



CAS-03463-R2W9C2 - Kronospan Low Carbon CHP Facility

Supporting Document 7

Biodiversity Assessment Report

Prepared for



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DNS4-007



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Well House Barns, Chester Road, Bretton, Chester, CH4 0DH
1st Floor, Barfield House, Alderley Road, Wilmslow, SK9 1PL
Maling Exchange, Studio 307, Hoults Yard, Walker Road, Newcastle Upon Tyne, NE6 2HL

T: 0344 8700 007
enquiries@axis.co.uk
www.axis.co.uk

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1.0 INTRODUCTION

1.1 Aims and Objectives

- 1.1.1 This Biodiversity Assessment Report (BAR) (**DNS4-007**) sets out the ecological impacts of the Proposed Development on features of biodiversity value within the wider vicinity of the Site.
- 1.1.2 The setting of the Proposed Development within the curtilage of the operational Kronospan site means that direct site-based impacts are not relevant to the assessment. However, it is necessary to consider any potential off-site impacts, arising from emissions to air and water, and potential disturbance impacts including noise and lighting.
- 1.1.3 A key purpose of the BAR is to assess any ecological effects in relation to Welsh legislation and planning policy, in particular with respect to the requirement to achieve a net benefit for biodiversity in accordance with the Biodiversity and Resilience of Ecosystems Duty in Section 6 of Environment Act (Wales) 2016.
- 1.1.4 The BAR helps define the nature and magnitude of ecological enhancement measures required to achieve net benefit.
- 1.1.5 The BAR is informed by the following documents and should be read in conjunction with these:
- ES Chapter 5.0: Noise and Vibration
 - ES Chapter 6.0: Air Quality and Odour
 - ES Appendix 6F: Dispersion Modelling Results – Ecology
 - ES Appendix 6G: Baseline Habitat Condition Survey
 - ES Appendix 6H: Ecological Interpretation of Air Quality Assessment

2.0 SCOPE AND METHODOLOGY

2.1 Scope of Assessment

Scoping Process

- 2.1.1 The scope of assessment was initially defined by consideration of the nature of the development and the sensitivity of the surrounding landscape, coupled with the legal and policy requirements for assessment of impacts on biodiversity and ecosystem resilience in Wales. Based on these factors, a proposed scope of ecological assessment was set out, and included in the Environmental Impact Assessment (EIA) Scoping Report (**ES Appendix 1C**).
- 2.1.2 A key determinant of scope was the location of the Proposed Development on existing hardstanding areas within the active operational Kronospan site. This excluded any risk of direct impacts on flora and fauna from habitat loss or disturbance. The need for a site-based ecological assessment, or a separate Biodiversity chapter in the Environmental Statement (ES) could therefore be scoped out.
- 2.1.3 The focus of ecological assessment therefore shifts to consideration of potential off-site impacts. As the proposed Low Carbon CHP Facility involves combustion processes, potential air quality impacts were identified as likely to require consideration in the ecological assessment. A number of statutory and locally designated conservation sites occur in the wider vicinity of the Proposed Development; field surveys had already been undertaken to assess sensitivity to air quality impacts and reported in **ES Appendix 6G**. The Scoping Report therefore proposed an ecological assessment of air quality impacts, based on the dispersion and deposition modelling undertaken by Fichtner Consulting Engineers and reported in **ES Chapter 6.0 (Air Quality and Odour)** and supporting appendices.
- 2.1.4 Based on distance to sensitive features, and sensitivity of features of proximal sites, a Habitats Regulations Assessment (HRA) was not considered likely to be necessary; however, this would be determined following consideration of the assessment set out in **ES Chapter 6.0 (Air Quality and Odour)**, which included consideration of European conservation sites.



- 2.1.5 Following consultation responses from Wrexham County Borough Council (WCBC) and Natural Resources Wales (NRW), an EIA Scoping Direction¹ (**ES Appendix 1D**) issued by Planning and Environment Decisions Wales (PEDW) confirmed the acceptance of scoping out a separate Biodiversity chapter in the ES. Several additions and modifications to the scope were suggested and have been made to address consultee responses, including those by WCBC, Canal and Rivers Trust in Wales (Glandŵr Cymru), and PEDW. These comprise:
- Recognising that protected species are a material consideration in the application and assessing any potential impacts on them.
 - Addressing the need of the Proposed Development to achieve a net benefit for biodiversity.
 - Contacting other relevant bodies (e.g. Biological Records Centres) to acquire biological information and records relevant to the site and its surrounds.
 - Considering the impacts of noise on ecological receptors.
 - Consideration of the above in the form of a BAR.
- 2.1.6 Following modifications to the Proposed Development (see **Section 2.3, ES Chapter 2.0 – EIA Methodology**), PEDW issued an EIA Scoping Direction Addendum² (**ES Appendix 1E**) which requested that the BAR be included as an appendix to the Air Quality or Noise ES chapters. The BAR is presented as a DNS supporting document, with the relevant documents that inform it forming appendices to **ES Chapter 6.0 (Air Quality and Odour)** (see paragraph 1.1.5 of this document above).
- 2.1.7 It is important to note that the Scoping Report proposed excluding consideration of impacts on the water environment from the EIA, and this was accepted by PEDW. This is because discharges from the facility would be contained within the Site's existing process water system and would be treated within the onsite water treatment facility and discharged in accordance with the Environmental Permit. The Framework Construction Environmental Management Plan (CEMP) (**DNS4-003**)

¹ PCAC PEDW (2024). EIA Scoping Direction. DNS CAS-03463-R2W9C2. Kronospan Low Carbon CHP. 31/07/2024

² PCAC PEDW (2025). EIA Scoping Direction Addendum. DNS CAS-03463-R2W9C2. Kronospan Low Carbon CHP. 14/01/2025



includes measures to protect the water environment during the construction phase of the Proposed Development.

Zone of Influence

2.1.8 Consideration of relevant Zones of Influence (Zol) is important in the identification of possible indirect, off-site impacts on sensitive sites and/or species. Zols can be defined by the scale, duration and extent of likely impacts of the Proposed Development.

2.1.9 For point-source emissions to air, Natural Resources Wales (NRW) guidance defines the following radii for consideration of effects on sensitive ecological receptors:

- 2km from emission source for Sites of Special Scientific Interest (SSSI), locally designated sites and ancient woodlands.
- 10km from emission source for European conservation sites and Ramsar sites.
- For traffic emissions, a 200m buffer from roads is used to identify any potentially affected designated sites.

2.1.10 ZOIs of other potential impacts are summarised in **Table 2.1** below.

Table 2.1 – Relevant Zones of Influence for Ecological Assessment

Potential Effect	Distance	Rationale
Land-take	0m	Zol defined by planning application boundary, including any related works covered in application (e.g. grid connection, sewer/surface water connections)
Loss of functionally linked land	0m	As above; functionally linked land defined as land outside (usually) SPA and Ramsar sites, used by significant numbers of SPA and Ramsar site features (e.g. high tide roost sites close to estuaries)
Emissions to air - dust	50m	IAQM screening criteria ³ for dust emissions to ecological receptors - 50m from site boundary, and 50m from access roads within 500m of site
Emissions to air - stack emissions	10km	Defined by NRW and IAQM for combustion processes affecting European sites
Emissions to air - stack emissions	2km	Defined by NRW and IAQM for combustion processes affecting nationally and locally designated sites

³ Holman, C. et al (2014). *IAQM Guidance on the assessment of dust from demolition and construction*, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf.

Potential Effect	Distance	Rationale
Emissions to air – traffic emissions	200m from vehicle routes	Based on dispersion of NOx from vehicle emissions in accordance with IAQM advice ⁴ (paragraph 5.3.7)
Emissions to water	Variable	Sensitive receptors downstream of Proposed Development, potentially including marine sites
Noise	Variable	Where noise-sensitive receptors occur in proximity to the Site, this can be defined by results of noise modelling, e.g. 55dB(A) can be regarded as limit of potential effects on birds based on Waterbird Disturbance Mitigation Toolkit ⁵ ; 50dB(Z) or assessment of higher frequency noise may be appropriate to define potential effects on bats
Lighting	Variable	Defined by results of lighting assessment - 1 lux development contribution at receptor can be regarded as limit of potential effects for most sensitive bat species
Human disturbance - activity on site	Up to 650m	Depends on species occurring on site - value shown is a maximum disturbance distance for a sensitive bird species (curlew) based on NatureScot advice ⁶
Recreational disturbance	Variable	Where recreational disturbance is identified as a pressure or threat, buffer zone used is based on recreational travel research in local area

2.1.11 Note that some of the above potential impacts (e.g. land-take, potential for increased recreational disturbance) have already been scoped out of the current assessment.

2.2 Assessment Methodology

Data Search

2.2.1 The location and boundaries of statutory designated sites were found using the Data Map Wales viewer. Digital boundary shapefiles were also downloaded for use in the ecological constraints plan (**Figure 1**). Individual SSSI Citations were also downloaded via the NRW Designated Sites Search web page⁷, together with the more detailed information on features within the NRW 'Your Special Site and its Future' publications.

⁴ Holman, C. et al (2020). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.1, Institute of Air Quality Management, London.

⁵ Cutts, N, Hemingway, K and Spencer, J (2013). Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Institute of Estuarine & Coastal Studies (IECS) University of Hull. Version 3.2.

⁶ Goodship, N.M. and Furness, R.W. (2022) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283.

⁷ NRW Designated Sites Search. <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en>



- 2.2.2 A data search for locally designated sites, protected and priority species within 2km radius of the Proposed Development was undertaken by North Wales Environmental Information Service (Cofnod). A similar search was undertaken by Shropshire Ecological Data Network (SEDN) for sites and species within England. These included boundary data and (if available) individual site citations; the latter were reviewed to identify reasons for designation but are not reproduced in this report due to copyright/data supply restrictions.

Assessment of Site Sensitivity to Air Quality Impacts

- 2.2.3 See **Section 2.2, ES Appendix 6H** for details of the methodology for assessment of site sensitivity to air quality impacts. This was based on Air Pollution Information Service (APIS) guidance, using recommended critical loads and levels for features of statutory designated sites. Where no guidance was given by APIS (e.g. in the case of locally designated sites, or some features of statutory sites such as waxcap grasslands), appropriate critical levels and critical loads have been applied based on habitats present in the locally designated site, or the closest habitat analogue or supporting habitat for other features.
- 2.2.4 The results of the assessment of sensitivity to air quality impacts are set out in **Section 3.0, ES Appendix 6H**.

Assessment of Sensitivity to Noise and other Disturbance Impacts

- 2.2.5 With the exception of estuarine and coastal bird species, which are not relevant to the location of the Proposed Development, there are no standards or adopted guidance for assessment of sensitivity to noise impacts. The data search for protected and priority species identified fauna which could be expected to occur in proximity to the Proposed Development, while information on proximal habitats gave an indication of other fauna (e.g. woodland bird assemblage) which could also be expected to occur and could be considered as sensitive receptors for the purposes of the assessment.
- 2.2.6 Assessment of sensitivity to noise and other potential disturbance impacts (e.g. lighting) required reference to published scientific literature and commissioned research to define sensitivity and appropriate threshold values. Precautionary thresholds based on published data are set out in more detail prior to the assessment of noise and other disturbance impacts in **Section 4.7** below.



Assessment of Effect Magnitude and Significance

Effect Significance

- 2.2.7 CIEEM (2018⁸) define a significant ecological effect as “*an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area*”.
- 2.2.8 In terms of assessment of impacts on features of designated sites, a significant impact may be one which affects its favourable condition or conservation status, or which prevents or significantly delays the return to favourable condition.
- 2.2.9 In terms of Welsh legislation and planning policy (see **Section 3.2** below) a significant effect could be postulated as one which affects the resilience of ecosystems, as expressed by attributes such as their structure and functioning, connectivity and diversity.

Assessing Significance of Air Quality Impacts

- 2.2.10 See **Section 2.2, ES Appendix 6H** for a more detailed discussion of the assessment of effect magnitude and significance with respect to air quality impacts.

Assessing Significance of Noise and Disturbance Impacts

- 2.2.11 Assessment of the significance of any noise or other disturbance impacts requires consideration of the extent of impact, and conservation status of the species concerned. Significant impacts are likely to be those that affect sites or areas used for reproduction; those that affect habitat utilisation; and those that affect habitat connectivity.
- 2.2.12 European and Welsh protected species legislation are primarily formulated to address cases of direct disturbance (e.g. damage or destruction of resting places). However, there are circumstances where indirect impacts such as lighting could be deemed to be in breach of legislation; an example would be an increase in lighting levels on a bat roost site.

⁸ CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester



3.0 LEGISLATION AND PLANNING POLICY

3.1 Protection of European and Internationally Designated Sites

- 3.1.1 The protection afforded to European (Natura 2000 Network) nature conservation sites is provided by the Conservation of Natural Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations'). These include Special Areas of Conservation (SAC) such as the River Dee and Bala Lake. Planning Policy Wales (PPW)⁹ summarises the protection afforded to European sites and procedures for assessing the impacts of plans and projects in paragraph 6.4.29.

3.2 National Legislation and Planning Policy

Section 6 Duty

- 3.2.1 The Biodiversity and Resilience of Ecosystems Duty in Section 6 of Environment Act (Wales) 2016 has been implemented through PPW, which integrates considerations of biodiversity and ecosystem resilience throughout its policies.
- 3.2.2 The Section 6 Duty is explicitly referenced in PPW paragraph 6.4.5, which states:

“Planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity and improve, or enable the improvement, of the resilience of ecosystems. A net benefit for biodiversity is the concept that development should leave biodiversity and the resilience of ecosystems in a significantly better state than before, through securing immediate and long-term, measurable and demonstrable benefit, primarily on or immediately adjacent to the site. The step-wise approach outlined below is the means of demonstrating the steps which have been taken towards securing a net benefit for biodiversity. In doing so, planning authorities must also take account of and promote the resilience of ecosystems, in particular the following attributes, known as the DECCA Framework:

- i) diversity between and within ecosystems;*

⁹ Welsh Government (2024). Planning Policy Wales. Edition 12, February 2024.



- ii) the extent or scale of ecosystems;*
- iii) the condition of ecosystems including their structure and functioning;*
- iv) the connections between and within ecosystems; and*
- v) the adaptability of ecosystems including their ability to adapt to, resist and recover from a range of pressures likely to be placed on them through climate change for example.”*

3.2.3 The Section 6 duty is a holistic, rather than quantified approach to promoting ecosystem resilience.

3.2.4 In addition to the Section 6 Duty, PPW sets out the levels of protection applied to international, national, and locally designated sites. For SSSIs, the presumption is to avoid development likely to damage the notified features (paragraph 6.4.26). For locally designated sites such as SINC, a step-wise approach in accordance with DECCA principles to seek to ensure there is no reduction in overall conservation value is recommended (paragraph 6.4.33).

Technical Advice Note 5: Nature Conservation and Planning

3.2.5 PPW Technical Advice Note 5 (TAN 5)¹⁰ provides supporting guidance for planning purposes on biodiversity, protected species and habitats.

3.2.6 TAN 5 Section 4 sets out advice and procedures for delivering the protection and enhancement of nature conservation required by PPW within the development control process. Section 5 adds more detail to the levels of protection of international, national, and locally designated sites set out in PPW. Section 6 provides advice on development affecting protected and priority habitats and species. A series of Annexes provide further advice, including on procedures for assessing impacts on European conservation sites under the Habitats Regulations.

3.2.7 Although the Environment Act (Wales) 2016 and subsequent revisions of PPW have superseded some of the underpinning legislation and policies referred to in TAN 5, it

¹⁰ Welsh Assembly Government (2009). Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning. September 2009.



remains relevant as supporting guidance to PPW. Its key principles (TAN 5 Section 2.1) remain relevant, and have not been substantively altered since in terms of overall aim; these include the principles that the planning system should:

- integrate nature conservation into all planning decisions looking for development to deliver social, economic and environmental objectives together over time;
- ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions; and
- look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally.

Assessment against DECCA Framework

3.2.8 Assessment of development impacts against the DECCA framework requires consideration of whether the following attributes and their contribution to ecosystem resilience are likely to be affected (summarised below from more extensive explanation in PPW p.146-147):

- **Diversity** - preventing further loss of species and allowing recolonisation of former range where possible, thereby achieving greater resilience. Policy states development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity.
- **Extent** - maintaining existing habitats, creating and restoring green networks and linkages between habitats.
- **Condition** - ensuring planning decisions do not compromise the condition of ecosystems, consider both direct and wider impacts and benefits, and plan for long-term management of retained habitats.
- **Connectivity** - building functional habitat and ecological networks within and between ecosystems and across landscapes.
- **Adaptability to Change** - achieved through protection of the extent, condition and connectivity of habitats, features and ecological networks.

3.3 Local Planning Policy

Unitary Development Plan

3.3.1 Two policies in the Wrexham Unitary Development Plan (UDP) are of relevance in assessing the impacts of the Proposed Development.

3.3.2 Policy EC4 (Hedgerows, Trees and Woodland) states:

“Development proposals should provide for the conservation and management of hedgerows, trees, orchards, woodland, wildlife and other natural landscape and water features, and include new planting in order to enhance the character of the landscape and townscape. Development which results in the loss or significant damage to valuable trees, important hedgerows or ancient woodland sites will not be permitted.”

3.3.3 Policy EC6 (Biodiversity Conservation) states:

“Development either within or close to sites of biodiversity interest will only be permitted where it can be clearly demonstrated that the need for the development outweighs the need to safeguard the intrinsic nature conservation value of the site. Where such development is permitted, damage should be kept to a minimum, and compensatory measures should be provided. Measures to improve the biodiversity value of sites and enhance their natural conservation interest and landscape quality including the establishment of local nature reserves, will be supported.”

Local Development Plan

3.3.4 Three policies in the Wrexham Local Development Plan (LDP) are of relevance in assessing the impacts of the Proposed Development.

3.3.5 Policy NE1 (International and National Nature Conservation Designations) states:

“Development likely to significantly affect any protected site of international importance, either alone or in combination with other plans or projects, will be subject to a Habitat Regulations Assessment (HRA). Development will only be permitted where it is possible to ascertain no adverse effect on the integrity of the habitat or site or where there are Imperative Reasons of Overriding Public Interest and compensatory measures are secured.



Permission for development likely to impact the special features of a Nationally Designated Site will only be granted in exceptional circumstances where appropriate compensation can be provided.

Development likely to affect any protected species will only be permitted when there is no satisfactory alternative and if there is no detrimental impact to the maintenance of the population concerned at a favourable conservation status in its natural range. The proposals must adequately demonstrate that they are for the purposes of preserving public health or safety or reasons of overriding public interest.”

3.3.6 Policy NE2 (Local Designations for Nature Conservation and Geological Importance) states:

“Development which adversely affects the nature conservation and/or geological importance of locally designated sites, habitats and species will only be permitted in exceptional circumstances where it can be demonstrated that:

- i. There is no satisfactory alternative location for the development which avoids nature conservation impacts; and*
- ii. Compensation measures are designed to ensure that there is no reduction in the overall nature or geological conservation value of the site.”*

3.3.7 Policy NE3 (Trees, Woodlands and Hedgerows) states:

“Development will only be permitted where it does not cause unacceptable harm to trees, woodlands and hedgerows of significant public amenity, natural or cultural heritage value or those that provide important ecosystem services.

Development affecting all existing and new proposed woodlands should:

- i. Support proposals which assist in the respectful and appropriate use and protection of woodlands and boundary edges;*
- ii. Promote sustainable management to deliver multiple benefits; and*
- iii. Support the relevant aims and objectives of the Wrexham Tree & Woodland Strategy 2016-2026 and all subsequent amendments.*



Where adverse effects cannot justifiably be avoided and sustainable integration is not possible then adequate mitigation will be required. In such cases development should include proposals for the planting of new trees, woodlands, and hedgerows within the site, ensuring connectivity between proposed and existing green infrastructure.”

4.0 SENSITIVE ECOLOGICAL RECEPTORS

4.1 European and Internationally Designated Sites

European Designated Sites (Natura 2000 Sites)

4.1.1 SAC are sites of European conservation importance, originally designated under the EU Habitats Directive as part of the Natura 2000 network and now protected under the Conservation of Habitats and Species Regulations 2017 (as amended).

4.1.2 There are two SACs within the maximum 10km screening radius:

- River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC
- Berwyn and South Clwyd Mountains/Berwyn a Mynyddoedd de Clwyd SAC

4.1.3 Special Protection Areas (SPA) are sites of European importance for birds, originally designated under the EU Birds Directive and forming part of the Natura 2000 network and now protected under the Conservation of Habitats and Species Regulations 2017 (as amended).

4.1.4 There is one SPA within the maximum 10km screening radius:

- Berwyn SPA

River Dee and Bala Lake SAC

4.1.5 River Dee and Bala Lake SAC is a 1309 hectare site, extending from its source at Bala Lake/Llyn Tegid downstream to the boundary with Dee Estuary SSSI; it takes in several tributaries, comprising the Ceiriog, Meloch, Tryweryn, and Mynach.

4.1.6 The nearest boundary of the SAC is on the Ceiriog tributary, located approximately 1.05km south of the Proposed Development, with intervening roads and urban development. The nearest section of the main River Dee is located approximately 2.72km north, near Pentre.

4.1.7 The SAC is designated for the following qualifying features, including Habitats Directive Annex I habitats and Annex II species:



- Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* Vegetation
- Atlantic salmon *Salmo salar*
- Floating water-plantain *Luronium natans*

4.1.8 A number of other Annex II species are present in the SAC, but are not a primary reason for site selection:

- Sea lamprey *Petromyzon marinus*
- River lamprey *Lampetra planeri*
- Brook lamprey *Lampetra fluviatilis*
- Bullhead *Cottus gobio*
- European otter *Lutra lutra*

Berwyn and South Clwyd Mountains SAC

4.1.9 Berwyn and South Clwyd Mountains SAC is a 27,209 hectare site, comprising three discrete sites - Berwyn; Llandegla Moor; and Ruabon & Llantysilio Mountains & Minera.

4.1.10 The nearest boundary of the SAC is 6.7km northwest of the Proposed Development (the Ruabon/Llantysilio Mountains section). The nearest boundary of the Berwyn section is 8.9km west of the Proposed Development.

4.1.11 The SAC is an upland moorland site, consisting of a mixture of dry heath and blanket bog vegetation, with patches of transition mires and quaking bogs¹¹. It is designated as a SAC for the following qualifying features (Annex I habitats):

- European dry heaths; and
- Blanket bogs.

¹¹ Countryside Council for Wales (2008). Core Management Plan including Conservation Objectives for Berwyn and South Clwyd Mountains SAC and Berwyn SPA. Version v.23, 20/03/2008.



4.1.12 The following Annex I habitats occur within the site, but are not a primary reason for site selection:

- Semi-natural dry grasslands and scrublands on calcareous facies (*Festuco-Brometalia*).
- Transition mires and quaking bogs.
- Calcareous and calcschist screes of the montane to Alpine levels (*Thlaspieta rotundifolii*).
- Calcareous rocky slopes with chasmophytic vegetation.

Berwyn SPA

4.1.13 Berwyn SPA is a 24,268 hectare site, largely contiguous with Berwyn and South Clwyd Mountains SAC, but excluding the northern Ruabon/Llantysilio Mountains section. The nearest boundary of the SPA is 8.9km west of the Proposed Development.

4.1.14 The SPA is classified for the occurrence of the following Birds Directive Annex I breeding species:

- Hen harrier *Circus cyaneus*;
- Merlin *Falco columbarius*;
- Peregrine *Falco peregrinus*; and
- Red kite *Milvus milvus*.

4.2 Nationally Designated Sites

Sites of Special Scientific Interest

4.2.1 SSSI are sites of national conservation interest designated under the Wildlife and Countryside Act 1981 (as amended).

4.2.2 Two SSSIs are within 2km of the Proposed Development:

- Chirk Castle and Parkland SSSI.



- River Dee SSSI.

4.2.3 A third site, Nant-y-Belan and Prynella Woods SSSI is over 3km northeast of the Proposed Development but is considered in the assessment because of the sensitivity of habitats and potential for air quality impacts.

Chirk Castle and Parkland SSSI

4.2.4 Chirk Castle and Parkland SSSI is a 308.4ha site, located 0.5km west of the Proposed Development.

4.2.5 The SSSI was notified for the following features:

- Veteran trees;
- Saproxylic (dead-wood) invertebrates;
- Lesser horseshoe bats; and
- Grassland fungi (waxcap and other grassland fungi).

River Dee SSSI

4.2.6 River Dee SSSI is a 1489.8 hectare site, largely contiguous with the River Dee SAC in the area of the Proposed Development and including tributaries such as the Ceiriog.

4.2.7 The SSSI was notified for the following features:

- Fish (salmon, bullhead, brook lamprey, river lamprey, sea lamprey);
- Otter;
- Aquatic and shingle-dwelling invertebrates (club-tailed dragonfly, the stonefly *Isogenus nubecula*, and the weevil *Baris lepidii*);
- Floating water-plantain;
- River habitat types;
- Saltmarsh transition habitats;
- Vascular plants (slender hare's-ear, sea barley and hard-grass);
- Geology: natural exposures of Carboniferous rocks at Dee Bridge; and



- Geology: fluvial landforms and processes at Rhewl, and between Holt and Worthenbury.

Nant-y-Belan and Prynella Woods SSSI

- 4.2.8 Nant-y-Belan and Prynella Woods SSSI is a 35 hectare site, located on the north bank of the River Dee, just over 3.0km northeast of the Proposed Development.
- 4.2.9 The SSSI was notified for the presence of semi-natural broadleaved woodland habitat, comprising ash and oak-dominated woodland.

4.3 Non-statutory Locally Designated Sites

- 4.3.1 There are three non-statutory Local Wildlife Sites (LWS) within the 2km screening radius:
- Canal Wood.
 - Barracks Field.
 - Pentre Wood.

Canal Wood LWS

- 4.3.2 Canal Wood LWS is located to the west of the Kronospan site, approximately 160m from the Proposed Development at its closest point and separated from it by the rail line. It is a 13.4 hectare site, comprising semi-natural broadleaved woodland either side of the Llangollen Canal. The Site Citation describes it as having a sycamore-dominated canopy with abundant ash, and frequent sessile oak and birch. In the understorey hawthorn is frequent with hazel, elder and elm. The ground flora comprises dog's mercury, nettles and tufted hair-grass with wood melick, bluebell and primrose also occurring.

Barracks Field LWS

- 4.3.3 Barracks Field LWS is a 0.8 hectare grassland site located approximately 1.8km northeast of the Proposed Development. It is a semi-improved neutral grassland site, described in the Site Citation as a tall coarse grassland dominated by cock's-



foot with abundant tall oat grass and scattered gorse scrub. Black knapweed and nettles are described as frequent.

Pentre Wood LWS

- 4.3.4 Pentre Wood LWS is located approximately 1.55km southwest of the Proposed Development. It is located within Shropshire, England, on the right bank of the Ceiriog River. It is a 4.86 hectare ancient woodland site; no further details of reasons for designation were available from the local biological records centre.

4.4 Ancient Woodlands

- 4.4.1 A number of ancient woodland sites are located within the 2km screening radius, as illustrated by **Figure 2**. These include a number of woodlands within Chirk Castle SSSI; Canal Wood and Pentre Wood LWSs; and a number of other woodlands in the Ceiriog and Dee valleys.

4.5 Protected Species Records

Introduction

- 4.5.1 The data search from Cofnod generated a written report listing all records, and an online GIS plan with searchable point data in the online eMapper application. To comply with copyright and confidentiality restrictions, these are not reproduced in full in this document but are summarised and described below where relevant to the assessment.
- 4.5.2 For the purposes of the assessment, protected species are defined as those listed under Schedules 1, 5 or 8 of the Wildlife and Countryside Act 1981 (as amended), and those species protected under the Habitats Regulations 2017 due to being listed under Annex II or Annex IVa of the Habitats Directive. Badgers are also included due to their protection under the Protection of Badgers Act 1992.

Bats

- 4.5.3 The closest bat records are two Daubenton's bat (*Myotis daubentoni*) records, and an unidentified bat species from 2021 along the canal within Canal Wood, around 0.32km southwest of the Proposed Development.



- 4.5.4 There are multiple bat records from Chirk Castle SSSI, including a number from Mynattyn Wood on the closest (eastern) edge of the SSSI, between 0.49 - 0.70km west of the Proposed Development, mostly dating from 2009. These comprise the following species:
- lesser horseshoe bat *Rhinolophus hipposideros*;
 - soprano pipistrelle *Pipistrellus pygmaeus*;
 - common pipistrelle *Pipistrellus pipistrellus*; and
 - noctule *Nyctalus noctula*.
- 4.5.5 There are also soprano and common pipistrelle records from Llwyn-y-Cil on the eastern boundary of the SSSI, between 0.49 - 0.71km west and southwest of the Proposed Development.
- 4.5.6 There are multiple bat records of the above species further west in Chirk Castle SSSI, which is notified for the presence of breeding lesser horseshoe bats. Other species recorded in the SSSI include brown long-eared bat *Plecotus auritus* (2003, Chirk Castle Tower, 1.6km west) and Natterer's bat *Myotis nattereri* (2009, Old Deer Park Wood, 1.14km southwest).
- 4.5.7 Biological Records Centre data is dependent on survey effort and submission of data and does not constitute a comprehensive record of species presence. Given reasonably good habitat continuity between Chirk Castle and Canal Wood (hedgerows and woodlands with no significant roads or built development) a precautionary assumption could be made that all the above species could occur in or around Canal Wood on the western edge of the Proposed Development.

Otter

- 4.5.8 There are two records of otter *Lutra lutra* in the Cofnod data from 2003-2014 located 0.7 - 0.8km from the Proposed Development. One of these is localised to the canal south of the tunnel, while the other could relate to the River Ceiriog. It is reasonable to assume that otters could occur in both habitats, although disturbance by boat traffic may limit utilisation of the canal.



- 4.5.9 The Shropshire data includes a number of otter records from 2006-2013, located in the Chirk Bank - Gledrid area approximately 1.2 - 1.97km from the Proposed Development. These comprise records on both the River Ceiriog and the Llangollen Canal.

Water Vole

- 4.5.10 There are a number of records of water vole from the Llangollen Canal from 1996-2004, with a single later record in 2009, located 0.5 - 2.0km from the Proposed Development. Given the population decline and range contraction of this species, it is uncertain whether they would still occur in this location. However, the Shropshire data includes records from 2015 on the Llangollen Canal near Gledrid, approximately 1.97km southeast of the Proposed Development, suggesting a higher possibility of continued presence.

Badger

- 4.5.11 The nearest badger records are within Chirk Castle SSSI, at a location over 0.75km from the Proposed Development. Based on habitat suitability and connectivity, it is reasonable to assume that badgers could occur in and around Canal Wood to the west of the Proposed Development.
- 4.5.12 There are also badger records in the Shropshire data at Pentre Wood and Chirk Bank, approximately 1.5km from the Proposed Development and separated from it by the River Ceiriog and urban development.

Birds

- 4.5.13 Bird species with special protection against disturbance (i.e. those listed on Schedule 1 of the Wildlife and Countryside Act 1981) recorded in the data search include kingfisher (*Alcedo atthis*), a species associated with river and canal habitats, and peregrine falcon (*Falco peregrinus*), a wide-ranging species which breeds on cliffs and tall structures. No Schedule 1 species are known to occur in close proximity to the Site; although the canal does provide potentially suitable habitat for foraging kingfisher, disturbance by boat traffic may limit utilisation of this site.

Reptiles

- 4.5.14 Two of the widespread reptile species with partial protection under Schedule 5 of the Wildlife and Countryside Act 1981 were recorded in the data search.
- 4.5.15 There is a single record of slow-worm *Anguis fragilis* from 2021, on the southern boundary of the settlement of Chirk, 0.91km southeast of the Proposed Development. It is likely that this species will occur in other suitable habitats in the wider vicinity, including potentially Canal Wood.
- 4.5.16 There are several records of grass snake *Natrix helvetica* between 1.3km - 1.7km from the Proposed Development, comprising two locations within Chirk Castle SSSI, and one to the northeast of the settlement of Chirk. It is possible that this species could occur in parts of Canal Wood, such as the wet alder woodland at the north end of the LWS.

Great Crested Newt

- 4.5.17 The closest record of great crested newt (GCN) *Triturus cristatus* is from 2007, located in a caravan park 0.78km southwest of the Proposed Development, and separated from it by a road and railway.
- 4.5.18 Further records dating from 2008 are located in a field pond to the east of Chirk, 1.1km from the Proposed Development and separated from it by industrial and urban development, and roads.
- 4.5.19 There are also GCN records from a pond at Chirk Castle dating from 2008, located 1.4km west of the Proposed Development.
- 4.5.20 Based on these records, and the absence of potential breeding ponds visible on mapping or aerial photography within 500m, there is no evidence that GCN would potentially occur in close proximity of the Proposed Development.

Protected Flora

- 4.5.21 There are historic (1954 -1959) records from the Cofnod and Shropshire data of floating water-plantain *Luronium natans* on the Llangollen Canal at Chirk, a species listed on Schedule 8 of the Wildlife and Countryside Act 1981. This was from a period when the canal was closed to navigation, and it is very unlikely indeed to still



occur in the main canal. There is a more recent (1987) record from a lagoon area adjoining the canal, approximately 1.5km north of the Proposed Development.

4.6 Priority Species Records

Introduction

4.6.1 For the purposes of the assessment, priority species are defined as those listed under Section 7 of the Environment (Wales) Act 2017. Priority species which are protected under other legislation and addressed above are not considered further here.

4.6.2 The 2km data search returned a large number of records, including many Lepidoptera (butterflies and moths) species from Chirk Castle and other sites. The following summary focuses on proximal records to the Proposed Development.

Mammals

4.6.3 The nearest hedgehog *Erinaceus europaeus* record is from 2022, from the industrial site (confectionary factory) to the south of Kronospan, approximately 0.3km southeast of the Proposed Development. A further record is located within the urban area of Chirk approximately 0.56km east of the Proposed Development. These records confirm that hedgehogs are very likely to occur in and around the settlement of Chirk.

4.6.4 The nearest brown hare *Lepus europaeus* record is from 1998, within Chirk Castle SSSI. There is little suitable habitat for hare in close proximity to the Proposed Development.

4.6.5 The nearest polecat *Mustela putorius* record are two 2015 sightings from the B4500 road, around 0.85km south of the Proposed Development, on the south-western edge of Chirk. Based on location, habitat connectivity and suitability, it is possible that polecat could occur in Canal Wood to the west of the Proposed Development.

Invertebrates

4.6.6 A number of priority species of Lepidoptera (butterflies and moths) have been recorded in the Cofnod data. The majority of these are from Chirk Castle and

Parkland SSSI. Butterfly records include grayling *Hipparchia semele*, white-letter hairstreak *Satyrion w-album* and small heath *Coenonympha pamphilus*.

Flora - Priority Species

- 4.6.7 Two priority species of lichen have been recorded in the Cofnod data. *Lecanora sublivescens* was recorded in 2017 at Chirk Castle SSSI at a location approximately 1.9km west of the Proposed Development. This was recorded as an epiphyte at the base of a sessile oak *Quercus petraea* in an open location. The key area for this species is the Wye Valley in Wales and Herefordshire, where the population is regarded as internationally important. It is regarded as sensitive to eutrophication¹².
- 4.6.8 There is a historic (pre-1900) record of speckled script-lichen *Schismatomma ricasolii* from Chirk Castle. The only recent (post 2000) records are from west Wales¹³, so it is very doubtful whether it still occurs in the search area.

4.7 Sensitivity to Potential Ecological Impacts

Air Quality Impacts

- 4.7.1 See **Section 3.0, ES Appendix 6H** for a detailed assessment of the sensitivity of sites and their features to air quality impacts.

Noise Impacts

Bats

- 4.7.2 Current guidance on the mitigation of development impacts on bats (CIEEM's *UK Bat Mitigation Guidelines*¹⁴) states that 'the study of noise on bats is in its infancy' (paragraph 7.3.22), but that tolerance to noise and requirements for mitigation will vary between species.
- 4.7.3 The guidance states that baseline conditions define levels of tolerance (for bat species utilising the habitat), but caution that it likely to be over-precautionary to

¹² <https://wales-lichens.org.uk/species-account/lecanora-sublivescens> (accessed 20/02/2025)

¹³ <https://wales-lichens.org.uk/species-account/schismatomma-graphidioides> (accessed 20-02/2025)

¹⁴ Reason, P.F. and Wray, S. (2023). *UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Version 1.1.* Chartered Institute of Ecology and Environmental Management, Ampfield.



- apply the distance at which noise impacts attenuate to background levels as an effect threshold. The guidance does not specify what sound pressure level (SPL) or frequency range may constitute a significant effect on the most sensitive bat species.
- 4.7.4 It should be noted that bat hearing range is not comparable to the human A-weighted frequency spectrum used to characterise noise impacts and extends into much higher frequency for echolocation and prey detection. It has therefore long been considered that higher frequencies (e.g. over 20 - 30kHz) are more likely to disturb bats, particularly given that bats are observed roosting in environments subject to high SPLs of lower, human-audible frequencies (e.g. under road bridges, church belfrys).
- 4.7.5 There is experimental evidence of avoidance of noisy environments by foraging bats. Schaub *et al* (2008)¹⁵ used a European species, greater mouse-eared bat (*Myotis myotis*) in flight cages with mealworm prey. They showed avoidance of traffic noise and broadband noise at 80dB SPL, but did not test the SPL which would not elicit a significant avoidance response (i.e. the 'effect level'). The highest degree of avoidance was demonstrated with broadband noise; the authors attributed this to the higher frequencies and continuous nature of broadband noise, which interfered with prey detection.
- 4.7.6 Allen *et al* (2021)¹⁶ used captive American pallid bats (*Antrozous pallidus*) subject to noise treatments at 50dB(Z) SPL 30cm from prey location. They used two frequency ranges, one overlapping the spectrum of the prey (4-14kHz), and one non-overlapping (14-24kHz) but lower than the minimum frequency of pallid bat sonar (30kHz). They found a significant reduction in foraging activity in the two noise treatments, but no difference between overlapping and non-overlapping frequency spectra. From this they concluded that bats could be deterred from foraging through distraction, rather than masking of the acoustic cues of prey species.
- 4.7.7 Both studies used species which glean prey from surfaces (as opposed to catching prey in flight), with an inference that they place greater reliance on listening for the

¹⁵ Schaub, A., Ostwald, J., & Siemers, B.M. (2008). Foraging bats avoid noise. *Journal of Experimental Biology*, **211**, 3174-3180.

¹⁶ Allen, L.C., Hristov, N.I., Rubin, J.J., Lightsey, J.T. & Barber, J.R. (2021). Noise distracts foraging bats. *Proceedings of the Royal Society B*, **288**. <https://royalsocietypublishing.org/doi/10.1098/rspb.2020.2689>



sounds of prey moving, rather than echolocation of moving prey in the air. Such species are more likely to be hampered by the distracting or masking effects of sounds below their echolocation frequency. The Allen study suggests that this could occur at relatively low SPLs of 50dB(Z), although it should be cautioned that the frequencies used in the experiment were above most of the range of the A-weighting used for human noise perception, and therefore not comparable to the measurement of noise from the Proposed Development.

- 4.7.8 In the vicinity of the Proposed Development, two bat species in particular forage by gleaning prey from surfaces and could be regarded as potentially more sensitive to noise impacts - lesser horseshoe bat, and brown long-eared bat. Of these, lesser horseshoe bat is of highest conservation concern and is one of relatively few species listed on Annex II of the Habitats Directive. As explained above, application of a 50dB(A) value as a threshold for potential effects would likely be over-precautionary, and it would be more appropriate to consider whether any new noise sources had a significant higher frequency component. In addition, following advice in the *Bat Mitigation Guidelines*, the magnitude of increase above baseline could be regarded as a relevant measure of potential effect.
- 4.7.9 It is also important to consider the extent of habitat affected by any noise impacts, and its potential value both as foraging habitat. In a local context the sheltered, humid woodland along the canal corridor is likely to represent the highest quality habitat for both foraging and commuting bats, although both eastern and western woodland edges will also be used.

Birds

- 4.7.10 Canal Wood LWS is not designated for its avifauna, although the woodland breeding bird assemblage could be regarded as an integral attribute of the site, contributing to its biodiversity value. An increase in noise and disturbance, sufficient to impact on utilisation of the LWS by woodland breeding birds, could therefore be regarded as a significant impact on the site's biodiversity value, requiring mitigation in accordance with the Regulation 6 Duty.

- 4.7.11 Unlike bats, the hearing frequency range for birds is comparable to that of humans; birds have a slightly narrower range and higher hearing thresholds¹⁷, but with considerable overlap of the most sensitive frequencies. It is therefore both acceptable and slightly precautionary to apply the A-weighting used in human noise assessments to consider potential impacts on birds.
- 4.7.12 Guidance on the characterisation of effect thresholds and mitigation of noise impacts on birds in UK is largely focussed on birds of estuarine habitats¹⁸; there is no published guidance on noise sensitivity for birds of scrub and woodland habitats, which are dominated by passerine (songbird) species. It is therefore necessary to examine published research on the subject to determine whether the relevant species are likely to be sensitive, and if possible, to derive an appropriate threshold value.
- 4.7.13 There is a significant scientific literature on the subject, mostly addressing potential effects of road noise on breeding birds, although some have studied industrial noise (e.g. from oil extraction infrastructure in forest habitats). Studies have found effects on population density¹⁹, clutch size/breeding success²⁰, population age structure²¹, and territorial defence²².
- 4.7.14 There is well-documented evidence of birds altering the minimum frequency²³ and amplitude²⁴ of their song in noisy environments, avoiding masking by (e.g.) lower pitched traffic noise. Song frequency, and the ability to raise amplitude and frequency levels varies between species, leading to varying sensitivity to noise

¹⁷ Dooling, R.J. & Popper, R.N. (2007). *The Effects of Highway Noise on Birds*. California Department of Transportation. <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/bio-effects-hwy-noise-birds-100707-a11y.pdf%EF%BB%BF>

¹⁸ Cutts, N, Hemingway, K and Spencer, J (2013). *Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects*. Institute of Estuarine & Coastal Studies (IECS) University of Hull. Version 3.2.

¹⁹ Reijnen, R., Foppen, R., Braak, C.T. & Thissen, J. (1995) *The effects of car traffic on breeding bird populations in woodland. III Reduction of density in relation to the proximity of main roads*. *Journal of Applied Ecology*, **32**, 187– 202

²⁰ Halfwerk, W., Holleman, L.J.M., Lessells, C.M. and Slabbekoorn, H. (2011). *Negative impact of traffic noise on avian reproductive success*. *Journal of Applied Ecology*, **48**, 210–219

²¹ Habib, L., Bayne, E.M. & Boutin, S. (2007). *Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla**. *Journal of Applied Ecology*, **44**, 176–184

²² Kleist, N.J., Guralnik, R.P., Cruz, A., & Francis, C.. (2016). *Anthropogenic noise weakens territorial response to intruder's songs*. *Ecosphere*, **7** (3) 1-12

²³ Slabekoorn H. & Ripmeester, E.A.P. (2007). *Birdsong and anthropogenic noise: implications and applications for conservation*. *Molecular Ecology*. doi: 10.1111/j.1365-294X.2007.03487.x

²⁴ Brumm, H. (2004). *The impact of environmental noise on song amplitude in a territorial bird*. *Journal of Animal Ecology*, **73**, 434–440



impacts between species²⁵. This in turn leads to changes in bird community structure as noise levels increase, with more tolerant species increasing in relative abundance²⁶.

- 4.7.15 The scientific literature provides good evidence that acoustic masking is a key mechanism for negative effects of noise on the woodland bird assemblage. There is also evidence for a greater effect on species with lower frequency songs and calls. However, there are no clear effect thresholds which can be expressed in terms of SPLs, other than a tentative implication from some studies that mean values below 50dB(A) are unlikely to have a significant effect on species abundance or diversity.
- 4.7.16 It should be further noted that when the implied impact mechanism is acoustic masking, it is appropriate to apply the dB(A)_{eq} value, rather than the dB(A)_{max} value which would be more appropriate for wetland birds. In the latter case, displacement from a habitat through disturbance by sudden noise is the key potential impact mechanism.
- 4.7.17 In addition, the increase above background could be applied to define a potential impact threshold, in a similar manner to noise impact assessment on human populations. Given the similarity of bird hearing sensitivity across the human audible frequency range, it is reasonable to apply the 3dB(A) value (doubling of sound pressure) to define a likely perceptible increase in noise.

²⁵ Francis, C.D., Ortega, C.P., & Cruz, A. (2011). Noise Pollution Filters Bird Communities Based on Vocal Frequency. *PLoS ONE* 6(11): e27052. doi:10.1371/journal.pone.0027052

²⁶ Polak, M., Więcek, J., Kucharczyk, M. & Orzechowski, R. (2013). The effect of road traffic on a breeding community of woodland birds. *European Journal of Forest Research*. 132. 10.1007/s10342-013-0732-z



5.0 PREDICTED ECOLOGICAL EFFECTS – AIR QUALITY

5.1 Summary of Air Quality Effects

Summary of AQA Interpretation

- 5.1.1 The following summary of impacts and effects is taken from the Ecological Interpretation of Air Quality Assessment (**ES Appendix 6H**), which should be referred to for further details of the Air Quality Assessment results and assessment. **ES Chapter 6.0 (Air Quality and Odour)** (including its appendices) should be referred to for details of the dispersion and deposition modelling which informs and underpins the ecological assessment.
- 5.1.2 Note that all impacts and predicted effects are based on the in-combination impact of the permitted Oriented Strand Board (OSB) manufacturing facility with the Proposed Development (see **ES Appendix 6C**). Other permitted and operational emission sources within the Site are quantified in the Air Quality Assessment, but (unlike the OSB facility) form part of baseline conditions.

Predicted Effects on European Sites

- 5.1.3 No likely significant effect is predicted on any European designated sites as a consequence of emissions from the Proposed Development, alone or in combination with the currently permitted OSB facility.

Predicted Effects on SSSIs

- 5.1.4 No significant effects are predicted at River Dee SSSI, or Nant y Belan and Prynella Woods SSSI. At the latter site, the 1% screening threshold for nitrogen deposition is exceeded for the most sensitive feature present on the site, but it is located outside the predicted area of potential impact.
- 5.1.5 At Chirk Castle SSSI, small magnitude exceedance of screening thresholds are predicted for ammonia levels, nitrogen and acid deposition for the veteran trees feature, using the critical loads and levels appropriate for broadleaved (mesic) woodland habitat. This is not predicted to result in a measurable ecological effect on woodland habitats, or to constitute an operation likely to damage the special interest of the SSSI. However, it would be an appropriate focus of mitigation measures, in accordance with policy and legislative requirements.



- 5.1.6 Values for nitrogen deposition at Chirk Castle SSSI reach the 1% screening threshold for the waxcap grassland notified feature, if the precautionary critical load for lowland hay meadows is applied to this feature. With reference to IAQM advice on interpretation of results very close to the screening threshold, it can be safely concluded that this does not constitute an operation likely to damage the special interest of the SSSI.

Predicted Effects on Locally Designated Sites

- 5.1.7 No impacts are predicted on Pentre Wood LWS or Barracks Field LWS, whilst impacts on most ancient woodlands within the search area are predicated on the presence of the most sensitive acid oakwood habitat with a 10kg N/ha/yr critical load for nitrogen deposition.
- 5.1.8 At Canal Wood LWS, a low magnitude impact of nitrogen and acid deposition in excess of the 1% screening threshold is predicted at the northern end of the woodland only. Part of this area supports an alder - stinging nettle community which is naturally eutrophic and not regarded as sensitive to atmospheric nitrogen deposition. The remainder is a mesic woodland community is not currently showing significant signs of eutrophication, despite background levels exceeding critical loads; potential effects may be moderated by the intact woodland canopy (see **Section 7.2** below for further discussion of why this may be occurring).
- 5.1.9 Predicted impacts on Canal Wood LWS are not considered likely to result in an unacceptable level of harm; however, it would be a suitable site for mitigation and enhancement measures aimed at achieving a higher level of resilience, in accordance with policy and legislative requirements.
- 5.1.10 A number of ancient woodland sites are predicted to experience low magnitude exceedances of the 1% screening threshold for ammonia, nitrogen deposition and acid deposition. These are not considered sufficient to result in an unacceptable level of harm. Mitigation measures aimed at ancient woodlands in Chirk Castle SSSI, and Canal Wood LWS would be an adequate and proportionate response to the predicted impacts on the local ancient woodland resource.

6.0 PREDICTED ECOLOGICAL EFFECTS – NOISE AND DISTURBANCE

6.1 Summary of Noise Impacts

- 6.1.1 Background noise levels in Canal Wood LWS were measured in March 2025 at an average of 65dB(A)_{eq} in the east side of the wood, and 57dB(A)_{eq} in the west side of the wood (see **Table 5.22, ES Chapter 5.0 (Noise and Vibration)**). Average daytime and night-time dB(A)_{max} levels ranged from 72 - 76dB(A). These are above values where some ecological effects may be anticipated, including a degree of habituation. Sensitivity to additional noise sources is therefore likely to be lower.
- 6.1.2 Noise levels as a consequence of the Proposed Development are not predicted to exceed 60dB(A)_{eq} during the construction phase (see **Table 5.24, ES Chapter 5.0 (Noise and Vibration)**) or 53dB(A)_{eq} during the operational phase (see **Table 5.27, ES Chapter 5.0 (Noise and Vibration)**). With the implementation of further mitigation measures (outlined in **ES Chapter 5.0 (Noise and Vibration)**), operational phase noise would not be predicted to exceed 53dB(A)_{eq} at the east side of the wood, and 48dB(A)_{eq} at the west side (see **Table 5.31, ES Chapter 5.0 (Noise and Vibration)**).
- 6.1.3 No increases in noise levels above +3dB(A)_{eq} are predicted at the nearest sensitive receptor during the construction and operational phases of the Proposed Development.
- 6.1.4 When cumulative effects of the Proposed Development in combination with other Kronospan developments are considered (see **Table 5.33, ES Chapter 5.0 (Noise and Vibration)**), the maximum increase in noise level is +1dB(A)_{eq}. This is not significant. When background noise levels are considered, the change is lower (+0.2-0.4dB(A)_{eq}; see **Table 5.34, ES Chapter 5.0 (Noise and Vibration)**).
- 6.1.5 No impact is therefore likely on the suitability of the LWS to support noise-sensitive species, including the woodland breeding bird assemblage, and foraging bats.

6.2 Summary of Lighting Impacts

- 6.2.1 With the exception of some high-level aviation lights on the stack, no increase in lighting is predicted as a consequence of the Proposed Development. There will be



no increase in light spillage at the boundary of the Site, and therefore no impact on light-sensitive species such as foraging bats.

6.3 Other Potential Disturbance Impacts

Human Disturbance

- 6.3.1 Construction and operational phase activities would take place within the curtilage of the Kronospan site, and no additional human activity is likely as a consequence of the Proposed Development which might impact on disturbance-sensitive species utilising nearby habitats.
- 6.3.2 No increase in recreational disturbance is likely as a consequence of the Proposed Development.

7.0 MITIGATION AND ENHANCEMENT OPTIONS AND PROPOSALS

7.1 Incorporated Mitigation – Emission Abatement

- 7.1.1 The proposed Low Carbon CHP Facility includes a number of abatement measures which will reduce emissions of nitrogenous pollutants below the levels required by current legislation (see **paragraph 1.1.6, ES Appendix 6C**).
- 7.1.2 These measures have the effect of reducing the spatial extent and potential significance of any exceedances of screening thresholds. In particular, they avoid any impacts on European sites, and on Nant y Belan and Prynella Woods SSSI, whilst reducing the magnitude and extent of impact on other sites, including Chirk Castle SSSI and Canal Wood LWS.

7.2 Additional Mitigation Requirements

Mitigation Priorities

- 7.2.1 As noted above, the magnitude and extent of air quality impacts is not assessed as likely to damage the special features of Chirk Castle SSSI or result in an unacceptable level of harm to Canal Wood LWS. However, as the Proposed Development (in combination with the OBC facility) would result in low magnitude impacts above screening thresholds over part of both sites, mitigation measures targeted at both sites are recommended.
- 7.2.2 The priorities for mitigation should align with legislative and policy objectives, in accordance with the DECCA framework, with the over-arching aim of maintaining **ecosystem resilience**. To go beyond any requirement for mitigation, and deliver a net gain for biodiversity, these measures should also include an element of enhancement, improving ecosystem resilience relative to current baseline conditions.
- 7.2.3 In the specific context of Chirk Castle SSSI and Canal Wood LWS, measures should be targeted at maintaining and enhancing the integrity and resilience of the woodland habitat feature. The primary aim of mitigation measures should be to protect against impacts of atmospheric nutrient pollution. However, enhancement measures could be aimed at delivering wider benefits within the DECCA framework, such as improved habitat connectivity.



Potential Nutrient Nitrogen Mitigation Options

Woodland Habitat Mitigation

- 7.2.4 There are few potential management options in woodland habitats which are regarded as effective in addressing the impacts of excess nitrogen deposition. A recent review by the James Hutton Institute in Scotland²⁷ noted that burning and thinning (to remove nitrogen-containing plant biomass), and liming (to reduce acidification impacts) were either ineffective or had negative effects (increasing nitrogen supply; decreasing plant diversity). The only treatment they cited with a positive effect on reducing nitrogen supply was the addition of a carbon source.
- 7.2.5 The scientific evidence for carbon addition as possible mitigation was an American study²⁸ which included experimental addition of a sawdust/glucose mixture to reduce nitrogen supply, as a means of limiting growth of an invasive N-demanding shrub (Japanese barberry, *Berberis thunbergii*). This is not currently recommended as a wider-scale mitigation method, but it could be a possible option to test, perhaps in areas where the woodland ground flora is currently dominated by brambles or nettles and other tall herbs.
- 7.2.6 The former Countryside Council for Wales (CCW; now NRW) also produced guidance on managing habitats to reduce impacts of nitrogen deposition²⁹. This indicated that grazing and browsing (by deer) could be beneficial in mitigating some of the effects of excess nitrogen from the woodland (e.g. through grazing brambles) and could reduce nutrient cycling through reducing the quantity and quality of litter returned to the soil. Based on these recommendations, re-introduction of light grazing by cattle or pigs may be beneficial but would need to be carefully monitored to avoid damage to the woodland ground flora. It may also not be practical in

²⁷ Britton, A.J., Fielding, D.A. & Pakeman, R.J. (2023) Nitrogen mitigation: A review of nitrogen deposition impacts and mitigation potential in Scottish semi-natural ecosystems. The James Hutton Institute, Aberdeen. Zenodo. DOI: 10.5281/zenodo.7755784

²⁸ Cassidy TM, Fownes JH, Harrington RA. (2004). Nitrogen limits an invasive perennial shrub in forest understory. *Biological Invasions* 6(1): 113-121.

²⁹ Stevens, C., Jones, L., Rowe, E., Dale, S., Payne, R., Hall, J., Evans, C., Caporn, S., Sheppard, L., Menichino, N., Emmett, B. (2013). Review of the effectiveness of on-site habitat management to reduce atmospheric nitrogen deposition impacts on terrestrial habitats. CCW Science Series Report No: 1037 (part A), 186pp, CCW, Bangor



woodlands with public access, including Canal Wood LWS, and most of the Chirk Castle SSSI woodlands.

- 7.2.7 The CCW report also describes the results of experiments in Poland and Germany that suggest leaf litter removal by raking could remove significant quantities of nitrogen from the system, equivalent to up to 75kg N/ha/yr. This is not a management method normally practised in Welsh woodlands and may be difficult and costly to implement in practice on a large enough scale, especially on steep-sided sites such as Canal Wood. It may also exacerbate any acidification effects by removal of base cations from the system and is likely to impact on the decomposer community (e.g. soil invertebrates, fungi) which are dependent on leaf-fall.
- 7.2.8 There is some evidence that maintaining continuous canopy cover in a woodland habitat may offset the potential effects of excess nitrogen deposition (see **Section 4.2.11, ES Appendix 6H**). The attenuation of light by a woodland canopy in leaf represents an environmental stress which the woodland ground flora are adapted to either by avoidance (growing in early spring before canopy closure) or shade-tolerance. Neither of these strategies allow for full exploitation of excess nitrogen; however, when the canopy is opened up, competitive, light-demanding species such as stinging nettles and brambles are able to predominate.
- 7.2.9 Woodland management strategies should therefore seek to maintain a closed canopy, avoiding heavy thinning or clear felling, and maintaining a well-developed shrub layer and understorey. Minimal intervention is normally the best strategy in semi-natural woodlands managed for conservation, using natural regeneration to recruit new trees to the canopy. However, underplanting may be necessary in some circumstances where natural regeneration is insufficient, or intervention in the canopy is necessary (e.g. to control tree diseases such as ash dieback, or to protect canal infrastructure).
- 7.2.10 Barrier planting around woodlands may be feasible in some places. This involves extending the margins with an adjoining shelterbelt of up to 50m wide to protect against proximal low-level inputs from agricultural sources. Although these are frequently planted around emission sources (e.g. intensive livestock sheds), there is evidence that buffering the conservation site is more effective than the source. The feasibility of this option would clearly depend on having land available next to the woodland, and which did not have any conservation value in its own right.



Veteran Trees Feature Mitigation

- 7.2.11 Some of the veteran trees within Chirk Castle SSSI occur within a woodland habitat; for these, mitigation measures directed at the **supporting woodland habitat** are likely to be of benefit. However, the majority of veteran trees noted in the survey were parkland trees, set in grazed pasture. In such settings, **grassland management** is likely to be more important in determining any impacts on veteran trees.
- 7.2.12 The potential impact pathway differs in veteran trees too, with atmospheric ammonia levels being particularly relevant due to its effect on epiphytic lichen communities. Agricultural sources of ammonia can be locally important and make a significant contribution to nitrogen deposition (e.g. at Chirk Castle SSSI 57.7% of total modelled nitrogen deposition is from livestock, 6.9% from fertiliser application - see **Section 4.2, ES Appendix 6H**).
- 7.2.13 As the grasslands within Chirk Castle are managed by National Trust, are within a SSSI, and support the waxcap grassland notified feature, it is likely that they are already being managed appropriately. NRW are likely to require low-input cattle grazing, with limited fertiliser use and controlled grazing pressure, and restrictions on supplementary feeding. However, there may be some scope to refine this in a management plan.
- 7.2.14 Where the SSSI adjoins other agricultural land, particularly where this is more intensively managed, there may be scope to attenuate local agricultural emissions by **barrier planting**, as described above in the context of woodlands. As noted above, this would have to be sited carefully so as not to impact on areas of high conservation interest, especially areas of waxcap grassland. The same planting design considerations and dimensions would apply.
- 7.2.15 An alternative approach is to create a buffer zone on the surrounding agricultural land. Modelling of ammonia levels and deposition around agricultural emission sources indicate that low-emission agriculture zones in buffer zones of around 500m

width could be effective at reducing impacts on nature reserves³⁰. Emission controls could include measures such as controls on the quantity, timing and method of application of manure and slurry. Measures which reduce overall stocking levels or the productivity of grasslands involve a cost to the farmer and require implementation as part of an agri-environment scheme. Other measures such as timing of manure spreading to minimise emissions should not have a cost implication for normal agricultural operations. This is unlikely to be feasible as a mitigation option however, as it would require control of land outside of the SSSI.

Potential Enhancement Options

- 7.2.16 There is no firm distinction between mitigation and enhancement options, as many of the mitigation options described above would have the effect of supporting the attributes set out in the DECCA framework. In the broadest sense, all options set out above are aimed at supporting ecosystem resilience. However, a number of enhancement options can be considered which do not have an explicit aim of mitigating air quality impacts.
- 7.2.17 One key attribute is that of connectivity. At Chirk Castle there may be some scope to improve connectivity of some of the more isolated woodland habitats, where this does not impact the protection of other notified features, such as waxcap grassland, or veteran trees in a parkland setting. There may be scope for increasing habitat linkage through shelterbelt or hedgerow planting.
- 7.2.18 As well as connectivity of woodland habitats, there may be opportunities to improve species **diversity**, for example by changing areas of grassland habitats to promote a more diverse sward. A number of techniques are available for this, including green hay spreading coupled with changes in management. At present the scope for such measures at Chirk Castle is not known.
- 7.2.19 Improving connectivity of woodland habitats and improving diversity of grassland habitats would also potentially improve habitat quality for lesser horseshoe bat, one of the SSSI notified features.

³⁰ Dragosits, U., Theobald, M.R., Place, C.J., ApSimon, H.M., & Sutton, M.A. (2009). *Spatial Planning as a Complementary Tool to Abate the Effects of Atmospheric Ammonia Deposition at the Landscape Scale*. In Sutton, M.A., Reis, S., & Baker, S.M. (eds.). *Atmospheric Ammonia. Detecting emission changes and environmental impacts*. Springer.



7.3 Proposed Mitigation and Enhancement Measures

Key Focus of Mitigation and Enhancement Proposals

- 7.3.1 The preceding section discussed a range of mitigation options, which vary in terms of evidential basis for efficacy, deliverability and compatibility with other conservation and landscape objectives.
- 7.3.2 Following discussions within the project team, and initial consultations with National Trust, mitigation and enhancement proposals would focus on two main areas:
- A westward extension to Canal Wood LWS, in order to buffer against local pollutant sources; and
 - Targeted management of Priority Habitats at Chirk Castle SSSI.

Canal Wood LWS Buffer Planting

Proposed Additional Mitigation Commitments

- 7.3.3 A westward extension is proposed to the northern part of Canal Wood LWS, onto what is currently a former golf course, now agricultural grassland. This will have the aim of buffering local pollution sources (e.g. emissions from fertilisers and livestock) - initially by removing adjoining land from agricultural management, then as trees grow by interception of pollutants. This will utilise land under the ownership of the Applicant. The proposed planting is shown on the drawing provided at **Figure 3** and **DNS3-012**.
- 7.3.4 This action will align with the mitigation option set out in **Section 7.2.10** above and aligns with the overall policy aim of improving ecosystem resilience. It also has the potential to improve habitat **extent** and **connectivity**, two key elements of the DECCA framework, and maintain species **diversity** and habitat **condition** within the LWS.
- 7.3.5 There is a reasonable amount of research and guidance on the design of tree planting to improve air quality, although much is focussed on the interception of particulate pollution (principally from road traffic) in the urban environment (Barwise



& Kumar, 2020³¹). In this case the focus is predominantly on interception through dry deposition of gaseous pollutants, through deposition onto leaf surfaces or active uptake through plant stomata. Nevertheless, some principles for shelterbelt design can be regarded as generally applicable and are set out below:

- Shelterbelts for buffering should ideally be 30-50m wide.
- They should form a continuous barrier, rather than groups of trees separated by gaps.
- The aim should be to achieve (once established) a range of tree and shrub heights, including a well-developed understorey and shrub layer.
- Notwithstanding point iii), planting should not be too dense so as to impede airflow into the shelterbelt when established (this point is emphasised in guidance for shelterbelts around intensive agricultural units) - there is an optimum leaf area density for infiltration and deposition of pollutants.
- Where the buffer is necessarily less than 30m wide, a greater foliage density is recommended.
- Species choice should include trees with complex leaf shapes (e.g. field maple, *Acer campestre*) and include an evergreen component (e.g. holly, *Ilex aquifolium* and Scots pine, *Pinus sylvestris*) to maintain effective capture through the year.
- For gaseous pollutant interception, anisohydric species which keep stomata open for longer in dry conditions may be more effective - these include oak (*Quercus*) and poplar (*Populus*) species.

7.3.6 The proposed planting design and species choice set out on the drawing provided at **Figure 3** and **DNS3-012** incorporates the above principles. These include the inclusion of lower growing shrub layer/understorey species in the mix; the incorporation of an evergreen component; the use of species with complex leaf shapes; and the use of anisohydric species.

³¹ Barwise, Y., Kumar, P. (2020). *Designing vegetation barriers for urban air pollution abatement: a practical review for appropriate plant species selection*. npj Clim Atmos Sci **3**, 12. <https://doi.org/10.1038/s41612-020-0115-3>



Existing Mitigation Commitments

- 7.3.7 **Figure 3** and **DNS3-012** also shows tree planting commitments which are mitigation for existing planning consents. This is located on former agricultural grassland to the west of the southern part of Canal Wood LWS, between the woodland and the eastern boundary of Chirk Castle SSSI. Although not explicitly designed for pollution mitigation, this scheme takes adjoining land out of agricultural use and will have some pollution interception benefits. It can therefore be considered as likely to have a cumulative positive effect in combination with the current proposals.

Chirk Castle SSSI Buffer Planting

- 7.3.8 Buffer planting is also proposed along the eastern boundary of Chirk Castle SSSI, where it abuts the former golf course currently used as pasture land. This is also shown on **Figure 3** and **DNS3-012**.
- 7.3.9 The buffer planting for Chirk Castle SSSI conforms to the same principles, with the same species mix as that proposed for the Canal Wood LWS buffer. It is therefore likely to have the same pollutant interception benefits, particularly for ammonia emissions emitted from local agricultural sources. The buffer planting would also remove land adjoining the SSSI from agricultural use, reducing a proximal emission source.
- 7.3.10 The location of the planting provides a direct benefit for the Wood Pasture and Parkland priority habitat feature, complementing existing woodland cover adjoining and within the eastern and southern boundaries of the SSSI which currently provides a protective function. Priority Habitats are those defined as being of principal importance for biodiversity conservation, as listed under Section 7 of the Environment (Wales) Act 2016. The priority habitat encompasses three of the four SSSI notified features: veteran trees, grassland fungi (waxcap grassland), and saproxylic invertebrates.
- 7.3.11 In terms of policy requirements, it aligns with the overall aim of ecosystem resilience and has the potential to improve habitat **extent** and **connectivity**, two key elements of the DECCA framework, and maintain species **diversity** and habitat **condition** within the SSSI.

8.0 CONCLUSIONS

8.1 Residual Impacts

- 8.1.1 The assessment has confirmed that no ecological impacts are likely as a consequence of noise, lighting or human disturbance during the construction and operational phases of the Proposed Development.
- 8.1.2 With respect to air quality, small magnitude exceedances of screening thresholds for nitrogen and acid deposition, and ammonia levels are predicted on part of Chirk Castle SSSI. A small magnitude exceedance of nitrogen and acid deposition rates is predicted over the northern part of Canal Wood LWS, as well as some small ancient woodland sites to the northeast of the Proposed Development.
- 8.1.3 No impacts are predicted on European conservation sites, or on any other statutory or locally designated sites.
- 8.1.4 The extent and magnitude of impact is not considered to constitute an operation likely to damage the special interest of Chirk Castle SSSI, or to be regarded as an unacceptable level of harm to Canal Wood LWS or ancient woodland sites. The Proposed Development therefore accords with policies NE1 - NE3 of Wrexham Local Development Plan.
- 8.1.5 To ensure compliance with the Biodiversity and Resilience of Ecosystems Duty in Section 6 of Environment Act (Wales) 2016, mitigation measures are proposed at Chirk Castle SSSI and Canal Wood LWS, with the overarching aim of increasing resilience to air quality impacts.
- 8.1.6 A number of ecological enhancement measures are also proposed on the above sites, with the aim of enhancing habitat connectivity and diversity. Implementation of these measures, in combination with mitigation measures, will ensure that the Proposed Development delivers a net benefit for biodiversity in accordance with the Section 6 Duty.

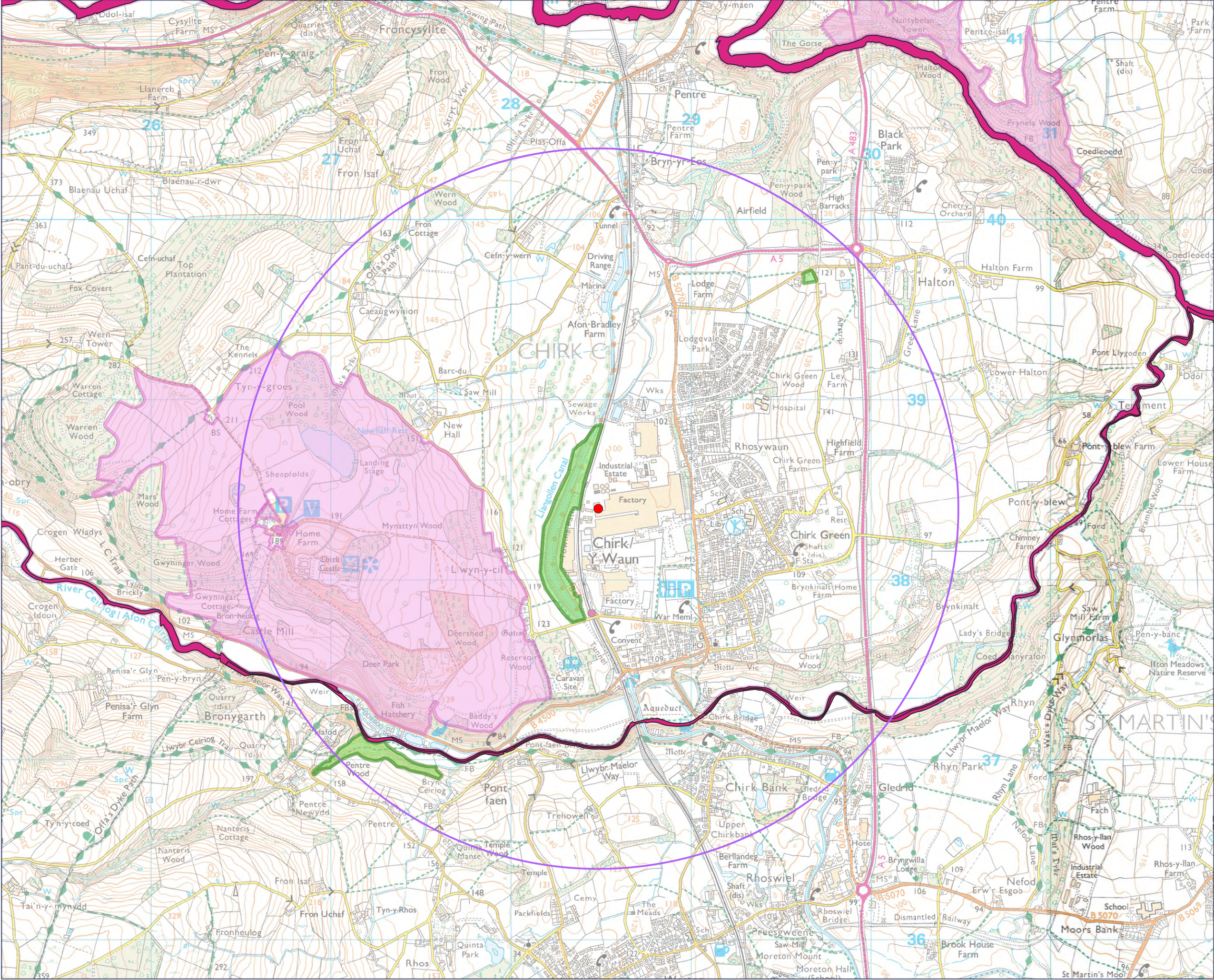
8.2 Implementation of Mitigation and Enhancement Measures

- 8.2.1 The planned mitigation measures will be undertaken on land controlled by the Applicant. Trees will be planted in the first winter planting season following planning consent.



- 8.2.2 A Shelterbelt Management Plan will be prepared which will set out establishment maintenance measures, including replacement of failures and suppression of competing vegetation. The aim will be to promote growth and establishment of trees and shrubs and achieve canopy closure as quickly as possible.
- 8.2.3 Subsequent management may involve selective thinning to maintain airflow through the canopy, whilst retaining a good mix of understorey and canopy species in accordance with the design principles set out in paragraph 7.3.5 above.





- Stack Location
- 2km radius from emission source
- Special Area of Conservation (SAC)
- SSSI
- Local Wildlife Sites (LWS)

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Kronospan Low Carbon Combined Heat and Power Facility

Figure Number

Figure 1

Figure Title

Ecological Constraints

Scale

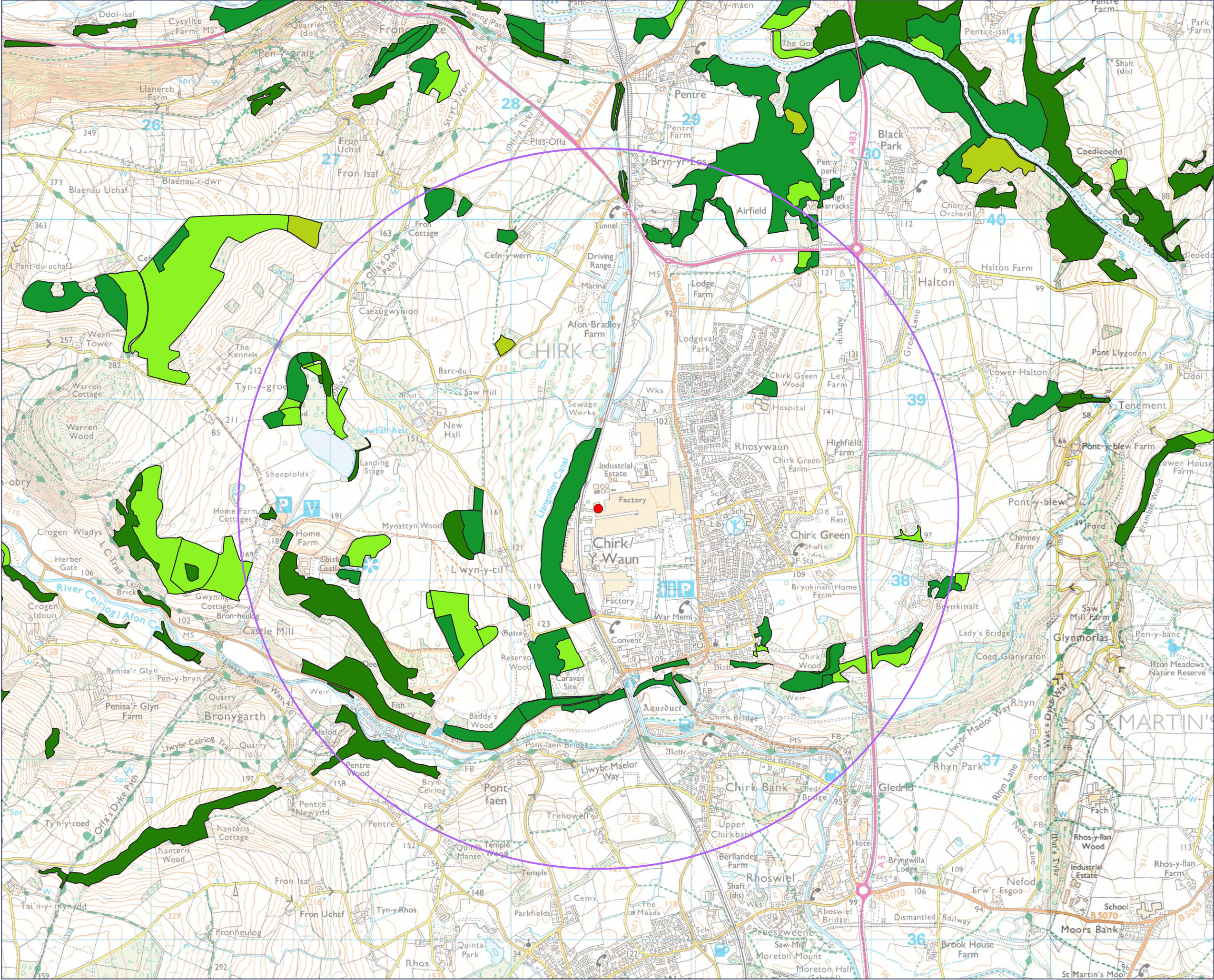
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Date

December 2025



0 400 800 1,200 1,600 2,000 m



- Stack Location
- 2km radius from emission source
- Ancient Woodland Inventory 2011
 - Ancient Semi Natural Woodland
 - Ancient Woodland Site of Unknown Category
 - Plantation on Ancient Woodland
 - Restored Ancient Woodland Site
- Ancient Woodland England
 - ASNW
 - PAWS

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Figure Number

Figure Title

Scale

Date

Figure 2

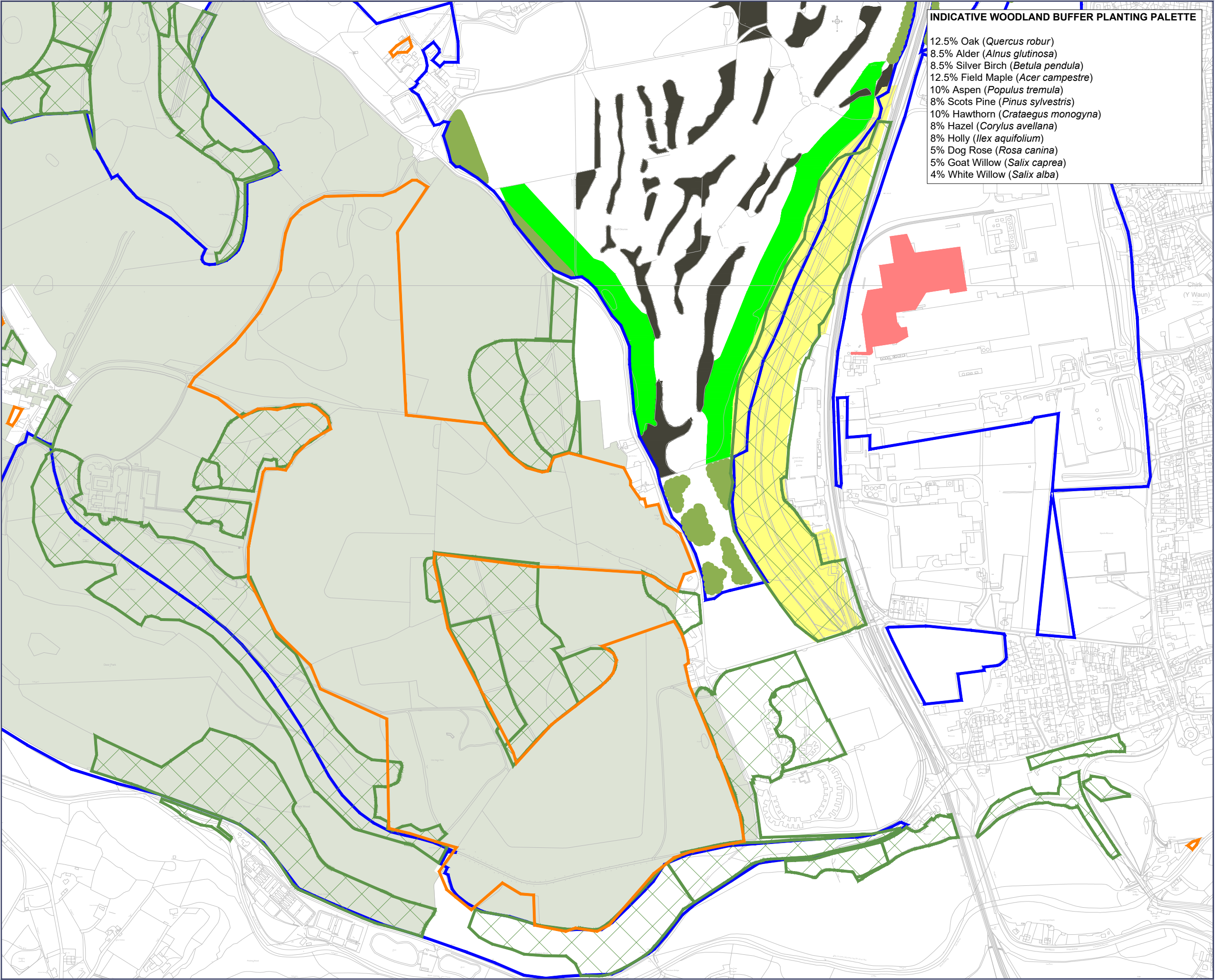
Ancient Woodland

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December 2025



0 400 800 1,200 1,600 2,000 m



- NOTES - PROPOSED WOODLAND BUFFER**
1. Aims of management are to improve habitat extent and connectivity and maintain species diversity and habitat condition within the LWS and SSSI
 2. Proposed Woodland Buffer to comprise a continuous belt of width 30m-50m, to form a woodland of diverse structure including a well developed understorey layer.
 3. Species to include tree with complex leaf shapes, anisohydric species (which keep stomata open for longer in dry conditions) and evergreen species to maximise effective capture of pollutants.
 4. Planting density should not impede airflow into the woodland once established.
 5. Management should seek to maintain a closed canopy following establishment (an unplanted strip will need to be maintained to allow for access to overhead utilities).

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Figure Number

Figure 3

Figure Title

Off-Site Biodiversity Mitigation and Enhancement

Scale

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Date

December 2025

