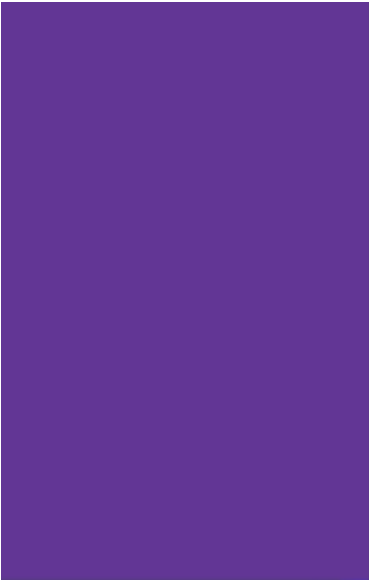


Arboricultural Assessment & Method Statement
Woodcroft Farm, Woodcroft Lane, Waterloooville

Alex Needs BA (Hons) MICFor MArborA

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16381-AMS-AN



barrell
TREE CONSULTANCY

Site location and approximate boundaries



This aerial image is provided courtesy of Google. The yellow line indicates the approximate site boundary and is illustrative only.

Report purpose, validation statement and tree protection plan

Report purpose

This is a BS 5837 compliant arboricultural assessment report providing sufficient information for the Local Planning Authority ("LPA") to consider the effect of the proposed development on local character from a tree perspective. It includes an analysis of how trees will be affected and an arboricultural method statement describing how retained trees will be protected and managed during the development activity. It is fully in line with the BS 5837 advice relating to the planning application stage of the process highlighted in Table B1 reproduced below:

Table B.1 Delivery of tree-related information into the planning system

Stage of process	Minimum detail	Additional information
Pre-application	Tree survey	Tree retention/removal plan (draft)
Planning application	Tree survey (in the absence of pre-application discussions)	Existing and proposed finished levels
	Tree retention/removal plan (finalized)	Tree protection plan
	Retained trees and RPAs shown on proposed layout	Arboricultural method statement - heads of terms
	Strategic hard and soft landscape design, including species and location of new tree planting	Details for all special engineering within the RPA and other relevant construction details
Reserved matters/ planning conditions	Arboricultural impact assessment	
	Alignment of utility apparatus (including drainage), where outside the RPA or where installed using trenchless method	Arboricultural site monitoring schedule
	Dimensioned tree protection plan	Tree and landscape management plan
	Arboricultural method statement – detailed	Post-construction remedial works
	Schedule of works to retained trees, e.g. access facilitation pruning	Landscape maintenance schedule
	Detailed hard and soft landscape design	

Validation statement

For LPA validation purposes, this report includes:

- a **BS 5837 compliant tree survey**, including a tree protection plan showing the location of the existing trees, their categorisation, the location of the new structures and hard surfacing, the trees to be removed, and the tree protection measures;
- an **arboricultural assessment** in Section 1, which describes how the development proposal will affect local character from a tree perspective;
- an **arboricultural method statement** in Section 2 describing the tree protection and management measures, and how they should be implemented; and
- two **appendices** in Section 3 setting out the background administrative information and a schedule of tree information.

Report purpose, validation statement and tree protection plan

The tree protection plan

More specifically, the tree protection plan is based on the provided information and it should only be used for dealing with the tree issues. It shows:

- the existing trees numbered, with high/moderate categories (A & B) highlighted in green triangles and low/unsuitable categories (C & U) highlighted in blue rectangles;
- the circular interpretation of root protection areas ("RPA") of category A, B and C trees (grey circles);
- the trees to be removed indicated by a red number and crown outline;
- the location of the construction exclusion zone ("CEZ"), which is the area of restricted access, to be protected by temporary barriers (fencing and/or ground protection); and
- the location of precautionary areas outside the CEZ where limited, but careful access is permitted.

Summary

1. The development proposal

The development proposal is to construct a new bridleway through a paddock and along an existing four wheel drive byway at Woodcroft Farm, Woodcroft Lane, WaterlooVille.

2. Background administrative information

Our instructions, how we prepared this report and other relevant background information is explained in Appendix 1. All the trees that could be affected were inspected and that information is listed in Appendix 2.

3. Table 1: Summary of category A, B and C trees to be removed, pruned or protected using special precautions

	British Standard 5837 Category		
	A (High quality)	B (Moderate quality)	C (Low quality)
Remove	-	-	W22 (part)
Prune	7	6	W22 (part)
Protect using special precautions	7, 13, 15, 16	4, 6, 9, 10, 11, 14, G17, 18, 20 W22 (part)	3, 5, G8, 19, G8, W22 (part)

W=Woodland; G=Group

Note: Category U trees are in such poor condition they would be removed irrespective of development and they are not included in this summary.

4. Table 2: Summary of the impact on local character of tree removal and pruning, and proposed mitigation

	Tree number(s)	Impact on local character	Mitigation
Remove	W22 (part)	Slight thinning of the woodland belt	None needed due to natural regeneration within the woodland
Prune	6, 7	No impact	None needed

5. Table 3: Extra precautions in addition to primary protection using barriers (fencing and ground protection)

Activities requiring extra precautions	Tree number(s)
Pollution control near retained trees	All trees
Installation of new surfacing and upgrading of existing surfacing in RPAs	3, 4, 5, 6, 7, G8, 9, 10, 11, 12, 13, 14, 15, 16, G17, 18, 19, 20 W22 (part)
Installation of new structures in RPAs	3, 4 and trees in W22 near vehicle blocker posts

Note: The detailed analysis explaining how these trees will be protected is provided in Section 2 of this report. The approximate locations of the protective measures are shown on the tree protection plan.

6. Overall assessment of how the development proposal will affect local character from a tree perspective

The proposal requires the construction of a new bridleway routed through a paddock and a woodland. Within the paddock the route passes close to mature field boundary trees and within the woodland it uses the route of an existing byway. The proposed route requires the removal of a small number of trees that are all low category because of their poor condition or small size. Their location within the woodland means they are predominantly screened by the larger trees

Summary

on the woodland edge and their loss will have a very minor impact on the woodland belt but no significant impact on the present character of the area.

The existing byway is used recreationally by 4x4 vehicles and is heavily rutted and uneven. There is evidence of significant ground compaction in places. The construction of a new no-dig bridleway offers an opportunity to improve the soil structure and prevent further damage. This will greatly improve the long-term prospects for the retained trees. Some minor pruning of low hanging branches both in the paddock and the woodland is required to allow free passage below the trees. However, this is not considered to impact the character of the local area or the long-term health of the trees.

The construction activity may affect further trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal will have no significant impact on the contribution of trees to character in the wider setting.

Section 1

Arboricultural assessment

This arboricultural assessment has taken account of all the recommendations set out in 5.4 of BS 5837 (reproduced courtesy of BSI below).

5.4 Arboricultural impact assessment

5.4.1 The project arboriculturist should use the information detailed in 5.2 and 5.3 to prepare an arboricultural impact assessment that evaluates the direct and indirect effects of the proposed design and where necessary recommends mitigation.

5.4.2 The assessment should take account of the effects of any tree loss required to implement the design, and any potentially damaging activities proposed in the vicinity of retained trees. Such activities might include the removal of existing structures and hard surfacing, the installation of new hard surfacing, the installation of services, and the location and dimensions of all proposed excavations or changes in ground level, including any that might arise from the implementation of the recommended mitigation measures. In addition to the impact of the permanent works, account should be taken of the buildability of the scheme in terms of access, adequate working space and provision for the storage of materials, including topsoil.

NOTE Scaled cross-sections and other drawings might be required to demonstrate the feasibility of the proposals (see Annex B).

5.4.3 As well as an evaluation of the extent of the impact on existing trees, the arboricultural impact assessment should include:

- a) the tree survey (see 4.4);
- b) trees selected for retention, clearly identified (e.g. by number) and marked on a plan with a continuous outline;
- c) trees to be removed, also clearly identified (e.g. by number) and marked on a plan with a dashed outline or similar;
- d) trees to be pruned, including any access facilitation pruning, also clearly identified and labelled or listed as appropriate;
- e) areas designated for structural landscaping that need to be protected from construction operations in order to prevent the soil structure being damaged;
- f) evaluation of impact of proposed tree losses;
- g) evaluation of tree constraints (see 5.2) and draft tree protection plan (see 5.5);
- h) issues to be addressed by an arboricultural method statement (see 6.1), where necessary in conjunction with input from other specialists.

Section 1: Arboricultural assessment

7. Trees to be protected using special precautions

All the retained trees on the paddock boundary will be protected from damage using barriers (fencing) or ground protection. Within the woodland area, the understory of holly and other shrubs and saplings will provide a natural barrier preventing most access to areas beyond the construction footprint.

Additionally, in the precautionary area shown on the tree protection plan with the yellow highlighting, special precautions relating to the management of new structures, and surfacing will be required. These precautions are explained in the arboricultural method statement in Section 2 of this report. If the precautions set out in this arboricultural method statement are implemented as described, these trees can be successfully retained without any adverse impact on them or on visual amenity.

8. Table 4: The impact of tree removal on local character

Tree number	Impact of tree removal
W22 (part)	• Limited impact: These trees are visible in glimpses from outside the site as part of a wider woodland group but not individually prominent. Their loss will be noticeable in the immediate vicinity in the short term, but there will be no significant impact on local character in the wider setting in the medium to long terms.

Note: Trees categorised as U are in such poor condition that they have been assessed as needing removal for management reasons irrespective of any development proposals. Removal of any category U trees will be a management decision; the loss will not be caused by this proposal and it should not be considered as a direct impact.

9. The impact of tree pruning on local character

Although trees 6, 7 and various trees in W22 will need crown lifting to achieve a reasonable clearance above the bridleway, these works fall within the bounds of normal management and are justified irrespective of any development. Such pruning would have no significant adverse impact on tree health and, because the profile from public viewpoints would remain unchanged, it will have no significant impact on local character.

10. Summary of the impact on local character

The proposal requires the construction of a new bridleway routed through a paddock and a woodland. Within the paddock the route passes close to mature field boundary trees and within the woodland it uses the route of an existing byway. The proposed route requires the removal of a small number of trees that are all low category because of their poor condition or small size. Their location within the woodland means they are predominantly screened by the larger trees on the woodland edge and their loss will have a very minor impact on the woodland belt but no significant impact on the present character of the area.

The existing byway is used recreationally by 4x4 vehicles and is heavily rutted and uneven. There is evidence of significant ground compaction in places. The construction of a new no-dig bridleway offers an opportunity to improve the soil structure and prevent further damage. This will greatly improve the long-term prospects for the retained trees. Some minor pruning of low hanging branches both in the paddock and the woodland is required to allow free passage below the trees. However, this is not considered to impact the character of the local area or the long-term health of the trees.

The construction activity may affect further trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal will have no significant impact on the contribution of trees to character in the wider setting.

Section 2

Arboricultural method statement

This arboricultural method statement has taken account of all the recommendations set out in 6.1 of BS 5837 (reproduced courtesy of BSI below).

6.1 Arboricultural method statement

6.1.1 A precautionary approach towards tree protection should be adopted and any operations, including access, proposed within the RPA (or crown spread where this is greater) should be described within an arboricultural method statement, in order to demonstrate that the operations can be undertaken with minimal risk of adverse impact on trees to be retained.

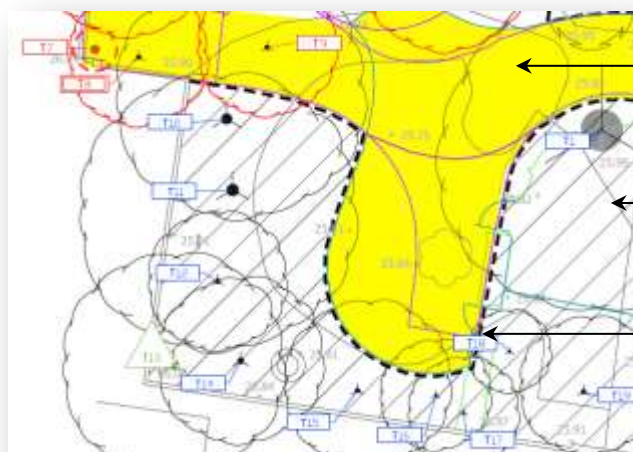
6.1.2 The arboricultural method statement should be appropriate to the proposals and might typically address some or all of the following, incorporating relevant information from other specialists as required:

- a) removal of existing structures and hard surfacing;
- b) installation of temporary ground protection (see **6.2.3**);
- c) excavations and the requirements for specialized trenchless techniques (see **7.7.2**);
- d) installation of new hard surfacing – materials, design constraints and implications for levels;
- e) specialist foundations – installation techniques and effect on finished floor levels and overall height;
- f) retaining structures to facilitate changes in ground levels;
- g) preparatory works for new landscaping ;
- h) auditable/audited system of arboricultural site monitoring, including a schedule of specific site events requiring input or supervision.

Section 2: Arboricultural method statement

11. Identification of areas to be protected

The tree protection plan (typical annotation illustrated below) shows all the areas where protective measures are necessary. The construction exclusion zone ("CEZ") boundary is shown on the plan as the heavy dashed black line, with the lighter diagonal hatching behind. If necessary, further precautionary areas outside the CEZ are shown on the plan as a coloured fill, where a high level of care is required.



The coloured fill is the precautionary area

The light black diagonal hatch is the CEZ

The heavy black dashed line is the line of fencing

12. Construction method statement (heads of terms summary)

A construction method statement is a description of how operations that may affect trees will be carried out to minimise any adverse impact on them. The details of how the site will be managed are construction and contractual matters that can only be finalised once the post-consent detailed planning begins. For that reason, at this stage in the planning process, it is only possible to list a heads of terms summary of the issues that will require more detailed consideration once consent is issued. The issues that may require further clarification on this site include:

1. The order of work on site, including demolition, site clearance and building work.
2. Who will be responsible for protecting the trees on site.
3. Detailed proposals for inspecting and supervising the tree protection, and how problems will be reported and solved.
4. How accidents and emergencies involving trees will be managed, including accidental damage to roots and their treatment.
5. The parking arrangements for workers and visitors.
6. A schedule of emergency contact numbers.
7. Areas for loading and unloading of materials and storage of materials and plant.
8. Where site facilities will be located and when will they be installed.
9. Details of earthworks, grading and mounding and removal of spoil, including any planned lowering or raising of ground levels.
10. Details of upgrading/removing/replacing existing surfacing and areas where this will happen, including detailed and precise cross-sections where no-dig surfacing is to be installed.

Note: It is not our role as arboricultural consultants to detail the timing and implementation of these measures, although we can input into the process and will need to confirm that the final proposals will not adversely affect retained trees.

Section 2: Arboricultural method statement

13. Arboricultural supervision

An arboricultural consultant should be appointed by the developer to advise on the tree management for the site and to attend:

- a pre-commencement meeting before any work starts;
- regular supervision visits to oversee the agreed tree protection; and
- further supervision visits as necessary to oversee any unexpected works that could affect trees.

More specifically, the form and purpose of the supervision should be as follows:

- **Pre-commencement meeting:** A pre-commencement meeting should be held on site before any of the site clearance and construction work begins. This would normally be attended by the site manager, the arboricultural consultant and a local planning authority ("LPA") representative. If a LPA representative declines to be present, the arboricultural consultant should inform the LPA in writing of the details of the meeting. All tree protection measures detailed in this document should be fully discussed so that all aspects of their implementation and sequencing are understood by all the parties. This should include agreeing the form and location of the most appropriate combination of fencing and/or ground protection to be used as barriers for the CEZ. Any agreed clarifications or modifications to the consented details will be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection should be agreed and finalised, which should then form the basis of any supervision arrangements between the arboricultural consultant and the developer.
- **General site management:** It is the developer's responsibility to ensure that the details of this arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents should be available on site and the site manager should brief all personnel who could have an impact on trees on the specific tree protection requirements. This should be a part of the site induction procedures and written into appropriate site management documents.
- **Ongoing supervision of operations that could affect trees:** Once the site is active, the arboricultural consultant should visit at an interval agreed at the pre-commencement site meeting. This would normally be every two to four weeks for general supervision, but could be at a longer interval if agreed between the parties. The supervision arrangement should be sufficiently flexible to allow the supervision of all sensitive works as they occur. The arboricultural consultant's initial role is to liaise with the developer and the LPA to ensure that protective measures are fit for purpose and in place before any works start on site. Once the site is working, that role should switch to monitoring compliance with arboricultural planning conditions and advising on any tree problems that arise or modifications that become necessary.

14. Summary of the tree issues to be project managed by the supervising arboriculturist

In overview, it is anticipated that arboricultural input is likely to be needed for the following operations:

1. Pre-commencement meeting
2. Preliminary tree felling and pruning
3. Installation of CEZ barriers (fencing and/or ground protection)
4. Pollution control near retained trees
5. Excavation in RPAs
6. Installation of new surfacing and/or upgrading of existing surfacing in RPAs
7. Installation of new structures in RPAs

Section 2: Arboricultural method statement

15. Table 5: Suggested programme of arboricultural supervision during the development process

Finalising tree management details after consent, but before work starts	
Action	Arboricultural input
Review of tree protection and any emerging design issues that may affect trees with the construction team	• Meeting/discussion with relevant members of the developer's team to explain the extent of the tree constraints • Review working space requirements to consider barrier and ground protection adjustments to improve site functionality • Review drainage proposals and identify potential conflicts with RPAs • Review any post-consent layout changes that may affect trees • Review all works within RPAs that may affect trees • Identify any potential conflicts and work towards resolutions • Preparation of working drawings, if necessary
Review consented tree protection proposals for discussion at pre-commencement meeting	If necessary: • prepare revised plans and specifications • liaise with LPA to discuss modifications
Pre-commencement site meeting with supervising arboriculturist, site manager and the LPA representative (if appropriate)	• Meeting on site • Agree detail of supervision requirements, i.e. frequency of visits and reporting • Review any updated proposals • Review tree protection, if already installed
Site operations before work starts on site	
Action	Arboricultural input
Tree works carried out	• Review the site requirements with the tree work contractor
Installation of tree protection for agreement by the LPA	• If appropriate, preparation of any revised plans and specifications for agreement by the LPA • Photographs showing relevant aspect of installed tree protective measures • Liaise with the contractor installing protection until satisfactorily completed
Operations that could affect trees during construction	
Action	Arboricultural input
Installation of new special surfacing within RPAs, but outside barriers	• Meeting with contractor for briefing before installation, with further supervision visits as necessary at the discretion of the arboricultural consultant
Installation of new structures	• Meeting with contractor for briefing before work starts, with further visits as necessary at the discretion of the arboricultural consultant

The precise order and timing of some of these operations may change due to site operating requirements, but all operations that could affect trees should remain under arboricultural supervision.

16. Tree works

In most situations, the tree works need to be carried out before the main construction activity starts. Tree works, based on our assessment of the proposal and the original site inspection, are set out in the work recommendations column of the tree schedule in Appendix 2. The location of each tree is shown on the tree protection plan and any to be removed are indicated with a red number and red crown outline. All tree works must be reassessed before any site activity starts as part of the standard risk management process.

Section 2: Arboricultural method statement

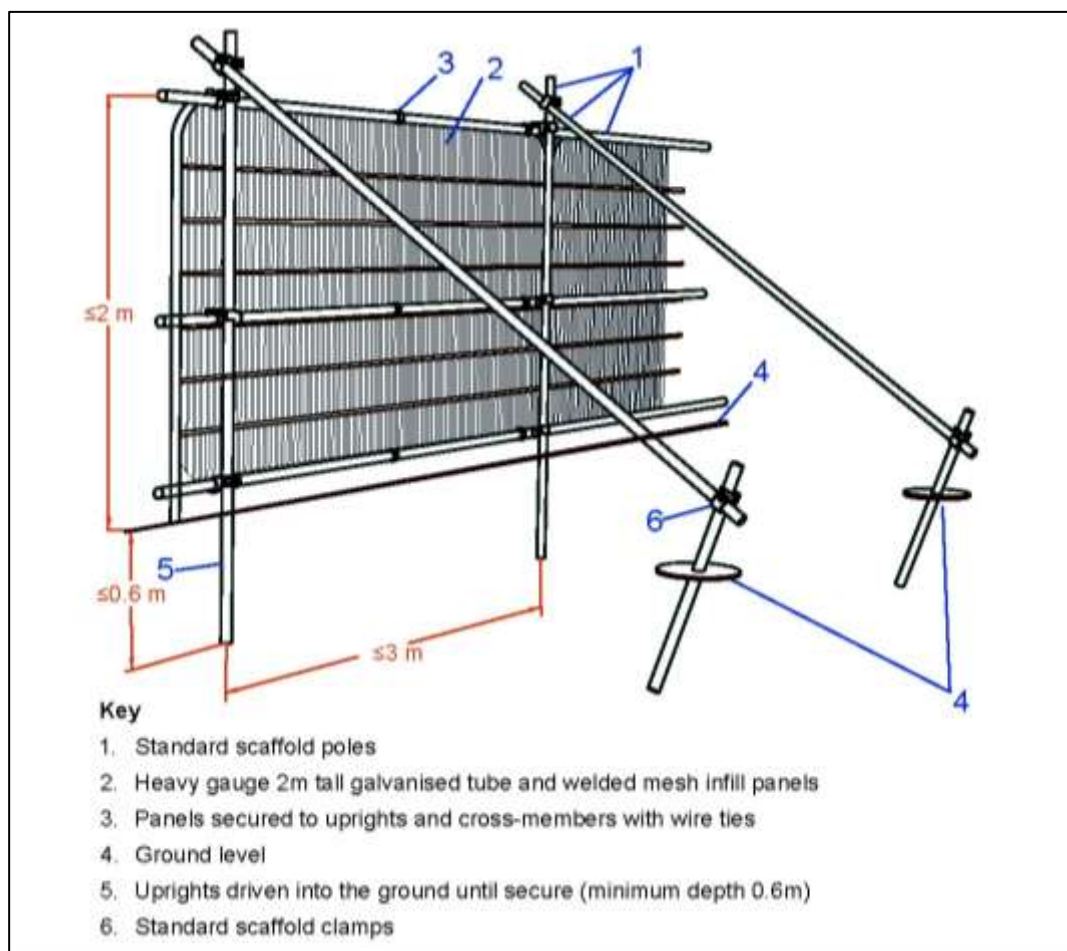
17. Primary tree protection using fencing

The CEZ is the RPA surrounding retained trees that must be protected from any disturbance by the construction activity. In practice, this can be done by any combination of fencing and ground protection, to be finalised and agreed at the pre-commencement meeting. Whether the CEZ is protected by fencing or ground protection, all the protective measures should be installed before the start of any site works that could affect trees. No protective measures should be removed or temporarily dismantled without consulting the supervising arboriculturist. Furthermore, the condition of all the protective measures should be regularly monitored to ensure they remain fit for purpose. The main means of preventing damage to trees and their RPAs in the CEZ are fencing, barriers and ground protection.

Protective fencing should be installed at the locations shown on the tree protection plan by the heavy black dashed line. If agreed with the LPA, fencing can be set back to improve access, provided the exposed ground is protected with ground protection. Various fencing options are illustrated in Fencing images 1–6. The minimum specification for the fencing should be as described in figure 2 of BS 5837 (Fencing image 1) or an equivalent design that effectively restricts access to the RPA it protects.

The precise form of the fencing can vary, provided it is fit for purpose in that it effectively restricts access and damaging activities within the RPA that it encloses. More specifically, behind the fencing, there should be no vehicular access; no fires; no storage of excavated debris, building materials or fuels; no mixing of cement; no service installation or excavation; no raising or lowering of soil levels; and no excessive cultivation for landscape planting. Any variations to these restrictions should be agreed by the supervising arboriculturist.

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Fencing image 1: Recommendations taken from figure 2 of BS 5837.



Fencing image 2: Heras fencing wired to scaffold braced posts is a robust and effective interpretation of the BS specification.



Fencing image 3: Close up of bracing detail, essential for increasing the stability of the vertical framework.

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Fencing image 4: Board specification on secure wooden posts is a suitable alternative to the standard braced scaffold design.

Where individual trunks or branches are vulnerable to impact damage, a framework of scaffold or wood can be constructed to provide protection (Fencing images 5 and 6).



Fencing image 5: A scaffold-braced framework surrounding the trunk reduces the risk of accidental impact.



Fencing image 6: Board secured to scaffold framework adds another layer of protection for vulnerable trunks and branches

18. Primary tree protection using ground protection

Where it is not practical to protect the CEZ by the use of fencing alone, BS 5837 (6.2.3) allows for the fencing to be set back and the soil protected by ground protection. This allows improved access during construction, with the ground protection preventing damage to the CEZ outside the protection of the fencing. A range of methods can be used, including retaining existing hard surfacing or structures that already protect the soil, installing new materials, or a combination of both. Whatever the choice of method, the end result must be that the underlying soil (rooting environment) remains undisturbed and retains the capacity to support existing and new roots. Ground protection images 1–8 illustrate a range of practical surface coverings that can effectively protect CEZs of retained trees.



Ground protection image 1: Heavy-duty plywood set onto a compressible woodchip layer and pinned into position is suitable



Ground protection image 2: Spreading soil excavated from footings is an effective way of buffering the plywood surface from

Section 2: Arboricultural method statement

to spread the loading from pedestrian access.



Ground protection image 3: Plywood fixed to a wood frame is another effective method of protecting soil from pedestrian compaction.

the wear of light vehicles.



Ground protection image 4: A scaffold framework attached to the main scaffold fencing can be used to support either scaffold planks or plywood to create an elevated platform with a gap beneath.



Ground protection image 5: Cellular products are a very effective means of providing ground protection where heavy vehicle use is expected. Here, it is being used to temporarily widen an existing road, to be removed once the construction is finished.



Ground protection image 6: Custom designed sectional tracks can be joined to support very heavy traffic use through sensitive areas.



Ground protection image 7: A combination of retaining existing surfacing and using temporary construction cabin accommodation can be a very effective means of preventing damage to sensitive areas.



Ground protection image 8: Steel plates can be an effective way of temporarily reinforcing weak surfacing over a construction access during the development activity.

On this site, all the precautionary areas annotated with yellow shading on the tree protection plan should be protected with ground protection while vulnerable to damage, in line with the above examples. Where appropriate, any existing hard surfacing can be retained and utilised. Any surfacing to be retained that is disrupted during the course of the construction activity can be replaced, reconditioned or upgraded as necessary. This work should be subject to arboricultural supervision.

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19. Extra precautions – pollution control near retained trees

The following guidance should be applied wherever risk assessment identifies a significant risk of chemical pollution.

Spilt chemicals that can soak into RPAs will kill existing roots and may prevent new roots growing, so provision must be made to minimise the risk of contamination to soil within the normal risk management protocols for the site. This would normally include means of containing spillages and procedures for clearing them up if they occur (Pollution image 1). All cement mixing and vehicle washing points must be located outside RPAs, with provision to contain any spillages. Where the contours of the site create a risk of polluted water or toxic liquids running into RPAs, a precautionary measure of bunding or a frame, sealed with heavy-duty plastic sheeting sufficient to prevent contamination (Pollution image 2), must be used to contain accidental spillages.



Pollution image 1: Where fuel or other chemicals are stored on site, it is now standard practice to have emergency spillage kits available to restrict the environmental impact of accidents.



Pollution image 2: Soil bunding or a supporting framework covered in heavy-duty plastic sheeting is essential where there is a risk of spillages contaminating RPAs. This specifically applies to cement mixing areas and vehicle washing facilities.

20. Extra precautions – installation of new surfacing in RPA

The following guidance will be applied to trees 3, 4, 5, 6, 7, G8, 9, 10, 11, 12, 13, 14, 15, 16, G17, 18, 19, 20 and trees in W22 which are shown on the tree protection plan.



Site photo 1: Showing deep rutting on existing byway.



Site photo 2: Showing typically small, low quality trees to be removed to allow bridgeway construction.

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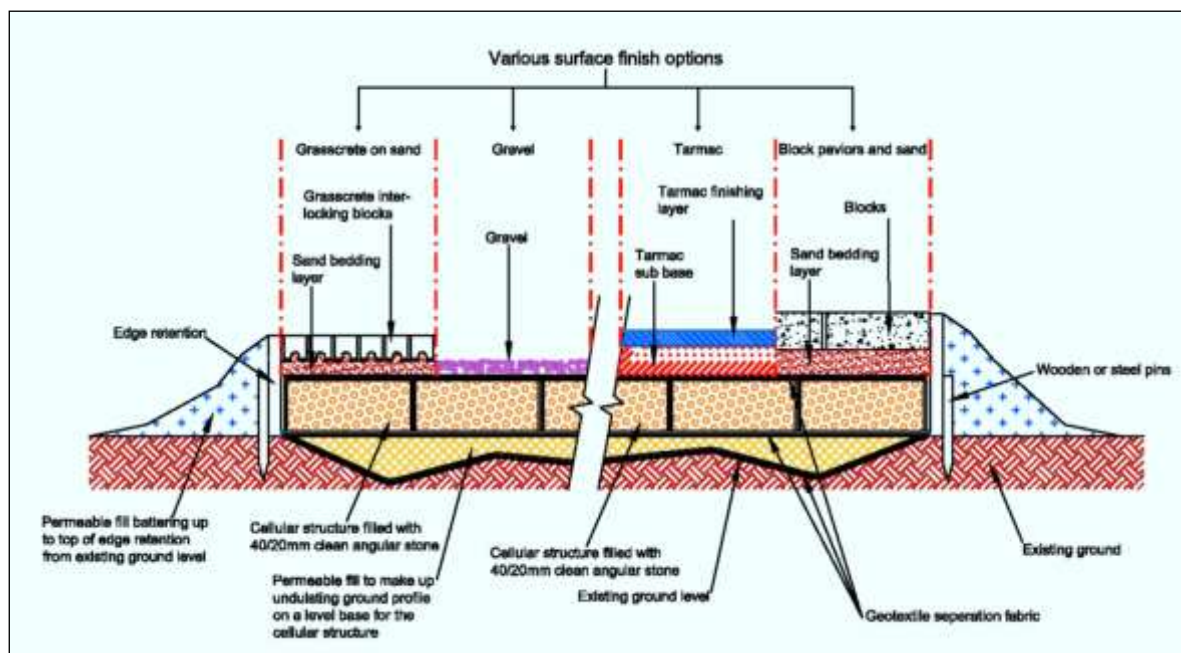
Site photo 3: Showing T23 and potential for routing the bridleway either side (leaf litter is covering byway rutting).

BS 5837 (7.4) confirms that new surfacing can be installed within RPAs, but it has to be carried out with care. These operations are potentially damaging to trees because they may require changes to existing ground levels, resulting in localised soil structure degradation and/or disrupt the efficient exchange of water and gases in and out of the soil. Older trees are much more prone to suffer from such changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in RPAs. Generally, the most suitable surfacing will be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction and require little or no excavation to limit direct damage. The actual specification of the design is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading and the frequency of loading. The detail of product and specification are engineering issues and must be provided by appropriate specialists.

Cellular confinement systems

BS 5837 (7.4.2.) sets out that no-dig, three dimensional cellular confinement systems can be used as the basis for extending hard surfacing into RPAs. It is our experience (www.barrelltreecare.co.uk/case-studies/SurfacingNearTrees.pdf) that this type of surfacing can be installed in the majority of situations without any significant adverse impact on adjacent trees, provided that proper consideration is given to all the circumstances. Most of our experience is with the CellWeb system supplied by Geosynthetics Ltd (www.geosyn.co.uk) and because of its sustained good performance over time, this is our preferred choice of product. The product is made from heavy-duty plastic that can be pulled apart to open into cells. These are then filled with washed stone, after the product is spread over the ground and pinned in place. This forms a base layer that acts as a floating raft, spreading the load across the whole construction width. The base layer can be topped with a variety of finishes as illustrated in New surfacing image 1. New surfacing images 2 and 3 show the product spread over the ground and then filled with stone to produce the base layer.

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New surfacing image 1: This conceptual cross-section illustrates the structural elements of the system and the multiple surfacing options that can be used with it.



New surfacing image 2: The three-dimensional cells are opened up, spread across the area to be surfaced and pinned in place ready for the stone filling.



New surfacing image 3: The stone-filled cells spread the load of traffic and the geotextile membrane on the ground prevents migration of the stone into the soil profile.

Dealing with undulating surfaces and establishing a tolerable level of excavation

The precise location and depth of roots within the soil is unpredictable and will often only be known when careful digging starts on site. Ideally, all new surfacing in RPAs should be no-dig, i.e. requiring no excavation whatsoever, but this is rarely possible on undulating surfaces. New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and need not be damaging to trees if carried out carefully and large roots are not cut. Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of an established turf layer up to 5cm is unlikely to be damaging to trees. However, this may not be possible where there is no grass because tree roots may grow right up to the soil surface. In some situations, it may be possible to dig to a greater depth depending on local conditions, but this would need to be assessed by an arboriculturist if excavation deeper than 5cm is anticipated.

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On undulating surfaces, finished gradients and levels must be planned with sufficient flexibility to allow on-site adjustment if excavation of any high points reveals large unexpected roots near the surface. If the roots are less than 2.5cm in diameter, it would normally be acceptable to cut them and the gradient formed with the preferred minimal excavation of up to 5cm. However, if roots over 2.5cm in diameter are exposed, cutting them may be too damaging and further excavation may not be possible. If that is the case, the surrounding levels must be adjusted to take account of these high points by filling with suitable material. If this is not practical and large roots have to be cut, the situation should be discussed with the supervising arboriculturist before a final decision is made.

Sub-base and finishing layers

Once the sub-base has been formed, the load spreading construction is installed on top without compaction. In principle, the load spreading formation will normally be cellular and filled with crushed stone, although the detail may vary with different products. Suitable surface finishes include washed gravel, permeable tarmac or block pavements set on a sand base (New surfacing image 1). However, for lightly loaded surfacing of limited widths (<3m) such as pedestrian paths, pre-formed concrete slabs may be appropriate if the sub-base preparation is as set out above.

Edge retention

Conventional kerb edge retention set in concrete-filled excavated trenches is likely to result in damage to roots and should be avoided. Edge retention in RPAs must be designed to avoid any significant excavation into existing soil levels (BS 5837, 7.4.3) and there are a number of approaches that are fit for this purpose. For block pavements, the use of pre-formed edging secured by metal pins is effective and can be reinforced by concrete supports as long as there is no excavation into the soil (New surfacing image 4). Railway sleepers (New surfacing image 5) pinned in place or wooden boards (New surfacing image 5) are two options, depending on the expected loading of the surfacing. A permeable soil fill can then be used to batter the grade back down to the existing soil level.



New surfacing image 4: A conventional concrete haunching can be used to retain new surfacing as long as it is not dug into a trench - here it is placed on top of the CellWeb layer.



New surfacing image 5: Although this is only a temporary surface, railway sleepers pinned into the ground can be used to retain the edges of new surfacing.

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New surfacing image 6: Wooden board pinned in place or held in position with backfilled topsoil can provide more informal and rustic surface edging.



New surfacing image 7: In some situations, it may be appropriate to cast a free floating concrete surface directly onto the soil surface provided provision is made to prevent soil contamination while the concrete is being poured, i.e. an impermeable membrane separating the concrete from the soil.

Footpaths and surfacing without a load-spreading base layer

In some situations, limited-width floating concrete rafts constructed directly onto the soil surface may be acceptable for both pedestrian (New surfacing image 7) and vehicular access (New surfacing image 8), but the design must not include any strip-dug supports. If concrete is poured directly, precautions must be taken to ensure that no toxic fluids can contaminate the adjacent soil. Alternatively, elevated paths supported on low impact frames or post supports allow a decking surface to cross sensitive areas (New surfacing images 9 and 10). Where paths are installed very close to trunks, provision must be made for distortion from future root growth by selecting flexible components for the supporting frame and surfacing (New surfacing image 11).



New surfacing image 8: This temporary access for heavy construction traffic on the outer edge of a RPA is a concrete slab cast above ground level and will be removed when the project is completed.



New surfacing image 9: Board walks supported on posts or a light frame are another way of providing pedestrian access across sensitive RPAs (photo courtesy of Philip van Wassenaeer).

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New surfacing image 10: New surfacing can be supported above the ground on posts leaving the soil surface beneath undisturbed.



New surfacing image 11: Where surfacing is needed close to rapidly growing buttress roots, a light metal frame with rubberised surfacing will allow the path to distort without cracking as the roots grow.

21. Extra precautions – installation of new structures in RPAs

The following guidance applies to trees 3, 4 and trees at the east and west ends of W22 near the proposed vehicle blocker posts.

Precautionary areas are RPAs outside the fencing, i.e. they are areas where construction activity can take place, but it must be carried out with care to avoid damaging the sensitive rooting environment. BS 5837 (7.2) makes provision for excavating in RPAs, explaining that all excavation must be carried out carefully using hand-held tools and preferably by compressed air soil displacement, taking care not to damage the bark and wood of any roots.

All soil removal must be done with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of smaller fibrous roots should be retained if they can be displaced temporarily or permanently beyond the excavation without damage. If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Once roots have been located, the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots to be removed should be cut cleanly with a sharp saw or secateurs 10–20cm behind the final face of the excavation. Roots temporarily exposed must be protected from direct sunlight, drying out and extremes of temperature by appropriate covering such as dampened hessian sacking. If necessary, roots less than 2.5cm in diameter can be cut cleanly without consultation with the supervising arboriculturist. Roots greater than 2.5cm in diameter should be retained where possible and only cut after consultation with the supervising arboriculturist.

New structures in RPAs are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Mature and over-mature trees are much more prone to suffer because of these changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in RPAs. This can be done by constructing the main structures above ground level on piled supports and redirecting water to where it is needed. The detailed design and specification of such structures is an engineering issue that should be informed and guided by tree expertise.

New foundations for vehicle blocker posts

Conventional strip foundations in RPAs for any significant structure may cause excessive root loss and are unlikely to be acceptable. However, BS 5837 (7.5) confirms special engineered foundations can be used in RPAs. Damaging disturbance can be significantly reduced by supporting the above ground part of the structures on small diameter post holes. The design should be sufficiently flexible to allow the holes to be relocated if significant roots are encountered in the preferred locations (New structure images 1 and 2). Before the actual installation of the new structure starts, any vulnerable RPA should be protected by temporary

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ground protection as set out above (New structure image 2). At expected post locations, gaps in the ground protection should be left to allow access to the soil beneath. The preferred post locations should be carefully excavated to a depth of 60cm to establish if there are any significant roots over 2.5cm in diameter that could be damaged. If significant roots are found, they should be dealt with as set out above or the post hole location may have to be moved slightly (New structure image 2).



New structure image 1: Where posts are proposed close to trunks, it is essential to excavate 50–75cm deep to see if there are any significant roots in the way, with provision to move the post hole location if roots are found (note the post was finally installed to avoid this root).



New structure image 2: Ground protection must be used to spread the load during excavation.

Vehicle blocker posts generally require larger holes and have less flexibility for relocation if large roots are found. Localised loss of roots may be unavoidable, so each situation should be assessed on its own merits by the supervising arboriculturist once the careful excavations have been completed. When installing any of these structures, the ground protection must remain in place until the construction is completed and there is no risk of damage to RPAs.

22. Removal of protection

All protective barriers must remain in place until the construction activity is finished and there is no realistic risk of damage to the protected soil surfaces.

23. Table 6: Contact details for parties involved in the development

Project partner	Contact details
Developer/Project manager	Marcia McGinty; 07824 362433; mmcginty@regeneration-management.co.uk ;
Project architect	Not applicable
Project arboriculturist	Alex Needs; 01425 651470; alex@barrelltreecare.co.uk
LPA tree officer	Jamie Gargett; 02392 474174; jamie.gargett@havant.gov.uk
LPA planning officer	Not known

Section 3 Appendices

Appendix 1: Background administrative information, data collection and any additional relevant information

24. Table 7: Background administrative information

	Background administrative information
Report date & reference	16381-AMS-AN 21/12/2016
Tree protection plan reference	BT1
Our instructing client	R&M Regeneration Management
Our instructions	Visit the site, assess the relevant trees, prepare a schedule of their details, describe the impact of the proposal on those trees and identify the tree protection issues in an arboricultural method statement
Provided documents	Land survey, drawing number 2DEE Survey Woodcroft Farm Layout, drawing ref. X-FOOTPATH.dwg Drawings GTWCROFT_ROW/700 Rev A and GTWCROFT_ROW/702 Rev A received by email on 15 December 2016
Report author and credentials	Alex Needs is a Chartered Forester (www.charteredforesters.org) and fully qualified to undertake the assessments in this report.
Report limitations	We have not checked if the trees are protected. If any tree works are proposed before a planning consent is given, then the existence of any statutory protection must be checked with the LPA. This report does not consider ecological or archaeological issues, or any other matter beyond the assessment of the trees.
Technical references	In preparing the analysis in this report, detailed consideration was given to the guidance and advice in the following technical references: • Climate Change Act (2008) www.legislation.gov.uk/ukpga/2008/27/contents • Town and Country Planning Act 1990 http://www.legislation.gov.uk/ukpga/1990/8/contents • National Planning Policy Framework ("NPPF"), published by the DCLG www.gov.uk/government/publications/national-planning-policy-framework--2 • BS 5837 (2012) <i>Trees in relation to design, demolition and construction – Recommendations</i>, BSI http://shop.bsigroup.com/ • Relevant local plan policy • BS 8545 (2014) <i>Trees: from nursery to independence in the landscape – Recommendations</i>, BSI http://shop.bsigroup.com/ • BS 3998 (2010) <i>Tree work – Recommendations</i>, BSI http://shop.bsigroup.com/ • <i>Trees in the Townscape: A Guide for Decision Makers</i>, published by the Trees & Design Action Group http://www.tdag.org.uk/ • <i>Trees in Hard Landscapes: A Guide for Delivery</i>, published by the Trees & Design Action Group http://www.tdag.org.uk/ • National Joint Utilities Group (2007) Volume 4, Issue 2: <i>Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees</i> www.njug.org.uk/publications/

Appendix 1: Background administrative information, data collection and any additional relevant information

25. Table 8: Data collection

	Data collection
Date of site visit	19 th December 2016
People present during site visit	Alex Needs
Weather & visibility	Dull, still, and dry, with average visibility
Limitations to observations	• Our inspection of the trees for the purposes of assessing their condition and work requirements is made on the basis that they will be annually inspected in the future to identify any changes in condition and review the original recommendations. For these reasons, the tree assessment advice only remains valid for one year from the date that the trees were last inspected. • All observations were of a preliminary nature and did not involve any climbing or detailed investigation beyond what was visible from accessible points at ground level. • Observations of trees outside the site boundaries are confined to what was visible from within the site. • All dimensions were estimated unless otherwise indicated.
Tree location and numbering	Each tree was inspected and the numbering scheme is indicated on the tree protection plan. If appropriate, obvious hedges and groups were identified and numbered. If important trees were found on site that were not included on the provided plan, their approximate positions and canopy extents are indicated on the plan.
Recording of tree data	For each tree and any group or hedge found on site, the information collected was recorded on the tree schedule in Appendix 2 and the tree protection plan.
Compliance of data collection with BS 5837	The data collection is fully compliant with the advice in subsection 4.4.2 of BS 5837. When collecting this information, specific consideration was given to any low branches that may influence future use, age class, physiological condition, structural condition and remaining contribution. Where appropriate, crown spreads were also noted where they differed from those shown on the provided land survey.
Calculation of RPAs	Following the recommendations in Table D1 of BS 5837, the diameter of each tree was rounded up to the next 2.5cm increment, with the radius of a nominal circle and the resultant RPA taken directly from that table. This information is listed for each tree in the tree schedule in Appendix 2.

Appendix 2: Tree schedule and explanatory notes

NOTE: Colour annotation is A & B trees with green background; C & U trees with blue background; trees to be removed in red text.

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)	RPA area (m2)
All retained trees & hedges								Carry out safety check and lift over site to 3-4m as necessary.		
T1	Oak	26	90	Mature	-	A	-	-	10.8	366
T2	Oak	7	90	Over-mature	-	U	Previously reduced to a habitat pole	-	10.8	366
T3	Oak	20	95*	Mature	-	C	Small crown with ivy throughout and in decline	-	11.4	408
T4	Oak	20	80	Maturing	-	B	Ivy clad	-	9.6	290
T5	Oak	13	85	Over-mature	-	C	Basal swelling with Ganoderma fungal bracket and dieback throughout crown	-	10.2	327
T6	Oak	18	87.5*	Mature	Yes	B	Dysfunction wood at buttresses and low limb over field	Crown raise to achieve 3.4m clearance above proposed bridleway	10.5	346
T7	Oak	18	87.5	Mature	Yes	A	Low limb over field	Crown raise to achieve 3.4m clearance above proposed bridleway	10.5	346
G8	Oak, hawthorn, willow, bramble, hazel	7	20	Maturing	-	C	Understorey informal hedging	-	2.4	18
T9	Oak	13	32.5	Young	-	B	Young tree with good future potential	-	3.9	48
T10	Oak	16	80	Maturing	Yes	B	-	-	9.6	290
T11	Oak	18	70	Maturing	-	B	-	-	8.4	222

Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)	RPA area (m2)
T12	Oak	13	65	Over-mature	Yes	U	Extensive dieback and limb failure with heavily asymmetrical crown.	-	7.8	191
T13	Oak	17	70	Maturing	Yes	A	Ivy clad	-	8.4	222
T14	Oak	17	50	Maturing	-	B	Ivy clad	-	6.0	113
T15	Oak	18	110	Mature	Yes	A	-	-	13.2	547
T16	Oak	18	12.5	Mature	Yes	A	-	-	1.5	7
G17	Oak	15	35	Young	-	B	Group of young hedgerow trees with reasonable growth potential	-	4.2	55
T18	Oak	18	70	Mature	-	B	Ivy clad	-	8.4	222
T19	Oak	18	60	Maturing	-	C	Ivy clad with asymmetrical crown	-	7.2	163
T20	Oak	18	85	Mature	-	B	Ivy clad	-	10.2	327
T21	Oak	16	80	Over-mature	-	U	Dead	-	9.6	290
W22	Oak, hawthorn, willow, bramble, hazel, wild service	20	75	Mature	-	B	Woodland edge group growing on field boundary and either side of a byway used as a recreational 4x4 vehicle track. Very heavily rutted and uneven ground along track with heavy compaction in many areas. A number of trees directly adjacent to the track have bark damage from collisions.	Crown raise to achieve 3.4m clearance above proposed bridleway. Fell small and low quality trees at pinch points (as shown on Tree Protection Plan).	9.0	254
T23	Oak	18	70	Mature	-	B	Byway passes both sides of trunk	-	8.4	222

Appendix 2: Tree schedule and explanatory notes

Explanatory Notes

- **Abbreviations:**

G : Group
W : Woodland
RPA : Root protection area

- **Botanical tree names:**

Ash : *Fraxinus excelsior*
Beech : *Fagus sylvatica*
Hawthorn : *Crataegus monogyna*
Hazel : *Corylus avellana*
Holly : *Ilex aquifolium*
Oak : *Quercus robur*
Wild Service : *Sorbus torminalis*
Willow : *Salix* sp
Yew : *Taxus baccata*

- **BS 5837 (2012) compliance:** All data has been collected based on the recommendations set out in subsection 4.4 of BS 5837.
- **Tree inspections and site limitations:** Each tree was subjected to a quick visual check level of inspection. Where there is restricted access to the base of a tree, its attributes are assessed from the nearest point of access. Climbing inspections are not carried out during this level of inspection and, if heavy ivy is present, tree condition is assessed from what can be seen from the ground. A separate note is recorded if further investigation may be required to clarify its status.
- **Crown spreads:** Crown spread dimensions are not listed in the tree schedule because they are illustrated on the land survey base to all the plans in this document. Where crown spreads of significant trees on site are found to deviate from those shown on the provided land survey, we have noted it in the text of the report and annotated it on our plans.
- **Dimensions:** All dimensions are estimated unless annotated with a '*'.
- **Species:** Species identification is based on visual observations. Where there is some doubt over tree identity, sp is noted after the genus name to indicate that the species cannot be reliably identified at the time of the survey. Where there is more than one species in a group, only the most frequent are noted and not all the species present may be listed.
- **Height:** Height is estimated to provide a broad indication of the size of the tree.
- **Trunk diameter:** Trunk diameter is estimated or measured and recorded in 2.5cm increments as advised in BS 5837 Table D1. It is measured with a diameter tape unless access is restricted, direct measurement is not possible because of ivy on the trunk or the tree is assessed as poor quality. The point of measurement and the adjustments for stem variations are as advised in Figure C1 of BS 5837.
- **Maturity:** In planning context, maturity provides a simplistic indication of a tree's ability to cope with change and its potential for further growth. For the purposes of this report, young indicates a potential to significantly increase in size and a high ability to cope with change, maturing indicates some potential to increase in size and a medium ability to cope with change, and mature indicates little potential to increase in size and limited ability to cope with change.
- **Low branches:** Any low branches that would not be feasible for removal during normal management and should be considered as a design constraint are noted here and explained in the notes.

Appendix 2: Tree schedule and explanatory notes

- **Category:** Our assessment automatically considered tree physiological/structural condition (BS 5837, 4.4.2.5h), and so these are not listed separately in the schedule. Additionally, the category accounts for the remaining contribution (BS 5837, 4.4.2.5i) as greater than 40 years for A trees, greater than 20 years for B trees, at least 10 years for C trees and less than 10 years for U trees, so this is also not listed separately in the schedule. Category A, B and C trees are automatically listed as sub-category 1 unless otherwise stated.
- **Notes:** Only relevant features relating to physiological or structural condition and low branches that may help clarify the categorisation are recorded. If there are no notes, then the presumption should be that no relevant features were observed.
- **Tree works:** The recommended tree works are based on the quick visual check level of inspection and only intended to address significant hazards identified during that inspection.
- **Future tree safety inspections:** Due to the time that may elapse between the original survey and the start of development, all trees should be re-inspected as part of the standard risk management process before any works start on site. Our assessment of the trees was carried out on the basis that a re-inspection would be carried out within a year of the assessment visit and our advice on tree condition must be reviewed annually from the date of that visit.



Field House
Fordingbridge Business Park
Ashford Road
Fordingbridge
Hampshire
SP6 1BY

01425 651470
info@barrelltreecare.co.uk
www.barrelltreecare.co.uk