

MANOR FARM
HALLETT ROAD &
COPSEYS NURSERY
DENVILLES
HAVANT
HAMPSHIRE

ARBORICULTURAL
IMPACT
ASSESSMENT
&
METHOD STATEMENT

ACD

Ecology

Arboriculture

Landscape Architecture

PREPARED BY
ACD
ARBORICULTURE

FOR
BARRATT HOMES &
GENERATOR GROUP

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1. EXECUTIVE SUMMARY

- 1.1. The proposed layout is in line with recommendations of BS5837 (BSI 2012 British Standards Institute). Adequate protection can be provided to ensure all retained trees are protected throughout development.
- 1.2. This report was revised in February 2013 following revisions to the proposed layout. It is confirmed that there are no significant changes in terms of the impact on trees on site as a result of these changes.
- 1.3. The existing farm and nursery buildings are to be replaced with residential dwellings. This will be approached through a hybrid planning application, proposing detailed plans for the Manor Farm site and the open spaces, and an outline application for the residential section of the Copseys Nursery site.
- 1.4. 161 individual trees and 5 groups of small trees are to be removed. 19 of these trees are included within the TPO. In mitigation, proposed new trees number 340, which is a net gain of 206 trees. In replacement for the 5 groups of small trees, the proposed new native hedgerows within the open space will more than make up for their loss.
- 1.5. Some site supervision will be required during the installation of surfaces close to trees, in addition to the monthly monitoring visits (to inspect the fencing).
- 1.6. The relationship between the buildings and retained trees is sustainable and does not result in any situations that may result in unreasonable pressure to prune requests from future occupants.
- 1.7. The arboricultural method statement and tree protection plan include details of all tree protection measures required, including provision for site supervision where required.
- 1.8. Any fencing and other tree protection measures should be erected after tree surgery but before any demolition or construction contractor enter the site, and before any soil stripping takes place.
- 1.9. There must be no changes in levels, service routing, machine activity, storage of materials or site hut positioning within areas to be protected and the protective fencing must remain in position for the duration of the construction process.

2. INTRODUCTION

- 2.1. Barratt Homes & Generator Group instructed ACD Arboriculture in November 2012 to prepare the following impact assessment.
- 2.2. Following the recommendations of BS5837:2012 Trees in relation to design, demolition and construction- Recommendations (BSI 2012 British Standards Institute), this report includes the necessary information to support a planning application. It demonstrates that the impact, both direct and indirect, of the proposed development within the site, has been assessed and where appropriate, mitigation and tree protection proposed.
- 2.3. The implementation of any protection methods and special construction details recommended within this report are critical for ensuring the retained trees are successfully protected through the construction process and must be implemented prior to any work on site.
- 2.4. This report was revised in February 2013 following revisions to the proposed layout. It is confirmed that there are no significant changes in terms of the impact on trees on site as a result of these changes.
- 2.5. This assessment is based upon the supplied layout drawing, ref: P754-Planning Layout-ZG and ACD tree surveys for both sites, ref: BSH17581tr & GEN16446tr. It must be noted that both tree surveys were carried out under the previous edition of BS5837. However, the data within them is still a valid and accurate representation of the trees on both sites, and has been referenced throughout this report. There is not significant reason why this should be an issue, or why the reports should need updating.
- 2.6. The controlling authority is Havant Borough Council, who can be contacted at: Civic Centre Road, Havant, Hampshire PO9 2AX, Tel: (023) 9247 4174.
- 2.7. This assessment considers the impact of the development on the constraints posed by the retained trees (both beneath ground: the root protection area (RPA), and above ground: the canopy).
- 2.8. Direct impact from development comes in six main forms:
 - 1) Surface installation within RPAs
 - 2) Root loss from excavation for foundations, drainage and other utilities within RPAs
 - 3) Soil stripping, removal and level changes within RPAs
 - 4) Excessive access facilitation pruning to retained trees
 - 5) Soil compaction from storage and vehicle movements within RPAs
 - 6) Soil contamination
- 2.9. Indirect impact can come from changes to the site hydrology, future pressure to prune or fell, failure of trees exposed by removal of neighbouring trees, and other environmental changes which can take several years to manifest.

2.10. The RPA for each tree represents a minimum area in m² that should be left undisturbed around each retained tree. This is initially represented by a circle but is often adjusted to account for constraints to root growth within the site (primarily highways and buildings). It is therefore important to ensure the protection of trees both above and below ground. Recommendations are provided in the British Standard as to the protection of existing trees before, during and after development. This is achieved by ensuring the tree protection plan and arboricultural method statement are implemented before any commencement on site.

3. ARBORICULTURAL IMPACT ASSESSMENT

3.1. OVERVIEW OF PROPOSED DEVELOPMENT

3.1.1. Currently the site is made up of two distinct areas: Copseys Nursey, and Manor Farm. The proposed development is to build residential dwellings on both sites, whilst providing a considerable size of open space within the application.

3.2. PLANNING CONTEXT

Tree preservation order/Conservation Area

3.2.1. Havant Borough Council Tree Preservation Order No.1927 '*Land at Manor Farm and Copseys Nursery*' covers the entire application area. A copy of the TPO plan and schedule is appended for reference, and reference is made to all TPO trees in both tree reports and also within this report where relevant.

Previous Planning applications and consent

3.2.2. There are no relevant past applications or extant planning consents for this site.

3.3. TREES PROPOSED FOR REMOVAL & SURGERY

3.3.1. The trees proposed for removal are listed at the appendix, but are summarised as follows: 161 individual trees and 5 groups of small trees. 19 of these trees are included within the TPO. These trees are clearly marked on the appended tree protection plan.

3.3.2. During the design process we have had discussions with the Council's tree officer to address tree removals and find common ground where possible. This was possible for many of the trees, and in mitigation for their removal, and the removal of the TPO trees, the proposed open space will include substantial new planting, along with typical planting within the residential areas. The new trees number 340, which is a net gain of 206 trees (67 of these are within the Copseys Nursery site and subject to the outline application). In replacement for the 5 groups of small trees, the proposed new native hedgerows within the open space will more than make up for their loss.

3.3.3. The boundary trees abutting the Chartwell Drive gardens are to be removed due to their poor quality. Whilst it is appreciated that these trees provide some current screening, they are not good enough quality to be sustainable in the long-term. Therefore, new planting is proposed (indicative at this outline stage) within the new

gardens. To ensure that the occupants of the new dwellings retain the planting, the Council can place tree preservation orders on the trees at the time of planting. The tree officer suggested this approach during a site meeting with ACD on 7th Nov 2012.

3.3.4. It must be noted that most trees proposed for removal are within the interior of the site and have little wider landscape value. Most boundary trees are being retained and enhanced with the new planting.

3.3.5. At this stage, tree surgery works are not proposed. A full schedule of works will be compiled once work starts on site, and should be controlled by an appropriately worded planning condition.

3.4. DEMOLITION & SITE CLEARANCE

3.4.1. To ensure damage does not occur to trees highlighted for retention, tree protection fencing must be erected before ANY plant/vehicles entering site whatsoever. This should be subject to a pre-commencement site meeting between the developer, their project arboriculturist and a representative from the Local Authority.

3.4.2. The existing sheds to the left of the Manor Farm entrance are to be demolished sensitively. This work must be carried out under the supervision of the project arboriculturist, as per the appropriate section of the method statement to ensure no underlying roots are damaged. Fencing must then be erected (as shown on the TPP) to protect the newly exposed ground.

3.5. CONSTRUCTION ENCROACHMENTS INTO RPAS

3.5.1. The construction of a few plots and ancillary buildings is proposed within the root protection areas of some trees. Those of note would be:

MANOR FARM SITE

- 1) The bin stores close to G1. This is a small encroachment and the fencing has been extended into adjacent ground to compensate for this root loss.
- 2) T47, where the adjacent plot No.2 requires working room and this, in addition to the demolition of the building and removal of the road/track result in a somewhat awkward retained rooting area. Nonetheless, the overall area is close to the recommended size, and we are comfortable will result in adequate protection for this TPOd tree.
- 3) T49. Again, the proposed plots force some encroachment into the notional circular RPA, but the fencing has been adjusted to encompass a similar area, thus avoiding impact upon the tree.
- 4) T54 (from the Copseys survey schedule). A slight encroachment into the notional circular RPA, but the fencing has been adjusted to encompass a similar area, thus avoiding impact upon the tree.

COPSEYS NURSERY SITE

- 1) Plot 1/T44 & Plot7/G1 relationships both require a slight encroachment into the notional circular RPA, but again, the fencing has been adjusted to encompass a similar area, thus avoiding impact upon the tree.

3.5.2. With reference to the above, section 6.2.3 of the British Standard recommends the use of ground protection in some cases. This can be used to protect underlying soft ground where access is required through RPAs. We feel that the above points of encroachment are minor enough, and as they are mitigated by extension of the fencing (section 5.3(a) of the British Standard), ground protection is not required. The installation of ground protection can present operational problems and experience has lead to the conclusion that, wherever viable, the erection of a solid immovable barrier is far better. However, should the Council feel that ground protection is necessary; this should be enforced by a suitably worded planning condition, and does not warrant a reason for refusal.

3.6. PERMANENT HARD SURFACES WITHIN RPAS

3.6.1. In section 7.4 of the British Standard, permanent hard surfacing within the RPAs of retained trees is addressed, and recommendations made.

3.6.2. On this site there are six areas of new surfacing that require a standard no-dig approach using a cellular confinement system (CCS). These can be seen in the appended tree protection plan. Any design must be approved for use by the project arboriculturist.

3.6.3. With specific reference to the Hallett Road access point: the design of the highway installation past the retained trees has been constructed to allow retention of the sycamore trees G1, and the hawthorn T26. The existing trackway predisposes the area to less root colonisation than typical soft ground, and therefore excavation of about 200mm is proposed, under close arboricultural supervision. This will enable the CCS to be installed within the existing track's construction profile and avoid significant excavation into the underlying soft ground. The result will be a slightly raised 'table' in the road at the pinch point. This approach has been discussed with the tree officer and the principle of the approach agreed.

3.7. PROTECTION BARRIERS

3.7.1. Figure 2 of the British Standard recommends a standard fencing design for tree protection. This is a weld mesh panel design, mounted upon a well-braced scaffold framework. This is perfectly adequate for this site and all the retained trees can be suitably protected by its erection before any works start on site whatsoever.

3.8. SHADE AND FUTURE PRESSURE TO PRUNE

3.8.1. ACD have worked with the design team from the start of this project and we feel that the resulting proposed layout is both sustainable and results in juxtapositions between trees and buildings which will not bring future requests for excessive pruning and/or tree removal.

3.9. SERVICES

3.9.1. Full details of the service and utility provisions for the site remain to be finalised. However, there is adequate space for utility trenches to access the site whilst avoiding RPAs and exclusion zones. It is fundamental to tree protection that infrastructure design is sensitively approached, as trenching close to trees may damage roots and affect tree health and stability. Details of services have not been provided at the time of writing. The Tree Protection Plan, showing the constraints posed by retained trees will be passed to the infrastructure engineers to inform their design, ensuring that all services avoid areas of potential conflict. As per BS5837:2012 Figure 1, once further details become available as part of the detailed/technical design for the site, the TPP and AMS may need to be revised to incorporate service details for inclusion in the tender documentation.

4. ARBORICULTURAL METHOD STATEMENT

TO BE READ INCONJUNCTION WITH THE APPENDED TREE PROTECTION PLANS REF: BSH17581-03A (MANOR FARM) & BSH17581-05A (COPSEYS NURSERY)

4.1. PHASING OF OPERATIONS, SITE SUPERVISION & MONITORING

4.1.1. The development process will be subject to arboricultural supervision and monitoring, especially areas where incursion into the RPA of retained trees is required. Therefore, in addition to monthly site monitoring visits, input and supervision from the project arboriculturist will be required at the following stages:

- 1) Pre-start site meeting with groundwork contractors, site manager and LPA arboricultural officer/landscape officer. To check fencing is in place prior to demolition/site clearance
- 2) Hallett Road access installation
- 3) No-dig paths and vehicular surface installation

4.1.2. Supervision is also required should any unplanned access and/or work be required in the construction exclusion zone.

4.1.3. Supervision will require the arboriculturist to be present throughout the task, to ensure all the arboricultural objectives are met. If the task is to take a long period of time, provided the arboriculturist is satisfied, and after an initial 'tool-box talk', the supervision may be reduced to telephone contact between the site foreman/contractor and arboriculturist.

4.1.4. Monitoring visits will initially occur on a monthly basis during time when the site is active, starting with the pre-start meeting (above). They will involve a visit from ACD and a standard report form being completed and sent to both Client and LPA outlining the condition of tree protection on site, and if any defaults to the approved protection have been found. If required, remedial measures will be advised by ACD in liaison with the Barratt Homes/Generator group and Havant Borough Council.

4.2. TREE PROTECTION AREAS

4.2.1. Based on tree survey data, tree protection areas have been determined for every retained tree. These areas are designed to protect at least a functional minimum of tree root mass in order to ensure that the trees survive the construction process.

4.2.2. Some trees on this site are subject to statutory protection by Tree Preservation Order. Damaging them is a criminal offence and is also contrary to planning conditions that, if breached, could lead to all work on site being stopped by the local authority.

4.2.3. It is the responsibility of everyone engaged in the construction process to respect the tree protection measures and observe the necessary precautions within and adjacent to them.

4.2.4. Inside the exclusion area of the fencing, the following shall apply:

- No mechanical excavation whatsoever
- No excavation by any other means without arboricultural site supervision
- No hand digging without a written method statement having first been approved by the project arboriculturist.
- No lowering of levels for any purpose (except removal of grass sward using hand tools)
- No storage of plant or materials
- No storage or handling of any chemical including cement washings
- No vehicular access
- No fire lighting

4.2.5. In addition to the above, further precautions are necessary adjacent to trees:

- No substances injurious to tree health, including fuels, oil, bitumen, cement (including cement washings), builders sand, concrete mixing and other chemicals shall be stored or used within or directly adjacent to the protection area of retained trees
- No fire shall be lit such that flames come within 5m of tree foliage.

4.3. TREE PROTECTION FENCING

4.3.1. The tree protection plans (see the latest revision of: BSH17581-03A & BSH17581-05A) show the alignment of tree protection fencing (TPF), which is to be installed prior to any of the following taking place:

- Demolition
- Plant and material delivery
- Soil stripping
- Utility installation
- Construction works
- Landscaping

4.3.2. Stages for installation of TPF:

- 1) Hand clearance of any vegetation to allow clear working access.
- 2) Setting out of fencing points
- 3) Fencing erected
- 4) Site meeting with project arboriculturist to 'sign-off' tree protection fencing.
- 5) Site accessible to demolition/construction traffic

4.3.3. Once erected, all TPF will be regarded as sacrosanct, and will not be removed or altered without prior recommendation by the project arboriculturist and approval of the local planning authority.

4.3.4. The typical TPF construction is suitable for areas of high intensity development, and shall comprise of interlocking weld-mesh panels, well braced to resist impacts by attachment to a scaffold framework that is set firmly into the ground. A detailed specification can be found on the TPPs.

4.3.5. If any alternative method of barrier construction is proposed, consultation with the project arboriculturist will be obtained to clarify the efficacy of the revised design prior to informing the local planning authority and obtaining their consent.

4.3.6. Once barriers have protected the exclusion zone, construction work can commence.

4.3.7. All weather notices should be erected on the barriers (for example see figure below).



Tree protection sign (download from www.acdarb.co.uk)

4.4. SITE STORAGE, PARKING, WELFARE FACILITIES, ETC.

4.4.1. The site will require provision for; site storage, contractor parking, welfare facilities, temporary services/drainage, material drop of points, etc.

4.4.2. No details of these provisions are available at the time of writing of this report.

4.4.3. None of the above provisions will be sited within RPAs of retained trees without the input or the project arboriculturist and the consent of the Local Authority.

4.5. TREE SURGERY AND REMOVAL

- 4.5.1. All trees to be removed are indicated on the TPPs, and listed at appendix 2.
- 4.5.2. If any further surgery work is proposed, it will be submitted to, and approved by, The Council, before being carried out.
- 4.5.3. All work will be carried out in accordance with BS3998 (BSI 2010 British Standards Institute) industry best practice and in line with any works already agreed with the Council.
- 4.5.4. The Tree Surgeon shall ideally be chosen from The Arboricultural Association's Approved Contractor list. All work shall be undertaken at the appropriate time and with the consent and approval of the Site Agent.
- 4.5.5. The statutory protection afforded by the Wildlife and Countryside Act (1981) and Countryside and Rights of Way Act (2000) will be adhered to. If further advice is required, particularly if bats are discovered during tree work, it will be obtained from Natural England or other competent persons and recommendations adhered to.
- 4.5.6. The stumps of any trees removed from within the Construction Exclusion Zone or the RPAs of retained trees will be either; cut flush to ground level and left in situ or ground out using a stump grinder. They will not be winched out.
- 4.5.7. All operations shall be carefully carried out to avoid damage to the trees being treated or neighbouring trees. No trees to be retained shall be used for anchorage or winching purposes.

4.6. SOFT LANDSCAPING

4.6.1. All landscaping and associated ground preparation within exclusion zones will be carried out sensitively to ensure root damage is mitigated as much as is practicable. At no time is any heavy plant to be used within any protected area. Removal of existing vegetation will be carried out by hand, turf may be removed using a mechanical turf stripper or by hand.

Turfing

4.6.2. Stages for turfing gardens and open spaces:

- 1) No plant/machinery to be used in the area for whatever reason
- 2) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 3) Remove TPF to allow access to area.
- 4) Re-erect TPF to secondary location (if required and shown on plan)
- 5) Do not reduce any high spots or excavate in any way.
- 6) Existing poor quality turf may be removed with a turf stripper.
- 7) Use good quality top-soil to level any low-lying areas and hollows, and provide a fine tilth to lay turf on. This imported soil must not result in a level increase of more than 100mm in any area.
- 8) Import turves by hand in wheelbarrow
- 9) Lay turves

Planting

4.6.3. Should the soil be compacted or have a poor structure that may hinder the development of any new planting, soil decompaction techniques may be used upon consultation with the project arboriculturist.

4.6.4. Stages for planting within tree protection areas:

- 1) No plant machinery to be used in the area for whatever reason
- 2) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 3) Remove TPF to allow access to area.
- 4) Re-erect TPF to secondary location (if required and shown on plan)
- 5) Remove existing vegetation by hand, turf may be removed using a mechanical turf stripper.
- 6) Do not reduce any high spots or excavate in any way.
- 7) Import good quality top-soil by hand (with wheelbarrow) into area.
- 8) Level to a depth of no more than 100mm with hand tools
- 9) Dig individual planting pits for each plant by hand (including hedging which must not be trench planted)
- 10) Any mulch should also be imported and spread by hand.

4.6.5. No works will be carried out within any protected areas if the soil moisture is of a level likely to allow compaction to occur.

4.7. INSTALLATION OF UNDERGROUND SERVICES

4.7.1. Mechanical trenching for the installation of underground apparatus and drainage severs any roots present and can change the local soil hydrology in a way that adversely affects the health of the tree. For this reason, particular care should be taken in the routing and methods of installation of all underground apparatus. Wherever possible, apparatus should be routed outside RPAs. Where this is not possible, it is preferable to keep apparatus together in common ducts. Inspection chambers should be sited outside the RPA.

4.7.2. Where underground apparatus is to pass within the RPA, detailed plans showing the proposed routing should be drawn up in conjunction with the project arboriculturist. In such cases, trenchless insertion methods should be used: Microtunnelling, Surface-launched directional drilling, Pipe ramming or Impact moling (see BS5837:2012 Table 3), with entry and retrieval pits being sited outside the RPA. Provided that roots can be retained and protected, excavation using hand-held tools might be acceptable for shallow service runs. If this is the case, the following methodology must be followed:

4.7.3. Stages for installing services by hand within tree protection areas:

No plant machinery to be used in the area for whatever reason

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 2) Remove just enough tree protection fencing to allow access to area and facilitate trenching
- 3) Remove any surface vegetation or existing hard surfaces using hand tools
- 4) Using an air-pick excavate the trench, keeping to minimum dimensions required
- 5) Roots occurring in clumps of 25 mm diameter and over are encountered they will be retained, and kept damp by covering with hessian (re-wetted as required). If required, these should be severed only following consultation with an arboriculturist, as such roots might be essential to the tree's health and stability
- 6) Feed in services.
- 7) Back fill trench with 200-300mm depth of excavated soil, or a mixture of excavated and imported top-soil to BS3882 (BSI 2007 British Standards Institute), firming down with heels
- 8) Repeat step 7 until trench is filled
- 9) Re-erect tree protection fencing as per approved plan

4.7.4. The method of excavation above, for trenching within RPA's, is using air excavation. This tool utilises compressed air to remove soil from around tree roots causing minimal damage and can be run off a typical site compressor. ACD can provide details of contractors supplying air excavation services if required.

4.7.5. Alternatively trenchless technology, such as thrust boring can be used in some instances and is particularly effective as it can pass directly under the tree, at a depth which is likely to avoid almost all impact on roots of the subject tree. As no access/thrust

pits will be located within the RPAs of the subject trees, the need for arboricultural supervision is limited.

4.7.6. Reference can be made to NJUG Vol 4 (NJUG 2007 National Joint Utilities Group) for guidance, but any approach must be approved by the project arboriculturist and brought to the attention of the local authority tree officer.

4.8. DEMOLITION CLOSE TO TREES

4.8.1. All TPF to be installed as per approved Tree Protection Plans prior to any plant arriving on site.

4.8.2. Sensitive demolition will occur under supervision from the project arboriculturist

4.8.3. Stages for demolition within tree protection areas:

- 1) No plant machinery to be sited on any exposed rooting area
- 2) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 3) Dismantle any fencing to allow work to proceed
- 4) Buildings to be folded in on themselves
- 5) Removal debris by hand or with plant machinery not located on any exposed rooting area.
- 6) Floor to be broken up with hand held breaker and pieces removed by hand. Slab floor can be lifted carefully by machinery if appropriate
- 7) Underlying ground levels to be retained. No excavation to occur
- 8) Any exposed roots and surrounding newly exposed areas to be covered with up to 100mm of topsoil, from elsewhere on site, or imported top-soil to BS3882 (BSI 2007 British Standards Institute). Soil may be placed in area by plant but must be spread by hand.
- 9) Tree protection fencing to be erected in final position as shown on plan

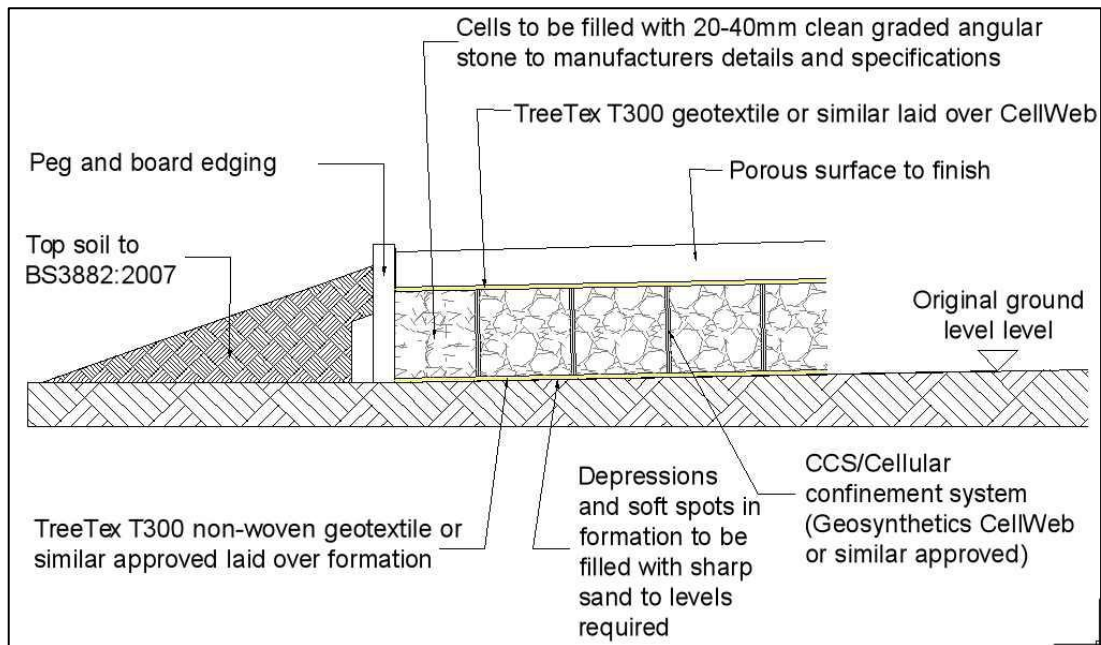
4.8.4. No reduction in levels of the underlying soil surface will occur.

4.8.5. At no point are any heavy machinery permitted within the RPA.

4.8.6. Contamination of the soil by fuel and lubricant leaks must be avoided at all cost. If such a situation arises the project arboriculturist must be notified to assess the situation and prescribe remedial measures.

4.9. INSTALLATION OF NO-DIG SURFACE

4.9.1. To ensure that tree roots, within the ground under the proposed surface, continue to survive during and after construction a cellular system such a CellWeb (Geosynthetics Ltd, 01455 617139, www.geosyn.co.uk) of 75-200mm depth is to be used .



No-dig cross-section

4.9.2. Stages for Installation of the cellular confinement surface:

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 2) Dismantle TPF and re-erect in secondary location as shown on TPP
- 3) Remove existing vegetation by using a specific herbicide (as advised by a specialist) or manual removal with hand tools only. Agreed removal of shrubs, saplings or trees, within the protected areas of retained trees are to be cut, or ground out to just below ground level rather than grubbed or winched out, which can damage roots of retained trees.
- 4) Retain all original ground levels after vegetation removal. No excavation whatsoever.
- 5) Remove any existing hard surfaces (paving, tarmac etc.) Hand tools should be used if possible. If machinery is required for this operation, it must be used only on existing surfaces or outside the protection areas and tree canopies (approval from project arboriculturist must be sought before using machinery). The sub base of existing surfaces or foundations should be left in situ where possible to avoid unnecessary root disturbance and provide a base for the new surface.

- 6) Install a non-woven Geotextile (such as TreeTex T300) directly over soil grade level (levelled where necessary, by non-compacted washed sand) and fix in place.
- 7) Lay the cellular system over the Geotextile, which is secured open under tension during the infill process with steel staples or wooden pegs.
- 8) Install kerbs and edgings directly on top of existing soil grade level. For light structures, a treated peg and board may be acceptable. For more substantial structures, railway sleepers, haunched concrete with road pins, drilled kerbstones, gabions or cast in situ kerbs will be appropriate.
- 9) Fill the cellular system ensuring any machinery works only on already filled areas. Typical infill consists of no fines angular granular material 20-40mm, which will remain un-compacted.
- 10) Cover with a non-woven Geotextile (such as TreeTex T300).
- 11) Install porous wearing surface.
 - Small Block Paving
 - Washed Gravel
 - Porous Asphalt

4.9.3. Any variation to the above specification must meet the following design criteria for low-invasive surfaces to provide the conditions for continued tree survival and growth:

- Maintain oxygen diffusion through new surface to rooting area (5-12% by volume (Roberts, Jackson et al. 2006 TSO)).
- Maintain sufficient passage of water to the rooting area (12-40% by volume (Coder 2000 University of Georgia)).
- Avoid compaction by maintaining a soil structure sufficient to sustain root growth (soil bulk density below 1.4g/cc (Harris 2004 Prentice Hall)).

4.9.4. Site analysis of the soil type and its structural characteristics will be required prior to determining the specific depth of products to be adopted for example, footpaths normally require a depth of 75mm and, 100mm 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.

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

4.10. INSTALLATION OF HALLETT ROAD NO-DIG SURFACE

4.10.1. With reference to appended engineering plan and TPP BSH17581-03.

4.10.2. Stages for Installation of the cellular confinement surface:

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work
- 2) Remove existing track construction and excavate to a depth of 200mm. Hand tools should be used if possible. If machinery is required for this operation, it must be used only on existing surfaces or outside the protection areas and tree canopies (approval from project arboriculturist must be sought before using machinery).
- 3) Underlying ground levels to be retained. No further excavation to occur.
- 4) Install a non-woven Geotextile (such as TreeTex T300) directly over soil grade level (levelled where necessary, by non-compacted washed sand) and fix in place.
- 5) Lay the cellular system over the Geotextile, which is secured open under tension during the infill process with steel staples or wooden pegs.
- 6) Install kerbs and edgings directly on top of existing soil grade level: haunched concrete with road pins, drilled kerbstones, gabions or cast in situ kerbs will be appropriate.
- 7) Fill the cellular system ensuring any machinery works only on already filled areas. Typical infill consists of no fines angular granular material 20-40mm, which will remain un-compacted.
- 8) Cover with a non-woven Geotextile (such as TreeTex T300).
- 9) Install porous wearing surface.

4.11. INSTALLATION OF BOUNDARY FENCING WITHIN PROTECTED AREAS

4.11.1. Stages for installing wooden fence posts:

No plant machinery to be used in the area for whatever reason

- 1) Contact project arboriculturist to hold pre-start site meeting and 'toolbox' talk before starting work.
- 2) Remove TPF to allow access to area.
- 3) Dig postholes using hand tools, avoiding damage to the protective bark covering larger roots. Roots smaller than 25mm diameter may be pruned back using either secateurs or a hand saw, leaving a clean cut.
- 4) Damage or severance of roots above 25mm diameter must be avoided. If roots of this size are discovered, the hole should be relocated. If there are a large number of such roots it may be necessary to relocate the hole by half a fence panels length and adjust the fence panels accordingly.
- 5) Line hole with non porous lining, for example durable polythene bag.
- 6) Insert post and fill post hole with concrete to just below ground level.
- 7) Trim polythene to ground level and fill with clean topsoil.

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APPENDIX 1: TREE PRESERVATION ORDER

APPENDIX 2: TREES TO BE REMOVED

Tree No.	Species	BS Category	TPO Nos.
COPSEYS SITE			
G10	Lombardy Poplar (<i>Populus nigra</i> 'Italica')	C1	TPO G7 4No.
G11	Locust Tree, Wild Cherry, Kohuhu, Cypress species, Walnut, Broom (<i>Robinia pseudoacacia</i> , <i>Prunus avium</i> , <i>Pittosporum tenuifolium</i> , <i>Cupressus</i> sp., <i>Juglans regia</i> , <i>Cytisus</i>)	C2	
G12	Cider Gum, Portugal Laurel, Wild Cherry, Elm species (<i>Eucalyptus gunnii</i> , <i>Prunus lusitanica</i> , <i>Prunus avium</i> , <i>Ulmus</i> sp.)	C2	
G13	Elder, Ornamental Cherry, Hawthorn (<i>Sambucus nigra</i> , <i>Prunus</i> sp., <i>Crataegus monogyna</i>)	C2	
G2	Apple, Pear (<i>Malus</i> , <i>Pyrus</i>)	C1	
G3	Kohuhu, Hawthorn, Whitebeam, Silver Birch, Wild Cherry (<i>Pittosporum tenuifolium</i> , <i>Crataegus monogyna</i> , <i>Sorbus aria</i> , <i>Betula pendula</i> , <i>Prunus avium</i>)	C2	
G6	Lawson Cypress, Field Maple, Rowan (<i>Chamaecyparis lawsoniana</i> , <i>Acer campestre</i> , <i>Sorbus aucuparia</i>)	C1	
G7	Lombardy Poplar (<i>Populus nigra</i> 'Italica')	C1	TPO G5 8No.
G9	Lombardy Poplar (<i>Populus nigra</i> 'Italica')	B2	TPO G3 3No.
9 Groups (consisting of 51 individual trees and 3 groups of small trees)			15 TPOd trees
T8	Cherry Plum (<i>Prunus cerasifera</i>)	C1	
T9	Cherry Plum (<i>Prunus cerasifera</i>)	R	
T10	Lawson cypress (<i>Chamaecyparis lawsoniana</i>)	C1	
T11	Silver Birch (<i>Betula pendula</i>)	C1	
T13	Leyland Cypress (<i>X Cupressocyparis leylandii</i>)	C1	
T14	Wild Cherry (<i>Prunus avium</i>)	R	
T15	Wild Cherry (<i>Prunus avium</i>)	C1	
T16	Bay (<i>Laurus nobilis</i>)	C1	
T17	Cider Gum (<i>Eucalyptus gunnii</i>)	C1	
T18	Cherry Laurel (<i>Prunus laurocerasus</i>)	C1	
T21	Unknown (Unknown)	C1	
T22	Apple (<i>Malus</i>)	C1	
T23	Hawthorn (<i>Crataegus monogyna</i>)	C1	
T24	Common Oak (<i>Quercus robur</i>)	C1	
T25	Weeping Willow (<i>Salix X chrysocoma</i>)	C1	TPO T5
T27	Western Red Cedar (<i>Thuja plicata</i>)	C1	
T28	Locust Tree (<i>Robinia pseudoacacia</i>)	C1	
T29	Sycamore (<i>Acer pseudoplatanus</i>)	R	
T30	Common Oak (<i>Quercus robur</i>)	C1	TPO T7
T31	Monterey Cypress (<i>Cupressus macrocarpa</i>)	R	

Tree No.	Species	BS Category	TPO Nos.
T41	Spruce (Picea species)	C1	
T42	Hawthorn (Crataegus monogyna)	R	
T43	Lawson Cypress (Chamaecyparis lawsoniana)	C1	
T46	Norway Spruce (Picea abies)	C1	
T47	Scots Pine (Pinus sylvestris)	C1	
T48	Cider Gum (Eucalyptus gunnii)	B1	
T50	Elder (Sambucus nigra)	C1	
T51	Lombardy Poplar (Populus nigra 'Italica')	C1	
T52	Lombardy Poplar (Populus nigra 'Italica')	C1	
T53	Hawthorn (Crataegus monogyna)	C1	
T55	Hawthorn (Crataegus monogyna)	C1	
T56	Hawthorn (Crataegus monogyna)	C1	
T57	Walnut (Juglans regia)	C1	
33 trees			2 TPO trees

Tree No.	Species	BS Category	TPO Nos.
MANOR FM			
G2	Apple, Elder (Malus, Sambucus nigra)	C1	
G3	English Elm (Ulmus procera)	R	
G4	Spruce (Picea species)	C1	
G5	Spruce (Picea species)	C1	
G7	Goat Willow (Salix caprea)	C2	
G8	Goat Willow (Salix caprea)	C1	
6 groups (consisting of 42 individual trees and 2 groups of small trees)			
T1	Spruce (Picea species)	C1	
T11	Horse Chestnut (Aesculus hippocastanum)	R	
T12	Hazel (Corylus avellana)	C2	
T13	Apple (Malus)	R	
T14	Magnolia (Magnolia)	C1	
T16	Kohuhu (Pittosporum tenuifolium)	C1	
T17	Pear (Pyrus)	R	
T18	Judas Tree (Cercis siliquastrum)	C1	
T19	Elder (Sambucus nigra)	C1	
T20	Elder (Sambucus nigra)	C1	
T21	Apple (Malus)	C1	
T22	Pear (Pyrus)	C1	
T23	Bay (Laurus nobilis)	C1	
T24	Spruce (Picea species)	R	
T25	Apple (Malus)	C1	
T28	Walnut (Juglans regia)	B1	TPO G2
T29	Spruce (Picea species)	C1	
T30	Silver Birch (Betula pendula)	B1	TPO T1
T31	Walnut (Juglans regia)	R	
T32	Ash (Fraxinus excelsior)	C1	
T33	Sycamore (Acer pseudoplatanus)	C1	
T34	Sycamore (Acer pseudoplatanus)	B1	
T35	Silver Birch (Betula pendula)	C1	
T36	Goat Willow (Salix caprea)	R	
T37	Elder (Sambucus nigra)	R	
T38	Silver Birch (Betula pendula)	B1	
T39	Sycamore (Acer pseudoplatanus)	B1	
T40	Apple (Malus)	R	
T46	Hawthorn (Crataegus monogyna)	C1	
T48	Hawthorn (Crataegus monogyna)	C1	
T5	Holly (Ilex aquifolium)	C1	
T50	Hawthorn (Crataegus monogyna)	C1	
T51	Hawthorn (Crataegus monogyna)	C1	
T8	Kohuhu (Pittosporum tenuifolium)	C1	
T9	Kohuhu (Pittosporum tenuifolium)	C1	
35 Trees			2 TPO trees

APPENDIX 3: HALLETT ROAD CONSTRUCTION DETAIL

APPENDIX 4: TREE PROTECTION PLANS

BSH17581-03 (MANOR FARM
BSH17581-05 (COPSEYS NURSERY)



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