Updated Arboricultural Impact Assessment

Land South and East of Adastral Park

On Behalf of: CEG

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Summary

This Arboriculture Impact Assessment (AIA) has been updated to provide clarification on tree losses with respect to the Northern Quadrant access road, proposed finished levels and detail for offsite access. Sections updated are restricted to this summary section and paragraphs 3.4, 5.3, 6.2 and appendix 6. This report should be read in conjunction with updated drawings:

- Adastral Park TPP Sheet 1 of 5 Rev F
- Adastral Park TPP Sheet 2 of 5 Rev F
- Adastral Park TPP Sheet 3 of 5 Rev E
- Adastral Park TPP Sheet 4 of 5 Rev E
- Adastral Park TPP Sheet 5 of 5 Rev E

An arboricultural survey has been carried out, and this report prepared to support an Outline application for up to 2,000 dwellings, an employment area of c0.6ha (use Class B1), primary local centre (comprising use Classes A1, A2, A3, A4, A5, B1, C3, D1 and D2), secondary centre (comprising possible use Classes A1, A3 and A5), a school, green infrastructure (including Suitable Accessible Natural Green Space (SANGS), outdoor play areas, sports ground and allotments/community orchards), public footpaths and cycleways, vehicle accesses and associated infrastructure for the site Land south and east of Adastral Park.

All trees that could be affected by the proposals were identified and inspected, with their details listed in Appendix 2.

This report seeks to provide information in accordance with British Standard *BS 5837:2012, Trees in relation to design, demolition and construction.*

6 trees (T161, T200, T229, T233, T234, T241), 5 tree group sections (G17, G85, G89, W101, G189) of moderate quality and value, 7 trees of low quality and value (T10, T198, T201, T202, T203, T205, T206), 17 tree groups (G1, G2, G7, G178, G190, G191, G222, G223, G224, G225, G227, G228, G230, G231, G232, G235, G236, G239, G240), 12 tree group sections (G84, G165, T183, G192, G193, G194, G209, G243, G244, G248, G249) and 2 sections of Hedgerows (H216 & H220) of low quality and value may require removal to accommodate the proposed development layout.

Provided precautions to protect the identified trees are specified and implemented through the measures included in this report, the development proposal will have little impact on the retained trees or their wider contribution to amenity and character.

If the recommendations made within this report are followed, the development should be achievable in arboricultural terms and should be acceptable to the local planning authority.

Contents

1.0 Introduction

1.1 Instruction

Southern Ecological Solutions Ltd has been instructed to produce an Arboricultural Impact Assessment for an Outline application for up to 2,000 dwellings, an employment area of c0.6ha (use Class B1), primary local centre (comprising use Classes A1, A2, A3, A4, A5, B1, C3, D1 and D2), secondary centre (comprising possible use Classes A1, A3 and A5), a school, green infrastructure (including Suitable Accessible Natural Green Space (SANGS), outdoor play areas, sports ground and allotments/community orchards), public footpaths and cycleways, vehicle accesses and associated infrastructure for the site Land south and east of Adastral Park. It has been produced in accordance with the principles of British Standard *BS 5837:2012, Trees in relation to design, demolition and construction - Recommendations* and includes the following information to accompany a planning application:

- *details of significant trees including an assessment of condition using BS 5837 categorisation;*
- *a plan showing tree survey information, retention categorisation and root protection areas;*
- *an assessment of the impact of the proposal on trees and any wider impact that has on local amenity and any impact trees may have on the proposed development;*
- *an arboricultural method statement dealing with the protection and management of the trees to be retained; and*
- *a schedule of tree works to facilitate construction.*

1.2 The proposal

The proposal is for an Outline application for up to 2,000 dwellings, an employment area of c0.6ha (use Class B1), primary local centre (comprising use Classes A1, A2, A3, A4, A5, B1, C3, D1 and D2), secondary centre (comprising possible use Classes A1, A3 and A5), a school, green infrastructure (including Suitable Accessible Natural Green Space (SANGS), outdoor play areas, sports ground and allotments/community orchards), public footpaths and cycleways, vehicle accesses and associated infrastructure for the site Land south and east of Adastral Park.

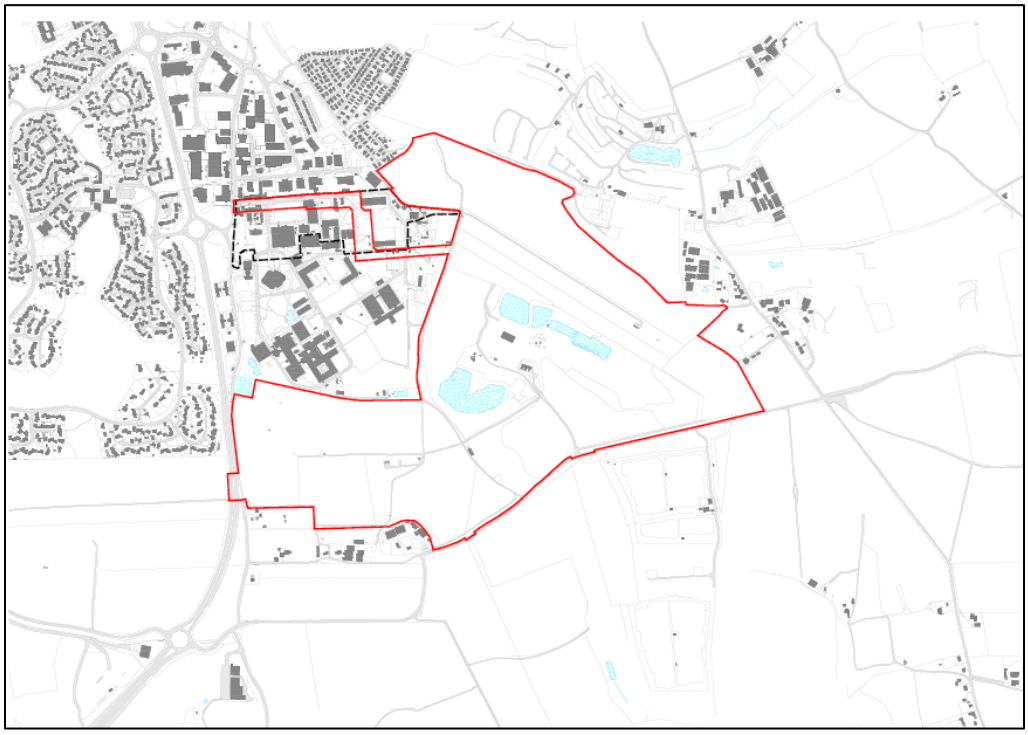


Image 1: Extent of proposed works.

1.3 Scope and purpose of this report

This report covers trees on the site and those adjacent to the site which could be affected by any development. It is concerned with the impact the development may have on trees and the effect retained trees may have on the development. Its purpose is to allow the Local Planning Authority to assess the tree information as part of the planning submission.

1.4 Legal constraints

A search undertaken with the Suffolk Coastal District Council's website identified that none of the trees are the subject of Tree Preservation Orders (TPOs) and the site is not part of a local Conservation Area (CA).

Anyone wishing to undertake works to prune or remove a tree with a Tree Preservation Order or within a Conservation Area will require written authorisation from the Local Planning Authority before any works can proceed.

1.5 Other information included in this report

The following information is included in Appendix 1:

- *documents and information provided;*
- *legal constraints and liabilities;*
- *survey methodology;*
- *contacts; and*
- *reference documents.*

2.0 Site Visit and Observations

2.1 Site visit

The site visits were undertaken from the 10th to the 18th January 2017 by Southern Ecological Solutions Ltd. The weather was overcast but dry.

2.2 Site description

The proposal site comprised of a number of arable fields and a large section of the site was being quarried with the materials stored throughout different locations. The majority of the tree cover formed tree groups which were positioned along and beyond the boundaries of the site with the centre of the site presenting limited tree cover.

2.3 The subject trees

A total of one hundred and thirty-three individual trees, one hundred and two tree groups, eleven hedgerows and two woodlands were identified as the subject of this report. These comprised a range of arboricultural values from low to high, and were identified in accordance with section 4.5 and table 1 of BS3837:2012 'Trees in relation to design, demolition and construction – Recommendations' (see Appendix 1).

2.4 Comments on specific trees

2.4.1 A range of tree cover was found throughout the site with the high value trees that were found positioned beyond the northern boundary of the site and along Newbourne Road to the south. The majority of the tree cover formed groups which provided natural barriers between the site and the surrounding area.

2.4.2 Spratts Wood was situated to the north of the site and presented a native mix of species. The woodland was considered to be of high arboricultural value and ecological value to the site and the surrounding area. Observed were large piles of green waste which could lead to the compaction of the soil in the woodland and could result in damaging the roots of the trees throughout the woodland. The woodland was found to contain scheduled monuments the appreciation of which is damaged by the green waste mounding.

2.4.3 The Scheduled Monuments are also at risk of harm if trees that are growing on top of the monument are uprooted by high winds. In response to a pre-application request from Historic England the trees growing on and around the scheduled monument will be felled. It is anticipated that the identification of the trees to be removed and the methodology for doing this will be agreed via a planning condition, but it is likely it will involve felling the trees and leaving the roots to rot in situ without digging them out. This would require Scheduled Monument Consent.

2.4.4 Many of the trees found along Newbourne Road were seen to be in good condition and form and were considered to be of high arboricultural value. These trees lined the road and were a feature of the local landscape as they were surrounded predominantly by arable farm land.

2.4.5 To the south of the site and along Newbourne Road were a number of large established tree groups. These groups provided natural barriers between the site and the surrounding area and were considered to be predominantly of moderate arboricultural value.

3.0 Arboricultural Impact Assessment

3.1 Generic summary of the impact on trees

Development can adversely impact on trees by causing them to be removed to facilitate the development, or in the future, by adversely affecting their potential for retention through disturbance in Root Protection Areas (RPAs)[1] or through post development pressures to prune or remove.

At the design stage, disturbance within the RPA should be avoided. If unavoidable, (which may need demonstrating), consideration must be given to any construction activity such as demolition, including removal of existing hard surfaces, changing soil levels and the provision of services where within RPAs, as well as new surfaces and structures.

Construction of hard surfaces and other construction may be acceptable within RPAs providing specialist methods of design and construction are used. This will often result in the use of minimal or no-dig methods which result in higher finished levels which must be allowed for during design due to the effect on access thresholds and structure heights etc.

The ability of trees to tolerate some disturbance depends on individual circumstances including prevailing site conditions, tree species, age and condition and this will be assessed by the project arboriculturist.

Protection measures, usually a combination of barriers and ground protection must be in place before any works, including site clearance, begin, and stay in place for as long as a risk of damage remains (Please refer to the Tree Protection Plan - TPP). The protection of trees must take account of the buildability of the proposal, including services, and ensure that all activities such as storage of materials, parking and the use of plant and vehicles can be accommodated outside of RPAs. Particular care and planning is necessary in the operation of excavators, lifting machinery and cranes to ensure all vehicle movement and lifting operations will not impact on retained trees. It is common practice for an Arboricultural Method Statement (AMS) to be produced following planning consent to address these issues, and may form part of planning conditions in relation to trees.

3.2 Tree survey plan (TSP)

The plan found at appendix 3 shows the existing trees numbered and categorised in accordance with BS 5837. Below ground constraints are represented by the RPA. The above ground constraints are represented by the trees crown spread and height where appropriate. The survey plan is an aid to design and should not be used post consent on site; the tree protection plan is to be used for this purpose.

[1] *Root Protection Area (RPA) - A layout design tool indicating the minimum area surrounding the tree that contains sufficient rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority. Assessed according to the recommendations set out in clause 4.6 of BS 5837. It is calculated by multiplying the radius squared by 3.142. Clause 4.6.2 of BS 5837 states that the RPA may be changed in shape, taking into account local site factors, species tolerance, condition and root morphology.*

[2] *Construction Exclusion Zone. An area based on the RPA in m^2 identified by an arboriculturist, to be protected during development, including demolition and construction work, by the use of barriers and/or ground protection fit for purpose to ensure the successful long-term retention of a tree.*

[3] *BS 5837recommends that in most circumstances all trees over 75mm stem diameter should be included in a pre-planning land and tree survey*

3.3 Tree protection plan (TPP)

Stems and crown spreads are coloured based on their categories for trees to be retained whilst trees to be removed have red hatched/shaded. Tree protection is shown as barriers and/or ground protection defining the Construction Exclusion Zone (CEZ)[2] and any areas requiring non-standard methods of demolition or construction are shown.

3.4 Trees to be removed

6 trees (T161, T200, T229, T233, T234, T241), 5 tree group sections (G17, G85, G89, W101, G189) of moderate quality and value, 7 trees of low quality and value (T10, T198, T201, T202, T203, T205, T206), 17 tree groups (G1, G2, G7, G178, G190, G191, G222, G223, G224, G225, G227, G228, G230, G231, G232, G235, G236, G239, G240), 12 tree group sections (G84, G165, T183, G192, G193, G194, G209, G243, G244, G248, G249) and 2 sections of Hedgerows (H216 & H220) will require removal to accommodate the proposals. As this is an outline application it may be possible to incorporate them into the design at the detailed design stage as part of public open spaces/ residential gardens. It is also proposed to remove trees growing on the Scheduled Monument in Spratt's Plantation as heritage mitigation; it is anticipated that the trees would be identified via planning condition and these works will require Scheduled Monument Consent.

3.5 Trees to be pruned

Opportunities for remedial pruning works to trees on site may be appropriate to ensure the trees are suitable for future retention and able to be incorporated into the future design. Spratts Wood (W82) contained large amounts of green waste which was thought to be fly tipped there. The removal of this waste would be beneficial to the surrounding trees as the material could cause compaction to the ground over a long period of time and damage the trees roots. Spratts Wood contained a scheduled monument the appreciation of which is damaged by the green waste mounding. All tree pruning/felling work to facilitate the development can be found at appendix 2 and 7. The woodland would also benefit from a woodland management plan to increase the woodlands longevity and maintain its importance to the local area.

3.6 Root protection area incursions

At this stage, there will not be any RPA incursions for trees to be retained but this should be reviewed at the detailed stage to determine the true extent of the developable parcels.

3.7 Protection of retained trees

Protective barrier fencing will be required for all tree cover that is suitable for retention.

4.0 Preliminary Arboricultural Method Statement

4.1 Introduction

This section is a preliminary arboricultural method statement specifying the methodology to be used for the protection of trees and works close to trees that have the potential to result in the loss of or damage to a tree. It includes details of site management and supervision required for successful tree retention.

Following planning consent, a detailed arboricultural method statement may be required, and secured by an appropriately worded planning condition.

4.2 Site clearance and set-up

4.2.1 Site clearance

Damage can easily be caused to trees to be retained during initial site clearance, therefore tree protection barriers must be in place before site clearance to protect trees identified in Section 3.

4.2.2 Site and fuel storage, cement mixing and washing points

All site storage areas, cement mixing and washing points for equipment and vehicles and fuel storage must be outside RPAs. No discharge of potential contaminants should occur within 10m of a retained tree stem or where there is a risk of run-off into RPAs.

4.2.3 Tree protection barriers

Appendix 5 includes guidance for protective barriers based on BS 5837:2012. The approximate location of the barriers and the CEZs is shown on the TPP. The precise location of the barriers and other protective measures should be confirmed at the pre-commencement meeting before any demolition or construction activities, including site clearance, start.

4.3 Ground protection

In areas where it is not possible to erect protective barriers, ground protection must be used to protect the CEZ of trees. Where it has been agreed during the design stage that vehicular or pedestrian access for the construction operation may take place within the CEZ, the possible effects of construction activity should be addressed by a combination of barriers and ground protection. The position of the barrier may be within the CEZ at the edge of the agreed working zone but the soil structure beyond the barrier to the edge of the CEZ should be protected with ground protection.

4.4 Precautions when working in CEZs

Only work agreed with the local planning authority can be carried out within CEZs**.** Any works must be carried out in accordance with the details as set out in Appendix 5 which are summarised below.

4.4.1 Removal of existing surfacing

The site comprises areas of hardstanding therefore care must be taken to minimise the impact on all trees for retention if these surfaces are to be removed which will include machinery positioned outside RPAs and the use of hand tools in sensitive areas.

4.4.2 Installation of new surfacing

Full details of the new surfacing proposed is not known at the time of writing. However, if resurfacing is required within the RPAs of any trees it will be necessary to use non-standard methods of construction, ideally new substrates and finished surfaces should be of a porous design to allow water and air passage in and out.

4.4.3 Installation of new services

The exact location of services is often difficult to establish until construction is in progress. Where existing services within RPAs require upgrading or new services have to be installed in RPAs, conventional excavation techniques are unacceptable and great care must be taken to minimise any disturbance. Trenchless installation should be the preferred option but if that is not feasible, any excavation must be carried out by hand or using a compressed air lance. Methodology must comply with *NJUG Volume 4: Guidelines for the Planning, installation and Maintenance of Utility Apparatus in Proximity to Trees.*

4.5 Tree works

Recommendations for tree works can be found in the tree works schedule in Appendix 6. All works shall be in accordance with British Standard *BS 3998:2010 Tree work: Recommendations,* or in accordance with current best practice. The use of a competent tree surgery contractor is necessary to comply with this (follow link for a list of Arboricultural Association approved contractors (Directory of Tree Surgeons - Arboricultural Association). The main contractor and tree surgery contractor must ensure that any necessary consents have been received from the local authority regarding planning constraints in regards to trees, and that no protected species or habitats are harmed whilst carrying out site clearance or tree surgery works.

5.0 Conclusions

5.1 A range of tree cover was found throughout the site with the high value trees that were found positioned beyond the northern boundary of the site and along Newbourne road to the south. The majority of the tree cover formed groups which provided natural barriers between the site and the surrounding area.

5.2 Spratts wood was situated to the north of the site and presented a rich native mix of species. The woodland was considered to be of high arboricultural value and ecological value to the site and the surrounding area. Observed were large piles of green waste which could cause compaction of the soil in the woodland and result in damaging the roots of the trees throughout the woodland. The woodland was found to contain a scheduled monument the appreciation of which is damaged by the green waste mounding. Therefore, Historic England should be consulted before the removal of this waste is undertaken.

5.3 6 trees (T161, T200, T229, T233, T234, T241), 5 tree group sections (G17, G85, G89, W101, G189) of moderate quality and value, 7 trees of low quality and value (T10, G190, G191, T198, T201, T202, T203, T205, T206), 17 tree groups (G1, G2, G7, G178, G222, G223, G224, G225, G227, G228, G230, G231, G232, G235, G236, G239, G240), 12 tree group sections (G84, G165, T183, G191, G192, G193, G194, G209, G243, G244, G248, G249) and 2 sections of Hedgerows (H216 & H220) will require removal to accommodate the proposals. As this is an outline application then it may be possible to incorporate them into the design at the detailed design stage.

5.4 In order to reduce the risk of damage to the schedule monument it is proposed that the trees that are growing on the scheduled monument are felled in order to prevent potential damage if the trees are uprooted by high winds. It is anticipated that these trees will be identified via planning condition. Scheduled Monument Consent will be required for the works.

5.5 The majority of trees are located outside the development therefore will not be greatly affected by the proposed development. Development provides the opportunity to increase the sites overall tree stock through structured new tree planting which can reinforce existing areas of tree cover.

6.0 Recommendations

6.1 The trees identified for retention should be protected during the development phase in accordance with BS 5837:2012 'Trees in Relation to design, demolition and construction – recommendations' (Figure 2) to exclude construction activity within the root protection areas. Barrier fencing, ground protection or a combination of both should be used (see Tree Protection Plan in Appendix 3).

6.2 Opportunities for remedial pruning works to trees on site may be appropriate to ensure the trees are suitable for future retention and able to be incorporated into the future design. Spratts Wood (W82) contained large amounts of green waste which was thought to be fly tipped there. The removal of this waste would be beneficial to the surrounding trees as the material could cause compaction to the ground over a long period of time and damage the trees roots. This wood also contained a scheduled monument the appreciation of which is damaged by the green waste mounding. All tree pruning/felling work to facilitate the development can be found at appendix 2 and 7. The woodland would also benefit from a woodland management plan to increase the woodlands longevity and maintain its importance to the local area.

6.3 Provided tree protection and methods of work close to trees outlined in this report are followed, the impacts on the remaining trees will be negligible.

6.4 If the recommendations made within this report are followed this scheme should be achievable in arboricultural terms and should be broadly acceptable to the local planning authority.

Appendix 1 - Survey and Background Information

1.0 Limitations

1.0.1 A detailed topographical plan showing the locations of individual trees was provided by the client. This data was used for the tree survey, so the positions of the trees were understood to be accurate and SES Ltd accepts no liability for the accuracy of any tree survey drawings based on the topographical plan supplied by the client. With the exception of the trees in the North West corner of the site which were plotted by hand.

1.0.2 Trees are living organisms whose health and condition can change rapidly and all trees, even healthy ones, are at risk from unpredictable climatic and manmade events. The assessment of risk for any tree is based upon factors evident at the time of the inspection and the interpretation of those factors by suitably qualified inspectors. The health, condition and safety of trees should be checked on a basis commensurate with the level of risk and preferably on an annual basis.

1.0.3 **Methodology**

The trees were surveyed from ground level without detailed investigations. All trees with a trunk diameter of 75mm or above[3] were surveyed. All dimensions were estimated unless otherwise indicated. Obvious hedges and shrub masses were identified where appropriate. Information collected is in accordance with recommendations in subsection 4.4.2.5 of BS 5837 and includes species, height, diameter, branch spread, crown clearance, age class, physiological condition, structural condition and remaining contribution. Each tree was then allocated one of four categories (U, A, B or C) to reflect its suitability as a material constraint on development.

1.1 Documents and information received

- *Topographical plan*
- *Proposed plan*

1.2 Contact

Name	Company/organisation	Tel. no.
Callum Campbell	Southern Ecological Solutions Ltd	01268 711021

1.3 Reference documents

- *British Standards Institution (2012) BS 5837: Trees in relation to design, demolition and construction – Recommendations;*
- *British Standards Institute (2010) BS 3998: Tree work – Recommendations;*
- *DETR Tree Preservation Orders – A Guide to the Law and Good Practice;*
- *National Joint Utilities Group (2007) Volume 4, Issue 2: Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees;*
- *DTLR (2001) Principles of Tree Hazard Assessment and Management - David Lonsdale.*

1.4 Legal Constraints and Liabilities

1.4.1 **Tree Preservations Orders/ Conservation Areas:** A search undertaken with the Suffolk Coastal District Council's website identified that none of the trees are the subject of Tree Preservation Orders (TPOs) and the site is not part of a local Conservation Area (CA).

1.4.2 **Occupiers Liability 1957 and 1984:** The Occupiers Liability Act places a duty of care to ensure that no reasonably foreseeable harm takes place due to tree defects. Therefore, this report includes recommendations within the tree tables for work required for safety reasons. 'Common sense risk management of trees (National Tree Safety Group 2012)' states that *'the owner of the land on which a tree stands, together with any party who has control over the tree's management, owes a duty of care at common law to all people who might be injured by the tree. The duty of care is to take reasonable care to avoid acts or omissions that cause a reasonably foreseeable risk of injury to persons or property.'*

1.4.3 **Common Law:** This enables pruning back of the crown and roots of trees on adjacent land where they overhang neighbouring property, providing the work is reasonable and does not cause harm. This right does not override TPO and CA legislation.

1.4.4 **Ecological Constraints:** The Wildlife and Countryside Act 1981, as amended, The Conservation of Habitats and Species Regulations 2010 and the Countryside and Rights of Way Act 2000, provide statutory protection to species of flora and fauna including birds, bats and other species that are associated with trees. These could impose significant constraints on the use and timing of access to the site. It is the responsibility of the main contractor and tree surgery contractor to ensure that no protected species are harmed whilst carrying out site clearance or tree surgery works. Unless competent to do so, the advice of an ecologist must be sought.

Appendix 2 - Tree Survey Sheets

See attached

Appendix 3 - Tree Survey Plan and Tree Protection Plan (TSP/TPP)

See attached

Appendix 4 - Tree Protection Barriers & Ground Protection

4.0 **Design of welded mesh, Heras type tree protection barrier**

Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place. The default specification should be in accordance with 6.2.2.2 of BS 5837, as set out below.

4.0.1 **Specifications:** Barrier shall be a minimum 2 m high. It shall consist of a vertical and horizontal scaffold framework, well braced to resist impacts, as illustrated below. The vertical tubes should be spaced at a minimum interval of 3 m and driven securely into the ground. Onto this framework, welded mesh panels should be securely fixed. See Figure 2 overleaf.

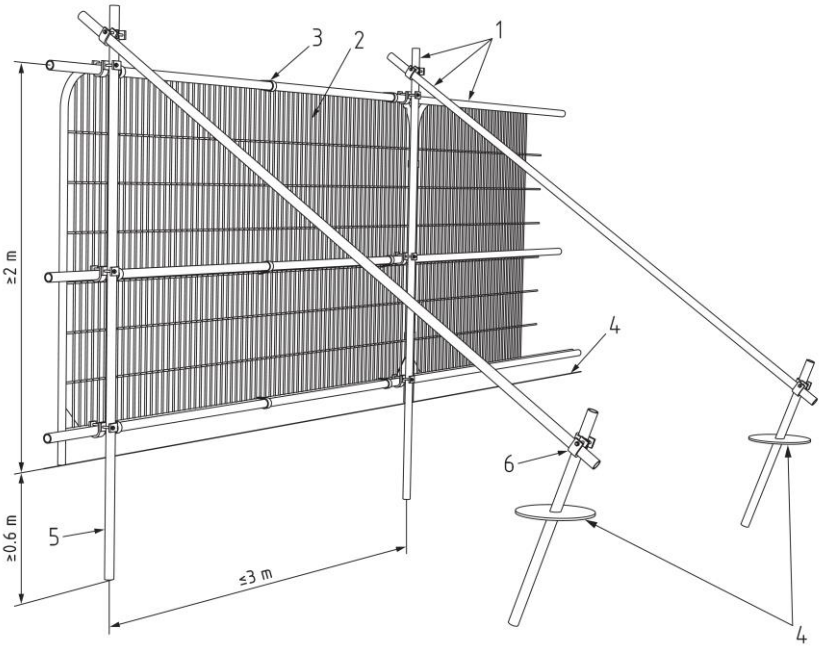
4.0.2 Where site circumstances and associated risk of damaging incursions into the RPA do not necessitate the default level of protection, an alternative specification may be used if agreed with the local authority. An example would be 'Heras' type welded mesh panels on rubber or concrete feet. The panels 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 panels should be supported on the inner side by stabiliser struts. See Figure 3 overleaf. All-weather notices should be attached to the barrier with words such as 'TREE PROTECTION ZONE - NO ACCESS.

4.0.3 **Location:** Barriers shall be positioned on the perimeter of the Root Protection Area to define the Construction Exclusion Zone or as specified in the Tree Protection Plan.

Shown on the Tree Protection Plan by a dashed black line

Figure 1 Example **of welded mesh barriers in use**

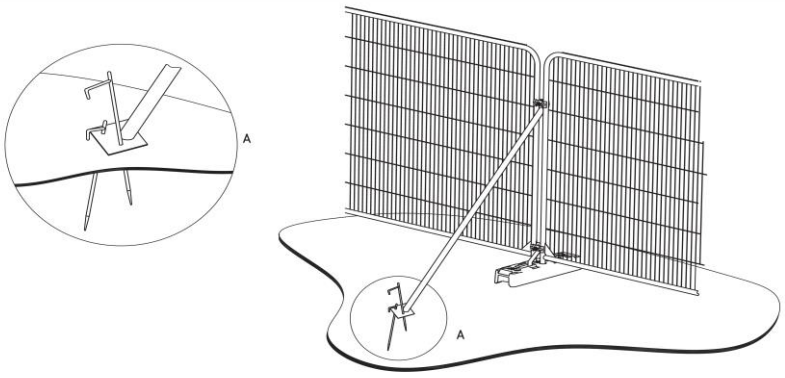
Figure 2 **Default specification for protective barrier**



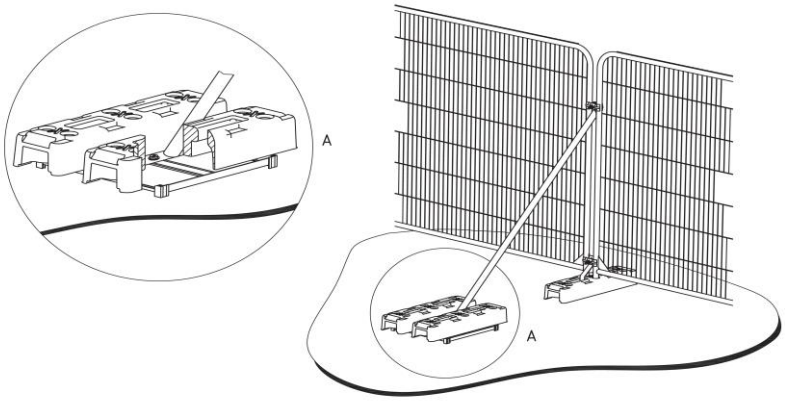
Key

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

Figure 3 **Examples of above-ground stabilizing systems**



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

Figures above are reproduced with the permission of the British Standards Institute.

4.1 Ground protection

In areas where it is not possible to erect protective fencing, ground protection must be used to protect the CEZ of trees. Where it has been agreed during the design stage, and as shown on the tree protection plan, that vehicular or pedestrian access for the construction operation may take place within the CEZ, the possible effects of construction activity should be addressed by a combination of barriers and ground protection. The position of the barrier may be within the CEZ at the edge of the agreed working zone but the soil structure beyond the barrier to the edge of the CEZ should be protected with ground protection. **This must be installed before any site activity takes place to protect soil structure and tree roots.**

4.1.1 Ground protection must be fit for the purpose of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil. It might comprise one of the following:

- *for pedestrian movements or the erection of scaffolding within the RPA the installation of ground protection in the form of a single thickness of scaffold boards either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip laid onto a geotextile;*
- *for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards or panels placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane; or*
- *for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.*

4.1.2 The following is a list of suppliers of temporary ground protection including polymer, metal or wooden panels. Other companies supply similar products and the following are given only as an example:

- *www.ground-guards.co.uk*
- *www.evetrakway.co.uk*
- *www.trakmatseurope.com*
- *www.centriforce.com*
- *www.marwoodgroup.co.uk*
- *www.groundtrax.com*

Cellular confinement no-dig systems can also be used.

4.1.3 Example of proprietary ground protection panels

Appendix 5 - Methods of Work Close to Trees

5.0 Guidance for working within RPAs

(This chapter sets out the general principles that must be followed when working in RPAs).

5.1 Removal of hard surfaces within RPAs

5.1.1 All structures including hard surfaces, walls and fences within construction exclusion zones (CEZ) must be removed following the methods detailed below to minimise damage to tree roots.

5.1.2 The use of conventional tracked and wheeled machinery causes damage to soil structure from compaction and damage to roots from excavation and must not be used within the CEZ. All areas of hard surfacing requiring removal within a CEZ will be broken up using a hand held pneumatic drill or mounted hydraulic breaker attached to a digger located outside the CEZ. The broken rubble will then be removed by hand.

5.1.3 The only exception to this is where the hard surface is of such a size as not to be reachable from outside the CEZ. In this situation, a rubber tracked mini-digger will be used. The maximum working height of the machine must be less than the lowest branch of any overhanging trees.

5.1.4 The mini-digger will work from the existing hard surface pulling the debris away from the tree/s.

5.1.5 No excavation of existing soil beneath the hard surface will take place.

5.1.6 Immediately after removal of the hard surface, topsoil or sharp sand must be used to cover the soil surface and any roots to prevent drying out.

5.1.7 Upon completion, the protective fencing must be moved out to the edge of the CEZ or ground protection used if access is required.

5.2 Services

5.2.1 The location and direction of new services should be designed to allow for services to be routed away from the RPAs of retained trees.

5.2.2 If any services need to run through a CEZ the main contractor must contact the project arboriculturist before any works are undertaken. Agreement will then be sought from the LPA tree officer on methodology. Works will only begin with the agreement of the LPA. Methodology used must comply with *NJUG Volume 4: Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees*, which can be summarised as:

- *hand excavate only;*
- *work carefully around roots only cutting as a last resort;*
- *do not cut roots over 25mm in diameter without referring to the project arboriculturist; and*
- *for roots less than 25mm in diameter use a sharp tool to make a clean cut leaving as small a wound as possible.*

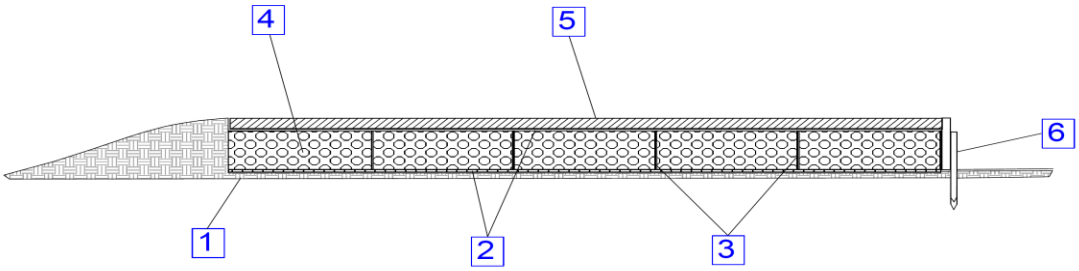
5.3 New hard surfaces within RPAs

5.3.1 Where it has been agreed with the LPA that hard surfaces are acceptable within RPAs of retained trees, these will require designing to be of above ground, no-dig construction to minimise impact on tree roots and soil structure. In addition, finished surfaces of the car parking and paved areas will need to be of porous design to allow water and air passage in and out.

5.3.2 An illustrative example of a cellular confinement no-dig system can be found below. The actual system will need to be designed by a structural engineer to accommodate the loadings anticipated.

5.3.3 The principles to follow are:

- *no excavation other than the removal of existing hard surfaces if required, or the removal of surface vegetation and no more than 50mm of leaf litter, vegetation debris etc;*
- *a method to spread and support the load of the hard surface and anticipated usage without causing compaction of the soil structure beneath;*
- *the use of a porous sub-base and finishing layer to allow water and air diffusion in and out of the soil;*
- *porosity must be designed to be long-term and not to block with fine particles in the short-term; therefore, irregular, no-fines aggregate must be used; and*
- *the pH of the aggregate must be considered as many conventional road stones have very high pH values which can damage susceptible trees and therefore aggregates with a near neutral pH should be preferred.*



Notes

1 Existing ground

2 Geotextile membrane

3 Cellular confinement system

4 20/40mm clean angular stone

5 Porous surface layer

6 Timber retaining edge

5.3.4 The following design criteria for non-dig will need to be considered when installing new hard, permeable surfacing within Root Protection Areas (RPAs) of retained trees:

- *Maintain oxygen diffusion through new surface to rooting area (3-12% by volume)*
- *Maintain sufficient passage of water to the rooting area (12-40% by volume)*
- *Maintain existing ground levels to avoid unsustainable root damage (severance/or asphyxiation)*
- *Avoid compaction by maintaining a soil structure sufficient to sustain root growth (soil bulk density below 1.6g/cc)*

5.3.5 The above criteria will provide the conditions for continued tree growth and preservation. Site analysis of the soil type and its Californian Bearing Ratio (CBR) should be established prior to determining the specific depth of products to be adopted for the no-dig sub-base system.

5.3.6 Footpaths normally require a depth of 100mm and, 150mm to 200mm depths are used for residential driveways, while greater depths may be required for the passage of heavier traffic such as for construction access and delivery vehicles.

1. The use of a three dimensional cellular confinement system within an LIS is an acceptable approach, which aims to fulfil the above design criteria. This system maintains the passage of oxygen and water to root systems; avoids root loss through severance or asphyxiation and minimises the potential for soil compaction. It is achieved by using Geotextile membranes and the introduction of the three-dimensional Cellular Confinement System product. The material is laid onto a geotextile membrane covering the soil, whose existing levels within the Root Protection Area (RPA) of retained trees, is to be maintained so far as practicable.

2. Retained trees must first be protected during all stages of the development including demolition, by the erection of fencing as shown in the diagram below and with reference to specifications and the Tree Protection Plan (TPP). Installing the LIS may require the re-positioning of the tree protection fencing to a secondary location in line with TPP and associated method statement. This follows the recommendations provided within British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations'.

3. Where ground levels are to be raised more than 150mm within the RPA this should be achieved by the use of a granular material, which does not inhibit vertical gaseous diffusion. For example: no-fines gravel (MOT Type 3), washed aggregate, structural soil (min. 20% sand content) or cobbles.

4. The approved wearing course is to be laid over the cellular confinement system. Where it is to cover in excess of 20% of the RPA of a previously uncovered RPA, justification is to be provided.

5. The use of a non-woven Geotextile beneath the cellular mattress acts as a separation/filtration layer and should be filled with **no-fines** stone in the 20-40mm range. This operation will be carried out avoiding the use of heavy machinery within the RPA of retained trees. Once filled, the perforated cellular wall structure provides mechanical interlock for infill materials, increasing the shear strength while allowing lateral drainage and gaseous exchange.

6. The system will be used as a permanent base for a wearing course and/or will provide a temporary site access for root protection. The minimum depth for CCS material is 75mm but depths up to 400mm may be suitable; the material required will depend on the load bearing capacity of the final surface. A structural engineer should design all engineering solutions to surfaces.

5.4 Fencing within RPAs

5.4.1 Where posts are to be installed within RPAs the holes must be dug carefully by hand. If roots with a diameter of 25mm or greater are found, the position of the post must be moved. Roots smaller than 25mm diameter can be cut with sharp tools leaving as small a wound as possible. The sides of the hole should be lined with an impermeable membrane such as plastic sheeting to prevent the caustic and toxic effects of wet cement in the concrete from damaging tree roots.

5.5 Landscaping works within RPAs

5.5.1 Landscape operations within tree protection zones have the potential to damage trees if not carried out with care; in addition, the removal of protective fencing to carry out landscape operations may allow other contractors in previously protected areas.

5.5.2 If protective fencing is taken down to facilitate landscaping operations, the area of the CEZ must be delineated by pins and marker tape, spray paint, or some other method to clearly show the extent of the CEZ.

5.5.3 The preparation of soil for planting and turf laying must be carried out by hand where within CEZs. Cultivation should be kept to a minimum and new topsoil added must not exceed 100mm in depth within 1m of the stem of any tree.

5.5.4 Topsoil and other materials must be transported by wheelbarrow on running boards when working within CEZs.

Appendix 6 - Tree Work Schedule

All tree works to be undertaken in accordance with *BS 3998:2010 Recommendations for tree works,* or industry best practice.

Tree no.	Species	Proposed works	Reason	Grade
G1	Silver Birch (Betula pendula)	Fell	To accommodate the proposed layout.	C1
G2	Silver Birch (Betula pendula) Crack Willow (Salix fragilis)	Fell	To accommodate the proposed layout.	C1
G7	Sessile Oak (Quercus petraea)	Fell	To accommodate the proposed layout.	C1
T10	English Oak (Quercus robur)	Fell	To accommodate the proposed layout.	C1
G17	Scots Pine (Pinus sylvestris).	Fell section	To provide sufficient space for the access.	B2
H44	Beech (Fagus sylvatica) Hazel (Corylus avellana)	Reinforce hedgerow with new structured planting.	To increase hedgerows longevity	C2
T45	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	B1
G46	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	B2
T57	English Oak (Quercus robur)	Monitor.	Monitor cavity at base for health and safety reasons.	B3
T64	English Oak (Quercus robur)	Remove large hanger	On health and safety grounds	B1
W82	English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Elder (Sambucus nigra). Norway Maple (Acer platanoides). Sycamore (Acer pseudoplatanus).	Green waste in the section of woodland should be. Archaeologists to be. Consulted before works start. Woodland management plan recommended	To reduce the risk of damage to the roots through soil compaction. Woodland management plan to provide a structured future management plan which will ensure the woodlands value is maintained.	A3
G84	Sessile Oak (Quercus petraea).	Fell section	To accommodate the proposed layout.	C1
G85	English Oak (Quercus robur). Elder (Sambucus nigra). Scots Pine (Pinus sylvestris).	Fell section	To provide sufficient space for the access.	B2
G89	English Oak (Quercus robur). Silver Birch (Betula pendula). Elder (Sambucus nigra). Scots Pine (Pinus sylvestris).	Fell section	To provide sufficient space for the access.	B2
H100	Hawthorn (Crataegus monogyna). Blackthorn (Prunus spinosa).	Reinforce hedgerow with new structured planting	To increase hedgerows longevity	C1
W101	English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Blackthorn (Prunus spinosa). Elder (Sambucus nigra). Scots Pine (Pinus sylvestris).	Fell section	To provide sufficient space for the access.	B2

Tree no.	Species	Proposed works	Reason	Grade
G110	Hawthorn (Crataegus monogyna). Blackthorn (Prunus spinosa). English Elm (Ulmus procera).	Reinforce with new structured planting	To increase tree groups longevity	C2
T113	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	C2
T116	English Oak (Quercus robur)	Monitor.	Monitor cavity at base for health and safety reasons.	A3
T117	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	B1
T119	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	A1
T132	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	B2
T136	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	A1
T137	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	A1
T138	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	A1
T143	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	C2
T144	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	C2
T145	English Elm (Ulmus procera).	Sever ivy.	To reduce the risk of crown suppression.	C1
G146	English Elm (Ulmus procera).	Sever ivy.	To reduce the risk of crown suppression.	C2
T149	English Elm (Ulmus procera).	Sever ivy.	To reduce the risk of crown suppression.	B3
G150	English Elm (Ulmus procera).	Sever ivy.	To reduce the risk of crown suppression.	B3
T156	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	A1
T157	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	B1
T161	English Oak (Quercus robur)	Fell	To accommodate the proposed layout.	B2
T164	English Oak (Quercus robur)	Sever ivy.	To reduce the risk of crown suppression.	C1
G165	English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Hazel (Corylus avellana). Hornbeam (Carpinus betulus). Scots Pine (Pinus sylvestris).	Sever ivy. Fell section	To reduce the risk of crown suppression. To accommodate the proposed layout.	C1
G178	English Oak (Quercus robur).	Fell section	To accommodate new road layout	C2

Tree no.	Species	Proposed works	Reason	Grade
G189	English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Blackthorn (Prunus spinosa). Sycamore (Acer pseudoplatanus). Lawson Cypress (Chamaecyparis lawsoniana). Scots Pine (Pinus sylvestris).	Fell section	To accommodate new road layout	B2
G190	Blackthorn (Prunus spinosa) Field maple (Acer campestre)	Fell all	Clear visibility splays	C2
G191	Sycamore (Acer pseudoplatanus).	Fell all	Clear visibility splays	C2
G192	English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Blackthorn (Prunus spinosa). Hazel (Corylus avellana).	Fell section	To accommodate new road layout	C2
G193	Cherry (Prunus avium). English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Blackthorn (Prunus spinosa). Sycamore (Acer pseudoplatanus).	Fell section	To accommodate new road layout	B2
G194	Blackthorn (Prunus spinosa). Field Maple (Acer campestre). Sycamore (Acer pseudoplatanus).	Fell section	To provide sufficient space for the access.	C2
T198	English Oak (Quercus robur)	Fell	To accommodate the proposed layout.	C1
T200	Silver Birch (Betula pendula)	Fell	To accommodate the proposed layout.	B1
T201	Silver Birch (Betula pendula)	Fell	To accommodate the proposed layout.	C1
T202	Silver Birch (Betula pendula)	Fell	To accommodate the proposed layout.	C1
T203	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	C1
T205	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	C1
T206	Hawthorn (Crataegus monogyna).	Fell	To accommodate the proposed layout.	C1
G209	Silver Birch (Betula pendula).	Fell section	To accommodate the proposed layout.	C2
H216	Hawthorn (Crataegus monogyna). Blackthorn (Prunus spinosa).	Fell section	To accommodate the proposed layout.	C2
H220	Cherry (Prunus avium). English Oak (Quercus robur). Hawthorn (Crataegus monogyna). Blackthorn	Fell section	To accommodate the proposed layout.	C2

	(Prunus spinosa). Cotoneaster (Cotoneaster frigidus).			

Tree no.	Species	Proposed works	Reason	Grade
G222	Silver Birch (Betula pendula). Blackthorn (Prunus spinosa). Scots Pine (Pinus sylvestris).	Fell	To accommodate the proposed layout.	C2
G223	Silver Birch (Betula pendula). Norway Maple (Acer platanoides)	Fell	To accommodate the proposed layout.	C2
G224	Silver Birch (Betula pendula). Scots Pine (Pinus sylvestris).	Fell	To accommodate the proposed layout.	C2
G225	Scots Pine (Pinus sylvestris).	Fell	To accommodate the proposed layout.	C2
G227	Monterey Pine (Pinus radiata)	Fell	To accommodate the proposed layout.	C2
G228	Silver Birch (Betula pendula). Sweet Chestnut (Castanea sativa). Scots Pine (Pinus sylvestris). European Larch (Larix decidua).	Fell	To accommodate the proposed layout.	C2
T229	Alder (Alnus glutinosa).	Fell	To accommodate the proposed layout.	B1
G230	Silver Birch (Betula pendula). Whitebeam (Sorbus aria).	Fell	To accommodate the proposed layout.	C2
G231	Silver Birch (Betula pendula). Whitebeam (Sorbus aria). Scots Pine (Pinus sylvestris).	Fell	To accommodate the proposed layout.	C2
G232	English Oak (Quercus robur). Silver Birch (Betula pendula). Norway Maple (Acer platanoides). Sycamore (Acer pseudoplatanus).	Fell	To accommodate the proposed layout.	C2
T233	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	B1
T234	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	B1
G235	Hawthorn (Crataegus monogyna). Silver Birch (Betula pendula). Whitebeam (Sorbus aria).	Fell	To accommodate the proposed layout.	C2
G236	Silver Birch (Betula pendula). Beech (Fagus sylvatica). Scots Pine (Pinus sylvestris). European Larch (Larix decidua).	Fell	To accommodate the proposed layout.	C2
G239	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	C2
G240	Silver Birch (Betula pendula).	Fell	To accommodate the proposed layout.	C2
T241	Lodgepole Pine (Pinus cordata)	Fell	To accommodate the proposed layout.	B1
G243	Silver Birch (Betula pendula). Sycamore (Acer pseudoplatanus).	Fell section	To accommodate the proposed cyclepath layout.	C2

Tree no.	Species	Proposed works	Reason	Grade
G244	Silver Birch (Betula pendula).	Fell section	To accommodate the proposed cyclepath layout.	C2
G248	Silver Birch (Betula pendula). Norway Maple (Acer platanoides). Sycamore (Acer pseudoplatanus).	Fell section	To accommodate the proposed cyclepath layout.	C2
G249	Silver Birch (Betula pendula). Norway Maple (Acer platanoides). Sycamore (Acer pseudoplatanus). Oak (Qurecus robur).	Fell section	To accommodate the proposed cyclepath layout.	C2

Appendix 7 - Specific report caveats

7.0.1 The survey was based on a topographical drawing provided by the client. Therefore, SES Ltd takes no responsibility for the accuracy of the trees locations. The accurate locations of tree cover in the North West corner of the site and along the proposed cycleway offsite to the west, was not available at the time of the survey therefore the trees have been plotted approximately. Their exact locations should be checked on site before any works is undertaken.

7.0.2 No internal diagnostic equipment was used other than a sounding mallet and probe.

7.0.3 The survey is concerned solely with arboricultural issues.

7.0.4 Any work with trees will discharge the due diligence requirements of all relevant wildlife and countryside legislation.

7.0.5 Trees are dynamic living organisms whose health and condition can change rapidly. Any changes to the tree or conditions close to the tree may change the stability and condition of the tree and a further examination would be required and may affect the validity of this report.

7.0.6 This report is valid for 12 months.

7.1 Copyright and non-disclosure

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