Bowdun Offshore Wind Farm, Onshore EIA Report

Volume 2, Appendix 6.1: Forestry and Arboricultural Report

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Glossary

Defined Term	Definition
Ash Die Back (ADB)	A chronic fungal disease of ash trees caused by *Hymenoscyphus fraxineus*. Affected trees experience shoot dieback, bark lesions, cankers, extensive deadwood and eventual death.
Ancient tree	An ancient tree is exceptionally valuable tree attributed with great age/size/cultural heritage/biodiversity value as a result of significant wood decay and the habitat created from the aging process. All ancient trees are veteran trees with very few trees of any species reaching the ancient life-stage.
Bark	A term usually applied to all the tissues of a woody plant lying outside the vascular cambium.
Bark lesions	A small area of dead, damaged or discoloured bark. Typically affected by a pathogen.
Buttress zone	The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of their junction.
Canker	A lesion formed by the death of bark and cambium often due to fungal or bacterial infection.
Canopy drip line	The outermost circumference of a tree's canopy, from which water drips to the ground.
Compaction	The process where soil particles are pressed together, reducing pore space and creating a dense soil structure. This can lead to restricted root growth, reduced water/nutrient uptake and increased susceptibility to tree stress and disease.
Condition	An indication of the physiological vitality of the tree. Where the term 'condition' is used in a report, it should not be taken as an indication of the stability of the tree.
Construction exclusion zone	Area based on the Root Protection Area (in square metres) to be protected during development, using barriers and/or ground protection.
Crown/Canopy	The main foliage bearing section of the tree.
Crown lifting	A term used to describe the removal of limbs and small branches to a specified height above ground level.
Deadwood	Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard.
Desiccation	The process of drying out or losing moisture.
Dieback	The death of parts of a woody plant, starting at shoot-tips or root-tips.
Diameter at Breast Height (DBH)	Stem diameter measured at a height of 1.5 metres (UK) or the nearest measurable point. Where measurement at a height of 1.5 metres is not possible, another height may be specified.

Defined Term	Definition
Facilitation pruning	The pruning of trees to allow for safe access and operation of machinery during construction or demolition.
Habit	The overall growth characteristics, shape of the tree and branch structure.
Hazard beam	An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting.
Minor deadwood	Dead wood of a diameter less than 25 mm and or unlikely to cause significant harm or damage upon impact with a target beneath the tree.
Notable	Notable trees are usually mature trees which may stand out in the local environment because they are large in comparison with other trees around them.
Pollarding	The removal of the tree canopy, back to the stem or primary branches. Pollarding may involve the removal of the entire canopy in one operation or may be phased over several years. The period of safe retention of trees having been pollarded varies with species and individuals. It is usually necessary to re-pollard on a regular basis, annually in the case of some species.
Primary branch	A major branch, generally having a basal diameter greater than 0.25 x stem diameter.
Pruning	The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs.
Rhizosphere	A narrow zone of soil surrounding and influenced by the root of vascular plants.
Root protection area (RPA)	An area of ground surrounding a tree that contains sufficient rooting volume to ensure the tree's survival, calculated with reference of BS5837.
Snag/stub	In woody plants, a portion of a cut or broken stem, branch or root which extends beyond any growing-point or dormant bud; a snag usually tends to die back to the nearest growing point.
Stand	A contiguous community of trees within a forest that is relatively uniform in species, size, age and density.
Stem(s)	The main supporting structure(s), from ground level up to the first major division into branches.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Proposed Development may be experienced by the relevant receptors (i.e. Zone of Influence).
Topping	In arboriculture it is the removal of the crown of a tree, or of a major proportion of it.
Tree Preservation Order (TPO)	An order made by the local authority and placed upon individual trees, groups of trees or areas of trees. The local authority must usually grant permission prior to any works undertaken to affected trees.

Defined Term	Definition
Veteran tree	A term for an old specimen that is of interest biologically, culturally or aesthetically because of its age, size or condition and which has usually lived longer than the typical upper age range for the species concerned.
Windthrow	The uprooting or overturning of trees by strong winds.

Acronyms

Acronym	Definition
ArbCoW	Arboricultural Clerk of Works
ADB	Ash Die Back
ALARP	As Low as Reasonably Practicable
AMS	Arboricultural Method Statement
ATI	Ancient Tree Inventory
BAP	Biodiversity Action Plan
BSI	British Standards Institution
CBRA	Cable Burial Risk Assessment
CCS	Cellular Containment System
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland
CEZ	Construction Exclusion Zone
CPS	Cable Protection System
CSIP	Cable Specification and Installation Plan
DBH	Diameter at Breast Height
DEFRA	Department for Environment Food and Rural Affairs
EC	European Commission
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EIAR	Environmental Impact Assessment Report
ESRI	Environmental Systems Research Institute
EU	European Union
FLS	Forestry & Land Scotland
GIS	Geographical Information System
GPS	Global Positioning System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HAZID	Hazard Identification
HDD	Horizontal Directional Drilling
HSE	Health and Safety Executive
ITP	Interpreted Forestry Type
INNS	Invasive Non-Native Species

Acronym	Definition
LiDAR	Light Detection and Ranging
LSE	Likely Significant Effects
NE	Natural England
NFIS	National Forestry Inventory Scotland
NJUG	National Joint Utilities Group
NPF	National Planning Framework
NPF4	National Planning Framework 4
NSA	National Scenic Area
NTM	National Tree Map
OLA	Option Lease Agreement
OS	Ordinance Survey
OWF	Offshore Wind Farm
PA	Project Arboriculturist
PAC	Pre-Application Consultation
POA	Plan Option Area
PPP	Planning Permission in Principle
RSPB	Royal Society for the Protection of Birds
RPA	Root Protection Area
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SSSI	Site of Special Scientific Interest
TOW	Trees Outside Woodland
TPO	Tree Preservation Order
TPP	Tree Protection Plan
TWP	Thistle Wind Partners Limited
UK	United Kingdom

Table of Units

Units	Definition
cm	Centimetre
km	Kilometre
km^2	Square kilometre
m	Metre
m^2	Square Metre
mm	Millimetre
°	Degree
%	Percent

1 Introduction

1.1.1 This Forestry and Arboricultural Technical Report presents the likely impacts with respect to forestry and arboriculture, including impact on woodland and trees outside of woodland (trees and groups of trees) for the Bowdun Offshore Wind Farm Project Onshore Infrastructure (hereafter referred to as the Proposed Development).

1.1.2 This report forms a technical appendix to Volume 1, Chapter 6: Land Use, Agriculture and Public Access. Trees and woodland are also considered in Volume 1, Chapter 7: Biodiversity and Terrestrial Ecology. This document establishes the baseline of the subject matter within the Study Area, and the potential impact. It does not draw conclusions on significance of impact which is reported in the relevant chapters outlined above.

1.1.3 Owing to the size of the survey area and the large number of trees within it, a proportional and focused assessment of the existing woodland and tree population was conducted. The assessment used a combination of a baseline datasets illustrating tree cover (based on Light Detection and Ranging (LiDAR) and aerial imagery via the National Tree Map (NTM), provided by BlueSky International Ltd (2025) and the National Forestry Inventory Scotland (NFIS) (National Forest Inventory Scotland, 2021), provided by the Forestry Commission), and targeted site survey work to address limitations which could arise from sole reliance on using the datasets in this way.

1.1.4 This report covers the potential impact of the Proposed Development on both woodland and trees outside woodland. Generally, the assessment of the impact of construction to trees outside of woodland fall within 'arboricultural assessments', specifically informed by surveys, and subsequent assessments carried out to BS5837:2012 (British Standards Institution, 2021). Therefore, the terms arboricultural and Trees Outside Woodland (TOW's) are generally interchangeable in this report.

1.1.5 All woodland boundaries have been obtained from the NFIS Interactive Map (National Forest Inventory Scotland, 2021).

1.1.6 All tree locations outside of woodland have been located using Global Positioning System (GPS) and LiDAR data, obtained from the NTM data. The tree stem location is based on the centre of an indicative circular canopy spread, so is approximate and subject to variation.

1.1.7 Land access was unavailable or pending for significant areas of the Planning Permission in Principle (PPP) Application Boundary during the time of the surveys. An exception to this was the Fetteresso Forest, as access was granted by Forestry and Land Scotland. Throughout the PPP Application Boundary, tree features could be surveyed at distance using binoculars from land parcels which had agreed access. Where land was inaccessible and not visible from surrounding accessible vantage points, total reliance on the NTM data was required; this approach is consistent with other large scale infrastructure projects where total land access is not fully available.

1.1.8 The assessment of woodland and arboricultural impacts has been based on GIS (Geographical Information System) data analysis using a range of assumptions and filters. As such, the assessment represents the likely potential impacts whilst adopting a precautionary approach. Some trees identified for removal may have the potential to be retained subject to further site-based assessment in relation to the detailed design. For example, trees which have a theoretical root protection area (RPA) affected by the Proposed Development located on a ditch feature that safely separates their root systems from construction activities may be suitable for retention.

1.1.9 This assessment does not take into consideration windthrow risk beyond the high-level information available from the emerging Forestry and Land Scotland (FLS) Mearns Land Management Plan. At this Planning in Principle stage, design information is not sufficiently developed to fully assess the impact on woodland and forestry within the survey area. The impact on Trees Outside of Woodland is considered in relation to the individual tree's root protection area and any impact the Proposed Development may have on it, in line with the guidance given in BS5837:2012 (British Standards Institution, 2021).

1.2 Study Area

Woodland Assessment

1.2.1 To inform the woodland assessment, the NFIS (National Forest Inventory Scotland, 2021) was obtained. The data set was then trimmed so that only NFIS records that are intersected by the PPP Application Boundary are included in the assessment. Only woodland within the PPP Application Boundary has been considered in the woodland element of this report. The Study Area for the woodland Assessment is therefore the PPP Application Boundary.

Arboricultural/TOW Assessment

1.2.2 To inform the TOW assessment NTM data were purchased for a wide area, extending well beyond the PPP Application Boundary. This represents a very large dataset which is useful to give context to the surrounding area and to support other assessments. The specific NTM data analysis can be undertaken on any specific area of trees within the larger project area but to keep the data analysis proportionate for this assessment, the Study Area was restricted to 30 m on either side of the PPP Application Boundary which includes, but is not limited to haul routes, access points, laydown areas and temporary drainage.

1.2.3 Trees have root systems which extend beyond the trees canopies in many cases. This means that trees that are on, or just outside the boundary of a development can be affected by the proposals and require consideration in any assessment. Because of this, a suitable buffer needs to be applied to capture these trees. BS5837:2012 (British Standards Institution, 2021) caps the maximum Root Protection Area (RPA) of any tree to 15 m. However, a 15 m buffer would potentially exclude veteran and ancient trees which have an uncapped RPA.

1.2.4 A maximum buffer of 30 m has been applied to the PPP Application Boundary to allow for the capture of any potential veteran trees which can have an

uncapped RPA as per BS5837:2012 and using the UK Government and the Ancient Tree Forum (Woodland Trust, 2013) recommendations of a stem diameter multiplier of 15 as opposed to the standard 12. For a veteran to have an RPA of 30 m, it would have a diameter at breast height (DBH) of 2 m. Identifying a tree any larger than this is considered unlikely due to the nature and geographical location of the Study Area, therefore resulting in the 30 m maximum buffer considered appropriate for this assessment.

1.3 Relevant Guidelines, Policy and Legislation

1.3.1 The following legislation was considered:

- Town and Country Planning (Scotland) Act 1997 (UK Government, 1997), as amended by the Planning etc. (Scotland) Act 2006 (UK Government, 2006) – Provides for the making of Tree Preservation Orders (TPOs) by the Planning Authority where it is considered desirable to preserve trees on amenity grounds. This prevents the cutting down, topping, lopping or wilful destruction of trees without the specific consent of the Planning Authority. Such TPOs do not apply to the cutting of trees which are dead or dying or have become dangerous, or to the cutting of trees in compliance with statutory obligations to prevent or abate nuisance; and
- Forestry and Land Management (Scotland) Act 2018 (UK Government, 2018) – Contains the main provisions for the felling of trees. Under this Act it is an offence for any person to uproot or cut down any tree unless the owner has obtained permission in the form of a felling licence from the Scottish Forestry, unless a relevant exemption exists.

1.3.2 The following policy was considered:

- National Planning Framework 4 (Scottish Government, 2023) – Sets out the Scottish Government's spatial principles, regional priorities, national developments and national planning policy. Policy 6 Forestry, woodland and trees intends to '*protect and expand forests, woodland and trees*'.
- Scotland's Forestry Strategy (Scottish Government, 2019) – Presents a 50-year vision and 10-year framework 'to *action, expand, protect and enhance Scotland's forests and woodlands*'.
- The Scottish Government's Policy on Control of Woodland Removal (Scottish Government, 2009) – Provides policy direction on planning decisions which require removal of woodland, with a presumption against granting permission for projects that require woodland loss.
- Aberdeenshire County Council Aberdeenshire Local Development Plan 2023 (Aberdeenshire Council, 2023a) – Contains a number of policy which

directly relate to woodland and trees, including Policy E3 Forestry and Woodland and Policy PR1 Protecting Important Resources.

- Aberdeenshire County Council Forestry & Woodland Strategy 2023 (Aberdeenshire Council, 2023b) – This document provides supplementary guidance to the Aberdeenshire Local Development Plan and defines the ACC strategy for sustainable management of woodland trees within the Council boundaries. It includes specific guidance for how trees should be considered during development.

1.3.3 The following technical guidance was considered:

- BS5837:2012 (British Standards Institution, 2021) – Details the steps that should be taken to ensure that trees are appropriately and successfully retained when a development takes place;
- National Joint Utilities Group (NJUG), Vol 4 Issue 2 – Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees (National Joint Utilities Group, 2007) – Technical guidance to guide the installation of underground services and allow them to co-exist with trees;
- BS3998:2010 Tree Work – Recommendations (British Standards Institution, 2010) – Gives general recommendations for tree work. It gives guidance on management options for established trees (including soil care and tree felling) and overgrown hedges;
- Ancient and other veteran trees: Further guidance on good management (Ancient Tree Forum, Woodland Trust, 2013) – Guidance for veteran tree classification and assessment;
- Tree Root Systems (Dobson, Martin & Arboricultural Advisory and Information Service, 1995) – Technical advice paper which considers the various factor influencing tree root growth;
- The Influence of Soils and Species on Tree Root Depth, Information Note, Peter Crow (Crow, Peter, 2005) – Technical advice paper which considers factor influencing tree root depth which is of relevance to buried utilities;
- The Root Atlas, Central European Forest trees and shrubs (European Commission, 2016), Stocker – European study of tree species rooting depth and spread (Lore Kutschera, Erwin Lichtenegger 2002); and
- The Landscape Below Ground, Proceedings of an International Workshop on Tree Root Development in Urban Soils, International Society of Arboriculture (Neely, Dan. Watson, Gary, 1995) P54-61 – A Selection of

technical papers which discuss tree root development and environmental influences on tree development.

1.4 Approach and Methods

Woodland Assessment

1.4.1 The NFIS (National Forest Inventory Scotland, 2021) is a publicly available data set published by the Forestry Commission. It identifies all woodland and forest areas over 0.5 ha with a minimum of 20% canopy cover (or the potential to achieve it, such as newly planted woodland), and a minimum width of 20 m. The geospatial data set also contains interpreted forestry type (ITP) based on aerial and satellite imagery and in non-wooded areas, open ground type.

1.4.2 The NFIS has been used to identify woodland within the Study Area. Potential temporary and permanent woodland losses have then been calculated using GIS software.

1.4.3 Several of the woodland areas within the Study Area are situated within Fetteresso Forest (part of the larger Mearns Forest), which is managed by FLS. Jacobs were provided information (Moray and Aberdeenshire Forest District, 2025) from FLS in relation to the species, forest design, future habitat, restocking, thinning and land management of the Mearns Forest; these plans are dated August 2025.

1.4.4 Using the geospatial data included in the NFIS and FLS's Mearns Forest Plans, the woodland baseline and potential impacts where calculated. The GIS metadata for the FLS forest plan management compartments was not available, and in places the boundary of the NFIS and FLS compartment boundaries differed. Therefore, manual interpretation of the available woodland management data was required, and this may have introduced slight inaccuracies in detailed compartment information. However, the overall area of woodland is identical between the two data sets.

1.4.5 These data provide insight into the forestry operations within the area and allows calculation of the expected losses, including the valued loss of tree stock and expected disruption to harvesting and thinning cycles, associated with the Proposed Development.

Arboricultural/TOW Assessment

1.4.6 Data for the assessment were collected via a two-stage process. Initially data were gathered from GIS datasets and other publicly available sources and subject to detailed GIS analysis. The analysed data were then subjected to ground truthing surveys by qualified arboriculturists to check for accuracy and provide information which cannot be wholly gathered from desk-based work (in particular the identification of 'significant trees').

Desk-Based Assessment

1.4.7 Using NTM data as a baseline dataset, a desk-based GIS analysis was conducted. Several filters were applied to the data to categorise the existing

tree stock within the Study Area. The NTM dataset contains a range of metadata that allowed this approach. For each individual tree record the NTM records:

- location as co-ordinates;
- maximum tree height;
- canopy area as both an indicative circular canopy and as an actual canopy outline; and
- approximate stem location based on maximum height.

1.4.8 Any NTM record which was located within, or intersected by, a NFIS woodland polygon was removed from the assessment data set. Once this step had been complete, the remaining NTM records are considered to be trees outside of woodland (TOW).

1.4.9 Using the Jacobs Project Mapper GIS database[1], Track Record, each NTM record was created as a unique item with an individual reference number. Tree height and tree canopy sizes were banded in size ranges commonly applied to tree inventory databases (Table 1.1 and Table 1.2). Each band was assigned a colour and a score. The combination of both score for height and canopy size was combined to give a total weighting score, which was also assigned appropriate colour scores (Table 1.3).

1.4.10 To keep the combined weighting score consistent with the preceding scoring bands, once added together, the combined score was divided by two to give an average and maintain a five-tier banding structure using the same colour symbology.

Table 1.1: Tree Height Banding

Height Range (m)	Weighting
<5	1
5-10	2
10-15	3
15-20	4
>20	5

[1] Jacobs utilise Project Mapper to consolidate various layers of information used by each discipline for the project. Technical disciplines are able to set up survey proformas, extract information and interpolate data with the aid of the GIS team through Project Mapper. Project Mapper is a tool used across multiple large-scale projects at Jacobs, with the aim of streamlining large data sets across multiple areas of the company.

Table 1.2: Tree Canopy Size Banding

Radius (m)	Range (m^2)		Weighting
	Bottom	Top	
1 to 3	0	28.2743	1
3 to 6	28.2744	113.097	2
6 to 9	113.098	254.47	3
9 to 12	254.48	452.39	4
12+	452.4	upwards	5

Table 1.3: NTM Accumulated Weighting

Combined Score	Colour
1	
2	
3	
4	
5	

1.4.11 This produced a series of 'heat' mapping figures of trees based on combined weighting (Figures 1a to 1g in Annex C). This gives an indication of the location of the 'important' trees in the Study Area based on the assumption that taller and larger canopied trees will be the most valuable trees in terms amenity/biodiversity/carbon absorption and storm water interception (collectively referred to as ecosystem services, of which there are numerous) and also that taller, larger canopied trees, in general, are older trees (with some species related exceptions). On all the 'heat' mapping Figures, trees in the 'darkest' colours are likely to be trees of greatest importance in the Study Area.

1.4.12 There is a risk that when using this methodology, a very tall tree with a small canopy or a short tree with very large canopy is underrepresented. While such trees would be very unusual, a review of the data indicated that no records fell into either category after scoring was completed.

Root Protection Area Mapping

1.4.13 The Root Protection Area (RPA) of any given tree is the area of ground around that tree which should not be disturbed by excavation, compaction, changes in level or other construction/demolition operations. The extent of the RPA is calculated in accordance with BS5837:2012, and is an important metric for understanding the impact a proposal will have on tree removal and retention and how to protect those trees retained.

1.4.14 It is well known that there is a strong relationship between tree height and stem diameter. While this can be influenced by many factors including climate and soils, for the purpose of the desk-based assessment, a ratio of 0.65 was

selected as this appeared to be the ratio most consistently referred to for European tree species in available research. Using the known tree height, this ratio can be used to calculate stem diameter. All trees in the dataset for the Study Area were then assigned an approximate/indicative RPA as calculated as per BS5837:2012 (which is 12 x stem diameter measured at 1.5 m from ground level). Most available studies on the relationship between tree height and stem diameter have been carried out in the United States of America on forestry trees. Therefore, the RPA generated in this way is likely to underestimate the stem diameter of an open grown tree in Scotland, as open grown trees generally grow larger and more expansive due to lack of competition. To allow for this, a second RPA was applied to the NTM indicative circular tree canopies. This was applied as a 2 m buffer on the outside of the canopy. The two RPAs applied to the individual trees represent what would be reasonably expected to be a maximum and minimum RPA of the trees, with a few notable exceptions.

1.4.15 It is a common misconception that tree roots are confined to the canopy drip line of the tree. Numerous studies, as well as BS5837:2012 guidance (British Standards Institution, 2021), make it clear that this is not always the case. Tree root morphology is complicated, and few trees grow perfectly circular root systems. An RPA provides a notional circular buffer around a given stem based on the stem diameter taken at 1.5 m. However, this is not necessarily representative of a tree root system, for example, the roots may extend beyond the RPA boundary on one side and remain inside it on the other. The actual root network extent is dependent on many factors including species, age, soil conditions, topography and exposure etc, which have not been considered in the assessment.

1.4.16 Veteran trees have an RPA calculated as 15 x stem diameter at breast height. All veterans in the Study Area are identified by field work, and the RPA subsequently plotted using field data and used in the assessment. A category trees, which might be larger than ‘average trees’ have also been identified and used for the assessment as per BS5837:2012 guidance.

1.4.17 Trees have a finite reserve of energy, produced (and excess stored) each year, throughout the spring/summer seasons, which is utilised for biological processes such as growth and defence against pests or diseases.

1.4.18 Any works in proximity to trees has the potential to cause harm to those trees unless control measures are identified and acted upon. As such, it is essential to consider the relationship between the Proposed Development and the retained trees to identify what precautions are necessary and proportionate. The Proposed Development has the potential to impact upon the above ground (canopy, stems and branches) and below ground (rooting environment) parts of the trees.

1.4.19 Whilst some clear and obvious physical damage can occur to trees during the construction phase, such as to stems and branches, other impacts are not always so immediately evident, such as damage to the soil structure by compaction and/or changes in ground levels causing root damage, altering the water table and affecting moisture availability.

1.4.20 This assessment recognises that activities during the construction phase pose a real and significant threat and assesses the likely impacts of the proposals on the tree stock and, where appropriate, recommends mitigation measures.

Identifying Trees of Significance

1.4.21 Using the weighting system (Table 1.3), 'significant' trees are identified through colour coding.

1.4.22 A significant tree is considered to be:

- An ancient, veteran or notable tree, assessed as per Ancient Tree Inventory (Woodland Trust, 2025) (that is a tree of great age for the species, of great girth for the species and exhibiting veteran tree features.).
- A large mature tree (or cohesive groups of trees, and woodland) which would be considered A category under BS5837:2012 (Annex A) contains BS5837:2012 (British Standards Institution, 2021) categorisation description).
- A tree notable for its ecological/cultural or historical significance, these are likely (but not exclusively) to be found in historic planned landscapes
- Ecologically important trees
- Trees covered by TPOs.

1.4.23 A TPO check was conducted on Aberdeenshire Council online TPO portal (Aberdeenshire Council, 2025) on 26 June 2025. No TPOs are present within the Study Area.

1.4.24 The Woodland Trust maintains the Ancient Tree Inventory (ATI) (Aberdeenshire Council, 2025), an online resource which records notable veteran and ancient trees across the United Kingdom and Ireland. This inventory was checked on 26 June 2025.

1.4.25 The check indicated that the Study Area contains no ATI trees within the PPP Application Boundary.

1.4.26 The ATI database is not a definitive record and an absence of records on the database does not necessarily mean there are no more veteran or ancient trees are within the Study Area.

1.4.27 A desk-based only tree survey based purely on size metrics has several inherent risks. One of the greatest risks is missing veteran trees, as the application of the above filters could potentially miss veteran or other 'significant' trees which often have very large stems but can have small canopies due to crown retrenchment and senescence caused by great age. There is also a more general risk across the Study Area that for whatever reason a tree has a large stem diameter but is limited in height.

Ground Truthing Survey

1.4.28 Ground truthing walkover surveys were carried out by qualified Jacobs arboriculturists between 16 June 2025 and 20 June 2025. The purpose of these surveys was to check the whole Study Area for 'significant' trees which may have been missed due to the limitations of the desk-based survey.

1.4.29 The arboriculturists based their assessment of potential veteran (ancient and notable) trees on the guidance provided by the Ancient Tree Forum and the Woodland Trust, specifically the document Practical Guidance, Ancient Tree Guide 4: What are ancient, veteran, and other trees of special interest (Woodland Trust, 2008) and the species-specific guidance on the Ancient Tree Inventory website (Woodland Trust, 2025).

1.4.30 Field surveys were conducted using mobile data collection apps generated using Environmental Systems Research Institute (ESRI) Field Maps. Data were geo-located using the smart devices internal GPS and cross-referenced against the NTM which was displayed as a reference layer in the data-driven map. Using this information, individual 'significant' trees were surveyed as well as a small sample of NTM trees to check the accuracy of the data contained in that data base. The information was then analysed and visualised in ArcGIS Pro. Survey data were handled in accordance with Jacobs Geospatial Information Management Plan standards. The ground truthing element found that the desk-based analysis and the underlying NTM data were reliable.

Assessment Methodology

1.4.31 The assessments here in are based on an indicative cable route. This cable route will be subject to further detailed design post consent and may change; however; the indicative route provides a realistic scenario for assessment and has been based on pre-FEED taking account of environmental and technical constraints. This assessment area has been called the 'Construction Scenario' and is used in the following assessments.

1.4.32 At the current level of design, details of certain elements of the scheme remain unknown, in particular the location and scale of compounds, laydown areas and storage area. As the location of these elements could require additional tree removals, especially TOW's, the assessments include a 'baseline' figure of all trees and woodlands within the PPP Application Boundary, + 30 m.

1.4.33 Further detail of assessment scenarios, including assumptions can be found in Section 1.6.2.

1.5 Baseline Conditions

Woodland

1.5.1 For the purposes of this assessment, each area of intersecting woodland has been numbered throughout the PPP Application Boundary, from south to north. Compartment information, including planting year has been extracted from the Mearns Forest Plan (2014 onwards) or the NFIS (National Forest Inventory Scotland, 2021) where available (see Section 1.4 for further details). Each numbered woodland area which intersects or is situated within the PPP

Application Boundary has an area of woodland, measured in hectares, displayed in Table 1.4.

1.5.2 The woodland species and category are extracted from the NFIS (2021) and may not reflect the current condition of the woodland area.

1.5.3 The NatureScot Ancient Woodland Inventory (NatureScot, 2025) was checked on 18 August 2025 for the presence of Ancient Woodland within the PPP Application Boundary. This check confirmed that no areas of Ancient Woodland are within the PPP Application Boundary.

1.5.4 The woodland baseline including the location of the areas identified in Table 1.4 is shown on Figures 1a to 1g in Annex C.

1.5.5 Table 1.4 includes all NFIS woodlands that are located within the PPP Application Boundary; Woodlands 23 to 33 are management compartments of the larger Mearns Forest.

1.5.6 The emerging FLS Mearns Land Management Plan consultation documents include an issues plan showing area of windthrow risk and existing windthrow areas. The Map 2b Mearns Issues – Fetteresso plan (Forestry and Land Scotland, 2024) indicates that the majority of the Fetteresso Forest located within the PPP Application boundary is Wind hazard class 4 (WHC4), with several areas of existing windthrow indicated to the north of the PPP Application boundary, in the vicinity of the proposed substation location. Forest management options are limited in areas of WHC 4, and any partial removal of established management coupes may require further felling to reach windfirm edges or to realise some value from the timber before the onset of wind damage.

1.5.7 No wind hazard information is available for woodlands located outside of Fetteresso therefore any risk of windthrow and additional need for felling would need to be resolved during detailed design.

Table 1.4 Baseline of Woodland and Forestry Areas (shaded cells indicate Woodlands which are compartments within FLS Mearns [Fetteresso] Forest)

Woodland ID	Total Area (ha)	Area Within PPP Application Boundary (ha)	Planted Year	Felling Year	Main Species	Commentary
Woodland 1 Craig Garbill	1.207	0.346	Unknown	N/A	Broadleaves	Assumed woodland. Adjacent to access track for wind turbine. Appears mixed species broadleaves on aerial imagery.
Woodland 2 Southeast of Hareden Wood	Outside of Study Area					
Woodland 3 Banff Croft	8.697	1.565	Unknown	N/A	Broadleaves	Part of woodland, outside of the RLB is within the Arbuthnott Garden and Designed Landscape. Woodland area adjacent to arable farmland. Mixed species broadleaves.
Woodland 4 Banff Croft	0.430	0.100	Unknown	N/A	Broadleaves	Woodland area adjacent to arable farmland. Mixed species broadleaves.
Woodland 5 East of Banff Croft	0.637	0.116	Unknown	N/A	Broadleaves	Adjacent to Peattie Burn. Mixed species broadleaf woodland.
Woodland 6 Banff Croft	0.556	0.067	Unknown	N/A	Broadleaves	Parallel to Woodland 5. Bounds mixed species woodland area on heathland.
Woodland 7 Kirkton	0.693	0.135	Unknown	N/A	Conifer	Joint planting between Woodland 7 and Woodland 8. Conifer planted strip adjacent to farm access track and arable land.
Woodland 8 Kirkton	0.356	0.012	Unknown	N/A	Conifer	Joint planting between Woodland 7 and Woodland 8. Conifer planted strip adjacent to

Woodland ID	Total Area (ha)	Area Within PPP Application Boundary (ha)	Planted Year	Felling Year	Main Species	Commentary
						farm access track and arable land.
Woodland 9 Kirkton Ford	0.293	0.145	Unknown	N/A	Broadleaves	Low density broadleaf woodland adjacent to farm access track. Mixed species.
Woodland 10 Kirkton Ford	0.998	0.115	Unknown	N/A	Conifer	Conifer planting with boundary strip of broadleaves adjacent to access track.
Woodland 11 West of Bloomfield	0.949	0.011	Unknown	N/A	Mixed	Listed as conifer woodland but appears to be mixed conifer and broadleaf woodland with minimal management. Low density. Only marginally clips PPP Application Boundary.
Woodland 12 North West of Little Wairds	1.710	1.403	2015-2020	N/A	Mixed	Listed as assumed woodland. Appears as scrubby heathland with conifer planting on aerial imagery dated 12/09/2023.
Woodland 13 North West of Little Wairds	11.335	6.110	2015-2020	N/A	Mixed	Listed as assumed woodland. Appears as scrubby heathland with conifer planting on aerial imagery dated 12/09/2023.
Woodland 14 East of Sheep Wash	1.019	1.019	Unknown	N/A	Broadleaves	Listed as assumed woodland. Appears to be mixed broadleaf planting adjacent to Forthie Water.
Woodland 15 Bridge of Mondynes	7.123	1.906	Mid 2000s	N/A	Mixed	Mixed conifer and broadleaf planting adjacent to Forthie Water and the A90. Appears to be predominantly early mature specimens on June 2022 street view imagery.
Woodland 16 Bridge of Mondynes	0.942	0.107	Mid 2010s	N/A	Conifer	Younger trees parallel to Woodland 15. Adjacent to Forthie

Woodland ID	Total Area (ha)	Area Within PPP Application Boundary (ha)	Planted Year	Felling Year	Main Species	Commentary
						Water. Low density on 20/03/2025 imagery.
Woodland 17 Bridge of Mondynes	1.164	0.195	Mid 2000s	N/A	Mixed	Continuation of Woodlands 15 and 16. Centrally situated between these woodlands sharing the same structure and species mix.
Woodland 18 West of Watery Baulk	1.152	0.009	1990s	N/A	Broadleaves	Centrally planted woodland between arable farmland parcels. Appears to be mixed species broadleaf. Only marginally within PPP Application Boundary.
Woodland 19 Gowans	0.991	0.000381	1990s	N/A	Beech, Scots Pine, Mixed Broadleaf	Primarily beech woodland block adjacent to private residence and gravel access track. Only marginally within PPP Application Boundary.
Woodland 20 Cuttiesouter	1.795	1.789	2000s	N/A	Primarily Scots Pine	Pine woodland block adjacent to farmland. Appears typical of pine woodlands with minimal management.
Woodland 21 Elf Hillock	0.693	0.680	Unknown	N/A	Mixed	Mixed species woodland block situated on Burn of Elfhill. Primarily broadleaf with central pocket of spruce. Typical of unmanaged trees on field boundaries.
Woodland 22 Elf Hillock	1.818	0.021	Unknown	N/A	Broadleaves	Mixed species woodland following the Burn of Elfhill. Area within PPP Application Boundary marginal. Typical of natural woodlands adjacent to watercourses.

Woodland ID	Total Area (ha)	Area Within PPP Application Boundary (ha)	Planted Year	Felling Year	Main Species	Commentary
Woodland 23 Elf Hill	54.022	29.70	Unknown	Larch - Long term retention. Sitka Spruce – Phase 7 Felling (2045-2049)	Larch, Sitka Spruce	Larch on boundary listed for long term retention, thinned in 2015. Bounds the forest plantation. Inner area of Sitka Spruce adjacent to felled area.
Woodland 24 Elf Hill	0.426	0.003	Unknown	Phase 6 Felling (2040-2044)	Sitka Spruce	Small area of Sitka Spruce that only marginally sits within PPP Application Boundary.
Woodland 25 Elf Hill	31.652	13.064	Unknown	Pre 2015	Likely Sitka Spruce	Area felled pre-2015. Planned restock with Sitka Spruce and Larch.
Woodland 26 East White Rashes	4.993	2.058	Unknown	Phase 7 Felling (2045-2049)	Sitka Spruce, Broadleaves	Area north of the Substation Search Area. Restocking with additional broadleaves in adjacent felled area.
Woodland 27 East White Rashes	1.463	0.510	Unknown	Phase 7 Felling (2045-2049)	Sitka Spruce, Broadleaves	North of Substation Search Area. Sitka Spruce and Broadleaves planting.
Woodland 28 Hurlie Bog	71.710	35.439	Unknown	Partly Felled Pre 2015. Partly Phase 2 Felling (2020-2024)	Sitka Spruce, Norway Spruce	Remaining areas of Sitka and Norway Spruce surrounding access tracks. Most of woodland area felled.
Woodland 29 Hill of Baulk	2.392	2.392	Unknown	After 2050	Larch, Broadleaves	Adjacent to forestry roads. Mixed species.
Woodland 30 Burn of Day	1070.921	49.932	Unknown	Phase 1, Phase 4, Phase 6, Phase 7	Sitka Spruce, Scots Pine, Other Conifer, Larch, Broadleaves	This woodland area spans a large part of the forest and access tracks. Multiple species are within.
Woodland 31 Hill of Baulk	20.135	1.626	Unknown	Phase 2 Felling (2020-2024)	Sitka Spruce	Small area adjacent to forestry road. Appears felled on aerial imagery.
Woodland 32 Hurlie Bog	3.398 – Other	1.753	Unknown	Part Felled Pre 2015, Part Phase 1 Felling	Sitka Spruce, Other Conifer	Part area of felled woodland with established areas adjacent

Woodland ID	Total Area (ha)	Area Within PPP Application Boundary (ha)	Planted Year	Felling Year	Main Species	Commentary
	Vegetation 29.215 – Felled Woodland			(2015-2019) Part Phase 4 Felling (2030-2034), Part Phase 7 Felling (2045-2049)		to forestry road. Multiple species forming parts of several harvest cycles.
Woodland 33 Burn of Day	0.797	0.797	Unknown	Phase 1 Felling (2015-2019)	Other Conifer, Scots Pine	Small pocket within larger area of plantation. Appears to be felled in line with management plan with new restock growth establishing.

Arboriculture/TOW

1.5.8 No TPOs or Conservation Areas were identified in the Study Area as explained in paragraph 1.4.23.

1.5.9 The Proposed Development PPP Application Boundary spans a large area of Aberdeenshire, from the coast between Gourdon and Johnshaven to the expansive Fetteresso Forest (part of the Mearns Forest area). Primarily comprised of arable farmland, the Study Area exhibits various tree species surrounding field boundaries. Most trees are situated as individuals within field boundaries, with some aiding in the formation of, or outgrown from, established hedgerows, regarded as typical of the setting. Several pockets of mixed broadleaf and conifer woodland are present within the survey area, with species such as spruce (*Picea sp.*), various pine species (*Pinus sp.*), pedunculate oak (*Quercus robur*), European alder (*Alnus glutinosa*), sycamore (*Acer pseudoplatanus*), European beech (*Fagus sylvatica*), common hawthorn (*Crataegus monogyna*) and common ash (*Fraxinus excelsior*) all noted in abundance, with several other species observed within the Study Area.

1.5.10 A large portion of the northern part of the Study Area spans the Fetteresso Forest, which is generally observed as a typical forestry plantation. Large stands of spruce, larch and other conifer with the occasional self-set fruit tree, likely established as a result of bird droppings.

1.5.11 Trees are generally limited to an age class of early mature or mature across the Study Area, with limited age class diversity present when excluding negligible amounts of natural regeneration in the areas observed.

1.5.12 The Study Area contained numerous ash trees of all age classes. The majority of these trees were noted to be suffering from Ash Die Back (ADB).

1.5.13 ADB also known as Chalara or Chalara dieback of ash, is a disease of ash trees caused by a fungus called *Hymenoscyphus fraxineus*. ADB causes leaf loss, crown dieback and bark lesions in affected trees. Once a tree is infected the disease is usually fatal, either directly or indirectly by weakening the tree to the point where it succumbs more readily to attacks by other pests or pathogens, especially *Armillaria* fungi, or honey fungus.

1.5.14 ADB has caused widespread damage to ash populations in continental Europe, where experience indicates that it can kill young ash trees quite quickly, while older trees can resist it for some time, until prolonged exposure or another pest or pathogen attacking them in their weakened state, eventually causes them to succumb.

1.5.15 Evidence from other parts of Europe and the United Kingdom suggest that infected trees rapidly lose structural integrity and are more prone to branch shedding and total collapse. Furthermore, ash, as a species is known for its inability to retain even small deadwood, which it sheds regularly as it appears in the crown. Therefore, it can be expected that many of the trees within the Study Area will be lost through natural die off associated with ADB, irrespective of if the Proposed Development is constructed or not.

1.5.16 Some of the individual trees within the Study Area, as well as groups of trees and woodlands, are located within areas of farmland which is subjected to a range of agricultural practices. Regular ploughing and associated sub-soiling are common practice in many areas, and this often occurs close to the stems of large established trees, well within the theoretical RPA calculated by BS5837:2012 (British Standards Institution, 2021). Some sub-soilers operate at depth of up to 60 cm below the surface, and regular ploughs in the region of 12 to 35 cm deep. There is little research done on the impact of such practices on tree root profile, but in many cases the trees affected appear to suffer few adverse impacts. It can be assumed that regular ploughing and sub soiling leads to a deeper rooting profile, and that the rhizosphere is much better adapted to the effects of trafficking from heavy vehicles and equipment. Field trees are generally also significantly crown lifted to allow large farm machinery to pass below them. This has been taken into consideration when assessing the requirement for tree removals and protection for such trees.

1.5.17 Watercourses are also a significant feature of the survey area. Such features create an effective root barrier to any trees growing alongside them, and it would not be expected to encounter tree roots on the opposite side of a watercourse to which the tree is growing.

1.5.18 Some of the trees are located alongside surfaced roads. Tree roots need uncompacted soils to grow within and survive, an important element being access to oxygen. Forestry Commission research (Crow, Peter & Forestry Commission, 2005) has found that tree roots do not occur in significant quantities at substantial depths (e.g. more than 2 m) in the soil profile. There are cases where isolated roots have been found at depths much greater than this, in deep and loose soils (Gilman 1990). However typically between 90 and 99% of a tree's total root length occurs in the upper 1 m of soil. All the roads in the Study Area appear to be of substantial construction and it is considered unlikely they will contain significant rooting from roadside trees, due to the harsh rooting environment they represent.

1.5.19 Table 1.5 and Plate 1.1 show the number of the trees by weighting (Table 1.3) in the Study Areas for the two Scenarios.

Table 1.5: Total Trees Within Scenario Study Areas

Combined Score	Assessment Area	PPP Application Boundary + 30 m
1	78	527
2	130	696
3	63	63
4	0	209
5	0	7
Total	**271**	**1502**

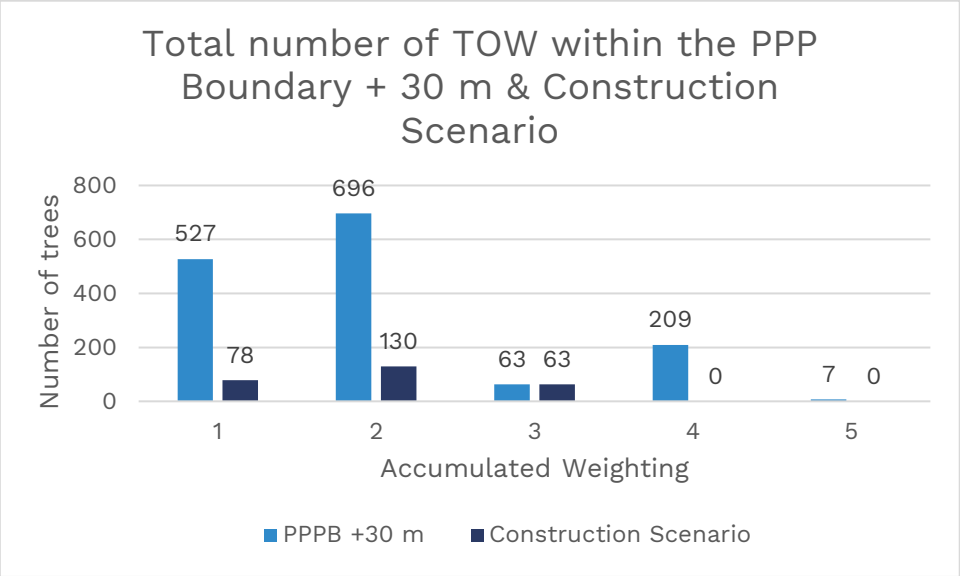

Plate 1.1: Total Trees within Scenario Study Areas

1.5.20 Figures 1a to 1f in Annex C presents trees by accumulated weighting.

1.5.21 Generally, the higher scoring trees can be considered the most important due to the numerous benefits they deliver, increasing with size. In general, the loss of trees with a score of 2 or less is of less significance than the higher scoring trees. Trees with lower scores are less important in terms of ecosystem and amenity benefits but in most cases represent younger trees which are an essential cohort of any tree population as they provide the replacement trees as the upper age classes of the population age and die. Younger trees can more easily be replaced than older trees, as can 'smaller' trees than 'bigger' trees in so far as it takes less time to replace a 10-year-old tree than a hundred-year-old tree.

1.5.22 However, on balance in assessing the impact of large linear infrastructure schemes, such as this, it is generally better to consider canopy area loss rather than individual tree loss, as the importance of the collective often far outweighs the importance of the individual.

Significant Trees

1.5.23 The ground truthing survey identified no significant trees within the PPP Application Boundary, and none within the Study Area that were considered A Category trees as per the BS5837:2012 guidance (presented in Annex B).

1.5.24 The ground truthing survey identified no veteran or ancient trees.

1.5.25 No trees within the assessment area achieved a weighting score greater than three, and only seven trees achieved a score of five within the PPP application boundary +30 m, with 209 given a weighting of four, and 63 a three.

TOW Canopy Area

1.5.26 Canopy area is an important metric, and one used by Governments to set targets for both tree planting and to limit deforestation. The Forestry Commission, Tree cover outside woodland in Great Britain (Forestry Commission, 2017), National Forestry Inventory, calculated that 19.4% of the

total land area of Scotland has tree cover (tree cover and canopy cover being interchangeable terms here). This compares with an average 33.5% at European Union (EU) level and 30% globally.

1.5.27 The same report calculated canopy cover of Scotland's TOW represented 18.3% of land area and 'tree cover outside woodland' represented 1.1% (the Great British average is 3.2%).

1.5.28 Within East Scotland (the area The Forestry Commission, Tree cover outside woodland in Great Britain, National Forestry Inventory defines the Proposed Development as being located within) woodland covered 104.2 ha (of land area) or 16.2% and 'tree cover outside woodland', 2.3% giving a total canopy area of 18.4%. Therefore, the Proposed Development is in a region of Scotland with an average canopy cover below that of the national level (19.4%). However, such a difference should be considered alongside the physical constraints the regions topography and climate present to widespread tree growth.

1.5.29 To calculate the canopy area of TOW, first the area of assessment area was calculated. The area of any NFIS polygons within these areas was subtracted to give the land area 'outside of woodland'. Canopy area was calculated for the Study Areas by merging all overlapping canopies of trees to give a combined canopy area of 2.55 ha for the assessment area and 12.95 ha for the PPP Application Boundary + 30 m; details provided in Table 1.6 below. This equates to a canopy cover of 0.01% of land area within Scenario 1 and 0.015% of land in Scenario 2. Both are lower than both the Region results in the FC Statistical Report and the national average. When the NFIS area is included in the Scenario 2 calculation (162.5 ha), the total canopy cover of the Scenario 2 area is 18% which is lower, but comparable with the regional and national averages.

Table 1.6: TOW Canopy Areas

Land Area within Construction Scenario (ha)	TOW Canopy Area Within Construction Scenario (ha)	Canopy Cover of Construction Scenario (as % of Land Area)	Land Area within Planning Application Boundary + 30 m (ha)	TOW Canopy Area within Planning Application Boundary + 30 m (ha)	Canopy Cover of Planning Application Boundary + 30 m (as % of Land Area)
235.7	2.55	0.011%	816.2	12.95	0.015%

1.6 Impact Assessment

1.6.1 This appendix does not attempt to attribute any significance to the potential impacts it has quantified to avoid overstating impacts already assessed by Volume 1, Chapter 6: Land Use, Agriculture and Public Access and Volume 1, Chapter 7: Biodiversity and Terrestrial Ecology.

1.6.2 Due to the scale of the Proposed Development and the current stage of design maturity, certain assumptions have been made to assess the impact on woodland and trees within the Study Areas. It should be noted that there are many variables which will need to be considered when deciding on the actual

removals required. Therefore, the assessment uses an indicative design scenario to provide a realistic impact in this section and identify with further design work woodland and TOW removals could be reduced.

1.6.3 Assumptions for the assessment of removals:

- For the installation of the cable, a realistic scenario is that TOW and woodland trees would only require removing within a 'construction corridor'. For the 220/275 kV cable, this would be 50 m wide construction corridor, for the 400 kV cable, this would be a 35 m wide construction corridor. The result of this assessment is presented in the following sections and is based on a Pre-FEED indicative alignment for the cable circuit routes. This alignment will be subject to additional design based on landowner discussions and FEED design post consent if PPP is granted.
- It is assumed that all the trees (with the exception of remote sections the compartment separated by land outside of the PPP Application Boundary) within the PPP Application Boundary and woodland management compartments within Mearns Forest in which the indicative Substation search area is situated, will be felled to facilitate construction. This is reflected in temporary woodland loss figures. Where the construction corridor for the 220/275 kV and 400 kV cables correspond with the felled management compartments, the areas lost have been adjusted accordingly, to prevent double counting of areas.
- The proposed Hurlie substation occupies an area of this application's PPP Application Boundary as Hurlie is the project grid connection point (GCP). At the time of writing the Hurlie substation planning application was still being considered by Aberdeenshire Council. The assumptions for this assessment are based on details in the Hurlie planning application, i.e. Hurlie will require the felling of trees for construction leading to a permanent loss under the new structure's footprint and easement.
- Once constructed, the new cables are assumed to require an unplanted easement directly over them, into which trees cannot be planted. This is considered a permanent loss, where it is within woodland. The unplanted easement for the Proposed Development, as set out in Volume 1, Chapter 2: The Proposed Development, is assumed to be 35 m for the 220/275 kV cable, and 15 m for the 400 kV cable.
- It is assumed that once constructed, the temporary clearance carried out to construct the Substation can be replanted (unless it falls within substation switchyard or the easement of a cable).

- The final location of the Substation, onshore export cables and other infrastructure are not yet known. Therefore, all figures are considered indicative at this stage and would be confirmed at Matters Specified in Conditions (MSC) stage.
- The PPP Application Boundary contains a number of long linear access tracks for the purpose of access and are existing roads/forestry accesses. These have been disregarded from the following assessments as these roads are assumed to be in a suitable condition to facilitate construction, without further tree removals.
- For the Arboricultural/TOW assessment. Trees located within the assessment area require removal to facilitate construction activities. When a tree is located outside of the boundary of the assessment area, but with more than 20% of the RPA located within the assessment boundary, it will require assessment by an arboriculturist to determine if it can be retained. Previous iterations of BS5837:2012 accepted that in the region of 20% of a tree's RPA could be removed with minimal adverse impact on the tree's health. However, the arboriculturist will need to assess severity of root damage, health of the tree, and potential working practices to determine if a tree can be safely retained or requires removal. These trees have been recorded as 'at-risk' in the Arboricultural/TOW assessment.
- The 2 m indicative maximum RPA was used for the initial assessment.
- The Proposed Development includes proposals to install numerous sections of the cable using trenchless construction methods e.g. horizontal directional drilling (HDD). Where a cable is installed using trenchless methods, it is not normally necessary to remove trees along the cable alignment between the launch and retrieval locations. However, at this stage of the design, the details of location and design of this element are unknown. Therefore, all trees in the corridors are assumed lost, as a worst-case scenario.

1.6.4 Based on these assumptions, a GIS desk-based assessment (with iterative refinements) was made on the woodland and TOW removals required to construct the Proposed Development.

Woodland

1.6.5 Table 1.7 summarises the area of woodland temporarily lost, assuming that all trees within the PPP Application Boundary are removed to facilitate the

installation of the 220/275 kV and 400 kV cables. This area has been adjusted to account for felling required for the Substation.

1.6.6 Table 1.7 summarises the area of woodland temporarily lost, assuming all trees within the woodland management compartments, located within the PPP Application Boundary need to be felled to facilitate the construction. This assessment is based on an indicative cable routes and Substation location and layout informed by Pre-FEED.

1.6.7 Table 1.7 summarises the permanent loss associated with the 220/275 kV and 400 kV cables and Substation, based on indicative alignments and locations.

1.6.8 The permanent footprint of the Hurlie Substation, located within the PPP Application Boundary has been calculated as 15.06 ha. It should be noted this is the permanent footprint only, and additional areas of temporary removals for the Hurlie substation may be required. The Hurlie permanent footprint overlaps with the assumed temporary clearance area for the Proposed Development by 0.3 ha and with the assumed permanent loss area (unplanted easement) by 0.21 ha. As the trees within these overlap areas will have been removed prior to the commencement of the Proposed Development, the stated temporary and permanent losses could be reduced by 0.3 ha and 0.21 ha respectively. These figures are indicative only and will be revisited as more detailed information becomes available.

Table 1.7: Woodland Area Loss

Woodland ID	NIWS woodland type	Construction Scenario Area (Ha)	Baseline (PPP boundary + 30 m)	Permanent loss (ha)
Loss Associated with both 275 kV and 400 kV Cable Installations				
1	Assumed woodland	0	0.35	0
3	Broadleaved	0	1.57	0
4	Assumed woodland	0.02	0.10	0
5	Broadleaved	0	0.12	0
6	Assumed woodland	0	0.07	0
7	Conifer	0	0.14	0
8	Assumed woodland	0	0.01	0
9	Low density	0	0.15	0
10	Conifer	0	0.12	0
11	Conifer	0.01	0.01	
12	Assumed woodland	0.29	1.40	0.09
13	Assumed woodland	1.97	6.11	0.59
14	Assumed woodland	0.37	1.02	0.11
15	Conifer	0	1.91	0
16	Young trees	0	0.11	0
17	Broadleaved	0	0.20	0
18	Broadleaved	0	0.01	0
19	Broadleaved	0.03	0.00	0
20	Conifer	0	1.79	0

Woodland ID	NIWS woodland type	Construction Scenario Area (Ha)	Baseline (PPP boundary + 30 m)	Permanent loss (ha)
22	Mixed mainly broadleaved	0	0.68	0
All Mearns compartments (23 – 33)	Conifer	12.12	146.61	4.79
Loss Associated with Substation Installation and Operation				
Loss for substation construction (within Mearns)		32.16		9.7
Totals				
All temporary loss		46.95	162.48	
All permanent loss				15.28

1.6.9 The indicative temporary woodland removal for the Proposed Development if all trees within the assessment area removed is 46.95 ha (against a base line of 162.48 ha.). Following construction, the permeant loss of woodland is 15.28 ha.

1.6.10 The current design proposal is only indicative, and as such, the exact location and scale of temporary and permanent loss areas is indicative, based on the assumptions set out in paragraph 1.6.3. At this stage it has not been possible to make assessments of any compartments' 'windfirmness' and the potential need to fell to a windfirm edge. It has also not been possible to provide detailed information of the potential impact of the Proposed Development on the existing and future management of the forest, beyond the baseline provided in Section 1.5 (in particular paragraph 1.5.6).

1.6.11 Once detailed design is complete, and the various elements of the Proposed Development are 'fixed', a detailed forestry impact assessment will be completed, which will set out clearly the impact of the proposals on forestry, including a definitive temporary and permanent woodland loss area.

1.6.12 Suitable mitigation, in the form of a new forest management plan and an appropriate area of compensatory woodland planting will be confirmed during the MSC stage; further details on mitigation are included in Section 1.7.

Arboriculture/TOW

1.6.13 The assessment of trees outside of woodland is aided by data from the BlueSky International National Tree Map (NTM). This is a spatial dataset measured using proprietary algorithms and processing techniques on high resolution aerial photography throughout the UK.

1.6.14 The NTM measures several parameters of recorded trees, including height, location and canopy spread/extent. Trees over 3 m in height are recorded with their location points and canopy extent providing information on the stature of the recorded tree. Further information on the collection and processing of NTM data can be found in Section 1.4.

1.6.15 The numbers of trees to be removed by weight banding are presented in Table 1.8. This assessment has been produced at this stage for illustrative purposes

to demonstrate a precautionary scenario of potential tree removals required. There is currently no definitive vegetation removal plans and TOW loss numbers will require further refinement as the Proposed Development design is progressed.

1.6.16 If the trees identified for removal in the assessment area are lost, out of a total of 271 trees within the Construction Scenario area, 62 will be required to be removed (22% of all the trees). A further 38 trees are at-risk in the Construction Scenario area (14% of all trees). In a precautionary scenario, where all at-risk trees will be required to be removed, 100 trees will need to be felled, representing 36% of the total trees within the Construction Scenario area.

Table 1.8: Tree Loss by Accumulated Weighting

Accumulated Weighting	Assessment Area			
	Removed	At Risk	Retained	Total
1	16	14	48	78
2	29	14	87	130
3	17	10	36	63
4	0	0	0	0
5	0	0	0	0
Total	62	38	171	271

1.6.17 While Table 1.8 presents the impacts as numbers of trees, a more useful metric for considering TOW loss on a project of this scale is canopy cover. Table 1.9 shows canopy loss within the assessment area.

1.6.18 Based on the below removal calculations if all trees are removed within the Construction Scenario area, 0.62 ha of canopy cover would be lost in the Construction Scenario area, with a further 0.4 ha at-risk. In a precautionary scenario, if all the at-risk trees are removed, 1.02 ha of canopy would be lost. The resulting canopy cover in the Study Area would be 0.006% (reduced from its current 0.011%). If all the at-risk trees could be retained, the resulting canopy cover of the Study Area would be 0.008%.

Table 1.9: Canopy Loss

Canopy Area Lost within Construction Scenario (ha)	Remaining Canopy Area within Construction Scenario (ha)	Canopy Area 'At Risk' in Construction Scenario (ha)
0.62	1.53	0.40

1.6.19 The precautionary scenario for canopy cover removal (i.e., all the at-risk trees are removed) would leave the canopy cover of the Study Area (21%) higher than the canopy area of the region (18.4%) the country (19.4%) and Great Britian (16.7%) as reported in the 2017 Tree cover outside woodland in Great Britian Statistics Report.

Impact on Significant Trees

1.6.20 Neither the desk-based study, nor the ground truthing surveys identified any significant trees, as defined in Section 1.4.

Operational Phase

1.6.21 Once construction is complete, there should be no direct further requirements for the removal of woodland or trees during the operation of the Proposed Development. However there remains a possibility that 'at risk' trees which have been retained with root damage succumb to either wind damage or physiological decline and require removal (or blow over).

1.6.22 An indirect need to fell additional trees may be created by the prevalence of infected ash trees within the Study Area. As the current tree stock declines further due to the effects of the disease, felling of dead and dangerous trees may be required to ensure the safety of personnel accessing elements of the new infrastructure. This felling will be the responsibility of the landowner upon which the trees are located and is necessary as part of their duty of care to persons on their land and neighbours.

1.6.23 Windthrow can be an issue in commercial crops following tree felling operations. The effects of windthrow can be unpredictable especially in relation to infrastructure projects which may locally impact on the movement and effects of wind in an unforeseen way. There is a residual risk that following completion of construction of the Proposed Development, some windthrow is experienced in surrounding commercial crops. However, windthrow in commercial crops would likely only trigger harvesting of a stand earlier than initially planned, along with associated restocking. As commercial sites are restocked, the overall impact on tree cover is relatively short lived, and temporary, as the new crop rapidly regrows.

1.7 Embedded Mitigation

Construction Phase

1.7.1 For both Woodland and TOW, the use of trenchless techniques for cable installation will provide the opportunity to significantly reduce both temporary and permanent loss of trees. While the launch and retrieval compounds for the HDD will require tree clearance, the land between remains undisturbed. The cable is installed at such a depth that it is not likely to be impacted by tree roots, which are generally confined to the top 600 mm of soil. This means clearance for a permanent easement is not normally required. The features under which trenchless techniques are employed are often the same features which contain concentrations of trees, such as river and watercourses. During detailed design, the location of the launch and retrieval will be reviewed to minimise impacts on trees and maximise the number of trees which can be retained.

1.7.2 Potential tree removals required to construct the Proposed Development are discussed in Section 1.6. The Proposed Development will have a comprehensive compensatory planting scheme which will replace the TOW and woodland lost (GEN1).

1.7.3 The new cables will require an unplanted easement over them in which the planting of large trees will be prohibited. Therefore, within this easement, tree loss (both woodland and TOW) is considered permanent within the PPP

Application Boundary. Compensatory planting will be provided as close to the Proposed Development as is reasonably practicable.

Woodland

1.7.4 Following detailed design, a detailed woodland impact assessment will be conducted, which will use the design detail and construction methodology to refine the impact of the proposed development on woodlands within the PPP Application Boundary (ARB1).

1.7.5 Once the impacts are confirmed, forest and woodland management plans will be created for the individually impacted woodland (based on a suitable management unit, for example Mearns). These documents will set out how the woodlands will be managed post construction, including measures taken to establish windfirm blocks.

1.7.6 An area of woodland, equivalent to the area of woodland permanently lost to facilitate the Proposed Development will be created to offset the permanent loss as required by the Scottish Governments Policy on Control of Woodland Removal. The new woodland will also be subject to a woodland management plan (if it does not form part of one of the existing woodland management units).

Arboriculture (TOW)

1.7.7 The following mitigation measures will be implemented during the detailed design stage:

- A Project Arboriculturist will be appointed to provide relevant additional input to be addressed at appropriate points (ARB2);
- A tree survey to BS5837:2012 will be completed of the trees within influencing distance of the final Proposed Development, which may be negatively impacted (ARB3). The data will be used to inform the following steps:
    - The generic Arboricultural Method Statement (AMS) (GEN2) (included in Annex B) will be reviewed and updated into a site-specific AMS to provide appointed contractors with details on how specific operations need to be performed to protect trees including use of exclusion zones and ground protection; and
    - A Tree Protection Plan (GEN2) will be produced providing schematic details of how protective fencing will be installed and any other pre-planned targeted tree protection measures.

1.7.8 At future design stages, potential design amendments and detailed arboricultural interventions will be considered to lessen the impact on the ‘at risk’ trees identified for removal, that have the potential to be retained in some form within the final Proposed Development design.

1.7.9 The following mitigation measures will be implemented during construction:

- site-specific AMS (GEN2) and Tree Protection Plan (GEN2) will be implemented as soon as works begin on-site;
- Project Arboriculturist (ARB2) will advise and resolve any unforeseen tree related issues which might occur and to provide general tree related advice; and
- on-site monitoring (GEN2) will be undertaken at agreed intervals before and during construction (this will be achieved through a combined effort between TWP and the appointed contractor) to ensure protection measures and the site-specific AMS are being implemented correctly.

1.7.10 The main element of the AMS is the protection of unmade (that is not protected by a loadbearing surface) RPAs by suitable buffers protected by suitably robust tree protection fencing or other barriers. On linear infrastructure schemes such barriers can often be formed by soil berms. Such works often require the pruning of retained trees, and such pruning schedules and specifications will be produced by a qualified arboriculturist, in line with BS 3998:2010 (British Standards Institution, 2010) and carried out by qualified arboricultural contractors. In this way, any tree pruning will not have a detrimental impact on the trees.

1.7.11 Annex B contains a generic AMS which sets out the general principles of the methodology that will be adopted on the Proposed Development, where appropriate. The generic AMS specifies generic tree protection measures to protect retained trees on-site; this AMS will be included in the Outline CEMP (Volume 2; Appendix 2.2).

1.7.12 The following mitigation measures will be implemented during the detailed design stage:

- A Project Arboriculturist (ARB2) will be appointed to provide relevant additional input to be addressed at appropriate points including discharge of any relevant planning conditions;
- The generic AMS (Annex B) (GEN2) will be reviewed and updated into a site-specific AMS to provide appointed contractors with details on how specific operations need to be performed to protect trees including use of exclusion zones and ground protection; and
- A Tree Protection Plan (GEN2) will be produced providing schematic details of how protective fencing will be installed and any other pre-planned targeted tree protection measures.

1.7.13 In addition, at future design stages, potential design amendments and detailed arboricultural interventions will be considered to lessen the impact on the ‘at

risk' trees identified for removal, that have the potential to be retained in some form within the final design.

Operational Phase

1.7.14 There are no anticipated direct impacts on the retained trees along the route of the Proposed Development during the operational phase, and therefore, no specific mitigation is identified.

1.8 Additional Mitigation

Construction Phase

No Additional Mitigation is required as compensatory planting is proposed, refer to Section 1.7. Operational Phase

1.8.1 Significant changes in land use including the construction of structures and hard surfacing can have unforeseen impacts on the localised effects of wind. Combined with tree clearance of existing wind firm trees and wind firm edges of commercial blocks, there remains a residual risk of windthrow in retained stands of trees. Windthrow in commercial stands usually leads to a quicker instigation of the felling and restocking cycle. This may lead to the loss of mature trees, but forestry regulations require the restocking of felled stands so any loss to windthrow is not likely to be permanent.

1.8.2 The impact of the Additional Mitigation and the residual significance of the effects on woodland are considered in Volume 1, Chapter 6: Land Use, Agriculture and Public Access and Chapter 7: Biodiversity, Terrestrial Ecology and Ornithology.

1.9 Conclusion

1.9.1 For Woodland, the indicative temporary woodland removal for the Proposed Development if all trees within the assessment area are removed, then the temporary loss is 46.95 ha. Following construction, the permanent loss of woodland is 15.06 ha.

1.9.2 For TOW, if all trees are removed within the Construction Scenario area, 0.62 ha of canopy cover would be lost in the Construction Scenario area, with a further 0.4 ha at-risk. In a precautionary scenario, if all the at-risk trees are removed, 1.02 ha of canopy would be lost. The resulting canopy cover in the Construction Scenario area would be 0.006% (reduced from its current 0.011%). If all the at-risk trees could be retained, the resulting canopy cover of the Study Area would be 0.008%.

1.9.3 The precautionary scenario for canopy cover removal (i.e., all of the at-risk trees are removed) would leave the TOW canopy cover of the assessment area (0.011%) lower than the canopy area of the region (2.3%) the country (1.1%) and Great Britian (3.2%) as reported in the 2017 Tree cover outside woodland in Great Britian Statistics Report. However, these numbers should be considered alongside the starting TOW canopy cover, which at 0.01% (for both areas) was already lower than the reports averages.

1.9.4 If all trees within the assessment area are lost, out of a total of 271 trees within the assessment area, 62 will be required to be removed (22% of all the trees).

A further 38 trees are at-risk in the Study Area (14% of all trees). In a precautionary scenario, where all at-risk trees will be required to be removed, 100 trees will need to be felled, representing 36% of the total trees within the Study Area.

1.9.5 It is expected to be able to retain the at-risk 'features' with the implementation of mitigation measures during construction.

1.9.6 The implementation of a site-specific AMS and associated Tree Protection Plans will minimise any impact on retained trees and significantly reduce the number of at-risk trees which require removal.

1.9.7 The use of HDD cable installation methodology will further reduce the loss of woodland and TOW.

1.9.8 Due to construction of the new structures and unplanted cable easements, some of the woodland and TOW loss is considered permanent within the PPP Application Boundary. However, the Proposed Development will have a comprehensive mitigation proposal which includes planting of an equivalent area of new woodland to that which is lost.

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ANNEX A. BS5837:2012 TABLE 1 CASCADE CHART FOR TREE QUALITY ASSESSMENT

A1.1.1 Extract from BS5837:2012 Trees in relation to design, demolition, and construction – Recommendations

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
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**.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
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)	See Table 2
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	See Table 2
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	See Table 2

Plate 2.1 BS5837:2012 Cascade Chart for Tree Quality Assessment

ANNEX B. GENERIC ARBORICULTURAL METHOD STATEMENT

B1 Arboricultural Method Statement (AMS)

B1.1 Introduction

B1.1.1 The most important and effective process, in terms of preventing damage to trees on a construction site, is the timely erection of tree protection fencing. This must be erected as the first operation on site, for example, before access track construction, before Contractor's site cabins, and before trenching for service runs.

B1.1.2 However, it is noted that the fencing provides an unnecessary and potentially dangerous restriction to essential tree works and therefore tree works can be carried out before fencing is erected.

B1.1.3 To protect retained trees and hedges correctly throughout the construction process, tree protection measures will be removed in the exact opposite order and methodology they were installed so that one of the last actions onsite is the removal of the tree protection measures.

B1.2 General

B1.2.1 This AMS is generic, and once the final development plans are finalised, it will be reviewed so that it is tailored specifically to the project. An AMS will always be supported by a detailed Tree Protection Plan, which will indicate the alignment of Tree Protection Fencing, Construction Exclusion Zones and other specific site methodologies.

B1.3 Phasing

B1.3.1 Detailed below is an indicative phasing programme which must be followed by the contractor throughout the life of the Proposed Development to ensure that trees are protected in accordance with the AMS.

B1.3.2 Phase 1 – enabling works

- Install Tree Protection Fencing as required;
- Install ground protection measures as required; and
- Carry out approved tree removal and pruning

B1.3.3 Phase 2 – development / construction

- Establish site compound - location for cabins, car park and the storage of materials;
- Carry out initial ground works and services installations; and
- Undertake main development construction.

B1.3.4 Phase 3 – post-development

- Carry out soft landscaping (e.g. proposed replanting, grass reinstatement etc);

- Remove protective fencing as required;
- Remove ground protection as required; and
- Carry out ground decompaction and reinstatement.

B1.4 Pre-Commencement

B1.4.1 A Pre-Commencement Site Meeting will be held with contractors who are responsible for operating machinery on site. The meeting will firstly highlight the potential for damage occurring to tree crowns, but thereafter ensure that extra care is applied when manoeuvring any machinery within proximity of retained trees to prevent any contact with the tree and consequent damage to crown, stem or roots.

B1.4.2 For clarity, prior to any construction or development work proceeding, the alignment of the protective fencing and the RPAs of any individual trees to be retained which are not able to be protected by fencing will be marked out using the distances provided by the Project Arboriculturist. Marking out will be completed or approved by a person with arboricultural expertise as individual trees will have root zones that may be affected by local conditions and allowances will need to be made to accommodate this.

B1.5 Access facilitation pruning

B1.5.1 It is expected necessary to operate a wide or tall load, plant bearing booms, jibs and counterweights or other such equipment, as part of construction works and/or traffic on the construction access road. Such equipment would have potential to cause injurious contact with crown material i.e. low branches and limbs, of retained trees within, or without, the RPA fencing. It is best advised that appropriate, but limited tree pruning, be carried out beforehand to remove any obvious problem branches. This is classed as 'Facilitation Pruning' within BS 5837:2012 (British Standards Institution, 2012).

B1.5.2 The Facilitation Pruning Works specification shall be prepared by an arboriculturist and submitted to the local planning authority for approval before construction, demolition or fencing operations commence on site.

B1.5.3 All tree works will be carried out in accordance with BS 3998:2010 'Tree Works-Recommendations'.

B1.5.4 The Facilitation Pruning will be carried out on site by a suitably qualified and experienced arborist before construction or demolition operations commence on site. The Facilitation Pruning can run concurrent with operations to erect tree protection fencing as long as this can be co-ordinated such that neither presents a hazard to the other.

B1.5.5 Trees on site which are not to be retained can be removed as part of the Facilitation Pruning (or earlier if the appropriate planning consent is confirmed). To avoid mistakes, the individual trees to be removed will be identified and marked by a person with arboricultural expertise.

B1.5.6 Any access facilitation pruning will not have a significant adverse impact on the tree's physiology or amenity value. In some cases, a suitable working space may be provided by temporarily tying back tree branches.

B1.5.7 Pruning will generally occur after the leaves have 'flushed' and hardened, so late spring through summer. There are some exceptions, however, as some species such as Birch, Walnut and Maples, will 'bleed' sap and risk losing valuable sugars in the process if pruned in early spring, therefore the pruning

of these trees will be carried out when this risk is low i.e. summer or mid-winter.

B1.5.8 Hornbeam trees have two growth phases each year. One during the spring and the other in summer. The best time to prune them therefore is in September after the summer flush and before the leaves change colour and drop. This is also outside of the bird nesting season which usually runs from March to August. Alternatively prune in mid-winter.

B1.5.9 Species belonging to the genus *Prunus* such as Cherry partially rely on the production of a resin or gum to aid in the defence against wound related pathogens, therefore pruning will occur in the summer. In general, pruning will avoid periods where the exposed wood will be left open to severe conditions such as drought, frost, and periods of fungal sporulation (autumn).

B1.5.10 Any tree works undertaken must take account of all protected species of flora and fauna and comply with all appropriate legislation. All tree work operations are covered by these provisions and advice from an ecologist will be obtained before undertaking any works that might constitute an offence.

B1.5.11 It is recommended that any trees that require removal or significant canopy works, will be checked in advance of works by an ecologist to ensure there is no possibility of any disturbance to nesting birds or roosting bats.

B1.6 Tree Protection Fencing and the Construction Exclusion Zone

B1.6.1 The development design prepared for the site indicates that a number of trees within the PPP Application Boundary are being retained. In addition, there are numerous trees within influencing distance of the construction activity. The majority of these trees need to be protected from all construction operations by a protective barrier which creates a sacrosanct Construction Exclusion Zone (CEZ).

B1.6.2 The alignment of the protective barrier could be based on the calculated extent of the RPA which has been generated as a maximum and minimum based on spatial measurements taken from the NTM, or based on site survey work, and in accordance with BS 5837:2012. The detailed alignment of tree protection fencing will be decided by the project arboriculturist and indicated on a tree protection plan.

B1.6.3 In principle, protective fencing will be erected before any construction operations start on site and will be removed only on completion of all construction works on site. In a phased project there may be a need to alter or remove/reposition fencing as the project progresses. The planning of these works will be carried out in consultation with the Project Arboriculturist and no tree will be left unprotected during construction works.

B1.6.4 Site hoarding is an acceptable alternative. It may be appropriate on some sites to use temporary site offices as components of the protection barriers, on the understanding that they will remain in situ for the duration of the construction works and their removal will be planned to ensure the Contractor's co-ordinated withdrawal from site away from the trees rather than towards them.

B1.6.5 BS 5837:2012 clause 6.2.2.3 specifies an alternative protective barrier where site circumstances and associated risk of damage incursion into the RPA do not necessitate the default level of protection. In this project it is proposed that in areas remote from significant construction activity alternative fencing will provide the tree protection fencing. In places this will consist of agricultural stockproof fencing. Elsewhere the corridor the CEZ will be delineated with high viability orange site netting firmly attached to wooden post. This fencing will be

erected before construction activities commence and will be inspected regularly and repaired as necessary.

B1.6.6 All weather notices will be placed on fencing to indicate that operations are not permitted within the high visibility fenced area, for example “CONSTRUCTION EXCLUSION ZONE – NO ACCESS” or similar.

B1.6.7 Once set up fences will not be removed or altered without prior consultation with the project arboriculturist.

B1.6.8 The presence of long grass and other vegetation in the ‘Construction Exclusion Zone’ is a welcome indicator that the protected area has been left undisturbed. However, on occasion, and certainly towards the end of the project, it is acceptable to cut the vegetation by handheld strimmer or scythe taking care not to work within 300 mm of the tree trunk (to avoid damaging the bark). Vegetation within 300 mm of the trunk can be cut with non-mechanised shears.

B1.7 Temporary Ground Protection

B1.7.1 Where unmade ground within the RPA of trees but outside the protective barrier is exposed to construction damage and/or soil compaction, temporary ground protection will be installed immediately following the erection of tree protection fencing and prior to starting work on site.

B1.7.2 The ground protection will be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

B1.7.3 BS 5837:2012 suggests temporary ground protection might comprise of one of the following:

- 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 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;
- For pedestrian-operated plant up to a gross weight of 2 t, proprietary (EuroMat or similar), interlinked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip) laid onto a geotextile membrane;
- 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. It may be that a cellular confinement system, such as Presto Geoweb or similar, laid on geotextile membrane and over filled with angular clean stone is more appropriate.

B1.7.4 Existing hard surfaces offer good ground protection, and as far as possible will remain in situ as temporary ground protection during site works. Upon completion of works the surface can be carefully lifted if not required or used as a sub-base as appropriate.

B1.7.5 Following completion of construction/demolition works, the ground protection will be removed and the ground reinstated without soil disturbance.

B1.8 Installation (or diversion) of power supply and services

B1.8.1 Any underground power supplies and services routed through the RPA will be installed in accordance with BS 5837:2012 clause 7.7.2 and NJUG Guidelines for

the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees[2]. The preference is for all excavations to be completed by hand within an RPA. If this is not possible, then the smallest toothless bucket will be utilised removing small amounts of soil at each pass. If a root is encountered, then it will be exposed by hand and a suitable course of action agreed with the project arboriculturist.

B1.8.2 When roots between 10-25 mm in diameter are encountered, these would be retained undamaged wherever possible and protected from desiccation/frost by damp hessian sacking or a similar protective material until the excavation is back filled. Roots below 10 mm in diameter may be trimmed back neatly in line with the edge of the excavation trench using secateurs.

B1.9 Construction within RPA

B1.9.1 The delivery, storage, mixing and discharge of concrete and all other cement-based materials shall be carried out so that there is no run-off and spillage near the RPAs of retained trees. No substances that are potentially injurious to plant tissue (including diesel, bitumen, concrete, mortar and other phyto-toxic materials) shall be stored, discharged, prepared or used, where direct contact, infiltration or run-off might reasonably be considered liable to harmfully affect existing root growth or other parts of retained trees.

B1.9.2 Where chemicals are stored, it is now standard practice to have emergency spillage kits available to minimise the impacts of any accidental spillages to the local environment. All cement mixing, vehicle washing or any other activity where toxic chemicals are used shall have the provision to contain any accidental spillage. This can be achieved using suitable soil bunding or using a supporting timber framework sealed with heavy duty plastic sheeting.

B1.10 Fence construction within RPAs

B1.10.1 Where fence posts need to be installed within RPAs, excavations will be minimal and carried out using handheld tools. Fence posts will be erected at least 1 m from trees and using metal post support spikes or if using concrete mix, post holes will be lined with an impermeable membrane to prevent contact between tree roots and potentially damaging chemicals in the concrete.

B1.10.2 The proposed fence alignment will allow for a minimum distance of 500 mm between the tree stems and the fence, providing sufficient room for the future increase of the stem diameter and minimising the risk of potential conflicts between the fence structure and the tree stem.

B1.11 Root Pruning

B1.11.1 The specific need for root pruning has not been identified in any areas of the Proposed Development though a number of retained trees have minor incursions into their theoretical RPA which means root severance may be required. In most cases, will tree roots be uncovered during excavation works then they are most likely to belong to trees removed during the site clearance. Will it be clear that an uncovered root is associated with a retained tree then the following steps will be taken.

[2] National Joint Utilities Group (2007) Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees [Online] Available at: https://streetworks.org.uk/wp-content/uploads/V4-Trees-Issue-2-16-11-2007.pdf

B1.11.2 Minor roots (less than 25 mm in diameter) will be cleanly severed with a sharp pruning saw, leaving as small a final cut wound as possible. Roots larger than 25 mm diameter will be carefully exposed by hand. Once exposed the Environmental Clerk of Works or the Project Arboriculturist will be contacted for advice on how to proceed. If it is considered the removal of the root will not have a destabilising, or detrimental impact on the parent tree, then it can be cleanly severed with a sharp pruning saw. A photographic record of any root pruning will be taken, along with its location marked clearly on a site plan.

B1.11.3 If it is considered an unacceptable risk to sever the root, then it will be reburied or wrapped in damp hessian to prevent desiccation, whilst the project team work through options for dealing with the situation. In certain cases, this may require the removal of the parent tree.

B1.12 Changes of level within RPAs

B1.12.1 Generally, the levels within the RPA or protected area will not be changed. Typically, between 90 and 99% of a tree's total root length occurs in the upper 1 m of soil. Obviously, any excavation into this will remove part of the root system and potentially affect the vigour or stability of the tree. Conversely, any additional material built up above ground level will compact the soil beneath it, potentially compacting all the air pores in the 600 mm depth of soil that most roots are in, effectively suffocating the roots and thus affecting the vigour or stability of the tree.

B1.12.2 On occasion, additional soil may be gently spread by hand within the RPA/protected area, for example, to marry levels in small areas between raised levels of no-dig construction and the existing levels. The maximum depth of this would be to 150 mm, reducing to nil. However, it is not generally acceptable, in large areas of the RPA/protected area to raise the level as a blanket. Any areas which will need to be raised are to be agreed with the project arboriculturist prior to construction. Specifically, there will be no mechanical equipment within the RPA/protected area to spread, compact, or level out soil levels as this would compact the soil.

B1.13 Permanent Surfacing (No-dig construction) in RPA

B1.13.1 Should permanent surfacing be required within the RPA of a retained tree, the following methodology will be adopted.

B1.13.2 After scraping off the above soil vegetation layer, a geotextile will be laid out on top of the existing ground, and subsequently a three-dimensional Cellular Confinement System (CCS) will be pegged out and infilled as manufacturer's recommendations. Infill materials will be no-fines aggregate (granular) which will interlock and be free draining and allow gaseous exchange. When infilled, this structure will act as the sub-base. Over fill (for example by 25 mm) in accordance with manufacturer's recommendations and proposed use. A separation geotextile will be laid on top of this construction before any final wearing course is installed (unless machine laid bounded surface) or overfill by 40-60 mm to provide the wearing course.

B1.13.3 The wearing course will be a permeable surface allowing gaseous exchange and the infiltration of water into the root zone.

B1.13.4 Where existing hard surfaces were retained as temporary ground protection, new permanent hard surfacing will be built using the existing subbase and therefore avoiding any excavations and changes in level. This is to be carried out only on completion of surrounding construction work.

B1.13.5 Roots smaller than 25 mm diameter may be pruned back, making a clean cut with a suitable sharp tool except where they occur in clumps. Roots occurring in clumps or of 25 mm diameter and over will be severed only following consultation with an arboriculturist, as such roots might be essential to the tree's health and stability.

B1.13.6 Kerbs and edgings that require excavations will not be used. Where kerbing is required for light structures, above-ground peg and board edging might be acceptable. Where the use of standard kerbs is unavoidable in areas used by vehicular traffic, foundations will not be continuous where this would require cutting or severing of roots larger than 25 mm diameter. Instead, the kerbs will be "bridged" over the roots, leaving space that allows for future increase of the root diameter.

B1.14 Excavations for soft landscaping

B1.14.1 Where soft landscaping is proposed within the RPA of retained trees, excavations will be kept to the minimum required to provide adequate conditions for the establishment of new shrubs and trees. Excavations will be carried out carefully and by hand, avoiding the severance of any roots larger than 25 mm diameter.

B1.15 Removal of Existing Hard Standing

B1.15.1 Where soft landscaping is proposed within the RPA in existing hard surfaces, the wearing course and its sub-base will be carefully lifted using handheld tools. Should any roots be exposed in the process, they will be immediately wrapped or covered to prevent desiccation and to protect them from rapid temperature changes. Any wrapping will be removed prior to backfilling, which will take place as soon as possible.

B1.15.2 Prior to backfilling, retained roots will be surrounded with topsoil or uncompacted sharp sand (other than builders' sand), or other loose inert granular fill, before soil or other suitable material is replaced.

B1.16 Soil Improvements and Mulching

B1.16.1 To compensate for root damage and stress caused by construction activities it is recommended that the RPA of significant retained trees onsite will be mulched where possible. The materials that may be used for mulching include coarsely divided plant matter, such as wood chip, pulverized bark, or leaf mould, any of which may be combined with well-rotted animal manure. The mulched area will extend over as much of the root system as can be allowed by other site-usage requirements. The depth of an organic mulch will not be so much as to inhibit aeration of the root system or to cause overheating of uncomposted material (normally no more than 80 mm to 100 mm). The mulch will be periodically replenished as it decomposes, so that it does not become depleted.

B1.17 Arboricultural Site Supervision

B1.17.1 Tree Protection of trees on development sites is an iterative process which does not end with the finalisation of Arboricultural reports.

B1.17.2 As such will appoint an Arboricultural Clerk of Works (ArbCoW), also known as the Project Arboriculturist (PA). Their role is to adapt and update the AMS and TPP as the Proposed Development is delivered to provide pragmatic and deliverable tree protection on site. As such the AMS and TPP will be seen as live documents, which are subjected to continual revision.

B1.17.3 The ArbCoW will arrange to make regular visits to the site to attend pre commencement meetings, at key stages of the development (such as checking the erection of tree protection fencing) and to resolve any issue arriving onsite.

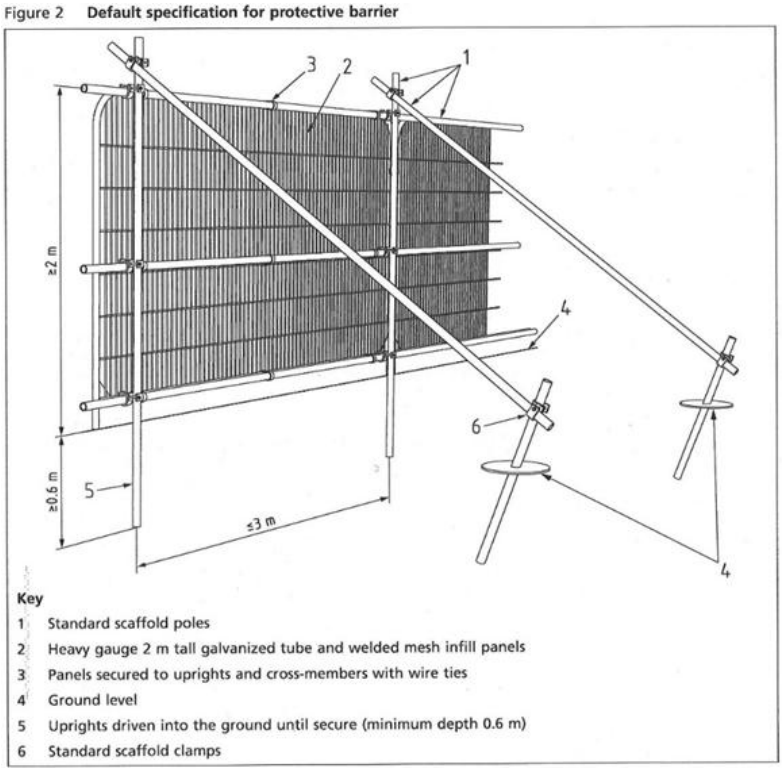
B1.17.4 Records of any visits will be kept in the site diary and as brief site report documents. If requested, details of site visits will be made available to the Local Planning Authority.

B1.17.5 Will non-compliance be observed during site visits, the ArbCoW will have the ability to halt work until the issues can be rectified, and the relevant persons informed.

B1.18 Suggested Tree Protection Specification

B1.18.1 Default Tree Protection Specifications (taken from pages 20-21 of BS5837:2012)

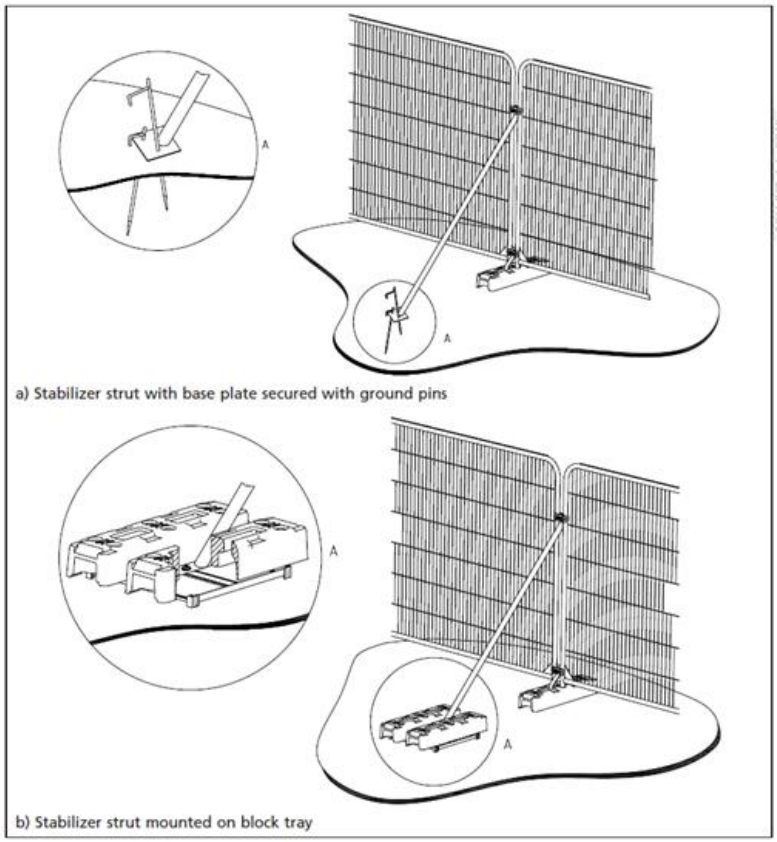
Figure 2 **Default specification for protective barrier**



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

Plate 2.2 Suggested Tree Protection Signage

ANNEX C. FIGURES