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Arboricultural Impact Assessment

The Hub. Leconfield Industrial Estate

For: Copeland Borough Council

Date: **10/03/2022**

Reference: **BA11303/I-AIA**

DOCUMENT CONTROL

Surveyed by*	Matt Metcalfe			**Report date**	08/03/2022
Prepared by*	Matt Metcalfe				
Reviewed by*	Sue Barnes				
Revision	A	**Date**	10/03/2022	**Notes:**	
	* Refer to qualifications and experience appendix				

VALIDATION STATEMENT FOR LPA REGISTRATION

This report contains information relating to the proposed Hub at Leconfield Industrial estate.

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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APPENDICES

SUMMARY OF TREE INFORMATION

The Proposal. This arboricultural impact appraisal accompanies the planning application Leconfield Industrial Estate as detailed in the extract of the block plan copied opposite.

Tree Information. This impact assessment is based upon our Tree Assessment reference B11078TS, which includes information on the trees condition and minimum protection requirements – attached in APPENDIX – PLANS.

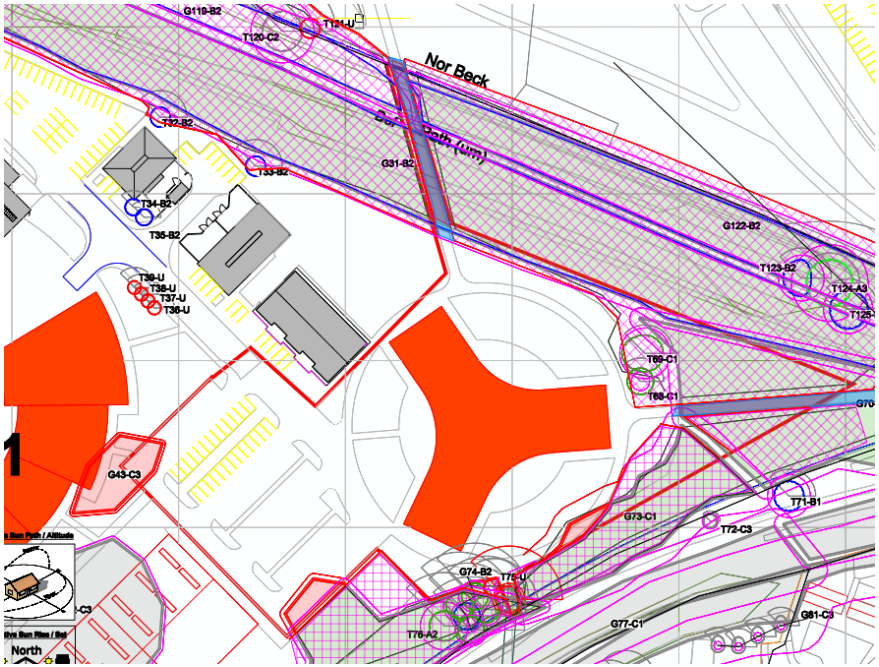
The assessment shows that the trees have little signs of management but have amenity value to the street scene. In addition, several trees have a range of defects that require management.

The Scheme. This assessment considers the potential conflicts with existing trees, which are detailed and shown on the Implication Assessment Plan reference BA11303HUBAIA – in APPENDIX – PLANS.

The design has been informed by the current state of the trees and has retained the majority of trees on the site.

General Tree Losses. The wider site currently has eleven poor quality 'U' category trees which should be removed to simplify ongoing management within the high target area irrespective of the scheme.

Losses for the scheme are detailed in the table opposite and are detailed in the appendix Tree Management to enable scheme.



Tree losses to enable the scheme.

Category	Entire Group	Partial Group	Individual
A	0	0	0
B	0	4	0
C	0	2	0
U	0	0	1

Trees Protection: The scheme does not significantly enter the Root Protection Areas of retained trees.

This assessment considers the potential conflicts with existing trees, along with protection recommendations which are detailed on the Tree Protection Plan reference BA11303HUBTPP – in APPENDIX – PLANS.

General protection can be easily achieved by erecting and maintaining Tree Protection Fencing (TPF) to restrict access close to trees and establishing and maintaining Construction Exclusion Zones. In this project suitable fencing has been advised being Heras Steel boarding with 90mm diameter support posts when cementing in the support posts, the hole should be lined with non-permeable visqueen or a similar product to prevent leaching into the rootzones.

Ground Protection where changes extend into the Root Protection Area, can be adopted to provide temporary or permanent access.

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 – TREE CONSTRAINTS.

Limiting Damage to Trees. Care has been taken regarding the retention of large, mature, over-mature or veteran trees which become enclosed within the new development. 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 – DESIGN CONSIDERATIONS.

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 – RISKS TO TREES DURING CONSTRUCTION.

Protection of Trees. The potential for conflicts between the proposal 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 – TREE PROTECTION.

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 could offset losses and improve the overall levels of screening and biodiversity.

Summary of the Impact on Trees

The current scheme requires the removal of:

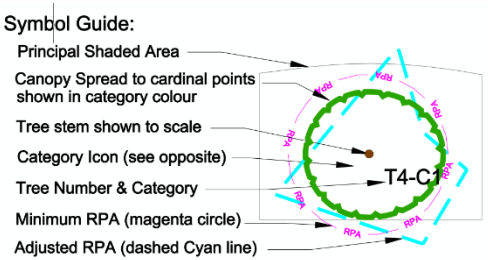
Category	Entire Group	Partial Group	Individual
A	0	0	0
B	0	4	0
C	0	2	0
U	0	0	1

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 the local amenity or character of the wider setting.

Legislative Protection. Information on Copeland District Council Website suggests that there are no trees on-site with a Tree Preservation Order and the site is not within a Conservation Area.

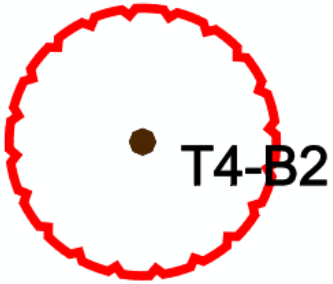
Retained Trees. These trees are highlighted with a green canopy, complete with a magenta circle to indicate the minimum Root Protection Area (RPA) or shown with an adjusted RPA where relevant, as shown opposite and within the Arboricultural Impact Assessment Plan - APPENDIX – PLANS.



Risk offered by the proposal. The principal risk to retained trees relates to the potential negative impacts from compaction by vehicles, plant and whilst undertaking the scheme, especially the construction and 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 – PLANS.

Removals to enable Development.

The tree removals are in red on the Arboricultural Impact Assessment plan as shown opposite.



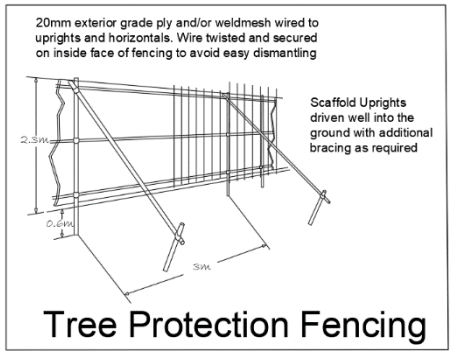
Details regarding the proposed management of the trees are included in Appendix G – Tree Management.

Trees requiring pruning. **Tree pruning to enable development:** At present, the scheme appears to require no pruning operations.

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 defended through the use of Tree Protective Fencing (TPF) outside the Root Protection Areas indicated by the magenta circle around retained trees, or adjusted cyan area. The location of **(TPF)** as shown below is included on the Arboricultural Impact Assessment Plan - APPENDIX – PLANS.

Examples of protective fencing types are included on the plan, the final choice for these barriers should be agreed within an Arboricultural Method Statement, though for construction of this type TPF1 should be used, an example of which is shown below from the BS5837, an alternative which should be acceptable for such a scheme is also shown. This product provides ease of access to operatives due to no bracing required and acts a dust / visual barrier.



Example above showing tree protection fencing 1 (BS5837:2012)

Example above showing tree protection fencing by the use Heras Steel Boarding. https://www.heras-mobile.co.uk/fencing/steelhoard

Fencing is to be used to define the location of **Construction Exclusion Zones (CEZ)** which are indicated by red net hatching shown opposite and on the Arboricultural Impact Assessment Plan BA11303AIA attached as APPENDIX – PLANS.

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.

Potential conflicts through the removal of existing hard surfacing shall be controlled using appropriate techniques and ground protection this should be detailed within an arboricultural method statement, to avoid direct damage and compaction and contamination of the soils.

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 shown on the Arboricultural Impact Assessment Plan BA11303HUBAIA attached as APPENDIX – PLANS.

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 landscape areas within RPA. Where RPA's of retained trees enter the proposed landscape areas of the proposal, these areas should always be protected from compaction and level changes.

Post Development Pressure. Considering the layout and height of the buildings, some pruning will be required to prevent direct damage only and no other pressures are expected. Leaf litter will not cause additional conflict to the users and would 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 and improved tree management than that seen today.

Considering the size of the site and the limited space for the landscaping scheme replacement trees should be designed into soft and hard landscaping areas, ensuring adequate soil volumes are provided to provide sustainable growing room this will improve the overall visual impact for receptors and users.

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 where required. as detailed on the Arboricultural Impact Assessment Plan - APPENDIX – PLANS.

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, FdSc Arboriculture, Professional member Arboricultural Association, VALID Tree risk validator.

APPENDICES

APPENDIX – 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), Arboriculture and Urban Forestry, HND Arboriculture. NDHt/Arb, Cert Arb L4 (ABC), 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 for 15 years. 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 a qualified tree risk assessor and experienced in trees and subsidence claims. He is a trainer in the UK for Fakopp equipment, Sonic and Electronic tomography, and Dynaroot and Static Tree pulls. He is also director of a hi-tech arborist/ landscape equipment and training company Tree Diagnostics Ltd providing training to arborists in advanced assessments. He undertakes ground-penetrating radar (Tree Radar) scans.

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 has been a head gardener for Local Health Authority. In partnership she ran a tree contracting and landscape design and build company for 15 years and also has been a tree and landscape consultant full time since 2007. Her main area of works is detailed commercial planting design, specifications (NBS), tree planting specifications and Arboricultural management, Trees on development sites BS5837 reports and plans. Experienced in trees and subsidence and also legal and planning conditions in regard to trees and landscapes. Sue undertakes ground-penetrating radar (Tree Radar) scans along with assisting with other further investigation works on trees such as tomography scans and assists in dynamic and static tree tests.

Mr Matt Metcalfe - Consulting Arborist/Team Leader
M.Arbor.A
Professional member of the Arboricultural Association, City and Guilds NPTC assessor/ Instructor, Lantra Apprenticeship End Point Assessor
FdSc Arboriculture, National Diploma in Arboriculture, Level 5 Certificate in Education.
VALID tree risk validator
IOSH Managging health and Safety in the Workplace
Matt has worked in the Arboricultural Industry since 2000. Firstly, as a climbing arborist in both the public and private sector. He became a lecturer at a land-based college in York in 2009 where he taught practical and theoretical Arboriculture at level 2/3 and then became the course manager in Arborist apprenticeships and an 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 and provides advanced tree assessment training assistance, undertakes BS5837 tree surveys, Arboricultural safety audits and is a trained tree risk assessor/validator. He undertakes ground-penetrating radar (Tree Radar) scans along with other further assessments on trees such as tomography, and dynamic tree testing and static tree pulls.

Mr Trevor Grigg – Consulting Arborist
Technical member of the Arboricultural Association,
Cert Arb L4 (ABC)
NC Horticulture (Arboriculture)
Lantra Professional Tree Inspector
QTRA Licensed

Since 2004, Trevor has been involved in arboriculture firstly as a climbing arborist, then as an Arboricultural Officer for a local authority. He has gained experience of working with a wide range of clients, from residential tree owners to schools, Parish Councils and Highways departments providing a variety of tasks and requests such as risk assessments, management plans and replanting schemes. Trevor joined Barnes Associates in 2021 with a view to widening his experience of trees in relation to developments and further investigations of trees using the specialist equipment available.

Mr John Evans – Consulting Arborist
Technical member of the Arboricultural Association,
Forestry and Arboriculture Level 3

For the past six years, John has been a climbing arborist, firstly working freelance for utility and domestic clients, then joining Darlington Borough Council. Whilst working for the council, he continued his professional development and working below and observing Darlingtons Tree Officer. John was very excited to move into a role with Barnes Associates to continue his development, learning how to use the advanced tree surveying equipment and developing into BS5837 report writing.

APPENDIX - 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, 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 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.

Our tree survey schedule in Appendix and the tree survey plan BA11078TS in Appendix 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 BA11078TS in Appendix.

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 - 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, the characteristics and condition of the trees should be taken into account. To maximise the probability of successful tree retention, the following factors are considered:

- **Shading of Buildings**. This can be a problem, particularly where there are rooms which require natural light.
- **Shading of Open Spaces & Gardens**. Enjoyment of outdoor spaces 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 be 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 foundation 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, causing 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 and the installation of services.

APPENDIX - 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 affect soil drainage, which may then cause waterlogging.

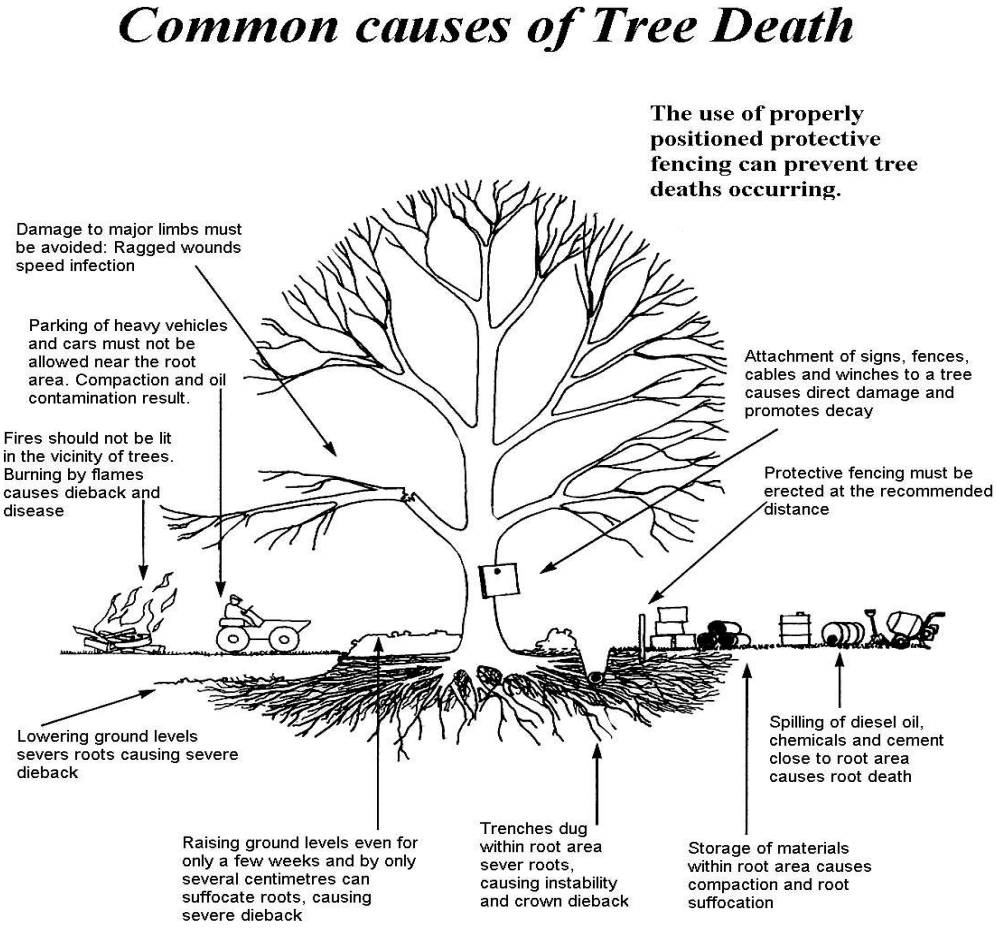
Excavations - any excavations close to the tree are likely to cause root severance. The closer excavations occur to the tree the more severe the damage. Root severance will lead to loss of vigour of the tree, reduce uptake of water and nutrients, allow access for decay organisms, and increase likelihood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



APPENDIX - 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. A 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.

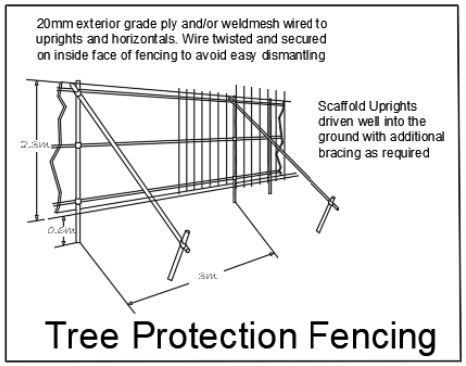
Protective Fencing: Based on tree survey data, **Root Protection Area (RPA)** have been calculated for the trees identified for retention and included in the tree schedule in Appendix C. The RPA's are designed to protect at least a functional minimum of tree root mass in order to ensure that the trees 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.

Severe 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.

High Risk - Tree Protection Fencing (TPF1)
Alternative TPF1 – upon agreement only. Ideal for where space is limited. Posts are fixed into ground.

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.**

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.

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.

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.

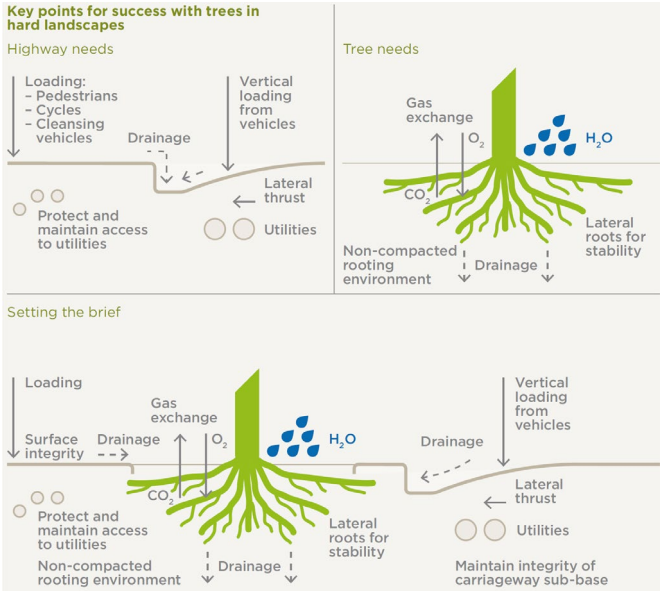
No Dig-Ground Protection GP1 - Option 2
For high use areas or were heavy vehicles are expected, substitute traditional dig out and compacted stone infill with an above ground Cellweb or similar, to avoid the need for excavation and limit compaction – may be retained as a porous sub base for hard Surfacing 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 subbase for hard surfacing within the scheme.

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 f 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, s**ubstituting 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 minimised 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.

Tree Impact Appraisal Plan – BA11303HUBAIA (A1 Plan Attached)

APPENDIX - TREE MANAGEMENT TO ENABLE SCHEME

Est Pos	TAG No.	Species	Age	Height (m)	Canopy Underside (m)	Canopy Radius (m)				Vitality	Safe Life	Category	Diameter @ 1.5m (mm)	No. Stems	Tree works required	Arboricultural Impact and Control Measures	Risk Assessment	Minimum RPA (Radius)	Minimum RPA (Area) (m^2)
						North	South	East	West										
Est Group,Est Dimensions	G31	Ash, Beech, Wild Cherry, Silver Birch, Common Alder, Hawthorn	M	14	1	3	3	3	3	Good	20+	B2	250	1	Partial removal of the group to enable the scheme (Path).	Protect the retaining parts of the group with tree protection fencing and construction exclusion zones.	Low	3	28.28
Est Group,Est Dimensions	G43	Goat Willow, Silver Birch	M	6	1	2	2	2	2	Fair	10+	C3	100	1	Partial removal of the group to enable the scheme	Partial loss of a fair condition group offset within the landscape scheme.	Low	1.2	4.52
	T68	Goat Willow	M	7	1	4	4	4	4	Fair	10+	C1	100,100, 100,150	4	None	Protect from change with Tree Protection Fencing, Construction Exclusion Zone	Low	2.75	23.76
	T69	Goat Willow	M	8.5	1.5	5.5	5.5	5.5	7	Good	10+	C1	300,250, 400,300	4	None	Protect from change with Tree Protection Fencing, Construction Exclusion Zone	Low	7.61	181.96
	G70	Goat Willow, White Poplar, Crack Willow, Hazel, Beech, Sessile Oak, Hawthorn, Ash, Downy Birch	M	8.5	1.5	5.5	5.5	5.5	7	Good	10+	C1	100,150, 100,150, 100	5	None	Protect from change with Tree Protection Fencing, Construction Exclusion Zone	Low	3.29	34.01

Est Pos	TAG No.	Species	Age	Height (m)	Canopy Underside (m)	Canopy Radius (m)				Vitality	Safe Life	Category	Diameter @ 1.5m (mm)	No. Stems	Tree works required	Arboricultural Impact and Control Measures	Risk Assessment	Minimum RPA (Radius)	Minimum RPA (Area) (m^2)
						North	South	East	West										
Est Position,Est Dimensions,Est Stem Diameter	G73	Goat Willow, White Poplar, Crack Willow, Hazel, Beech, Sessile Oak, Hawthorn, Ash, Downy Birch, Sycamore	M	8.5	1.5	5.5	5.5	5.5	7	Good	10+	C1	250,300, 200,100, 100	5	Partial rermoval of the group to enable the scheme (path)	Protect the retaining group from change with Tree Protection Fencing, Construction Exclusion Zone	Low	5.53	96.09
Est Position	G74	Italian Alder	M	16	2	4	4	4	4	Fair	40+	B2	400	1	Partial removal of the group to enable the scheme.	Protect the retaining parts of the group with tree protection fencing and construction exclusion zones.	Low	4.8	72.39
	T75	Ash	M	9	2	3	2	2	3	Fair	<10	U	300	1	Remove due to poor condition, irrespective of scheme	Loss of a poor condition tree	Low	3.6	40.72
Est Group, Est Dimensions	G119	Ash, Beech, Wild Cherry, Silver Birch, Common Alder, Hawthorn, Cherry Laurel	M	14	1	3	3	3	3	Good	20+	B2	250	1	Partial removal of the group to enable the scheme.	Partial loss of a hedge that may be offset within landscape scheme.	Low	3	28.28
Est Group,Est Dimensions	G122	Ash	M	14	1	3	3	3	3	Good	20+	B2	250	1	Partial removal of the group to enable the scheme.	Partial loss of a hedge that may be offset within landscape scheme.	Low	3	28.28

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