areas where special precautions are required to prevent potential damage to the roots.

3.3.3. The trunk diameter circle and crown outline show the BS Category in the following colours:

Category U	Dark red
High Quality (A)	Light green
Moderate Quality (B)	Mid-blue
Low Quality (C)	Grey

3.3.4. Trees in Relation to Design, Demolition and Construction - Recommendations BS 5837: 2012 do not include arguments for or against development, or for the removal or retention of trees. Where development is likely to occur, the standard provides guidance on how to decide which trees are appropriate for retention.

4. Brief Site Description

4.1. General

4.1.1. The proposed development area is an approximately level rectangular area enclosed by the rear gardens of residential properties in Denmark Street, Park Lane, Manor Road and Chalgrove Road.

4.2. Statutory Tree Protection

4.2.1. The Town and Country Planning (Tree Preservation) (England) Regulations 2012 allows for trees either as groups, or individuals, or as woodlands, to be protected by Tree Preservation Orders (TPO). These have the effect of preventing the cutting down, topping, lopping, uprooting, wilful damage or wilful destruction of trees except in certain circumstances, other than with the consent of the local planning authority.

4.2.2. A Conservation Area is an area designated by the Local Planning Authority as one of "special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance". Special controls exist with regard to demolition and alteration of buildings; Listed Building Consent must also be obtained for any demolition, even if the building is not itself listed. Similarly, trees are given some protection with the requirement for the local authority to be given six weeks written notice before carrying out any work on trees; this gives the authority time to decide if a TPO is necessary.

4.2.3. The property does not stand within a Conservation Area and retained trees are not subject of a Tree Preservation Order.

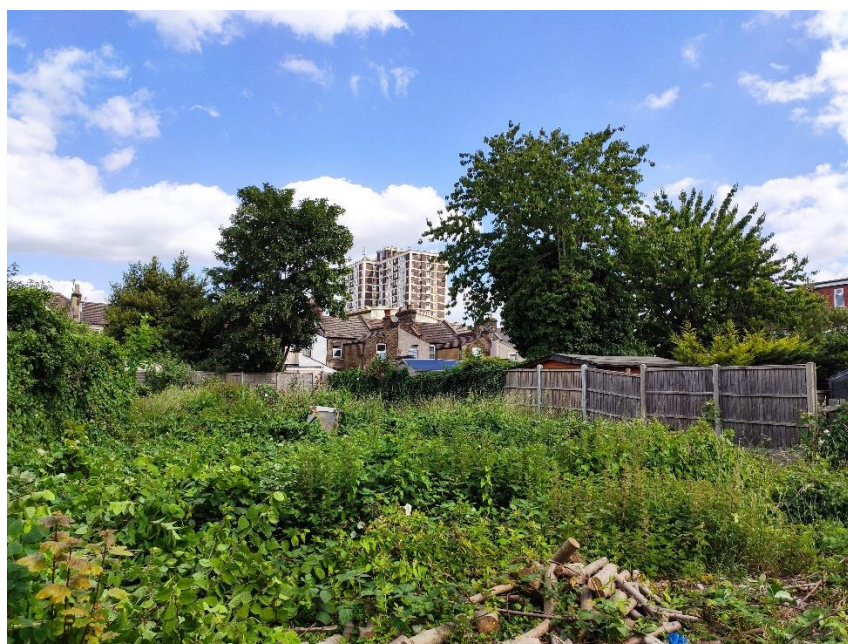
4.3. Development Proposal

4.3.1 The development proposal is for the construction of part one and two-storey buildings to provide 100% affordable housing for homeless families (Use Class C3) comprising six homes and associated open space. The proposal creates a linear terraced housing over two floors, with first floor gaps every two homes.

4.3.2. This report has been produced to reflect the current design layout and the potential impacts on the tree population. Where significant conflicts exist, the removal of trees of generally good condition and landscape value may be acceptable following negotiation with the council planning department providing the submitted landscape plan has provision for high quality replacements of long-term potential.



Photograph 1 looking south across proposed development site.



Photograph 2 looking north across proposed development site.

5. Tree Population

5.1. Tree schedule

5.1.1. As noted in sections 2.1.3. and 3.2, inspection of the trees followed a defined protocol as per BS 5837:2012 to ensure a systematic and consistent approach and assessment of the condition and value of the trees.

5.1.2. Refer to appendix A of this report for updated records of the individual trees and drawing Tree Constraints Plan (drawing number TCP_18DENMARKST_1 Rev A) for the location of the tree surveyed.

Species	Total Number	Age Class	BS Category
Sycamore	1	Mature	B2
Sycamore	1	Early mature	B2
Wild Cherry	1	Mature	C2
Ash	1	Mature	U
Ash	1	Early mature	C1



Photograph 3 showing tree 1 (Sycamore) adjacent to the entrance to the development area.

5.1.3. Tree 1 is a mature Sycamore (*Acer pseudoplatanus*) located within the boundary fencing of 18 Denmark Street and the neighbouring property in Park Lane. The tree is of

average condition and normal vigour. It has been pollarded in the past and more recently managed by crown reduction. The tree has been categorised as B2 as it is a significant feature at the entrance to the proposed development and is visible from the surrounding properties.

5.1.4. Tree 2 is an early mature Sycamore within the rear garden of a property in Park Lane. It is self-set in origin and multi-stemmed at ground level. The tree is of average condition and normal vigour. This tree has been categorised as B2 on the basis of its amenity provision and life expectancy. Both trees 1 and 2 provide screening and canopy cover between the rear gardens of the properties in Park Lane and the proposed development site.



Photograph 4 showing trees 1 and 2 (Sycamore) at north end of site.

5.1.5. Tree 3 is a mature Wild Cherry within the rear garden of a property in Chalgrove Road (refer to photograph 2 above). It is a mature tree with dense Ivy growth on the trunk and extending into the crown which is prohibiting the inspection. The tree is of average condition but may be declining in vigour as the crown of the tree appears to be becoming sparse. It has been categorised as C2 based on its current condition and life expectancy. However, the tree does provide screening and canopy cover between the rear gardens of the properties in Chalgrove Road and the proposed development site.

5.1.6. Tree 4 is a mature Ash tree standing within the rear garden of 10 Denmark Street. The trunk of the tree has had bark removed to 1.9 metres height and the tree is dead. This tree has been categorised as U and will require removal regardless of the proposed development.

5.1.7. Tree 5 stands within the rear garden of 11 Denmark Street. The tree is twin stemmed at ground level and the southeast stem is almost dead (refer to photograph 5 below). This stem will require removal in the near future regardless of the proposed development. The stem on the north west side appears to be healthy. The crown has been reduced in the past and is

unbalanced to the north. It has been categorised as C1 based on its current condition and life expectancy. However, the tree does provide screening and canopy cover between the rear gardens of the properties in Denmark Street and the proposed development site.



Photograph 5 showing trees 4 and 5 (Ash) on southwest side of the site.

6. Arboricultural Impact Assessment

6.1. Impact on Trees

6.1.1. Existing trees are an important factor on construction sites, whether on or near the working areas. BS5837:2012 – “Trees in relation to design, demolition and construction – Recommendations” is intended to assist decision-making with regard to existing and proposed trees in the context of design, demolition and construction. Root systems, stems and canopies, with allowance for future movement and growth, need to be taken into account.

6.1.2. BS5837:2012 - Trees in relation to design, demolition and construction – recommendations have been used to calculate the RPAs. It should be noted that this method is primarily used to calculate the volume of soil required to maintain healthy growth based on the trunk diameter of the tree. In practice, roots may extend beyond this area, and in some cases the spread may be less. The majority of a tree's root system is generally

considered to be in the top 600mm of the soil, extending radially in any direction for distances frequently in excess of the tree's height.

6.1.3. The trees surveyed are all within the neighbouring rear gardens and so will be protected and retained during the development. Once the layout of the development is agreed a tree protection plan and construction method statement can be produced.

6.2. Tree Protection Plan (TPP)

6.2.1. The TPP illustrates the location of the protective barriers and must be displayed on site in a highly visible area so that all staff involved in the works have a point of reference for tree protection issues.

6.3. Construction Exclusion Zone (CEZ)

6.3.1. For the purpose of this report the CEZ can be defined as all the area within the RPAs of retained trees outside the work areas and the areas behind the tree protection fencing.

6.3.2. Site operations are not permitted in the CEZs without reference to the Arboricultural Method Statement in this report (refer to section 8 of this report).

7. Development

7.1. Threats to trees during development

7.1.1. These may be listed, in general terms as:

- Compaction of ground
- Covering rooting areas with impervious surfaces
- Excavations for foundations
- Excavation for service runs
- Alterations in ground level
- Access and movement of machinery
- Need for temporary site storage
- Crown damage by passage of high-sided vehicles

7.1.2. British Standard 5837 (1991) 'Trees in relation to construction' provided useful guidance for the assessment and formulation of measures for the mitigation of such threats. Using the experience gained from this Standard, it was revised and upgraded to 'Recommendation' status as British Standard 5837 'Trees in Relation to Construction' (2005). This British Standard was withdrawn on 30th April 2012 and replaced with Trees in Relation to Design, Demolition and Construction - Recommendations BS 5837: 2012. To assist in the prediction of the likely impact of development on retained trees, a model is used. This model is based on the age, vitality and size of individual specimens.

7.1.3. The British Standard relies heavily on the creation of a protected zone (RPA) around each tree. This area should be protected from disturbance "in order to avoid unacceptable

damage to the tree as a result of severance or asphyxiation of the root system." The recommended minimum area (m²) for each tree to avoid potentially harmful disturbance have been calculated for all the trees on site and entered into the tree schedule (appendix A).

7.1.4. BS 5837: (2012) acknowledges that the shape of the tree root system may be affected by several factors and that the shape of the RPA should reflect this. Any deviation in the RPA from the original circular plot should take 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 present existing site conditions (e.g. the presence of roads, structures and underground apparatus).
- b) Topography and drainage.
- c) Likely tolerance of the tree to root disturbance or damage based on factors such as species, age, condition and past management.

7.2. Root Damage

7.2.1. Trees that are growing satisfactorily have achieved equilibrium with their surroundings. Any construction work that affects this equilibrium could be detrimental to health, future growth and the safety of the tree.

7.2.2. The part of the tree most susceptible to damage is the root system, which, because it is not immediately visible, is frequently ignored. Damage or death of the root system will affect the health, growth, life expectancy and safety of the rest of the tree. The effects of such damage may only become evident several years later.

7.2.3. The majority of a tree's root system is generally considered to be in the top 600mm of the soil, extending radially in any direction for distances frequently in excess of the tree's height. However, roots are adventitious and if conditions suitable for root development exist to a greater depth, the roots may extend to depths of three metres or more. Works within the root spread may damage the root system.

7.2.4. Close to the trunk are the main structural roots that develop in response to the tree's need for structural stability. Beyond these major roots, the root system rapidly subdivides into smaller diameter roots; off this main system a mass of fine roots develops.

7.2.5. Tree root systems can be damaged in a number of ways during construction works.

- **Root severance.** Severing of a root will destroy all parts of the root beyond that point. Even roots less than 10mm diameter may be serving a mass of fine roots over a large area. The larger the root severed, the greater the impact on the tree.
- **Damage to root bark.** The bark protects the root and is essential for further root growth; it is loosely attached and easily damaged. If damage extends around the whole circumference, the root beyond that point will be killed.

- **Compaction of the soil.** Compaction of the ground reduces the space between soil particles, particularly in clay soils. A single passage of heavy equipment or the storage of materials can cause significant damage. Compaction can restrict or even prevent gaseous diffusion through the soil and thereby asphyxiate the roots. The roots must have oxygen for survival, growth and effective functioning.
- **Alterations in ground levels.** Lowering the level will strip out the mass of roots near to the surface. Raising the ground levels will have the same effect as compaction.
- **Covering the rooting area with impervious surfaces.** This prevents natural diffusion of gases between the soil and the atmosphere and can lead to oxygen depletion in the soil.
- **Direct toxicity of some materials.** For instance, petrol or diesel spillage or lime in cement can kill underlying roots.
- **Wounding.** Minor wounds to root bark can allow pathogens into the tree root system that can lead to a further impairment of water absorption. The general debilitation of trees due to root severance can make them more susceptible to invasion by some decay fungi such as *Armillaria* spp.
- **Damage to the fine roots** by severance of a main root, or by compaction, or by alteration of levels, will prevent the fine roots absorbing the water and nutrients essential for tree growth. The effects of damage from different causes will be cumulative.

7.2.6. The effects of tree root damage may not be immediately apparent. If the root system is capable of rapid regeneration, the tree may recover without noticeable ill effects, though usually symptoms take several years to develop. The range of symptoms varies from minor branch dieback, to deterioration and ultimate tree death depending on the severity of the damage and the ability of the roots to regenerate.

7.2.7. The default position should be that structures are located outside the RPAs of trees that are to be retained. The cumulative effects of incursions into the RPA e.g. from excavations for utility apparatus are damaging and should be avoided. Where there is evidence that a tree has been previously subjected to damage by construction activity this should be taken into account when considering the acceptability of further activity within the RPA.

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APPENDIX A TREE SCHEDULE 18 DENMARK STREET, LONDON N17 0JL.

Tree No.	Species	Height (m)	Stem No.	DBH (mm)	Crown radius (m)				Lower crown height (m)	Life stage	Condition Comments	Est. Rem'ing contrib'n	BS Cat	RPA (m ²)	RPA as circle of radius (x)m
					N	E	S	W							
1	Sycamore	13	1	520	6.3	6	6.2	5.4	1.7	M	Rooted in boundary fencing. Self-set tree. Average condition. Normal vigour. Lapsed pollard. Roots lifting surfacing. Occluded wounds on trunk. Previously crown reduced. Decay pockets in pruning wounds. Branches encroaching upon building. Screen value. Appropriate to location. Contributes to general amenity of area. Some landscape amenity value.	40+	B2	122.3	6.24
2	Sycamore	10	5	200	3	2.5	2	2.5	2	EM	Base not accessed. Diameter estimated. In neighbouring property. Self-set tree. Average condition. Normal vigour. Multiple stems at ground level. Screen value. Contributes to low level screen. Contributes to general amenity of area.	40+	B2	18.1	2.4

Tree No.	Species	Height (m)	Stem No.	DBH (mm)	Crown radius (m)				Lower crown height (m)	Life stage	Condition Comments	Est. Rem'ing contrib'n	BS Cat	RPA (m²)	RPA as circle of radius (x)m
					N	E	S	W							
3	Wild Cherry	9	2	500	5.5	5	4	4.5		M	Plotted by eye on plan. Diameter estimated. In neighbouring property. Base not accessed. Self-set tree. Declining condition. Unable to inspect stem due to Ivy. Stem divides at ground level. Crown becoming sparse. Crown not over site. Dense Ivy growth into crown. Screen value. Appropriate to location. Contributes to general amenity of area.	10+	C2	113.1	6
4	Ash	10	1	420	5.5	5.5	3	6.5		M	In neighbouring property. Dead. Leaning West. Bark removed from trunk to 1.9m	<10	U	79.8	5.04

Tree No.	Species	Height (m)	Stem No.	DBH (mm)	Crown radius (m)				Lower crown height (m)	Life stage	Condition Comments	Est. Rem'ing contrib'n	BS Cat	RPA (m²)	RPA as circle of radius (x)m
					N	E	S	W							
5	Ash	10	2	320	6.5	5.3	1	6.5		EM	Diameter estimated. In neighbouring property. Self-set tree. Declining condition. Suppressed tree. Exposed roots. Stem divides at ground level. Southeast stem is almost dead. Previously crown reduced. Rubbing branches causing damage. Light deadwood in crown. Unbalanced crown shape. Crown not over site. Screen value.	10+	C2	46.3	3.84

TREE QUALITY ASSESSMENT CASCADE CHART

Category and definition	Criteria (including subcategories where appropriate)		
Trees unsuitable for retention 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</i>	
Trees to be considered for retention	1 Mainly arboricultural qualities	2 Mainly landscape qualities	3 Mainly cultural values, including conservation
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 150 mm	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 B TREE PROTECTION GENERAL GUIDANCE

1.1. Pre-commencement site meeting.

1.1.1. A pre-commencement site meeting may be required prior to any works commencing on site, to agree all the approved processes with the relevant concerned parties.

1.2. Protective fencing and ground protection.

1.2.1. All trees to be retained on site should be protected by barriers and ground protection where applicable. Barriers should be in place before any materials or machinery is brought onto site. Once in place, barriers and ground protection should be considered sacrosanct and should not be altered or removed without prior recommendation by an arboriculturist and approval of the local planning authority. Barriers should be fit for excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). Barriers should be maintained to ensure that they remain rigid and complete.

1.2.2. The protective fencing is to be erected prior to any site works or demolition works.

1.2.3. The barrier is to comprise of a vertical and horizontal framework (Figure 1 below), well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. Weldmesh panels, such as Heras, should be securely fixed with wire or scaffold clamps to this framework. Weldmesh panels on rubber or concrete feet are not resistant to impact and should not be used. Care should be exercised when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid contact with structural roots. If the presence of underground services precludes the use of driven poles, an alternative specification should be prepared in conjunction with the project arboriculturist that provides an equal level of protection. Such alternatives could include the attachment of the panels to a freestanding scaffold support framework.

1.2.4. Where retained trees are near the existing buildings, a higher specification hoarding will be required to prevent damage from falling rubble. In place of the weldmesh, panels solid hoarding should be used, for example, scaffold boards.

1.2.5. Where the site circumstances and associated risk of damaging incursion into the RPA do not necessitate the default level of protection, an alternative specification should be prepared by the project arboriculturist and, where relevant, agreed with the local planning authority. For example, 2 m tall welded mesh panels on rubber or concrete feet might provide an adequate level of protection from cars, vans, pedestrians and manually operated plant. In such cases, the fence panels should be joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence. The distance between the fence couplers should be at least 1 m and should be uniform throughout the fence. The panels should be supported on the inner side by stabilizer struts, which should normally be attached to a base plate secured with ground pins (Figure 2 below). Where the fencing is to be erected on retained hard surfacing or it is otherwise unfeasible to use ground pins, e.g. due to the presence of underground services, the stabilizer struts should be mounted on a block tray

1.2.6. It is advised that a plan be pinned up on site in highly visible areas such as in the site huts, so that all ground staff involved in the demolition and construction works have a point of reference for tree protection issues. All demolition and construction workers should be briefed on the importance of tree protection prior to works commencing. Special attention must be paid to ensure that protective fencing remains rigid and complete during all works.

1.2.7. Where it is agreed that vehicular or pedestrian access for construction purposes is necessary within the RPA, ground protection measure will be required to prevent damage to the soil structure within the RPA.

1.2.8. For pedestrian access within the RPA, the installation of ground protection in the form of a single thickness of scaffold boards over a compressible layer laid onto a geotextile, or supported by scaffold, is likely to be acceptable.

1.2.9. For wheeled or tracked vehicle, access within the RPA the ground protection should be designed by an engineer to accommodate the likely loading and may involve the use of proprietary systems or reinforced concrete slabs. The structure must use a no dig design (see methodology described in 1.7 below) to prevent root severance and must prevent localised soil compaction by distributing the load across the track width. Such a system may include the use of three-dimensional cellular confinement systems (CCS) as a component of the sub-base, to act as a load suspension layer.

1.2.10. New permanent hard surfacing should not cover more than 20% of the RPA or be wider than 3m within it; it should be constructed to be permeable to moisture and gas.

1.3. Construction exclusion zone

1.3.1. Once the construction exclusion zone (CEZ) has been protected by barriers and/or ground protection, demolition/construction can take place.

Inside the Construction Exclusion Zone (CEZ) of the protective fencing, the following prohibitions shall apply:

- No mechanical digging or scraping
- No hand digging
- No storage of plant, equipment or materials
- No vehicular or plant access
- No fire lighting
- No washing down of vehicles or machinery
- No handling, discharge or spillage of any chemical substance, including cement washings
- No action likely to cause localised waterlogging
- No change in ground levels
- No construction of a hard surface
- No earthworks

1.3.3. To inform site personnel of the purpose of the fencing, information notices shall be fixed to the fencing at 5m intervals. These notices shall be of all-weather construction and shall be in the form of the example provided at Figure 4 below and replaced as and when necessary.

1.3.4. In addition to the above, further precautions are necessary adjacent to trees outside the CEZ:

- Materials that will contaminate the soil, e.g. concrete mixing, diesel soil and vehicle washings, should not be discharged within 10 metres of the tree stem. This should take into consideration the topography of the site and slopes to avoid materials such as concrete washings running towards trees.
- Fires should not be lit in a position where their flames can extend to within 5m of foliage, branches or trunk. This will depend on the size of the fire and the wind direction.
- Notice boards, telephone cables or other services should not be attached to any part of the tree.

1.4. Avoiding damage to stems and branches

1.4.1. Site operations should be planned to ensure that wide or tall loads or plant with booms, jibs and counterweights, could operate without coming into contact with retained trees. Mechanical damage from large plant can be significant and make their safe retention impossible. Any transit or traverse of plant in close proximity to trees should be conducted under the supervision of a banksman to ensure adequate clearance from trees is maintained at all times.

1.4.2. If the use of a tower crane is necessary, its location will be predetermined and agreed in writing by the Local Planning Authority, and its operation and movements supported by a detailed Method Statement.

1.5. Reporting damage to trees and protective fencing

1.5.1. In the event of any damage to trees scheduled for retention, the damage should be reported to the site agent immediately. The site agent shall report up the chain of responsibility to the project arboriculturist or in the absence of such an appointment to an appropriately qualified arboriculturist, to enable remedial measures to be carried out immediately and if possible.

1.5.2. Should protective fencing be damaged to impair its function, all work shall cease near the damage until the fence has been returned to standard.

1.6. Excavating in RPAs

1.6.1. All excavations must be carried out using hand tools (spades, forks and trowels) and taking care not to damage bark and wood of the roots. It is acceptable to use a pneumatic hammer carefully to break up any existing hard surface for removal. Specialist tools (air spade) may be suitable in certain situations to remove soil from around the roots. All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of the excavation. Where a mass of flexible roots is encountered, it may be possible either to displace the roots to another location temporarily or permanently to avoid areas of excavation. Exposed roots to be removed should be cut cleanly with a sharp saw or secateurs approximately 20cm back from the face of the final excavation. Roots that are exposed temporarily should be protected from drying out, direct sunlight and extremes of temperature by suitable covering. Roots greater than 2.5cm diameter should be retained where possible; roots up to 10cm diameter should only be cut in exceptional circumstances and roots greater than 10cm should only be cut after consultation with the appropriate supervising officer.

1.6.2. Working within RPAs requires a high level of care to ensure the long-term potential of the trees. Qualified supervision is vital to minimise the risk of misinterpretation. Site personnel must be properly briefed before work commences and ongoing work should be regularly inspected by an arboriculturist to confirm compliance by the contractor.

1.7. Removing Surfacing in RPAs

1.7.1. Roots are frequently found beneath or adjacent to existing surfacing or built structures and care is needed. Damage to the roots may be by direct physical damage or compaction of the soil from the weight of plant and machinery or repeated pedestrian movement. This is generally not a problem whilst surfacing is in place as the load is spread and additional protection is not required. However, once the existing surface is removed and the soil below exposed significant damage can occur to the soil structure and directly to the roots in a very short time. The following rules must be followed:

1. No vehicular activity or repeated pedestrian access into the RPAs unless on existing hard surfacing or custom designed ground protection, this must be designed for anticipated loads.
2. Regular vehicle and pedestrian access routes must be protected from compaction by temporary ground protection.
3. RPAs exposed by the works must be protected as set out in BS 5837:2012 until there is no risk of damage from construction activity

Appropriate tools for manually removing debris may include a pneumatic breaker/drill, crow bar, sledgehammer, pick, mattock, shovel, spade, trowel, fork and wheelbarrow. Secateurs and a bow saw must be available to deal with any exposed roots that have to be cut. Machines with a long reach may be used if they can work from outside RPAs or from areas protected by ground protection designed for the loading within the RPA. Debris to be removed from RPAs manually must be moved across existing hard surfacing or temporary ground protection to prevent compaction damage. If possible, leaving below ground structures in place should be considered if their removal may cause excess root disturbance.

1.8. Installation of new Surfacing in RPAs

1.8.1. New surfacing is potentially damaging to trees as it may require changes to existing levels, result in localised soil structure damage and disrupt the exchange of water and gases in and out of the soil. Mature or older trees are more sensitive to this type of damage than younger trees. Potential adverse impacts on the trees can be minimised by limiting the extent of these changes. The most suitable surface will be porous to allow the relatively free movement of gas and water and load spreading to limit compaction damage. The actual specification is an engineering issue that has to be considered in the context of the load-bearing capacity of the soil; this element requires specialised input from the appropriate professional.

1.8.2. The actual location and depth of roots is unpredictable and will only become clear once excavation starts and following the guidance in section 1.7 above. Ideally, all new surfacing in the RPAs will be no dig, but this is rarely possible on undulating surfaces. New surfacing generally requires an evenly graded sub-base which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand; this sub-base must not be compacted as in a normal installation. Some limited excavation is usually necessary to achieve this and need not be damaging to the tree if carried out with care and avoiding cutting large roots. Tree roots generally do not occupy the top 5cm of soil so the removal of a turf layer need not cause root damage. It may be possible to dig to a greater depth with care and dependant on local conditions. On undulating surfaces, finished levels must be carefully planned and flexible enough to allow on-site adjustment if excavations reveal large roots. Roots of 2.5cm diameter and less can normally be cut without a significant impact on the tree and the minimal 5cm depth can be used. If roots larger than 2.5cm diameter are encountered and it is considered inappropriate to cut them by a suitably qualified professional, the surrounding levels must be adjusted to take into account the high points by infilling with a suitable material.

1.8.3. Generally, the construction of hard surface access within the root protection area is to be that of a 'no-dig' design to avoid root loss due to excavation. In addition, the structure of the hard surface should be designed to avoid localised compaction, evenly distributing the carried weight over the track width and wheelbase of any vehicles that will use the access. The design will be based on a cellular confinement system as an integral component of the sub-base, to act as a load suspension layer.

1.8.4. The finished surface will be either a granular material, permeable and gas-porous finished surface (wearing course) to allow moisture infiltration and gaseous diffusion. It is essential to maintain adequate supplies of water and oxygen for trees through the soil. Porosity is important particularly where the new hard surface covers an area of previously unmade ground, under which tree roots may have developed preferentially.

1.8.5. No-fines granular materials should be used wherever fill or a sub-base is required to help to ensure adequate gaseous diffusion. Excess water in the root protection area should be avoided, particularly on clay soils where water logging can occur. In these cases, the hard surface should slope away from the tree to avoid ponding. Provided surface water is not liable to be contaminated by salt or toxic run-off from oil or petrol, a permeable surface should be employed.

1.8.6. Washed gravel. Washed gravel retains its porosity unless excessively consolidated, and is particularly useful where changes of level occur, or an irregular shape is needed around the stem of a tree. Gravel is easily renewed or topped up. Although weeds may become established, they can be controlled by chemical or mechanical means. However, gravel is rarely suitable for use where there is vehicle or pedestrian traffic for example, in residential areas. Materials with high fines content, such as binding gravels or hogging, should not be used due to their almost impermeable texture when consolidated.

1.8.7. Paving slabs and block pavers. Paving slabs and block pavers are available with built in infiltration spaces between the slabs or blocks. These are ideal, though they should be laid dry-jointed on a sharp sand foundation to allow air and moisture to penetrate to the rooting area.

1.8.8. Graded Soil. Sufficient spoil shall be placed along the edge of the area to receive Geoweb, suitably graded away from the works in order that it may be pulled in later. This eliminates the need to transport soil over the finished surface. The spoil (E.g. Heicom sand) shall be graded into the finished structure at the end of the scheme.

Figure 1: Tree Protective fencing

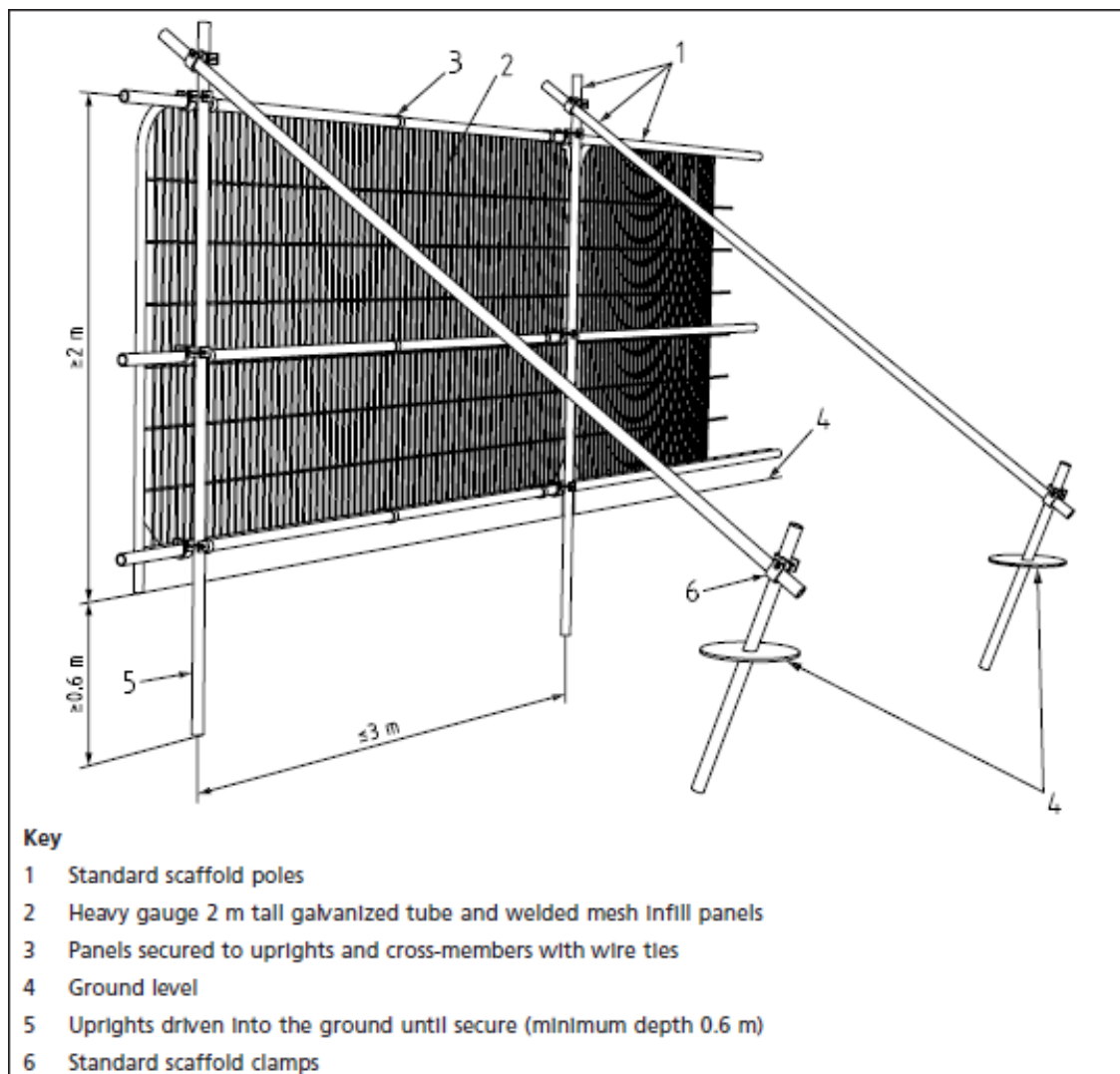


Figure 2: Tree Protective fencing (alternative)

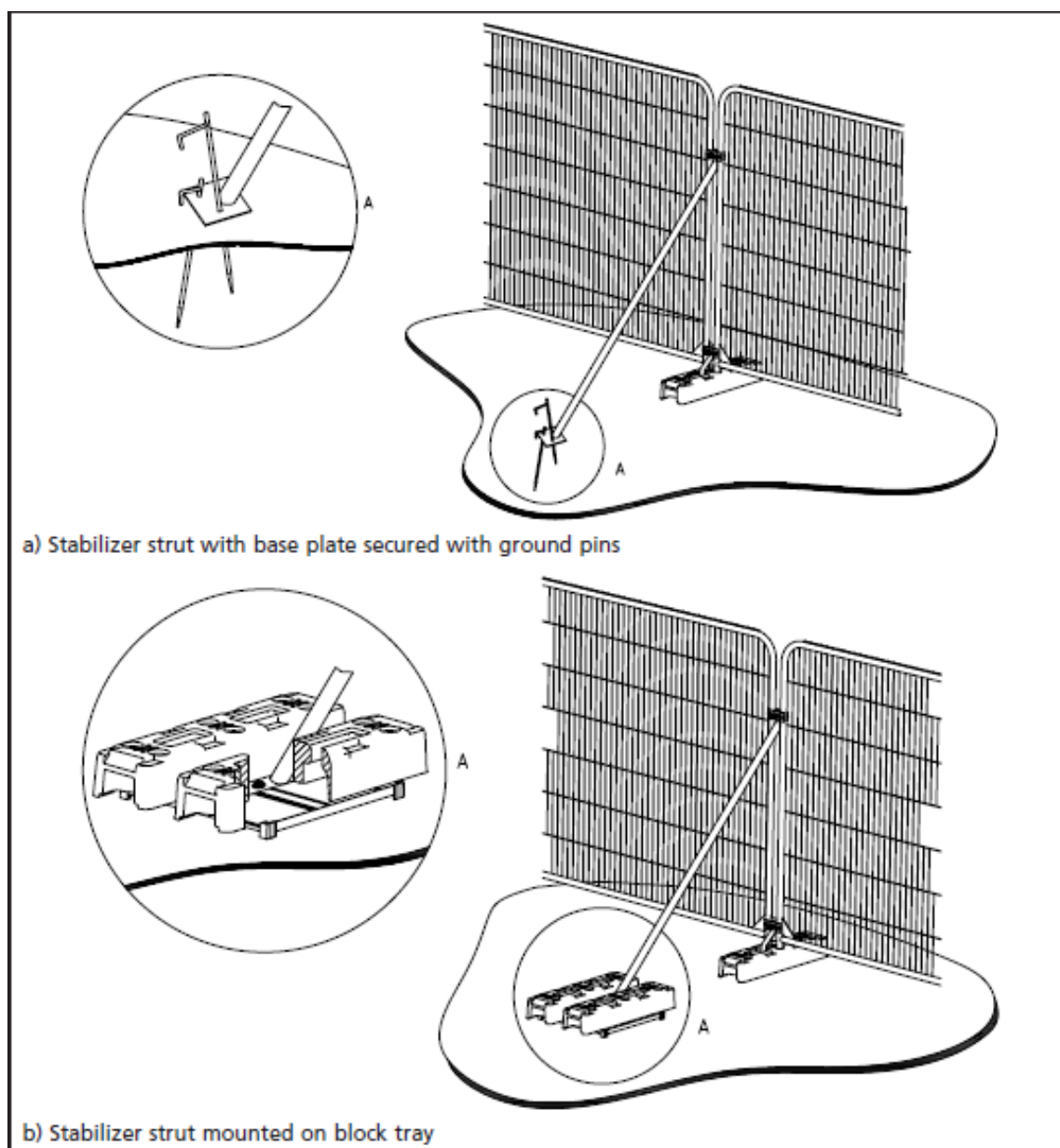


Figure 3: Example of warning notice





3 WALNUT CLOSE
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KEY

- BS CAT B
- BS CAT C
- BS CAT U
- ROOT PROTECTION AREA
- SHADE SEGMENT
- TRUNK DIAMETER

DRAWING TITLE
TREE CONSTRAINTS PLAN
EXISTING SITE

PROJECT
18 DENMARK STREET

CLIENT

SCALE	1:200@A3		
DATE OF ISSUE	JUNE 2022		
SURVEYOR	FC	DATE	
DRAWN BY	GMC		
DRAWING No.	TCP_18DENMARKST_1	REV	A
DATE		REVISION	

