

BS5837 Arboricultural Impact Assessment

Land off Northmoor View, Brimington, S43 1NN

For: Vistry Homes

Date: 04/11/2020

Reference: BA10077AIA



VALIDATION STATEMENT FOR LPA REGISTRATION

This report contains information relating to the proposed development of Land off Northmoor View, Brimington, S43 1NN

For Local Planning Authority (LPA) validation purposes, this report contains the following:

- An **Arboricultural Impact Appraisal** of the proposed development, detailing trees to be retained and the proposed protection measures (Impact Appraisal).
- Appended information on trees and protection methods (Appendices)

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SUMMARY OF TREE INFORMATION

The Proposal. This arboricultural impact appraisal accompanies the planning application for the scheme for 150 units on Land off Northmoor View, Brimington, S43 1NN.

This scheme has been informed by the current land use and the presence and condition of the trees, with some tree losses to be sustained.

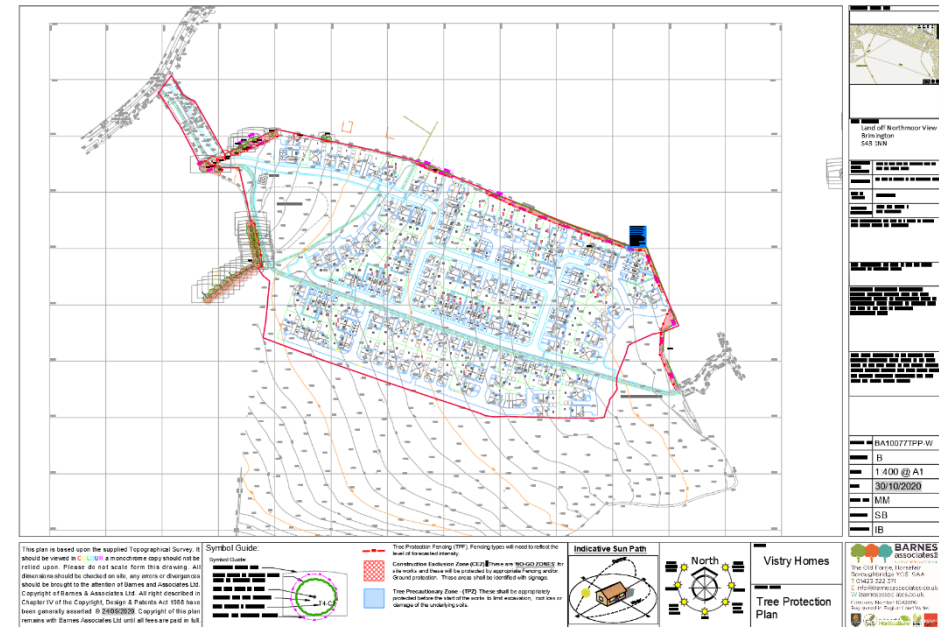
This assessment considers the potential conflicts with existing trees, which are detailed and shown on the Implication Assessment Plan - in Appendix F.

Tree Information. This impact assessment is based upon our Tree Assessment reference BA10077TS, which includes information on the trees condition and minimum protection requirements - attached in appendix F.

The assessment shows that the trees are mostly these growing on or around the boundary and have had little or poor historic maintenance.

Tree Losses.

The scheme requires the removal of 3 trees and the further partial removal of 1 partial Group of understory scrub. The tree removals are detailed on the Arboricultural Impact Assessment plan BA10077AIA, and in total this proposes losses of 3 trees/1 partial groups for the proposal.



**3no Category 'C' individual trees to be removed.
1no Category 'C' partial group removal.**

Tree pruning to enable development: No pruning is expected to be required as part of the scheme.

Replacement Trees: No re planting scheme has been released to us as the time of this report being constructed.

Trees Protection: The scheme on the whole does not extend into root protection areas and those that do are considered minor.

Where this occurs the adoption of low impact methods of construction and protection of Root Protection areas in line with BS5837:2012, is proposed to avoid significant negative changes.

General protection can be easily achieved by erecting and maintaining Tree Protection Fencing (TPF) to restrict access close to trees.

Ground Protection where changes extend into the Root Protection Area (RPA) for the duration of the project, can be adopted.

These protection methods can, if required, be expanded upon within a conditional Arboricultural Method Statement.

Providing appropriate protection is installed the risks to trees can be controlled enabling trees to continue to screen the site to help provide separation between the site, neighbouring properties and the public realm.

IMPACT ASSESSMENT

This assessment describes how the proposal will affect trees and any impact this will have on local amenity and character.

Tree Constraints. Typically, trees can offer constraints to potential layouts. Ideally, the requirements of the trees and the proposal should be considered at the design stage. A general guide to potential tree constraints is included in Appendix B.

Limiting Damage to Trees. Care has been taken regarding the retention of the tree population by the structures being placed in the open ground and only the access to the site affecting the trees. This is a single access point for all proposed structures to minimise impact and losses of trees. Achieving successful integration has required careful consideration during the design stages and has considered the constraints offered by trees and follows the general guidelines, included in Appendix C.

General Risks to Trees. The development process does have the potential to both damage existing trees and compromise tree planting opportunities through the severance of roots or changes to the soil levels, volume or structure. A general guide to potential tree damage is included in Appendix D.

Protection of Trees. The potential for conflicts between the proposal and the existing trees do exist if protection is not in place. However, these foreseeable risks can be defended through the adoption of tree protection to help protect the RPA and maintain sufficient space to enable the confident retention of trees. In general, tree protection requires a combination of protective fencing, ground protection, and the adoption of building design, materials and techniques that can sustain normal growth, further details included in Appendix E.

Retained trees need to be considered as part of any site changes and protected from the potentially negative effects of alterations or construction. Where protection is not possible removal and replacement of a tree with a suitable landscaping scheme may help offset losses and improve the overall levels of screening and biodiversity.

Summary of the Impact on Trees and Local Character. The proposal requires the removal of loss of 3 Trees and 1 Partial group for the access of the proposal.

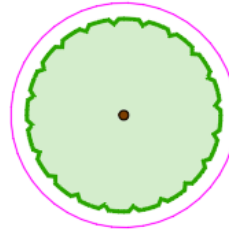
The remaining trees will require protection from alterations in ground levels and compaction of soils during the build phase and subsequent landscaping. These points can be detailed within a method statement.

The proposed changes may affect retained trees, both on and off-site if appropriate protective measures are not taken and put in place. This presents a possible risk to retained trees. However, if adequate precautions to protect the retained trees are implemented, there should be no significant impacts on the contribution of retained trees to local amenity or character of the wider setting.

Legislative Protection.

Information on Chesterfield Borough Council online search suggests the site is not protected by either preservation orders or Conservation Areas however this would need to be checked in detail prior to any operations.

Retained Trees. These trees are highlighted with a green canopy, complete with a magenta circle to indicate the minimum Root Protection Area (RPA) as shown opposite and within the Arboricultural Impact Assessment Plan - Appendix F.



Risk offered by the proposal. The principal risk to retained trees relates to the potential negative impact from compaction by vehicles, plant and whilst undertaking the scheme especially the landscape works. If services or the formation of new hard surfacing requires changes in levels, then these will require protection from potential conflicts. These conflicts are outlined below and detailed on the Implication Assessment Plan - Appendix F.

Removals to enable Development. X3 individual 'C' grade trees and x1 'C' grade partial group are required for removal as part of the scheme.



The trees for removal are shown by a red canopy and red X as shown above and within the Arboricultural Impact Assessment Plan - Appendix F. The trees to be removed are detailed in the Appendix G - Tree Management.

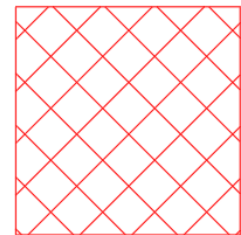
Reducing Risks to Trees. Potential conflicts between the proposal and the existing trees do exist where site levels and significant material changes extend into the Root Protection Area and protection is not used.



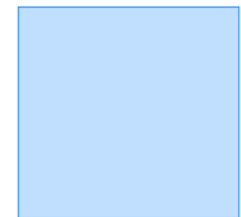
Foreseeable risks to the retained trees can be largely defened through the use of Tree Protective Fencing (TPF) outside the Root Protection Areas indicated by the magenta circle around retained trees. The location of **(TPF)** as shown above is included on the Arboricultural Impact Assessment Plan - Appendix F.

Examples of protective fencing types are included on the plan, the final choice for these barriers should be agreed within an Arboricultural Method Statement.

Fencing is to be used to define the location of **Construction Exclusion Zones (CEZ)** which are indicated by blue net hatching shown on the Arboricultural Impact Assessment Plan BA10077AIA attached as Appendix F.



Where changes are proposed close to or within the Root Protection Areas, these areas will need to be protected by establishing a **Tree Precautionary Zone (TPZ)**. These areas are indicated by blue dot hatching (shown opposite) and are shown on the Arboricultural Impact Assessment Plan BA10077AIA attached in Appendix F.



Examples of ground protection and low impact construction methods and materials are included both on the plan and in Appendix E. The final details are to be agreed within an Arboricultural Method Statement, which shall detail access and activity within the Tree Precautionary Zone.

Principally, protection of retained trees will avoid excavation and minimise soil level changes and limit access by use of Tree Protection Fencing to limit access and avoid the effects of compaction and works within these areas.

The potential conflicts from traditional 'Cut and Fill' construction can be readily defended through the adoption of lower impact methods as outlined within BS5837:2012. Techniques and materials, which limit excavation and minimise soil level or compaction changes will need to be adopted within the Tree Precautionary Zone.

The principal protection requirements are included on the Arboricultural Impact Assessment Plan BA10077AIA attached as Appendix F.

Where hard surfacing is required close to trees, BS5837:2012 and the principles of Arboricultural Practice Note 12, through the Trees to Development, AAIS 2007, [APN 12] regarding "No-Dig" surfacing will be employed, although incorporating improvements to the construction methods.

Location of Services. Services may be located within the RPA or close to retained trees, if required they should be located outside the RPA of retained trees. Where there is not an alternative and they need to enter the RPA they can be readily defended by adopting

low impact methods for installation. Ideally services that are required will be installed away from trees.

Underground services near to trees will need to be installed in accordance with the guidance given in BS5837 together with the National Joint Utilities Group Volume 4 [NJUG4]: 2007. Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees (Issue 2).

Location of gardens / landscape areas within RPA. Where RPA's of retained trees enter the proposed garden areas of the properties, these areas should be protected from compaction and level changes at all times.

Post Development Pressure. Considering the layout, there is expected to be excessive shading or leaf litter to cause additional conflict to property owners or seasonal nuisance from shading and should not oblige the council to give consent for inappropriate tree works.

Conclusion. Although the scheme does require the removal of trees, these losses can be appropriately offset through mitigation tree planting and other landscape improvements if a planting scheme is developed.

Considering the size of the site and available green space a landscaping scheme can offer significant improvement the overall visual impact for receptors from the public footpath and highways is negligible.

Retained trees will need to be considered as part of the site and protected at every stage of the scheme from the potentially

negative effects of groundworks and construction.

Foreseeable risks to the retained trees can be readily defended through the creation of Construction Exclusion Zones which will restrict access to the Root Protection Areas.

Where access into these areas is required, protection of the ground can be achieved through the establishment of Tree Precautionary Zones as detailed on the Arboricultural Impact Assessment Plan - Appendix F.

Providing access around the trees can be controlled and the construction methods acknowledge the requirements of the retained trees, there are no significant arboricultural restrictions in respect of the proposal.

I conclude that a proposal to develop this site should be relatively straightforward and pose a manageable risk to the retained trees, providing appropriate protection methods are adopted.



Matt Metcalfe- Surveyor.
FdSc Arboriculture
Professional member Arboricultural Association
VALID Tree Risk Validator.

APPENDICES

APPENDIX A - CONSULTANT BRIEF QUALIFICATIONS AND EXPERIENCE

Mr Ian Barnes - Director

RCArbor.A, F.Arbor.A, C.Hort, CEnv,

Arboricultural Association Registered Consultant, Fellow Arboricultural Association, Chartered Horticulturalist, Chartered Environmentalist.

Professional member Consulting Arborist Society.

BSc (Hons) Arb. HND Arboriculture, NDHT/Arb, Tech.Cert (ArborA), ISA TRAQ Qualified, QTRA Licensed

Ian has been in the horticulture and Arboricultural industry since 1985, he has experience in commercial horticulture, local authority and highway authority tree surveying. He has been a commercial Arboricultural climber. He ran in partnership a tree and landscape contracting business for over 15 years. He has been a full time Arboricultural consultant since 2007. His main area of works are trees and development (BS5837) and advanced tree assessments using various advanced techniques. He is also director of a hi-tech arborist/ landscape equipment and training company Tree Diagnostics Ltd providing training in advanced assessments.

Mrs Sue Barnes- Director

CMLI, F.Arbor.A, C.Hort, CEnv, MBALI

Chartered Landscape Architect, Fellow Arboricultural Association, Chartered Horticulturalist, Chartered Environmentalist, Registered Designer BALI

FdSc Arboriculture, NDHT/Arb

Professional Member Consulting Arborist Society, Affiliate member RIBA,

Sue has been in the horticulture / Arboricultural industry since 1986. She has experience in amenity parks and gardens and she has been a head gardener for local health authority. In partnership she ran a tree and landscape design and build company for 15 years, she has been a tree and landscape consultant full time since 2007. Her main area of works are detailed planting design and Arboricultural and landscape management.

Mr Matt Metcalfe - Consulting Arborist:

M.Arbor.A

Professional member of the Arboriculture Association, City and Guilds NPTC assessor/ Instructor, End Point Assessor.

FdSc Arboriculture, National Diploma in Arboriculture, Level 5 Certificate in Education.

VALID Tree Risk Licenced.

Matt has worked in the Arboricultural Industry since 2000. Firstly, as a climbing arborist in both the public and private sector. He became a teacher at a land-based college in York in 2009 where he taught Arboriculture at level 2/3 and then course manager in Arborist apprenticeships and internal verifier. He became a City and Guilds NPTC Assessor in 2012, in ground based and aerial Arboriculture and NPTC City and Guilds Instructor/Assessor in land-based industries. In 2018 he became a fulltime consulting arborist dealing with BS5837 surveying and provides advanced tree assessment training assistance and is a trained tree risk assessor.

APPENDIX B - TREE CONSTRAINTS

Legal constraints. Trees can be protected by planning legislation in several ways. These include being located within a National Park or on a Site of Special Scientific Interest, located within the grounds of a listed building, conservation area or by being subject to a current Planning condition. In general, the main type of protection for trees adopted by the Local Planning Authority (LPA) on potential development sites is the Tree Preservation Order (TPO).

The protection of trees is a duty of the LPA under the Town and Country Planning act 1990 and aims to encourage rational discussion and consideration of trees within the design process. The following guidelines are proposed to encourage rational discussion and consideration of trees within the design process. Legislation indicates that protection should be used to protect healthy trees that are likely to have a reasonable safe useful life expectancy. Generally, those classified with a condition rating of (A) Excellent & (B) Good are worthy of a TPO. Those classified (C) Fair are generally poorer and therefore unlikely to qualify for a TPO on grounds of poor appearance, management issues or unlikely to have a sufficient safe life expectancy. Those trees classified (U) are Unsuitable for retention, generally contain structural defects, have a short safe useful life expectancy or are dangerous and therefore would not qualify for a TPO as indicated within the legislation.

The presence of a TPO should be expected upon development sites for the above reasons. It can however only be regarded as a material consideration, as can any other tree or significant natural feature, within the planning process, and cannot be used as a means of preventing development. Any trees protected or otherwise, which are located on or close to the site can be expected to be regarded as a material consideration or offer a design constraint within the development process.

General Constraints posed by existing trees. The constraints imposed by trees, both above and below ground should inform the site layout design, although it is recognized 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.

Our tree survey schedule in Appendix C and the tree survey plan BA10077TS in Appendix H includes the relevant constraint information, plotted around each of the categories A, B and C trees and included information on shading and the minimum Root Protection Area (RPA), in addition to a suggested limit for construction.

Typically, development should endeavour to retain category A & B trees and category C trees where they can be either improved and included in low risk areas or help improve biodiversity.

Ideally, structures should be located outside areas of shading and the recommended construction limit (Minimum Root Protection Areas plus an additional 2 metres) of trees to be retained should inform the development. However, in some cases the existing site layout has impacted on the trees in particular when existing structures or hard-surfacing extend or have been installed in the root protection areas. To help understand this I have colour coded the principal Structures, Hard Surfacing, Services, Earthworks and areas of High water content on the tree survey plan BA10077TS in Appendix H.

However, where there is an overriding justification for construction within the RPA, technical solutions might be available that prevent damage to the tree(s). If operations within the RPA are proposed additional information can be provided to demonstrate that the tree(s) can remain viable and offer mitigation measures such as but not limited to, improvements to the soil environment that is to be used by the tree for growth.

APPENDIX C - DESIGN CONSIDERATIONS

Care is needed regarding the retention of large, mature, over-mature or veteran trees which become enclosed within the new development. Where such trees are retained, adequate space should be allowed for their long-term physical retention and future maintenance. However, such retentions are seen as beneficial, helping to contribute to climate change resilience, amongst other benefits of habit and biodiversity. Achieving successful integration of large species trees requires careful consideration at the conceptual and design stages and specialist arboricultural input.

Design Considerations. To enable a realistic assessment of the probable impacts of any proposed development on the trees, and vice versa which should take into account the characteristics and condition of the trees. To maximize the probability of successful tree retention, the following factors are taken into account.

- **Shading of Buildings.** This can be a problem, particularly where there are rooms, which require natural light.
- **Shading of Open Spaces & Gardens.** Sitting normally requires direct sunlight for at least for part of the day. However, *shading can be desirable to reduce glare or excessive solar heating, or to provide for comfort during hot weather.*
- **Privacy and screening.** The retention of trees helps to reduce overlooking by neighbours or to mitigate undesirable views, such as busy roads, railway lines or industrial premises.
- **Direct damage.** Below ground, damage to structures can occur because of incremental root and stem growth. In addition, above ground damage can occur to trees and structures by the continuous whipping of branches against the fabric of a building. Therefore, this needs to be considered to avoid the need for frequent remedial pruning or other maintenance.
- **Future pressure for removal.** The relationship of buildings to large trees can cause apprehension to occupiers or users of nearby buildings or spaces, resulting in pressure for the removal of the trees. Buildings and other structures should be sited to allow adequate space for a tree's natural development, with due consideration given to its predicted height and canopy spread.
- **Seasonal nuisance.** Trees are naturally growing and shedding organisms. Leaves of some species can cause problems, particularly in the autumn, by blocking gullies and gutters. Fruit can cause slippery patches or accumulations of honeydew, which can be damaging to surfaces, these aspects, should also considered.

In general, developments close to trees needs to maintain the site and particularly the soils close to the current prevailing conditions and avoid significant changes. However, a development is achievable providing the 8 key points listed below can be incorporated into the proposal's design:-

1. **Available Space,** The proposal should consider the available space both now and in the future and avoid the need to remove large diameter branches and stems whilst providing sufficient space for future growth.

2. **Foundations**, the proposal will need to offer support to the structures with the need for minimal excavation to avoid tree root severance, typically a pile and beam or partial cantilever solution could be considered following the advice of a structural engineer.
3. **The Building**, particularly the underside of the proposal will need to be above the current soil level to avoid compaction, excavation and ensure continued soil hydration and aeration. Typically, either a timber frame or block and beam can be adopted to achieve this relatively simply.
4. **Ground Protection**, needs to be a principal theme running throughout the proposal with the current ground being protected from, Excavation, Cultivation or Compaction and should remain wherever possible close to its current condition. This can be significantly simplified through the adoption of timber frame construction avoiding the need for potentially damaging heavy weights and potential noxious material such as concrete blocks, bricks and chemicals such as cements to be used near trees.
5. **Services** for the proposal should be located outside the Root Protection Area to avoid the need for excavation. Where new services are required within the Root Protection Area, these should adopt low impact methods of installation such as moling. Ideally, existing site utilities should be either isolated and retained in situ where they extend into the RPA or recycled or upgraded where this can be done without excavation.
6. **Hard surfacing** will typically be required unless it can be substituted for decking or above ground walkways. Hard surfacing will need to be installed without the need for excavation and should be porous to allow continued soil hydration and aeration. Typically, either a porous paving system or gravel supported by a NO-dig foundations such as Cell-Web can be adopted to achieve this.
7. **Building use**, within the proposal, available light should help inform the building design, layout and its use. Ideally, windows and views should be directed away from trees and toward open areas. In addition, the use of secondary or passive light through light reflecting tubes should be considered to help reduce the negative aspects of large trees.
8. **Building maintenance** will be required, particularly where canopies of trees extend close to or above the roofline, this can cause maintenance difficulties due to leaf and organic matter build up in the gutters and down pipes. This problem needs to be designed out as far as possible by the addition of filters in the gutters to restrict the access to leaves and small twigs.

The design should take account of the effects of any tree loss required to implement the design, and any potentially damaging activities proposed near retained trees. This might include the removal of existing structures and hard surfacing, the installation of new hard surfacing, the installation of services.

APPENDIX D - RISKS TO TREES DURING CONSTRUCTION

The following operations are all very damaging to trees, I have included a poster that demonstrates these points, and this might be useful for full circulation:

Compaction of the soil - Compaction will destroy the soil structure by removing the spaces between soil particles preventing the uptake of oxygen and nutrients. Compaction is caused by storage of materials, including bricks, soil, gravel and cement, and even a single vehicle movement will cause damage. Compacted ground will also damage soil drainage, which may then become waterlogged.

Excavations - any excavations close to the tree are likely to cause root severance. The closer excavations occur to the tree the more severe the damage. Root severance will lead to loss of vigour of the tree, reduce uptake of water and nutrients, allow access for decay organisms and increase likelihood of wind throw.

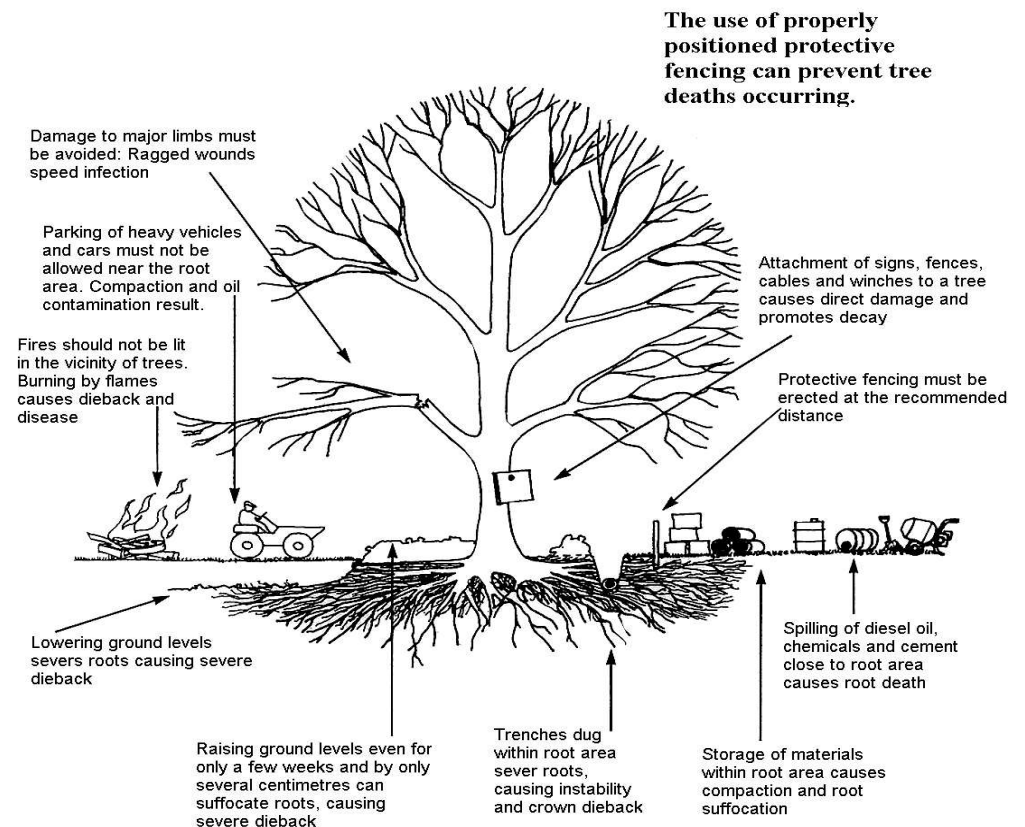
Ground level changes - both reduction and raising of soil levels will be detrimental even if this is only by a few centimetres. Reducing ground levels will sever roots, and can increase the drainage of a site thereby reducing water availability. Raising ground levels will cause compaction, suffocate roots and damage fibrous roots.

Impact damage - this can be caused by machinery - including torn branches and damage to bark and trunks. This will lead to entry for decay organisms and reduced vigour.

Soil contamination - this can be caused by spillage of oil, fuel and chemicals and mixing cement or other materials. Allow for sloping ground – keeping toxic material downhill from trees and aim to store them 10m from the Protected Zone to allow for leaching through the soil.

Fires - both the intense heat and direct flame will damage the trees causing loss and damage to both major roots and fibrous roots. Intense heat will damage the trees vascular system under the bark even if the bark does not appear burnt.

Common causes of Tree Death



APPENDIX E - TREE PROTECTION

Protection of retained trees. The successful retention of trees depends on the quality of the protection and the administrative procedures to ensure those protective measures remain in place while there is a risk of damage. An effective means of doing this is through an arboricultural method statement that can be specifically referred to in a planning condition. An arboricultural method statement for this site should ideally be agreed. Implementation of a method statement will allow all the retained trees to survive without any adverse impact and allow them to continue to contribute to local amenity and character.

Limiting Threats to Trees. To help reduce the potential impact of site changes BS5837:2012 recommends in Section 3.7 that a **Root Protection Area (RPA)** is included as a layout design tool. This protected area is based upon the Root Protection Area - a point equivalent to 12 times the trunk diameter. This indicates the minimum area around a tree deemed to contain sufficient roots and rooting volume to sustain the tree's viability, though ideally the offset shown as the Construction Limit should be adopted to provide additional space and enable trees to thrive.

Tree Protection: where retained trees need to be protected this is most easily achieved by establishing a **Construction Exclusion Zone (CEZ)** as part of a **Tree Protection Zone (TPZ)** to protect the roots and aerial parts as recommended in BS5837:2012 – further details upon request. Within this area, retained trees need to be protected from the effects of site changes and in particular excessive root severance, soil level changes or soil compaction.

Appropriate site organisation and management are essential following the adage of '*Prevention is better than Cure*'. Unfortunately, tree damage can easily occur and although it is costly to repair, it comes with few guarantees.

Inside the exclusion area of the fencing, the following actions need to be avoided:-

No linear mechanical excavation whatsoever.

No excavation by any other means without arboricultural site monitoring.

No hand digging without a written Method Statement having first been approved in writing by the consulting arboriculturist.

No lowering of levels for any purpose (except removal of grass sward by hand).

No construction of a sealed hard surface (except where agreed with the arborist)

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:-

A 10m separation distance shall be observed between any tree and substances injurious to tree health, including fuel, oil, bitumen, cement (including cement washings), builders' sand, concrete mixing and other chemicals.

No fire shall be lit such that flames come within 5m of tree foliage; this shall be taken to mean a fire separation distance of 20m from any tree's canopy.

Protective Fencing: Based on tree survey data, **Root Protection Area (RPA)** have been calculated for the trees identified for retention and included in the tree schedule in Appendix C. The RPA's are designed to protect at least a functional minimum of tree root mass in order to ensure that the trees survive the construction process. Tree protection will need to be installed following the initial tree works and before the onset of any demolition or ground works. The RPA should remain in position for the whole of the construction and demolition phase.

Protection fencing is highlighted on the Impact assessment Plan BA6281AIA attached to this report in Appendix F.



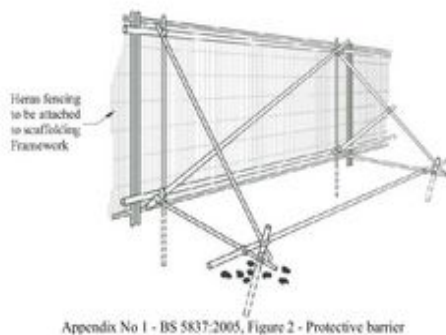
Sever Risk Area's - Stem Protection (TST).

To be protected from impact damage by Boarding or Plywood Boxes constructed clear of the stem. Boxes are to contain compressible material to absorb shock loading. To be located where vehicles may come into direct contact with existing trees.



Moderate Risk - Protection Fencing (TPF2)

This is to be erected as a temporary barrier to protect areas designated for later construction or landscaping the Precautionary Zone. This shall consist of Heras type panels mounted onto rubber/concrete 'boots' as shown opposite.



High Risk - Tree Protection Fencing (TPF1)

This is to be provided by Braced Heras Fencing or solid panels. Post-holes shall be excavated by powered hand auger or low ground-pressure plant working of ground protection or outside the Precautionary Zone. Alternative more traditional post supports such as the Heras Steadfast system with an additional brace can be used where this can be pinned into position and fitted with an **Anti-Tamper Coupler**.



Low Risk - Protection Fencing (TPF3)

This is to be erected as a visual barrier to protect areas designated for no or later construction. Consisting either stock fencing, post and rail fencing, Chestnut Pale fencing or Orange Extruded Plastic Netting.

Ground Protection (Temporary): Access across the RPA, if this is required this can be achieved for the duration of the development phase in such a way, which will reduce the potential negative effects of compaction.



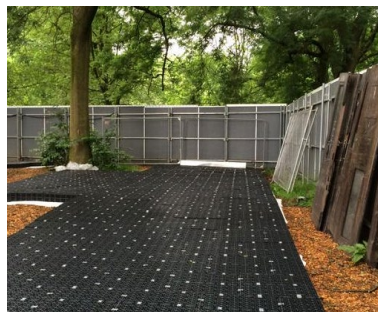
No Dig-Ground Protection GP1 - Option 1

For lower traffic areas, where heavy vehicles are expected, substitute compacted stone infill with a temporary above ground Trackway. This avoids the need for excavation and limits the weight of material build up and limits compaction when installed with compressible sub-surface.



No Dig-Ground Protection GP1 - Option 2

For high use areas or where heavy vehicles are expected, substitute traditional dig out and compacted stone infill with an above ground **Cellweb** or similar, to avoid the need for excavation and limit compaction – may be retained as a porous sub base for hard Surfacing within the scheme.



No Dig-Ground Protection GP1 - Option 3

Void forming system such as **Permavoid** or **ArborRaft** act as a protection to the tree roots and avoid the need for excavation. These systems also limit the weight of material build up and can be installed with compressible sub-surface. – may be retained as a porous sub base for hard surfacing within the scheme.



Ground Protection GP2 - Option 1

Where pedestrian-operated plant up to a gross weight of 2t are forecasted, proprietary, interlinked ground protection boards are available; such as **DuraDeck** or **Ground Guard**. These can limit compaction when installed with compressible sub-surface.



Ground Protection GP2 - Option 2

For more permanent small plant and pedestrian movements ground protection in the form of a single thickness of scaffold boarding supported by scaffold, as opposite, can be adopted to bridge areas and avoid compaction.



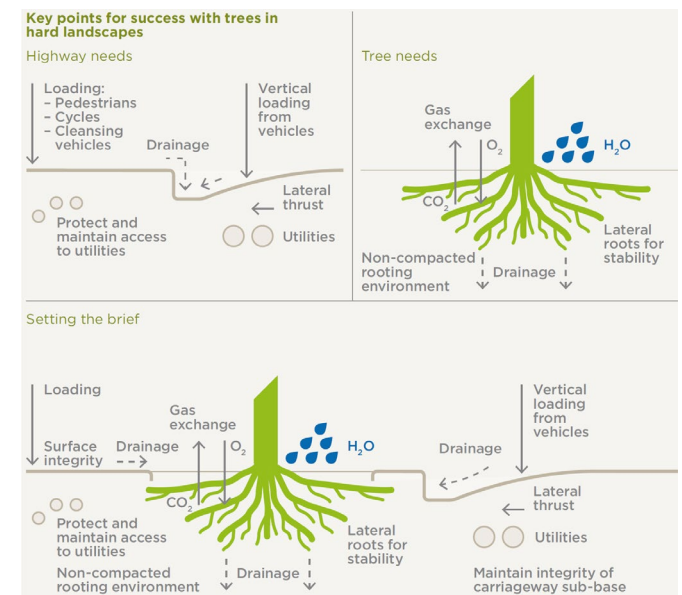
Ground Protection GP3

For Pedestrian movements ground protection in the form of a single thickness of scaffold boards or plywood on top of a compressible layer (Woodchip) laid onto a geotextile, or supported can be used to form the access or provide a sub base to other ground protection.

Ground Protection (Permanent): The creation of Hard Surfacing within or close to trees offers a risk to trees through compaction, excavation, soil level changes or contamination and these need to be avoided or appropriately defended as indicated opposite, so that underlying soils can continue to allow the ingress of water and exchange of gas between the soil and the atmosphere. Protective measures can be adopted successfully to help retain trees and this information should be agreed within Arboricultural Method Statement.

To counter risks, all hard surfacing shall be above the existing ground within the Root Protection Area using a porous sub-base or by bridging to support a permanent porous surface/wearing course. This will maintain continued gaseous exchange and water ingress as outlined in the opposite brief copied from Tree in the Hard Landscape (TDAG).

On the majority of sites, substituting traditional compacted stone infill with **ArborRaft** or **Cellweb** as described above will provide appropriate protection. Alternatives may include grates, a suspended pavement or road by installing pre-cast elements avoiding largescale excavation and limiting the weight of material build up. Alternatively, a cast concrete slab or above ground concrete deck supported by piles can be adopted for sites with difficult access, soils or strata as shown in the examples below.



Construction within the Root Protection Area: The creation of structures within or close to trees offers a risk to trees through compaction, excavation, soil level changes or contamination and again these need to be avoided or appropriately defended so that underlying soils can continue to allow the ingress of water and exchange of gas between the soil and the atmosphere. Protective measures can be adopted successfully to help retain trees and this information should be agreed within Arboricultural Method Statement. The work is in line with best practice guidance detailed in section 7.5.2 and 7.5.5 of **BS5837:2012 Trees in relation to design, demolition and construction – Recommendations**, that states:

Section 7.5.2 recommends Root damage can be minimized by using:

- piles, with site investigation used to determine their optimal location whilst avoiding damage to roots important for the stability of the tree, by means of hand tools or compressed air soil displacement, to a minimum depth of 600 mm;
- beams, laid at or above ground level, and cantilevered as necessary to avoid tree roots identified by site investigation.

In section 7.5.5 the standard states - Where piling is to be installed near to trees, the smallest practical pile diameter should be used, as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. If a piling mat is required, this should conform to the parameters for temporary ground protection given in **6.2.3**. Use of the smallest practical piling rig is also important where piling within the branch spread is proposed, as this can reduce the need for access facilitation pruning. The pile type should be selected bearing in mind the need to protect the soil and adjacent roots from the potentially toxic effects of uncured concrete, e.g. Sleeved bored pile or screw pile.

Example 1 -Screw Piles. Using the hydraulic rotation motor, the screw pile can be installed from outside the outside the Root protection area. Usually, heavy buildings that need several piles to be installed use this method of installation before being joined by a beam.



Example 2 – Thrust or Bored Piles. Small plant piles can be installed within Root protection area. To enable heavy buildings to be supported several smaller piles can be connected to form a pile cap providing improved support as shown below.



APPENDIX F - PLANS

Tree Impact Appraisal Plan – BA10077AIA (A1 Plan Attached)

APPENDIX G - TREE MANAGEMENT TO ENABLE SCHEME

Tree management required to enable scheme:

Est Pos	No.	Name	Age	Height	Crown Hgt	North	South	East	West	Condition	Life Exp	Category	Diameter	Stems	Works to enable the scheme	Arboricultural Impact and control measures	Risk	RPR Radius	RPA Area
Est Pos	G1	Ash Goat Willow Norway Spruce Wild Cherry Sycamore Hybrid Poplar	EM	14	0	4	4	4	4	Fair	10+	C2	200	1	None	Protect from change with tree protective fencing	Low	2.4	18.1
Est Pos	H2	Hawthorn Elder	M	12	0	3	3	3	3	Fair	10+	C2	150	1	None	Protect from change with tree protective fencing	Low	1.8	10.18
Est Pos	G3	Ash Silver Birch	EM	14	2	4	4	4	4	Fair	10+	C2	200	1	None	Protect from change with tree protective fencing	Low	2.4	18.1

Est Pos	T4	Ash (Fraxinus excelsior)	M	12	3	5	3	5	5	Fair	10+	C2	200, 200, 100, 200	4	None	Protect from change with tree protective fencing	Low	4.33	58.91
	T5	Ash (Fraxinus excelsior)	M	12	3	5	5	3	3	Fair	10+	C2	250,300	2	Remove to enable the Scheme	Loss of mature tree which can be offset with a good quality planting scheme	Low	4.69	69.11
	T6	Ash (Fraxinus excelsior)	EM	12	4	3	3	3	3	Good	20+	B2	200	1	None	Protect from change with tree protective fencing	Low	2.4	18.1
	T7	Ash (Fraxinus excelsior)	M	12	3	5	5	3	4	Fair	10+	C2	250, 200, 200, 100	4	Remove to enable the Scheme	Loss of mature tree which can be offset with a good quality planting scheme	Low	4.69	69.11
Est Pos	G8	Hawthorn Privet	M	6	0	2	2	2	2	Fair	10+	C2	100	1	Partial removal to enable the scheme	Partial removal of a understory group	Low	1.2	4.52
	T9	Goat Willow (Salix caprea)	M	6	0	3	3	3	3	Fair	10+	C3	100,100 ,75,75	4	None	Protect from change with tree protective fencing	Low	2.12	14.12

T10	Ash (<i>Fraxinus excelsior</i>)	EM	12	3	1	3	3	3	3	Good	20+	B2	250	1	None	Protect from change with tree protective fencing	Low	3	28.28
T11	Ash (<i>Fraxinus excelsior</i>)	EM	10	2	2	2	2	2	2	Fair	10+	C3	100	1	None	Protect from change with tree protective fencing	Low	1.2	4.52
T12	Ash (<i>Fraxinus excelsior</i>)	EM	12	3	3	3	3	3	3	Fair	10+	C2	300	1	None	Protect from change with tree protective fencing	Low	3.6	40.72
T13	Ash (<i>Fraxinus excelsior</i>)	EM	10	2	2	2	2	2	2	Fair	10+	C3	100	1	None	Protect from change with tree protective fencing	Low	1.2	4.52
T14	Ash (<i>Fraxinus excelsior</i>)	M	12	2	3	3	3	3	3	Fair	10+	C2	250,100	2	None	Protect from change with tree protective fencing	Low	3.23	32.78

	T15	Ash (Fraxinus excelsior)	M	12	2	3	3	3	3	Fair	10+	C2	350, 150, 200	3	None	Protect from change with tree protective fencing	Low	5.16	83.66
Est Pos	G16	Ash Elder	M	6	1	2	2	2	2	Fair	10+	C3	100	1	None	Protect from change with tree protective fencing	Low	1.2	4.52
	T17	Ash (Fraxinus excelsior)	M	16	6	1	3	5	3	Fair	10+	C1	300	1	Remove to enable the Scheme	Loss of mature tree which can be offset with a good quality planting scheme	Low	3.6	40.72
Est Pos	G18	Wild Cherry (Prunus avium)	EM	5	1	2	2	2	2	Fair	10+	C2	200	1	None	Protect from change with tree protective fencing	Low	2.4	18.1
Est Pos	H19	Leyland Cypress Common Alder Hawthorn	M	2	0	1.5	1.5	1.5	1.5	Fair	10+	C2	75	1	None	Protect from change with tree protective fencing	Low	0.9	2.55

Est Pos	H20	Holly Box Hawthorn	M	1.5	0	2	2	2	2	Fair	10+	C2	75	1	None	Protect from change with tree protective fencing	Low	0.9	2.55
Est Pos	H21	Holly Box Hawthorn	M	1.5	0	2	2	2	2	Fair	10+	C2	75	1	None	Protect from change with tree protective fencing	Low	0.9	2.55

Tree Surveys & Condition Reports

Tree Health & Safety Reports

Tree Risk Assessments

Tree Population Site Inventories

Estate Tree Management

Woodland Management

Tree radar – Root Mapping

Insurance & Mortgage Reports

Decay Detection & Mapping

Wind load & Stability Assessments

Development Site Tree Reports to BS5837

Arboricultural Implication Assessments (AIA)

Arboricultural Method Statements (AMS)

Construction Exclusion Zone Management

Tree Protection Plan Design

Tree Valuation & Replacement Costing

TPO Objections & Appeals

Tree planting Schemes

Landscape visual impact assessment

Landscape architecture



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