Wentworth Castle Gardens
Park Drive,
Barnsley

Pre-development Arboricultural Report

Prepared at the request of
Sarah Dennett,
National Trust

13 December 2018

By
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Treescapes Consultancy Ltd.

SUMMARY

Treescapes Consultancy Ltd. have been instructed by Sarah Dennett, senior building surveyor with the National Trust, to inspect significant trees growing within the grounds of Wentworth Castle, Park Drive, Barnsley, that are close to the site of a proposed IT service trench and customer kiosk. We have been asked to provide a pre-development arboricultural report in which we assess whether important trees may be affected by the proposed development and, if so, the potential level of disturbance. We have also been asked, if necessary, to suggest ways the proposals could be implemented to limit potential disturbance to an acceptable level.

I visited the site on 20 November 2018 and inspected 30 trees and two woodland areas growing within the property that are close to the proposed development. The site forms a small part of the grounds of Wentworth Castle Gardens.

The species, size and condition of the trees, and my management recommendations, are listed in the schedule included as Appendix 5. Plans 1 and 2 show the existing and proposed site layouts, the locations of the trees, their canopies and Root Protection Areas (RPAs) calculated using the guidance contained in the British Standard: Trees in relation to design, demolition and construction – Recommendations (BS 5837, 2012). I assessed 16 of the trees to be in retention Category C, ten trees and the two woodland areas to be in retention category B and four to be in the highest retention category A.

Plan 2 shows that the IT trench will encroach marginally onto the edge of the RPA of four trees – 4, 5, 10, 11 and one woodland area (19). The IT trench will encroach significantly into the RPA of Trees 6, 13 and 14. The trench would need to be carefully hand dug or the trees removed. These are category C trees. The trench will need to be hand dug through the second woodland area (28). The guidance contained within the National Joint Utilities Group Volume 4 (Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees (Issue 2, 2007); (http://streetworks.org.uk/) should be followed when installing underground services within the RPAs of these trees.

The proposed location of the new grease trap would be within the RPA of Tree 6. It is proposed to remove this tree to accommodate the grease trap and service trench. Whilst this is a large and significant tree it has been included in the lowest retention category (C) because of the significant damage to the main stem associated with fire damage.

The proposed visitor kiosk will encroach slightly into the RPA of Tree 22. Trees 24, 25 and 26 would need to be removed. These are small, young recently established trees. These could be readily replaced elsewhere with new planting.

Plan 3 is a tree protection plan that shows suggested locations of tree protection barriers and areas where the ground should be protected. The protective measures should be installed prior to any other development activity taking place and remain in place for the duration of the work.

Based on the information discussed in this report, and provided all the technical recommendations it contains are followed, I consider the proposed development can be implemented in accordance with the guidance contained in BS 5837 (2012) with minimal impact on important trees to be retained.

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APPENDICES

1 INTRODUCTION

1.1 Instruction

Treescapes Consultancy Ltd. have been instructed by Sarah Dennett, senior building surveyor with the National Trust to inspect significant trees that may be affected by the installation of an IT service trench and construction of a new visitor kiosk in part of the grounds of Wentworth Castle Gardens. We have been asked to provide a pre-development arboricultural report in which we assess whether important trees may be affected by the proposed development and, if so, the potential level of disturbance. We have also been asked, if necessary, to suggest ways the proposals could be implemented to limit potential disturbance to an acceptable level. Plan 1 shows the existing site layout and Plan 2 the proposals.

The trees have been inspected and this report prepared in accordance with the guidance contained in the British Standard: Trees in relation to design, demolition and construction – Recommendations (BS 5837, 2012).

1.2 Qualifications and experience

I have based this report on my site observations and provided information, and I have come to conclusions in the light of my experience. I have experience and qualifications in arboriculture and list the details in Appendix 1.

1.3 Documents and providedinformation

Sarah Dennet provided a topographic survey of the existing site layout and a plan showing the proposals as Autocad compatible files. I have not checked the accuracy of these plans or the locations of the trees plotted on them.

1.4 Relevant background information

I met with Sarah Dennett on the day of the survey and we walked the route of the service trench and identified the location of the visitor kiosk.

1.5 Report limitations

This report:

- is only concerned with assessing the condition of the trees along the route of the trench that are directly affected by the development proposals;
- does not take account of whether the trees could affect the soil in the area and cause tree related subsidence damage;
- is based on the documents provided and the information collected during the site visit;
- contains recommendations concerning work that should be carried out to responsibly manage the risks posed to and by the trees, and where necessary, reduce those risks to an acceptable level. However, even after carrying out the recommended work, there is a risk failure could still occur, especially during extreme weather conditions and/or if there are major hidden defects;
- does not take into account the possibility of extreme weather events;
- cannot account for future outbreaks of pests or diseases;
- does not take into account mechanical operations carried out in the vicinity of the trees which could affect their health and stability; and
- does not contain data collected with technical decay detection equipment

2 SITE VISIT AND OBSERVATIONS

2.1 Site visit

I visited the site and inspected the trees on 20 November 2018. All my observations were from ground level without detailed investigations and I estimated all dimensions unless otherwise indicated. While I was on site the weather was overcast, still and dry at the beginning of the survey. Heavy rain affected the last hour of the survey. Visibility remained adequate throughout.

2.2 Site description

The site is located at Ordnance Survey grid reference SE 3207 0330 to the south of Lowe Lane, which runs in a southwest to northeast direction at this point.

The site is accessed from Lowe Lane along a drive that runs in a southerly direction towards the Northern College buildings and car park.

The trees considered in this report are either side of the proposed IT service trench which runs along the access drive between the main Wentworth Castle buildings and gardens to the informal and unsurfaced car park to the north.

2.3 Identification and locations of the trees

The approximate locations of the significant trees are shown on the topographic site survey included as Plan 1 that was provided by the National Trust. I did not check the accuracy of the topographic site survey or the locations of the trees marked on it. Significant trees have a stem diameter greater than 150mm, measured 1.5m above ground level. If necessary smaller trees that have not been included on the plans could be transplanted if of a suitable quality. Alternatively they could be replaced.

All the trees, except trees 24 to 27 and some on the western edge of woodland 29, were plotted by a Land Surveyor.

The plans included in this report are for illustrative purposes only and should not be used for directly scaling measurements: all measurements should be checked on site. All relevant information is contained within this report, the topographic site survey and other documents submitted with the planning application.

2.4 Tree observations

I visually inspected the significant trees and information on their species, dimensions and condition, as well as my initial management recommendations, is included in Appendix 5.

Cohesive groups of trees with similar attributes, both aerodynamically and visually, often have greater value as a group rather than individuals. I have

therefore recorded data on these as a single group in the schedule included as Appendix 5. This includes Group 12 and Woodlands 19 and 28.

3 REFERENCES, PLANNING POLICY AND GUIDANCE

3.1 National policy

Section 197 in the Town and Country Planning Act 1990 makes it the duty of Local Planning Authorities (LPAs), '*in the interests of amenity*,' to protect trees, when granting planning permission, either by the imposition of conditions or serving Tree Preservation Orders (TPOs).

The National Planning Policy Framework (NPPF) mentions trees and should be taken into account.

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

> *b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*

175. When determining planning applications, local planning authorities should apply the following principles:

> *c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons58 and a suitable compensation strategy exists;*

Annex 2: Glossary

Ancient or veteran tree: A tree which, because of its age, size and condition, is of exceptional biodiversity, cultural or heritage value. All ancient trees are veteran trees. Not all veteran trees are old enough to be ancient, but are old relative to other trees of the same species. Very few trees of any species reach the ancient life-stage.

Ancient woodland: An area that has been wooded continuously since at least 1600 AD. It includes ancient semi-natural woodland and plantations on ancient woodland sites (PAWS).

Irreplaceable habitat: Habitats which would be technically very difficult (or take a very significant time) to restore, recreate or replace once destroyed, taking into account their age, uniqueness, species diversity or rarity. They include ancient woodland, ancient and veteran trees, blanket bog, limestone pavement, sand dunes, salt marsh and lowland fen.

3.2 British Standard: Trees in relation to design, demolition and construction – Recommendations (BS 5837, 2012)

The British Standard: *Trees in relation to design, demolition and construction – Recommendations* (BS 5837, 2012) contains guidance on how to assess trees in or close to proposed development and information to include in pre-development arboriculturalreportssubmittedwith planning applications. Appendices 2 and 3 contain relevant extracts from BS 5837 (2012).

3.3 Barnsley Metropolitan Borough Council Planning Policies

The site is within the area administered by Barnsley Metropolitan Borough Council. The following is from the council's Unitary Development Plan which is to be used to make decisions on planning applications until the new Local Plan is adopted.

"Woodland Hedgerows & Trees Policy GS22 THE COUNCIL WILL SEEK THE RETENTION AND MANAGEMENT OF EXISTING HEDGEROWS, WOODLANDS AND TREES BOTH INDIVIDUALLY AND IN GROUPS. 3.87 Trees, woodlands and hedgerows contribute positively to the overall character of the landscape and to the local environment, enhancing the appearance of an area and providing a home for wildlife. Many of the woodlands in the Borough have been identified as the sites of Ancient Woodlands, some of which are important for nature conservation. A number have been designated Natural Heritage Sites (see Policy GS15). Woodlands also provide an important recreation resource and can be a source of timber production. Page 180 BARNSLEY UNITARY DEVELOPMENT PLAN Adopted December 2000 Volume 1 - Part II Greenspace

3.88 Managing woodlands trees and hedgerows is an important means of ensuring they thrive in the longer term and remain as valuable landscape features, also that opportunities for wildlife and recreation are increased. The Council is able to designate Tree Preservation Orders to protect individual trees or groups of trees, if their removal would have a significant impact on the environment and its enjoyment by the public. 3.89 The management of existing hedgerows is encouraged and assisted by the Countryside Commission's Hedgerow Incentive Scheme, now integrated into the Countryside Stewardship Scheme, which the Borough Council is keen to see applied in its area.

Policy GS22A IN ASSESSING PLANNING APPLICATIONS THE DESIRABILITY OF RETAINING MATURE TREES AND HEDGEROWS WILL BE AN IMPORTANT MATERIAL CONSIDERATION.

3.90 The development control process will be used to protect mature trees and hedgerows. 3.91 Section 197 of the Town and Country Planning Act 1990 places a special duty on Local Planning Authorities to include appropriate provision for the preservation of trees when considering planning applications and where appropriate by the serving of Tree Preservation Orders. This duty is elaborated upon in DoE circular 36/78.

Policy GS22B THE FOLLOWING REQUIREMENTS WILL APPLY TO PLANNING APPLICATIONS CONTAINING MATURE TREES OR HEDGEROWS : A) PLANNING APPLICATIONS PROPOSING DEVELOPMENT ON A SITE CONTAINING MATURE TREES AND HEDGEROWS SHOULD INCLUDE A SURVEY IDENTIFYING THE TYPE, SIZE, LOCATION AND GENERAL CONDITION OF ALL MATURE TREES AND HEDGEROWS AND DETAILS OF ANY REMEDIAL SURGERY REQUIRED. THE SURVEY IS THE RESPONSIBILITY OF THE APPLICANT AS ADVISED IN DOE CIRCULAR 36/78 B) WHERE DEVELOPMENT IS ACCEPTABLE IN PRINCIPLE ON A SITE CONTAINING MATURE TREES WHICH ARE TO BE RETAINED, THE LAYOUT MUST ENSURE THAT NO BUILDINGS, ACCESS ROADS, PARKING AREAS OR DRAINAGE SYSTEMS ARE LOCATED WITHIN THE SPREAD OF ANY TREE AND NO EXCAVATIONS OR ALTERATION TO GROUND LEVELS SHOULD BE

MADE WITHIN THOSE AREAS C) IN ORDER TO PROTECT TREES DURING CONSTRUCTION, TEMPORARY FENCING SHOULD BE ERECTED AROUND THEIR CANOPY SPREAD AS ADVISED BY DOE CIRCULAR 36/78. WHERE PLANNING PERMISSION IS GRANTED FOR DEVELOPMENT ON SITES CONTAINING TREES TO BE RETAINED CONDITIONS WILL BE IMPOSED TO THIS EFFECT. Page 181 Volume 1 - Part II Greenspace BARNSLEY UNITARY DEVELOPMENT PLAN Adopted December 2000

3.92 Tree Preservation Orders will be made where appropriate to protect trees that contribute to the character of an area. For many types of development it will be necessary for the developer to submit a full survey of trees and hedges, providing all the information specified in Policy GS22B. In some cases, however, where there are extensive areas of trees and hedges and it is clear they will not be affected by development, it will be sufficient to show their location and general extent. In cases where extensive areas of trees and hedges are to be affected by development it will be necessary to show the location, extent and range of species affected, together with information endorsed by a competent person as to the effect of the loss of the trees on interests of ecology and landscape quality."

4 TREE CONSTRAINTS

4.1 Tree Retention Category – BS 5837 (2012)

I assessed the retention category of each tree or group of trees using the guidance contained in Table 1 of BS 5837 (2012). A copy of Table 1 of BS 5837 (2012) is included as Appendix 3. The retention category of each tree is listed in Appendix 5 and shown on the plans included in this report by the colours used to depict them:

Green: Category A – a high quality tree that should be retained where possible;

Blue: Category B – a moderate quality tree that could be retained;

Grey: Category C – a low quality tree that could be retained for a time but shouldn't be considered to be a constraint to development; and

Red: Category U – a tree in such a condition that it cannot realistically be retained as a living tree in the context of the current land use for longer than 10 years unless it is in a little frequented area and it is desired to retain it for wildlife.

There are 25 significant trees, one group of small trees and two woodland areas growing close to the proposed IT trench and visitor kiosk. I assessed four individual trees to be in Retention Category A; five individual trees, one group of five trees and two woodlands to be in Retention Category B; 16 individual trees are in Retention Category C; none are in Retention Category U.

BS 5837 (2012) states, in Table 1, that trees with trunk diameters less than 150mm should be allocated to Retention Category C. Section 4.5.10 states:

'Particular care is needed when evaluating young trees, especially where they occur as individual specimens. Where these are less than 150 mm stem diameter at 1.5m above adjacent ground level, it might be acceptable and relatively straightforward to mitigate their loss, if necessary, with similar new tree planting. Alternatively, it might be practicable to relocate such trees within the site (e.g. using a tree spade). Whilst the presence of young trees of good form and vitality is generally desirable (i.e. those trees which have the potential to develop into quality mature specimens), they need not necessarily be a significant constraint on the site's potential.'

'NOTE It is sometimes possible to relocate mature trees. However, as this is a costly and complex operation with a variable chance of success, it is a viable option only in exceptional cases.'

I consider that none of the trees with trunk diameters less than 150mm at 1.5m should be constraints to developing the site. However, I have been informed that Tree 27, a young giant redwood close to the position of the proposed visitor kiosk, may have been planted as a memorial tree.

4.2 Tree constraints – above and below ground

Plans 1 and 2 show the existing and proposed site layouts, the locations of the trees, their crowns and Root Protection Areas (RPAs) calculated using the guidance contained in BS 5837 (2012). If retained, tree canopies are vertical constraints to development. Pruning trees can sometimes provide adequate clearance to implement development proposals but should be carried out in accordance with the guidance contained in the British Standard: *Tree work – Recommendations* (BS 3998, 2010).

The RPA of a tree is described to be the minimum area of soil required by its roots to maintain healthy growth and should be considered a constraint to development if it is to be retained.

5 ARBORICULTURAL IMPACT ASSESSMENT

5.1 Trees growing close to the proposed development

Plan 2 shows the proposed layout, the locations of the trees, their crowns and RPAs.

Trees 1, 2, 3, 7, 8, 9, 15, 16, 17, 18, 20, 21 and Group 12 will be unaffected by the proposals.

The proposed IT service trench will encroach slightly into the edges of the RPAs of Trees 4, 5, 10, 11 and woodland 19. This is very minor and is well within the tolerable limits.

The IT trench and new grease trap together would significantly affect Tree 6, a mature sycamore, as they would both affect the central and northern areas of the RPA. The service trench would be within 2m of the base. This could affect structural roots.

The tree has suffered badly from a fire near the base within the last six months or so. For this reason it is proposed to remove the tree for facilitate the proposals. Had the tree not been damaged by fire it would have been included in a higher retention category and I would have recommended repositioning of the grease trap and hand digging or relocating the trench.

There is a hole at a branch union with the trunk of the tree. This is a potential bat roost. It will be necessary to establish whether this is a bat roost before felling. If a roost is present then a licence will be require from Natural England.

The IT trench would pass through the centre of the RPAs of Trees 13, a sycamore, and 14, a yew. The trench would need to be hand dug or the trees removed. Both trees are growing close to the existing garden wall and may not be in a sustainable location in the long term in any case, particularly the sycamore.

Trees 22 and 23 are in close proximity to the proposed visitor kiosk. The footprint encroaches slightly into the RPA of Tree 22 but it would be possible to retain the tree. These trees are however not particularly valuable. Tree 22 has a large area of dead bark with decay in the upper stem. Tree 23 only has moderate vitality. I believe it would be reasonable to remove the trees and replant with new trees following completion of the development.

Trees 24 to 26 are very young recently established trees. Whilst their positions were not plotted on the topographical survey they would be within the footprint of the layout. In accordance with BS5837 these trees are below the size considered to be important. The trees could readily be replaced by new planting elsewhere on the site.

Tree 27 is also a very young recently established tree. The position was not plotted on the topographical survey. In accordance with BS5837 this tree is below the size considered to be important and could readily be replaced by new planting elsewhere on the site. However, I believe this tree was planted as a memorial tree. Provided the footprint of the kiosk is more than 1.5m from the tree it would be unaffected. In the long term this species develops large buttress roots with the roots in the first 4m from the stem very close to the surface. The roots may therefore cause difficulties for the kiosk in the long term if cited too close.

Woodland 28 has effectively one large root protection area along the IT trench route at this point. The trench will need to be hand dug through the woodland.

5.2 Shading from trees

Shading will not be an issue for the proposed visitor kiosk building.

5.3 Levels

Altering the ground level within the RPA of a retained tree may have a detrimental impact on its health and longevity.

5.4 Ground surface materials

Altering the ground cover, such as by using impervious or semi-pervious surface materials to cover areas that were previously vegetated soil, will alter the moisture content and recharge of the soil and its oxygen and carbon dioxide content. This could have a detrimental effect on the health of tree roots growing in it.

5.5 Site access

Vehicles and plant operating or parking on unprotected soil within the RPA of a retained tree could compact or contaminate it and this could have a detrimental impact on its long-term condition and longevity.

Vehicle movements under the crown of a tree could damage its trunk and/or branches. This could potentially create a safety hazard and reduce its life expectancy.

5.6 Storing fuel, materials and equipment

Storing fuel, equipment and materials close to a tree increases the risk of damage to its trunk and branches, soil compaction and/or contamination with toxic substances.

5.7 Activity under tree canopies

Activity under a tree canopy, such as mixing cement, lighting bonfires or storing equipment, plant and materials, may damage its branches or stem(s). It may also be detrimental to soil within its RPA that is utilised by its roots.

6 RECOMMENDATIONS

6.1 General precautions

The following general precautions should ensure the health and longevity of retained trees. They should be enforced within their RPAs and under their canopies during the construction phase and in locations where new trees will be established unless the soil will be suitably remediated.

- No storing materials, equipment, plant or fuel.
- No refuelling mechanical equipment.
- No storing or mixing cement.
- No washing cement mixers within or uphill of the RPA.
- No bonfires within 10m of the outer edge of the crown or RPA.
- No raising the soil level without prior discussion with Treescapes Consultancy Ltd.and agreement of the Local Planning Authority (LPA).
- No excavations without prior discussion with Treescapes Consultancy Ltd. and agreement of the LPA.
- No redirection of surface water runoff, either into or out of the RPA.
- No temporary buildings, sheds, or offices without prior discussion with Treescapes Consultancy Ltd. and agreement of the LPA.
- No dumping or storing materials or waste, whether in a skip or on the ground.
- No vehicles and plant unless the soil is suitably protected as recommended by Treescapes Consultancy Ltd. and agreed by the LPA.
- Only operate or park vehicles and plant in areas where new trees will be established if the soil is suitably protected, as recommended by Treescapes Consultancy Ltd. and agreed by the LPA. Alternatively, soil compaction should be relieved prior to the establishment of the trees once the construction phase has been completed.
- Follow the guidance contained within the National Joint Utilities Group Volume 4 (*Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees* (Issue 2, 2007); http://streetworks.org.uk/ when installing or maintaining underground services within the RPA of a retained tree.

If necessary Treescapes Consultancy Ltd. can monitor the implementation and adequacy of tree protection measures at critical stages of the project to ensure they are in accordance with BS 5837 (2012) and conditions listed on the planning consent notice.

6.2 Poor quality trees – trees in Retention Category 'U'

Using the guidance contained in BS 5837 (2012), I did not assess any trees to be in retention category U.

6.3 Poor quality trees – trees in Retention Category 'C'

Using the guidance contained in BS 5837 (2012), I assessed trees 6, 7, 9, 11 13 to 18 and 22 to 27 to be in retention category C. I consider that these are either poor trees that have limited life expectancies and therefore should not be constraints to development or are young and could be readily replaced with new planting.

6.4 Trees 1, 2, 3 and 4

Trees 1, 2, 3 and 4 have been assessed to be in Retention Category A because I consider that they will probably survive for at least 40 years and they are large, old mature trees that contribute significantly to the setting of the grade 1 listed site.

6.5 Tree work required to implement the proposals

Fell Tree 6. There is a hole at a branch union with the trunk in the crown. This is a potential bat roost. It will be necessary to establish whether this is a roost before felling. If a roost is present then a licence will be require from Natural England.

I recommend that trees 13 and 14 should be removed to allow the proposals to be implemented and to avoid potential for damage to the wall as the trees grow.

I recommend that consideration is given to removal of Trees 22 and 23 to accommodate the visitor kiosk.

I recommend that Trees 24, 25 and 26 are removed to accommodate the visitor kiosk.

These have all been assessed to be in Retention Category C as they are either relatively poor trees or young and small and their removal will not significantly affect the visual appearance of the area.

If Tree 27 is retained because it has been planted as a memorial tree then I recommend that consideration is given to citing the kiosk at least 4 to 5m from the tree to avoid damage to the kiosk as the tree matures.

6.5.1 Pruning

I recommend pruning to crown lift trees over the IT service route and neighbouring track is carried out where necessary to provide adequate clearance to avoid branches being struck by vehicles.

6.6 Recommended tree work

Appendix 5 contains prioritised tree work recommendations.

6.6.1 Risk abatement tree work

Recommended risk abatement work is listed as Category 1 and has been prioritised as:

- High priority – carry out this work as soon as possible;
- Medium priority – this work doesn't need to be carried out straight away but these trees should be inspected every two years and after adverse weather conditions. If it is decided not to carry out this work straight away I recommend that provision is made in future budgets to have it carried out at a later date.
- Low priority – this work doesn't need to be carried out straight away but these trees have notable defects that could develop over time. I therefore recommend that these trees should be inspected every two years and after adverse weather conditions.

6.6.2 Tree work category

- Category 1 work is necessary to manage risks posed by the trees and has been prioritised as described above.
- Category 2 work is recommended to establish high levels of arboricultural and silvicultural management and is not necessary to abate safety concerns and therefore hasn't been prioritised.

6.7 Implementing the tree work

Recommended tree work should be carried out by a suitably qualified, competent, experienced and insured contractor. The contractor should carry out all tree work in accordance with the guidance contained in the British Standard: *Tree Work– Recommendations* (BS 3998, 2010).

If required, Treescapes Consultancy Ltd. will obtain quotations for required tree work and oversee its implementation.

6.8 Design and construction considerations

Construction work can adversely affect trees in many ways. Consequently, I suggest that it would be beneficial for all members of the project team to be aware of tree protection recommendations contained within this report and tree protection conditions listed on the planning consent notice, and make provision for them throughout the project. To avoid unnecessary damage to retained trees I recommend that Treescapes Consultancy Ltd. should be involved throughout the project at all stages, from pre-planning to hand-over.

We are able to provide feedback at each stage of the project and carry out a supervisory role to ensure that retained trees are adequately protected.

6.9 Temporary tree protection barriers

Plan 3 is a Tree Protection Plan that shows suggested locations of temporary tree protection barriers and ground protection. These barriers must be robust enough to withstand impacts from machinery and plant that will operate close to them. In areas where lighter plant and machinery (typically <2t) are operating, I recommend using one or a combination of the following designs.

- 2 m tall welded mesh panels on rubber or concrete feet secured with pins driven 0.5m into the ground. The panels should be joined together using a least two anti-tamper couplers, installed so that they can only be removed from inside the fence. Support the panels on the inner side with stabilizer struts, secured with ground pins driven 0.5m into the ground. There should be one stabiliser strut between each pair of panels and one at each end of a line of panels. Where the fencing is erected on hard surfacing or it is otherwise unfeasible to use ground pins, mount the stabilizer struts onto a block tray.
- Wooden posts (Ø75-100mm x 1.8m) driven securely into the ground (300-500mm) every 2m, with top and bottom wooden rails (2m x 25mm x 100mm) attached securely to the posts to create a rigid structure. Chestnut paling fencing (1.25-1.5m high) should be attached securely to the rails every 300-400mm.
- Metal road-pins (1.2m) securely driven into the ground (200-300mm) at 2m centres, supporting orange mesh barrier fencing (1m high) securely attached to the pins using strong cable ties (4.8mm x 300mm).

The protective barriers should be erected prior to any trenching or development activity taking place and remain in-situ for the duration of the project. They should not be moved without the written consent of the LPA or until construction activity has finished.

I recommend that suitable members of the project team, including the main contractor and arboricultural consultant, should prepare a definitive Tree Protection Plan showing the locations of temporary tree protection measures to be installed during the construction phase and prepare a method statement for their installation and removal.

6.10 Temporary ground protection

The ground within the RPAs of retained trees should be protected throughout the project from compaction and contamination. If vehicle movement is to take place within the RPAs of retained trees and off of the existing roadway then the following suggestions may be appropriate. This is particularly important for Trees 1 to 4 and in Woodland area 28.

- For heavy construction vehicles (>2t), use reinforced concrete slabs, the three dimensional cellular confinement system described in section 6.9,

or an alternative engineered solution capable of supporting the likely loading without deforming and compacting the underlying soil.

- For lighter machinery (<2t), use inter-linked ground protection boards placed on a 150 mm deep layer of woodchip laid on a geotextile membrane.
- For pedestrian traffic, use a single thickness of scaffold boards placed either on a driven scaffold frame, so as to form a suspended walkway, or placed on top of a 100 mm deep layer of woodchip laid on a geotextile membrane.

I recommend that suitable members of the project team, including the main contractor and arboricultural consultant, should prepare a definitive Tree Protection Plan showing the locations of temporary tree protection measures to be installed during the construction phase and prepare a method statement for their installation.

6.11 Trees not included in this report

There are many trees growing in the grounds of Wentworth Castle Gardens that are not discussed in this report. I understand that excavations are not planned out with the area discussed in this report. For this reason, I consider that no further ground protection is required. However, if construction activities are to be carried out in other areas of the grounds, the canopies and RPAs of the trees should be protected accordingly.

6.12 Tree establishment

A number of trees of suitable species could be established in appropriate locations to enhance the visual character of the site and ensure that trees remain part of the landscape for decades to come.

Areas where trees are to be established should be protected from soil compaction and contamination during the construction phase by the same design of temporary barriers and/or ground protection used to protect existing trees and the soil within their RPAs. Alternatively, if compacted or contaminated, the soil will have to be suitably remediated or replaced to enable the trees to grow.

If required Treescapes Consultancy Ltd. are able to draw up a tree and shrub planting plan for the property.

It is however acknowledged that a lot of tree planting has taken place in the grounds in the last five years and it may not be necessary to establish new trees at this stage.

6.13 Tree management – future inspections

Due to the size of a number of the trees, their condition and locations close to buildings, roads, gardens, public open space and car parks, I recommend that they should be inspected every two and a half years and after tree altering weather events, such as drought or windstorms, by a suitably qualified, experienced and insured arboricultural consultant.

7 LEGAL CONSIDERATIONS

7.1 Protected trees

I have not made enquiries with the Local Planning Authority (LPA) to find out whether any of the trees discussed in this report are legally protected.

If these trees are protected by a Tree Preservation Order (TPO), located in a conservation area or protected by planning conditions, it will be necessary to obtain permission from the LPA before any work, other than certain exempted operations, can be carried out to them. The work specified in this report is necessary for their reasonable management and should be acceptable to the LPA but tree owners should appreciate that they may take an alternative point of view and have the option to refuse to grant consent.

I understand that full planning consent allows the minimum amount of work to protected trees necessary to implement the consented development without requiring permission under tree protection legislation – this should be checked with a solicitor or planning consultant.

7.2 Forestry legislation

A felling licence is required from the Forestry Commission to fell more than a small amount of timber in any calendar quarter unless the trees fall into one of the exempted categories. Information about felling licences is available on the Forestry Commission website –www.forestry.gov.uk(viewed 13/12/18). A felling licence may be required if more than $2m^3$ of timber is to be felled and sold, or more than $5m^3$ for personal use.

I understand that full planning consent allows the minimum amount of tree work necessary to implement the consented development without requiring a felling licence – this should be checked with a solicitor or planning consultant.

7.3 Wildlife conservation legislation

The nests of most birds are legally protected while they are in use. Bats are also legally protected and their roosts are protected whether or not they are in use. Contractors should be aware of their duties under legislation enacted to protect wildlife and carry out their site assessment and work accordingly. If bats are suspected Natural England should be consulted. The Forestry Commission and others produced a leaflet called: *Woodland Management for Bats* (2005) which contains some useful advice and is freely available to download from:

http://www.forestry.gov.uk/forestry/INFD-6K3CXY

On page 14 this publications states:

'The Wildlife and Countryside Act 1981 makes it an offence to disturb, damage or destroy bats or their roosts (even if bats are not present in the roost at the time of any incident). The Act applies in both England and Wales, and requires consultations with the appropriate Statutory Nature Conservation Organisation [Natural England] before carrying out activities which might harm or disturb bats or their roosts (even if unoccupied).'

'The Act is amended by the Countryside and Rights of Way Act 2000 in England and Wales. This adds 'reckless' to the offence of damaging or destroying a place a bat uses for shelter or rest, or disturbing a bat while using a roost. Under EU Regulations damaging or destroying a breeding site or resting place is an absolute offence, regardless of whether the act of doing so may be considered reckless or deliberate.'

8 CONCLUSIONS

Based on the information discussed in this report, and provided all the technical recommendations it contains are followed, I consider the proposed development can be implemented in accordance with the guidance contained in BS 5837 (2012) with minimal impact on important trees to be retained.

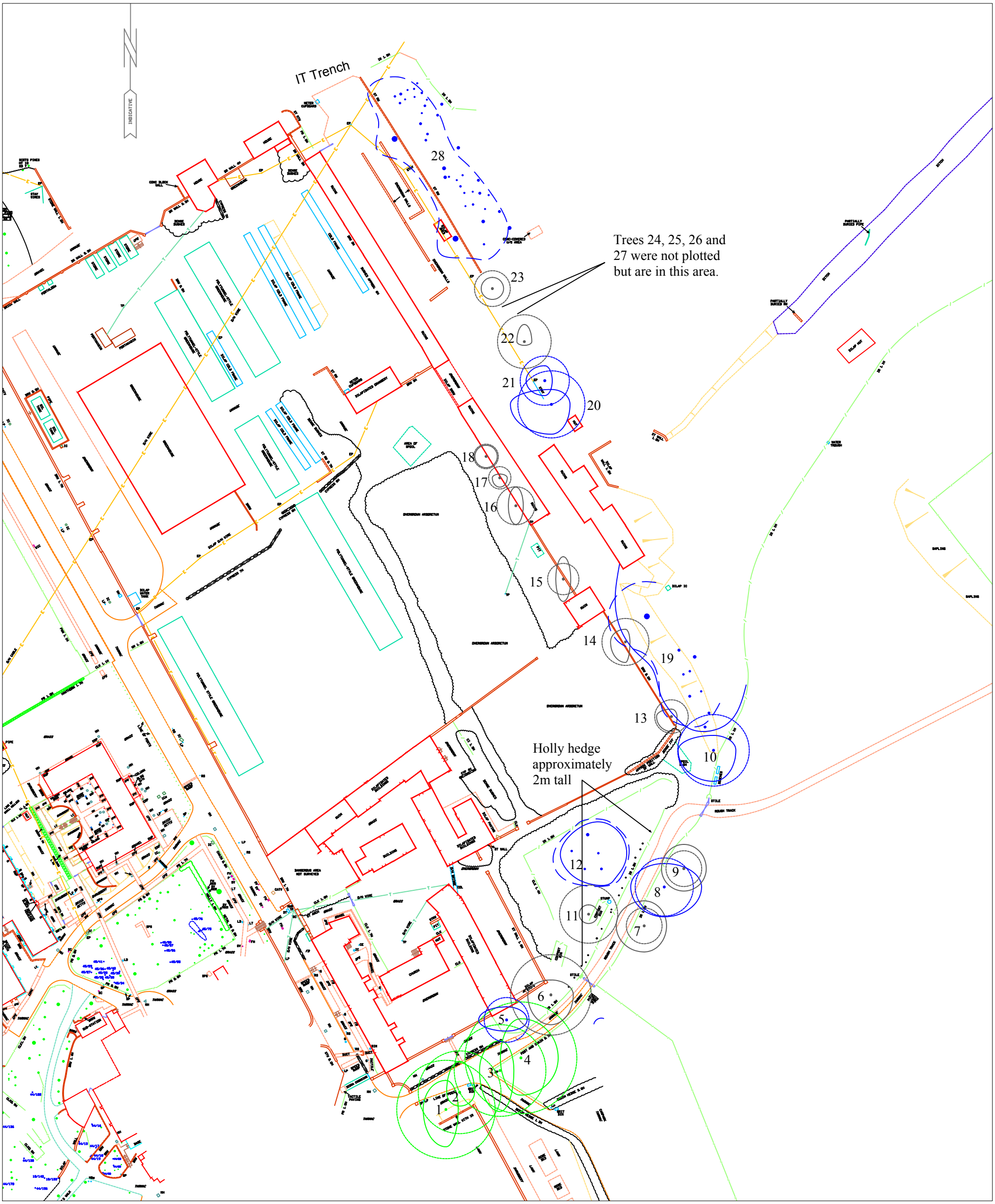
Ian Kennedy BSc.(Hons), M.Arbor.A. MICFor.

9 REFERENCES

Anon, 2005. *Woodland Management for Bats*. Forestry Commission, Wetherby. 15 pp.

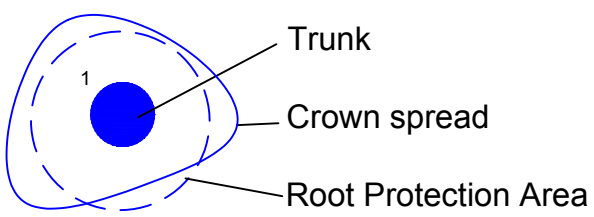
BS 5837, 2012. Trees in relation to design, demolition and construction – Recommendations

BS 3998, 2010. Tree work - Recommendations

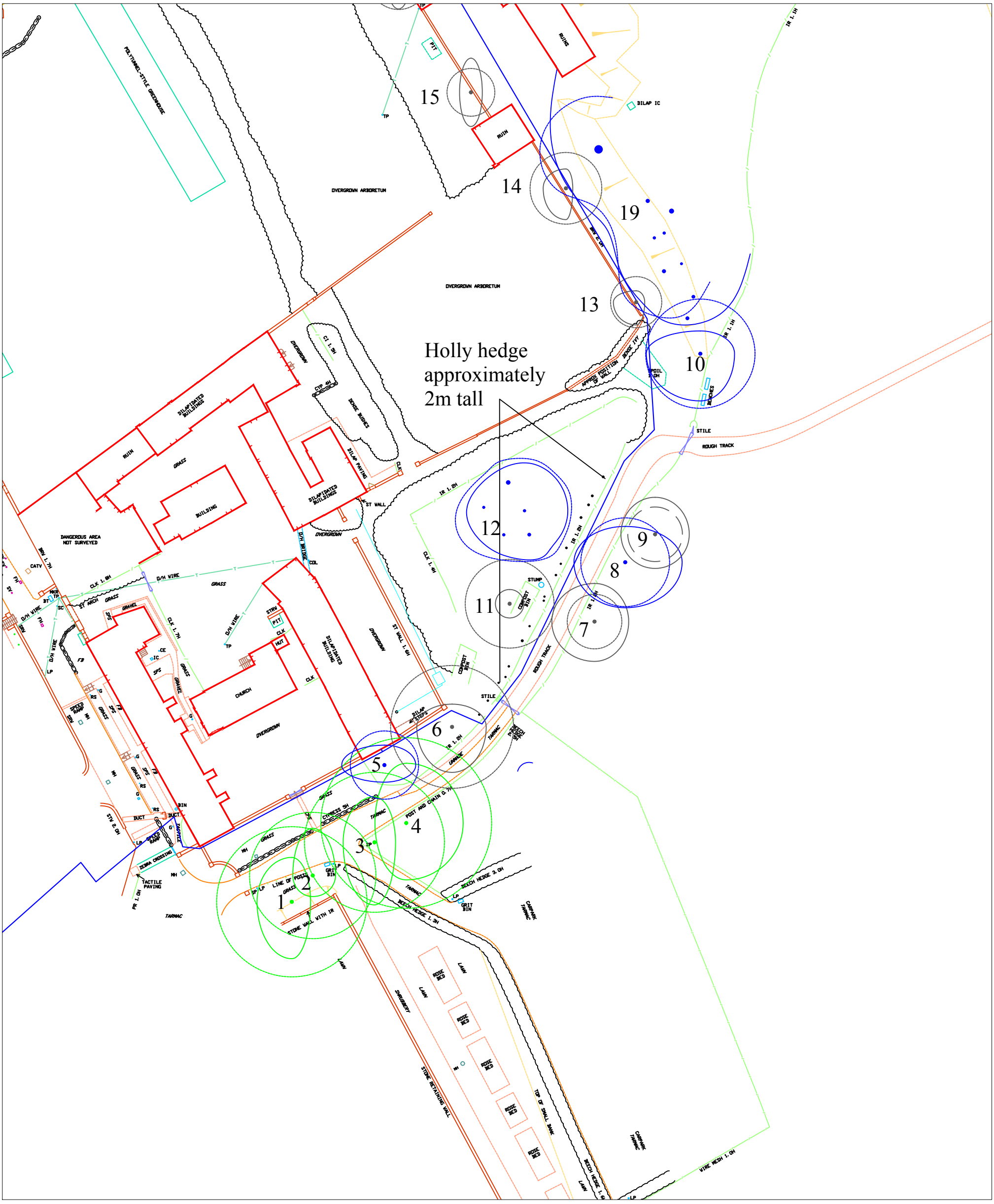


Plan 1 Tree constraints plan showing the existing site layout

The location of a tree and its respective number

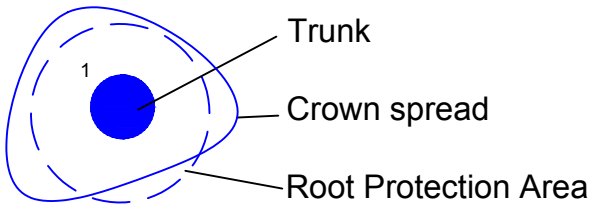


Green - Retention category A
Blue - Retention Category B
Grey - Retention Category C
Red - Retention Category U

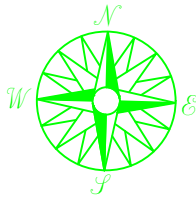


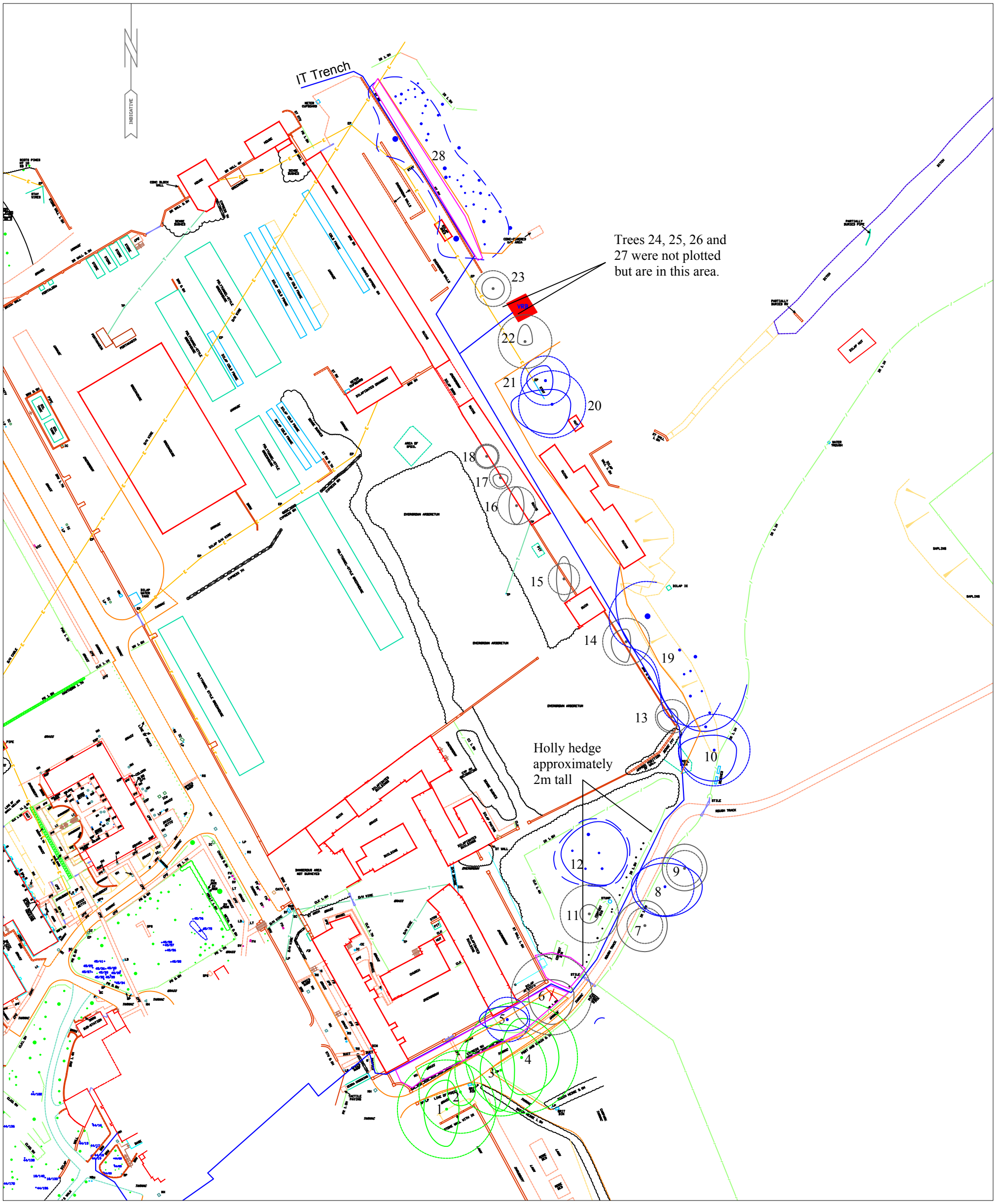
Plan 2 Tree constraints plan showing the proposed site layout

The location of a tree and its respective number



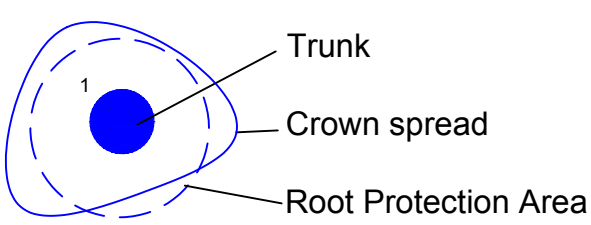
Green - Retention category A
Blue - Retention Category B
Grey - Retention Category C
Red - Retention Category U





Plan 3 Tree protection plan showing the proposed site layout

The location of a tree and its respective number



Green - Retention category A
Blue - Retention Category B
Grey - Retention Category C
Red - Retention Category U

Tree Protective fencing

Ground protection

Tree to remove

Appendix 1

Ian Kennedy – Experience and Qualifications

1. Qualifications

Ian graduated from the Scottish Agricultural College in August 1995 with a Higher National Diploma in Horticulture (HND) with Distinction.

In 1998 Ian graduated from the University of Aberdeen with aBSc (Hons) Upper second class in Forestry with Arboriculture and Amenity Forestry.

He passed the LANTRA Professional Tree Inspection examination in (2006).

In 2009 his application to become a professional member of the Arboricultural Association was assessed to fulfil all the necessary requirements and he became a professional member of the Association that year.

In 2011 he passed the final examination of the Institute of Chartered Foresters and become a member of that institute in January 2012.

2. Practical experience

Presently Ian is working in private practice as an independent arboricultural and woodland management consultant undertaking tree conditions surveys, pre-development tree surveys to the BS5837:2012 standard, mortgage reports and woodland management planning works. Clients range from home owners and farmers to architects, building companies, local authorities, schools and larger development companies.

Prior to private practice Ian held a number of positions in local government. Firstly he was the arboriculturalist within a planning office in Essex. Ian gained considerable experience regarding trees in relation to development, in particular BS 5837.

Development work formed the core of his duties and applications ranged from small back garden developments to major schemes such as the redevelopment of Ministry of Defence land for private residential development. Ian also undertook all functions associated with Tree Preservation Orders (TPOs), including the making of new TPOs, assessing suitability of applications to work on protected trees and trees in conservation areas.

Ian went on to managed a 500 hectare woodland estate for a local authority in South Yorkshire that included a mix of urban and rural woodlands. This included preparation and implementation of detailed management plans for multiply use woodlands. He undertook all aspects of silvicultural management from marking to contract tendering and monitoring. He also managed the access, conservation, landscape and archaeological requirements of the estate.

Ian was directly involved in the estate achieving Forest Stewardship Council certification in 2003 and personally ensured continued certification.

Ian worked extensively with Forestry Commission to obtain the necessary licences for management works and ensured the estate benefited fully from the full range of grants available.

Latterly at the same authority Ian went on to manage the trees and woodlands unit, having overall responsibility for management of the authority's tree and woodland stock and associated staff, together with delivery of other tree related services such as those associated with the Town and Country Planning Acts.

3. Continuing professional development

Ian regularly attends meetings, seminars and training events hosted by The Arboricultural Association, Institute of Chartered Foresters, Royal Forestry Society and Forestry Commission and benefits from the respective journals, briefings and newsletters available to members of the first three of the organisations listed.

4. Relevant experience

Ian has spent 18 years working with trees, including as the arboricultural advisor to planning officers for a Local Planning Authority and manager of a trees and woodlands unit for another local authority with overall responsibility for trees, including in relation to the Town and Country Planning Acts. Work in private practice is wide ranging in nature and includes all aspects of tree and woodland management and protection.

Appendix2

Extracts from the British Standard:Trees In Relation To Design, Demolition and Construction – Recommendations (BS 5837, 2012)

TREE CATEGORISATION

The trees have been categorised as recommended in Section 4.5, Tree categorisation method and Table 1 of the standard (BS 5837, 2012). A copy of Table 1 is included as Appendix 3.

TREE CONSTRAINTS

Section 5 of BS 5837 recommends producing a tree constraints plan (TCP) showing the trees and an area around them referred to as the root protection area (RPA). The RPA is a calculated area of soil sufficient to provide enough water and nutrients for the tree to remain in a healthy condition. The RPA is equal to the area of a circle with a radius 12 times the diameter of the trunk measured 1.5m above the ground. Alternatively, for multi-stemmed trees with more than five stems, the RPA is equal to the area of a circle with a radius equal to 12 times their mean trunk diameter measured at 1.5m above the ground level.

In Section 5.2.3, the Standard states:

'The following factors should also be taken into account during the design process:

a) the presence of tree preservation orders, conservation areas or other regulatory protection;

b) potential incompatibilities between the layout and trees proposed for retention;

c) the working and access space needed for the construction of the proposed development;

NOTE This might involve access facilitation pruning, or the use of a height restriction bar to prohibit tall vehicles accessing a site containing trees with low canopies.

d) the effect that construction requirements might have on the amenity value of trees, both on and near the site, including the effects of pruning to facilitate access and working space;

e) the requirement to protect the overhanging canopies of trees where they could be damaged by machinery, vehicles, barriers or scaffolding, where it will be necessary to increase the extent of the tree protection barriers to contain the canopy;

f)infrastructure requirements in relation to trees, e.g. easements for underground or above-ground apparatus; highway safety and visibility splays; and other infrastructural provisions, such as substations, refuse stores, lighting, signage, solar collectors, satellite dishes and CCTV sightlines;

g) the proposed end use of the space adjacent to retained trees;

h) the potential for new planting to provide mitigation for any losses.'

TREE PROTECTION

The RPA forms the basis for a construction exclusion zone (CEZ) and requires protection during the development by means of barriers and/or ground protection fit for ensuring the successful long-term retention of the trees. Section 6.2.1.1 of the standard states:

‘All trees that are being retained on site should be protected by barriers and/or ground protection (see 5.5) before any materials or machinery are brought onto the site, and before any demolition, development or stripping of soil commences. Where all activity can be excluded from the RPA, vertical barriers should be erected to create a construction exclusion zone. Where, due to site constraints, construction activity cannot be fully or permanently excluded in this manner from all or part of a tree’s RPA, appropriate ground protection should be installed.’

TREE PROTECTION BARRIERS

With regard to barriers erected to protect the retained trees, Section 6.2.2.1 of the standard states:

‘Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). Barriers should be maintained to ensure that they remain rigid and complete.’

In addition, Section 6.2.2.2 states:

‘The default specification should consist of a vertical and horizontal scaffold framework, well braced to resist impacts, as illustrated in Figure 2. The vertical tubes should be spaced at a maximum interval of 3 m and driven securely into the ground. Onto this framework, welded mesh panels should be securely fixed. Care should be exercised when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid contact with structural roots. If the presence of underground services precludes the use of driven poles, an alternative specification should be prepared in conjunction with the project arboriculturist that provides an equal level of protection. Such alternatives could include the attachment of the panels to a free-standing scaffold support framework.’

Appendix 7 of this report is a diagram of a tree protection barrier based default specification shown in BS 5837 (2012).

GROUND PROTECTION

With regard to protecting the soil within the RPA from compaction, Section 6.2.3.3 of BS 5837 (2012) states:

‘New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

NOTE The ground protection might comprise one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.’

CONSTRUCTION WITHIN THE RPA

Section 7.5.1

'The use of traditional strip footings can result in extensive root loss and should be avoided. The insertion of specially engineered structures within RPAs may be justified if this enables the retention of a good quality tree that would otherwise be lost (usually categories A or B). Designs for foundations that would minimize adverse impact on trees should include particular attention to existing levels, proposed finished levels and cross-sectional details. In order to arrive at a suitable solution, site-specific and specialist advice regarding foundation design should be sought from the project arboriculturist and an engineer. In shrinkable soils, the foundation design should take account of the risk of indirect damage'

Section 7.5.2

'Root damage can be minimized by using:

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

Section 7.5.3

'Where a slab for a minor structure (e.g. shed base) is to be formed within the RPA, it should bear on existing ground level, and should not exceed an area greater than 20% of the existing unsurfaced ground.'

Section 7.5.4

Slabs for larger structures (e.g. dwellings) should be constructed with a ventilated air space between the underside of the slab and the existing soil surface (to enable gas exchange and venting through the soil surface). In such cases, a specialist irrigation system should also be employed (e.g. roof run-off redirected under the slab). The design of the foundation should take account of any effect on the load-bearing properties of underlying soil from the redirected roof run-off. Approval in principle for a foundation that relies on topsoil retention and roof run-off under the slab should be sought from the building control authority prior to this approach being relied on.

Section 7.5.5

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

HARD SURFACES WITHIN THE RPA OF RETAINED TREES

Section 7.4.2 of BS 5837 (2012) states:

‘7.4.2.1 The design should not require excavation into the soil, including through lowering of levels and/or scraping, other than the removal, using hand tools, of any turf layer or other surface vegetation. If it is intended to use the new surface for construction access, it is essential that the extra loading and wear arising from this are taken into account during the design process.

7.4.2.2 The structure of the hard surface should be designed to avoid localized compaction by evenly distributing the loading over the track width and wheelbase of any vehicles expected to use the access.

7.4.2.3 New permanent hard surfacing should not exceed 20% of any existing unsurfaced ground within the RPA.

7.4.2.4 If the new surface is likely to be subject to de-icing salt application, an impermeable barrier should be incorporated to prevent contamination of the rooting area. Run-off should be directed away from the RPA (see also 8.6.5).

7.4.2.5 Where a permeable surface is to be used by vehicular traffic, a geotextile should be used at the base of construction to help prevent pollution contamination of the rooting area below.

7.4.2.6 Permeable hard surfacing can result in soil volume moisture content remaining at or near field capacity for long periods. Where there is a risk of waterlogging, the design should incorporate appropriate land drainage (see also 4.3 and 8.6.5). Land drainage within the RPA should be designed to avoid damage to the tree and the soil structure, e.g. sand slitting formed by compressed air soil displacement with the slits set radially to the tree.

7.4.2.7 The hard surface should be resistant to or tolerant of deformation by tree roots, and should be set back from the stem of the tree and its above-ground root buttressing by a minimum of 500 mm to allow for growth and movement. Resulting gaps may be filled using appropriate inert granular material.

NOTE 1 Appropriate sub-base options for new hard surfacing include three-dimensional cellular confinement systems. Alternatively, piles, pads or elevated beams can be used to support surfaces to bridge over the RPA or, following exploratory investigations to determine location, to provide support within the RPA while allowing the retention of roots greater than 25 mm in diameter.

NOTE 2 The use of two-dimensional load suspension systems is not recommended for surfaces intended for use by vehicles.’

Appendix 3

Table 1 from the British Standard: *Trees In Relation To Design, Demolition and Construction – Recommendations* (BS 5837, 2012)

Table 1 – Cascade Chart for Tree Quality Assessment

TREES UNSUITABLE FOR RETENTION (see Note)			
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7 below.		
TREES TO BE CONSIDERED FOR RETENTION			
Category and Definition	1. Mainly arboriculturalqualities	2. Mainly landscape qualities	3. Mainly cultural values, including conservation
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value

BS 5837 (2012) Section 4.5.7 states:

'Where trees would otherwise be categorized as U, but have identifiable conservation, heritage or landscape value, even though only for the short term, they may be upgraded, although they might be suitable for retention only where issues concerning their safety can be appropriately managed.'

Appendix 4

Explanatory notes for some of the terms used in Appendix 5

Mathematical abbreviations:> = Greater than: < = Less than.

Compass Bearing: N = north; S = south; E = east; W = west; NE = north-east; NW = north-west; SE = south-east; SW = south-west; NNE = north, north-east; NNW = north, north-west; ENE = east, north-east; WNW = west, north-west; SSE = south, south-east; SSW = south, south-west; ESE = east, south-east; WSW = west, south-west.

Estimated measurements: The symbol '#' will be used to indicate when measurements have been estimated.

Tree Number: This is the number used to indicate the trees approximate position on the plans. This number is also used in Appendix5.

Species: The species identification is based on visual observations and the common English name of what the tree appeared to be

Trunk Ø: Trunk diameter 1.5m above ground level recorded in millimetres measured with a diameter tape. If branches below 1.5m the trunk diameter will be measured just above ground level and 'base' will appear after the figure. If, for whatever reason, the diameter was measured at a different height above the ground the height will be mentioned. More than one figure indicates that the individual is has a number of stems. Many stems are indicated with a 'M'. If the DBH has been estimated '#' will appear in the column.

Height: The height of the tree measured with a Truepulse laser rangefinder.

Age Class: Assessed as either:

- Sapling or newly established = a size which could be easily transplanted;
- Semi-mature = prior to seed bearing age and could be transplanted with care;
- Juvenile Mature = young and if healthy growing rapidly, not yet achieved full mature height;
- Young Mature = early maturity, not fully grown but of seed bearing age and may have achieved mature height;
- Mature = fully grown, annual growth is much reduced;
- Old Mature = old for the species, possibly starting to decline;
- Ancient = exceptionally old for the species, the crown may be retrenching, provides many opportunities for wildlife and is likely to be an important habitat.

Health:

- Normal Vitality = normal growth and twig extension;
- Moderate Vitality = reduced twig extension but other than that few signs of ill-health;
- Early Decline = reduced twig extension and some dead twigs in the outer canopy;

- Mid-decline = small internodes, the canopy may be thinning and contain dead twigs and/or branches in the outer canopy, older branch wounds that haven't occluded may be decaying and forming cavities;
- Severe Decline = sparse crown, numerous dead twigs and branches in the outer canopy, older branch wounds likely to be decaying and forming cavities;
- Dead.

Retention category: The retention category assessed using the guidance in Table 1 of BS 5837, 2005 [see Appendix 3].

A) (light green) Trees of high quality and value: in such condition as to be able to make a substantial contribution (a minimum of 40 years is suggested);

B) (mid blue) Trees of moderate quality and value: those in such a condition as to make a significant contribution (a minimum of 20 years is suggested);

C) (grey) Trees of low quality and value: currently in adequate condition to remain until a new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150mm.;

U) (dark red) Trees in such a condition that any existing value would be lost within 10 years and which should, in the current context be removed for reasons of sound arboricultural management.

Crown Radius: The distance from the tree trunk to the cardinal points of the compass measured in metres.

Radius of the RPA: The radius of a circular Root Protection Area (RPA) in metres as specified using the guidance contained in BS 5837 (2012).

Area of the RPA: The area of the Root Protection Area (RPA) in square metres as specified using the guidance contained in BS 5837 (2012).

Location of defect: The part of the tree with a significant defect.

Type of defect: The general type of defect.

Description of defect: If required a description of the size, location or cause of the defect.

Significance: A subjective assessment of a combination of the likelihood of failure occurring or the defect leading to the death of the tree. Defects are categorised as either: Observation, no significance; Minor, little significance; Moderate, some significance; or Major, a major defect that could cause the tree to fail at any time.

Remedial action: General description of recommended work.

Details: Elaboration of the Remedial action

Work Priority:

- High priority work should be carried out as soon as possible;
- Medium priority work need not be carried out straight away but the trees should be inspected every twelve to eighteen months and after strong winds. If this work is not carried out straight away I recommend that provision is made in future budgets to have it carried out at a later date.

- Low priority work need not be carried out straight away but defects have been noted that could develop over time; these trees should be inspected every twelve to eighteen months and after strong winds.

Work Category:

- Category 1 work is required to establish acceptable levels of safety for the site and should be carried out in the time scale indicated by the priority attached to the recommendation;
- Category 2 work is advisory to establish high levels of arboricultural and silvicultural management of the existing trees and is not necessary for safety reasons.

Appendix 5

Tree Schedule

South of old stable block

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE / E SE / S SW / W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
1	Lime	20.0 / 110 @ 1.5	Old Mature / >40	Normal Vitality	7.8 3.3 10.0 # 6.1	13.2 m / 547 m²	• structural branch — Branch wound (occluding) Where limb failed. — Minor	A1&2

Clear Stem (m): 3.0 **Height to Lowest Part of Crown (m):** 1.5 **Low Crown Direction:**

Notes: There are a few small old branch wounds that are forming cavities that may be of interest to roosting bats.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE / E SE / S SW / W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
2	Lime	22.0 / 93.5 @ 1.5	Old Mature / >40	Normal Vitality	8.3 4.0 3.7 3.5	11.2 m / 395 m²	• Trunk — Pruning wounds (occluding) — Minor • Lateral branch — Broken and hanging branch over grass — Minor • Lateral branches — Dead Small, over grass — Minor • Trunk — branch wound (decaying and occluding) 20cm diameter — Minor	A1&2

Clear Stem (m): 5.0 **Height to Lowest Part of Crown (m):** 3.0 **Low Crown Direction:**

Notes: Limited bat roost potential in the tree. There may be opportunities under loose bark.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE / E SE / S SW / W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
3	Lime	22.0 / 103.3 @ 1.5	Old Mature / >40	Normal Vitality	8.0 3.7 11.0 5.5	12.4 m / 483 m²	• Trunk — Pruning wounds (occluding) <20cm diameter — Minor	A1&2

Clear Stem (m): **Height to Lowest Part of Crown (m):** **Low Crown Direction:**

Notes: The small pruning wounds that are forming cavities will be of interest for bat roosting.

Recommended Tree Work	Details	Work Priority	Category
• None			

South of old stable block

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect	Description of Defect	Severity	BS 5837 Retention Category
4	Lime	22.0 / 129 @ 1.5	Old Mature / >40	Normal Vitality	10.5	10.0 #	10.0 #	5.5	15.5 m / 753 m²	• trunk (upper)	The leader in the upper stem failed creating a bark wound at 20m	Minor	A1&2
5	Yew	13.5 / 50 @ 1.5	Mature / >40	Normal Vitality	3.5	5.5	3.0	7.5	6.0 m / 113 m²	• Crown	almost touching the neighbouring building	Observation	B2
6	Sycamore	20.0 / 90 @ 1.5	Mature / <10	Normal Vitality	4.0	6.0	8.0	6.2	10.8 m / 366 m²	• Trunk; between its base and 3m	large bark wound affecting 50% of the stem from the base to 3m following fire	Major	C1
										• structural branch	bark wound following fire	Moderate	
										• Crown	Weight biased to the south.	Minor	

Clear Stem (m): 4.0 **Height to Lowest Part of Crown (m):** 4.0 **Low Crown Direction:**

Notes: There are a number of small old branch cavities that are suitable for bat roosting. There is a hole under a branch union suitable for bat roosting.

Recommended Tree Work	Details	Work Priority	Category
• Monitor health		Yearly	

South of track to the deer park

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
7	Norway Maple	13.0 / 45 @ 1.5	Young mature / >40	Normal Vitality	6.7	6.0 #	7.0 #	7.5	5.4 m / 92 m²	• No significant defects to report	C1

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: Low bat roost potential. There is the odd small cavity that might be suitable.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
8	Sycamore	20.0 / 65 @ 1.5	Mature / >40	Normal Vitality	6.3	10.0 #	8.0	9.0	7.8 m / 191 m²	• No significant defects to report	B1&2

Clear Stem (m): 3.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: There are small decay cavities in structural branches that could be suitable for bat roosting.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
9	Norway Maple	13.0 / 40 @ 1.5	Young mature / >40	Normal Vitality	6.5	6.0	6.0	6.0	4.8 m / 72 m²	• No significant defects to report	C1

Clear Stem (m): 1.5 **Height to Lowest Part of Crown (m):** 1.5 **Low Crown Direction:**

Notes: The tree has low bat roost potential.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
10	Sycamore	20.0 / 80 @ 1.5	Mature / >40	Normal Vitality	4.0	6.0	8.3	9.5	9.6 m / 290 m²	• No significant defects to report	B1&2

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 1.5 **Low Crown Direction:**

Notes: There is significant ivy cover to the main stem. This is good for bat roosting but limits inspection of the tree.

Recommended Tree Work	Details	Work Priority	Category
• None			

Grassy picnic area

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect	Description of Defect	Severity	BS 5837 Retention Category
11	Yew	9.0 33 @ 1.5 31 @ 1.5	Juvenile mature >40	Normal Vitality	2.5	2.5	2.5	2.5	4.5 m 64 m²	• No significant defects to report			C1

Clear Stem (m): 0.0 **Height to Lowest Part of Crown (m):** 0.0 **Low Crown Direction:**

Recommended Tree Work	Details	Work Priority	Category
• None			

Notes: Low bat roost potential

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect	Description of Defect	Severity	BS 5837 Retention Category
12	Group Pine x 2 Yew x 2 cedar of Lebanon x 1	9-15 0 @ 0	Young mature >40	Normal Vitality	6.0	7.0	4.5	4.5	0.0 m 0 m²	• No significant defects to report			B2

Clear Stem (m): 1.0 **Height to Lowest Part of Crown (m):** 1.0 **Low Crown Direction:**

Recommended Tree Work	Details	Work Priority	Category
• None			

Notes: Low bat roost potential; possibly behind loose bark in the pines.

Between the track and the wall

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect	Description of Defect	Severity	BS 5837 Retention Category
13	Sycamore	8.0 37 @ 1.5	Juvenile mature >40	Normal Vitality	2.0	1.5	4.0	4.0	4.4 m 62 m²	• Crown	weight biased to the west	Observation	C1
										• Base of trunk	growing against the wall May cause displacement of the wall as it grows		

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Recommended Tree Work	Details	Work Priority	Category
• Fell		Low	

Notes: The tree is growing close to the wall. It has low bat roost potential.

Between the track and the wall

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
14	Yew	6.0 / 53.2 @ 1.5	Juvenile mature / >40	Normal Vitality	3.4	1.2	5.5	4.0	6.4 m / 128 m²	• No significant defects to report	C1

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: The tree is growing close to the wall. It has low bat roost potential.

Recommended Tree Work	Details	Work Priority	Category
• Fell		Low	

Otherside of the garden wall from the proposed route of the trench.

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
15	Pear	7.0 / 28 @ 1.5	Mature / 10+	Moderate Vitality	6.0	2.0	6.0	2.0	3.4 m / 35 m²	• No significant defects to report	C1

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: The tree has low bat roost potential.

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
16	Pear	6.0 / 22 @ 1.5 / 21 @ 1.5	Mature / 10+	Normal Vitality	5.0	2.0	5.0	2.0	3.0 m / 29 m²	• No significant defects to report	C1

Clear Stem (m): 5.0 **Height to Lowest Part of Crown (m):** 5.0 **Low Crown Direction:**

Notes: The tree has low bat roost potential

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
17	Pear	6.0 / 26 @ 1.5	Mature / 10+	Moderate Vitality	1.0	2.0	2.5	2.0	3.1 m / 31 m²	• No significant defects to report	C1

Clear Stem (m): 3.0 **Height to Lowest Part of Crown (m):** 3.0 **Low Crown Direction:**

Notes: The tree has low bat roost potential.

Recommended Tree Work	Details	Work Priority	Category
• None			

Otherside of the garden wall from the proposed route of the trench.

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
18	Goat Willow	6.0 / 28 @ 1.5	Young mature / 10+	Normal Vitality	3.0	3.0	3.0	3.0	3.4 m / 35 m²	• No significant defects to report	C1

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: The tree has low bat roost potential.

Recommended Tree Work	Details	Work Priority	Category
• None			

East fo the track

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
19	Broadleaved woodland	16.0	Young mature / >40	Normal Vitality	3.0	3.0	3.0	4.0		• No significant defects to report	B2

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes:

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
20	Sycamore	17.0 / 74 @ 1.5	Young mature / >40	Normal Vitality	4.0	5.0	8.0	11.0	8.9 m / 248 m²	• No significant defects to report	B2

Clear Stem (m): 3.0 **Height to Lowest Part of Crown (m):** 3.0 **Low Crown Direction:**

Notes: There may be some temporary roost potential under loose bark

Recommended Tree Work	Details	Work Priority	Category
• None			

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
21	Sycamore	17.0 / 56 @ 1.5	Young mature / >40	Normal Vitality	4.0	2.-	4.0	5.0	6.7 m / 142 m²	• No significant defects to report	B2

Clear Stem (m): 3.0 **Height to Lowest Part of Crown (m):** 3.0 **Low Crown Direction:**

Notes: There may be some temporary roost potential under loose bark

Recommended Tree Work	Details	Work Priority	Category
• None			

East fo the track

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N	E	S	W	RPA Radius / Area	Defects: Location of Defect	Description of Defect	Severity	BS 5837 Retention Category
22	Sycamore	17.0 / 59 @ 1.5	Young mature / 10+	Moderate Vitality	4.6	2.0	1.0	2.0	7.1 m / 157 m²	• Trunk; above 3m	Dead patch of bark Containst decay and affecting 2m of he upper stem	Moderate	C1

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: There is some bat roost potential under bark and in small cavities

Recommended Tree Work	Details	Work Priority	Category
• Fell		If permission is granted	1

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N	E	S	W	RPA Radius / Area	Defects	BS 5837 Retention Category
23	Yew	13 / 39 @ 1.5	Mature / 20+	Moderate Vitality	3.0	3.0	2.9	3.0	4.7 m / 69 m²	• No significant defects to report	C1

Clear Stem (m): 1.0 **Height to Lowest Part of Crown (m):** 1.0 **Low Crown Direction:**

Notes: The tree has low bat roost potential

Recommended Tree Work	Details	Work Priority	Category
• Fell		If permission is granted	

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N	E	S	W	RPA Radius / Area	Defects	BS 5837 Retention Category
24	Hornbeam	2.0 / 10 @ 1.5	Semi-mature / >40	Normal Vitality	1.0	1.0	1.0	1.0	1.2 m / 5 m²	• No significant defects to report	C1

Clear Stem (m): 1.0 **Height to Lowest Part of Crown (m):** 1.0 **Low Crown Direction:**

Notes: A very young tree with no bat roost potential. Could be readily replaced because of its young age.

Recommended Tree Work	Details	Work Priority	Category
• Fell		If permission is granted	

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N	E	S	W	RPA Radius / Area	Defects	BS 5837 Retention Category
25	Hornbeam	2.0 / 10 @ 1.5	Semi-mature / >40	Normal Vitality	1.0	1.0	1.0	1.0	1.2 m / 5 m²	• No significant defects to report	C1

Clear Stem (m): 1.0 **Height to Lowest Part of Crown (m):** 1.0 **Low Crown Direction:**

Notes: A very young tree with no bat roost potential. Could be readily replaced because of its young age.

Recommended Tree Work	Details	Work Priority	Category
• Fell		If permission is granted	

East fo the track

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
26	Hornbeam	2.0 / 10 @ 1.5	Semi-mature / >40	Normal Vitality	1.0	1.0	1.0	1.0	1.2 m / 5 m²	• No significant defects to report	C1

Clear Stem (m): 1.0 **Height to Lowest Part of Crown (m):** 1.0 **Low Crown Direction:**

Notes: A very young tree with no bat roost potential. Could be readily replaced because of its young age.

Recommended Tree Work	Details	Work Priority	Category
• Fell		If permission is granted	

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
27	Giant Redwood	2.0 / 10 @ 1.5	Semi-mature / >40	Normal Vitality	1.0	1.0	1.0	1.0	1.2 m / 5 m²	• No significant defects to report	C1

Clear Stem (m): 0.5 **Height to Lowest Part of Crown (m):** 0.5 **Low Crown Direction:**

Notes: A very young tree with no bat roost potential. Could be readily replaced because of its young age but I understand it may be a memorial tree.

Recommended Tree Work	Details	Work Priority	Category
• None			

North of the car park

Id No.	Species	Height (m) / Trunk Ø (cm)	Age Class / Life Expectancy	Health	Crown Radius (m) N NE	E SE	S SW	W NW	RPA Radius / Area	Defects: Location of Defect / Description of Defect / Severity	BS 5837 Retention Category
28	Broadleaved woodland	16.0	Young mature / >40	Normal Vitality	2.5	2.5	2.5	2.5		• No significant defects to report	B2

Clear Stem (m): 2.0 **Height to Lowest Part of Crown (m):** 2.0 **Low Crown Direction:**

Notes: The woodland will probably be valuable to bats for foraging along the edges.

Recommended Tree Work	Details	Work Priority	Category
• None			

Appendix 6

Tree Work

RECOMMENDED TREE WORK

South of old stable block

ID No.	Species	Remedial Action	Details	Priority	Category
5	Yew	Prune	to give around 1.0m clearance of the building	Medium	
6	Sycamore	Monitor health		Yearly	

Between the track and the wall

ID No.	Species	Remedial Action	Details	Priority	Category
13	Sycamore	Fell		Low	
14	Yew	Fell		Low	

East of the track

ID No.	Species	Remedial Action	Details	Priority	Category
22	Sycamore	Fell		If permission is granted	1
23	Yew	Fell		If permission is granted	
24	Hornbeam	Fell		If permission is granted	
25	Hornbeam	Fell		If permission is granted	
26	Hornbeam	Fell		If permission is granted	

Appendix7

British Standard: BS 5837 Trees In Relation To Design, Demolition and Construction – Recommendations (2012): Tree Protection Barrier

on retained hard surfacing or it is otherwise unfeasible to use ground pins, e.g. due to the presence of underground services, the stabilizer struts should be mounted on a block tray (Figure 3b).

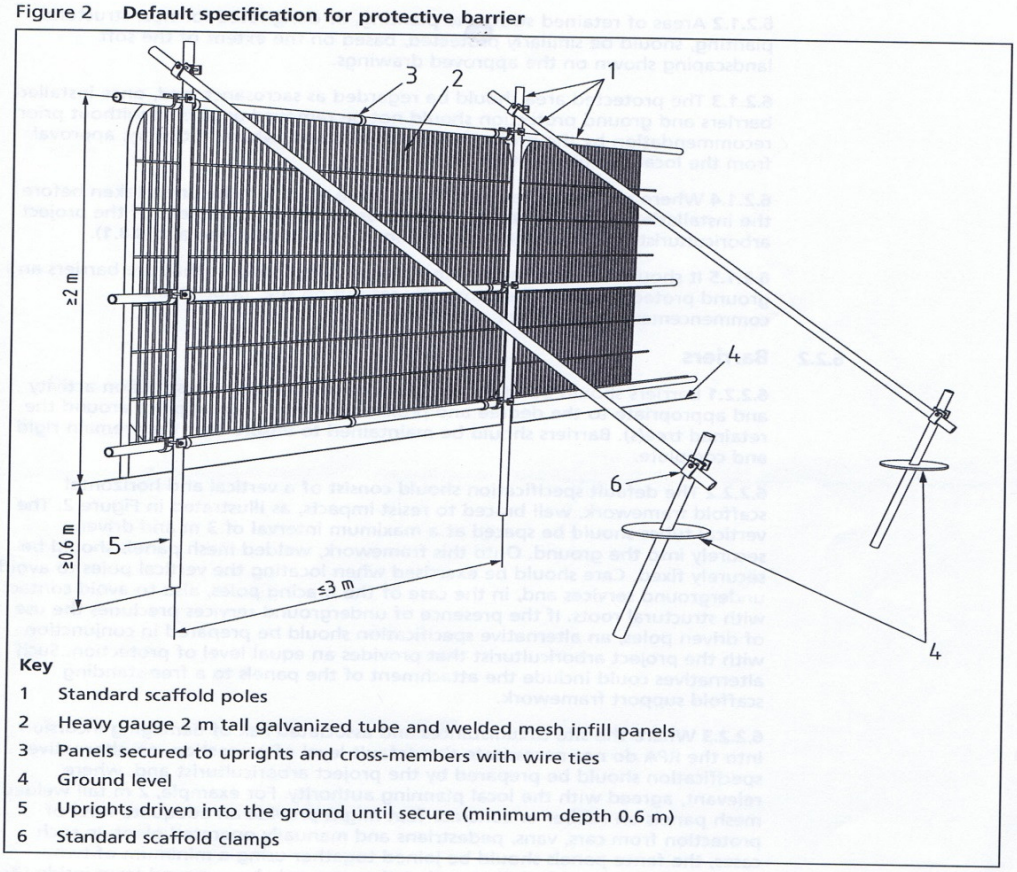
NOTE 1 Examples of configurations for steel mesh perimeter fencing systems are given in BS 1722-18.

NOTE 2 It might be feasible on some sites to use temporary site office buildings as components of the tree protection barriers, provided these can be installed and removed without damaging the retained trees or their rooting environment.

6.2.2.4 All-weather notices should be attached to the barrier with words such as:

"CONSTRUCTION EXCLUSION ZONE – NO ACCESS".

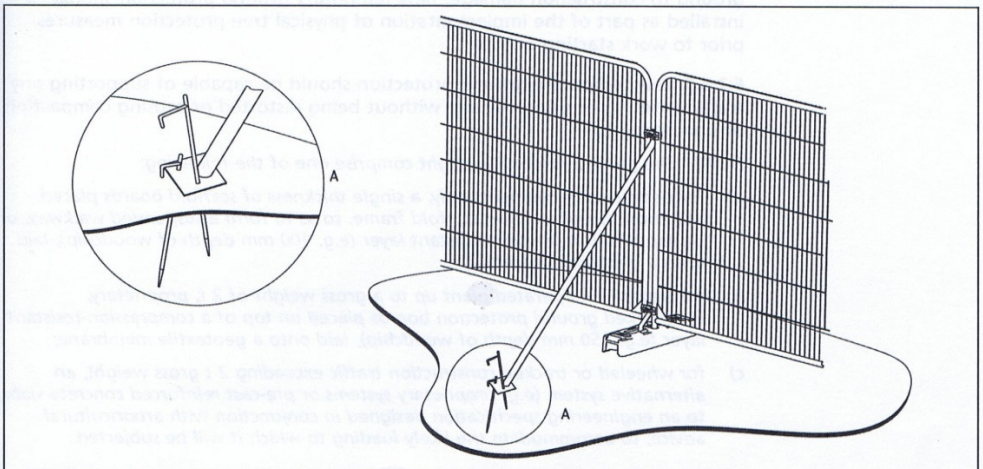
Figure 2 **Default specification for protective barrier**



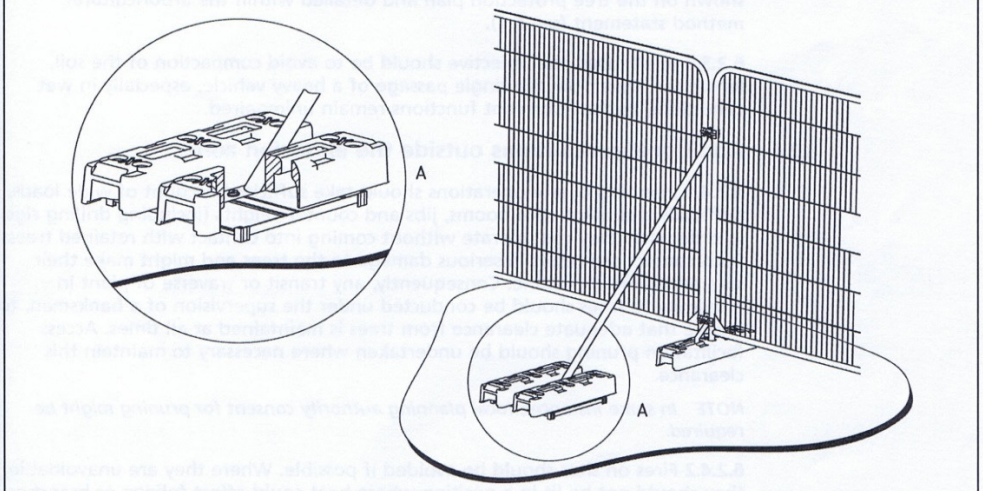
Key

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

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



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

6.2.3 Ground protection during demolition and construction

6.2.3.1 Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier. In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed during demolition. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate.

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