Chapter 17

Residual Effects, Mitigation and Enhancement

Contents

Glossary

Term	Definition
Baseline	The existing conditions that prevail against which the effects of the proposed development are compared.
Construction Environmental Management Plan (CEMP)	A plan prepared by a contractor before the start of construction work, detailing 'environmental aspects' that may be affected by the construction work and management methods to prevent any such effects. The CEMP would include methods and site management practices to be applied to prevent generation of nuisance dust, accidental pollution events and a range of other potential sources of accidental damage to the environment, and response and reporting procedures to minimise the damage in the event of a pollution incident.
Environmental Impact Assessment	EIA is a means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development.
Environmental Statement	A document reporting the findings of the Environmental Impact Assessment (EIA) and produced in accordance with the EIA Regulations.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of rock formations.
Habitat	The area or environment where a species naturally occurs.
Ice throw	Under certain conditions, ice may form on turbine blades. If the turbine is operational and the ice becomes detached while the blades are rotating, it may be projected away from the turbine.
Infrastructure	This is used to describe all parts of Y Bryn Wind Farm that require construction activities, both temporary and permanent, including turbines, hard standings, borrow pits and tracks (where new or widened).
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors.
Landscape Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes the landscape different from another, rather than better or worse.
Landscape Character Areas	These are single unique areas which are the discrete geographical areas of a particular landscape type.
Mitigation	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for potential negative effects of a development.
North section	Section of development located north of Bryn settlement, within Penhydd forestry block.
Peat	A largely organic substrate formed of partially decomposed plant material.
Planning Statement	A document outlining the policy and legislation relevant to the proposed development and demonstrating the accordance or otherwise of the development with this policy and legislation.
Private water supply	Any water supply which is not provided by a water company and is not connected to mains supply. Most private water supplies are situated in more remote, rural parts of the country and may just serve one property or several properties through a network of pipes.
Protected Species	Animals or plants protected by legislation.
Recreational Route	Routes created by local authorities, government agencies or volunteer organisations. They mainly follow existing rights of way.
Residential Visual Amenity (RVA) Threshold	The point at which a proposed development is likely to change the visual amenity of a residential property to such an extent that it becomes a matter of 'Residential Amenity'. The effect(s) of the development on the 'private interest' is so great that it becomes a matter of 'public interest'.
Scoping	The process of identifying the issues to be addressed by an Environmental Impact Assessment.
Seascape	Landscapes with views of the coast or sea, and coasts and adjacent marine environments with cultural, historical, and archaeological links with each other.
Seascape Character	A distinct, recognisable, and consistent pattern of elements in the seascape that makes the seascape different from another, rather than better or worse.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that response.
Significance	A measure of the importance of the environmental effect, defined by significance criteria specific to the environmental topic.
Silviculture	The growing and cultivation of trees for timber.
Site boundary	Includes the wind farm areas and AIL areas.
South section	Section of development located south of Bryn settlement, within Bryn forestry block.
Shadow flicker	The effect caused when turbine blades cast shadows over neighbouring properties as they turn, through constrained openings such as windows.
Statutory consultees	Organisations that the Client is required to consult under The Developments of National Significance (Procedure) (Wales) Order 2016 (as amended).
The proposed development	Y Bryn Wind Farm development
Y Bryn site boundary	The area within which the proposed development will be located.
Topography	The physical features of a geographical area.
Visual Amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of the activities of the people loving, working, recreating, visiting or travelling through an area.
Visual Effects	Effects on specific views and on the general visual amenity experienced by people.

List of Abbreviations

Abbreviation	Description
AIL	Abnormal Indivisible Load
AMEP	Access Management and Enhancement Plan
AQA	Air Quality Assessment
AQMA	Air Quality Management Area
BCBC	Bridgend County Borough Council
CAA	Civil Aviation Authority
CAPEX	Capital Expenditure
CEMP	Construction Environmental Management Plan
CMRA	Coal Mining Risk Assessment
ECoW	Environmental Clerk of Works
ES	Environmental Statement
EIA	Environmental Impact Assessment
EcIA	Ecological Impact Assessment
GGAT	Glamorgan Gwent Archaeological Trust
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HGV	Heavy Goods Vehicles
HMP	Habitat Management Plan
IOF	Important Ornithological Features
LCA	Landscape Character Areas
LCOE	Levelised Cost of Energy
LISS	Low Impact Silviculture Systems
LOSHIW	Landscapes of Special Historic Interest in Wales
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
L&V	Landscape and Visual
MW	Megawatt
NML	Noise Monitoring Location
NPTCBC	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
OMP	Operational Management Plan
ONS	Office for National Statistics
OS	Ordnance Survey
PAA	Pre-Assessed Areas
PEDW	Planning and Environment Decisions Wales
PRoW	Public Rights of Way
PWS	Private Water Supply
RVAA	Residential Visual Amenity Assessment
SLA	Special Landscape Area
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPP	Species Protection Plan
SSA	Strategic Search Area
SuDS	Sustainable Drainage System
TAN	Technical Advice Note
TMP	Traffic Management Plan
VP	Viewpoint
WG	Welsh Government
WSI	Written Scheme of Investigation

17.1 INTRODUCTION

17.1.1 This chapter of the Environmental Statement (ES) presents a summary of the topics scoped for the Environmental Impact Assessment (EIA) for Y Bryn Wind Farm (the proposed development). Comments regarding the proposed development from consultees have been addressed, if applicable from scoping and throughout the EIA process. This chapter summarises the EIA results where these are potentially significant, the mitigation proposed and the residual effects. Synergistic effects are potential effects which may be caused through a combination of effects from different topics, and these are assessed in Sub-section 17.4.

17.1.2 The ES includes five introductory chapters:

- Introduction (Chapter 1);
- Legal and Policy Context (Chapter 2);
- Approach to EIA (Chapter 3);
- Site Selection and Design Evolution (Chapter 4); and
- Project Description (Chapter 5).

17.1.3 Assessments are provided in the following chapters:

- Ecology (Chapter 6);
- Ornithology (Chapter 7);
- Seascape, Landscape and Visual (Chapter 8);
- Cultural Heritage (Chapter 9);
- Hydrology, Geology and Hydrogeology (Chapter 10);
- Traffic and Transport (Chapter 11);
- Noise (Chapter 12);
- Forestry (Chapter 13);
- Health and Public Safety (Chapter 14);
- Aviation (Chapter 15);
- Existing Infrastructure (Chapter 15); and
- Socioeconomic (Chapter 16).

17.2 SUMMARY OF ASSESSMENT

Legal and Policy Context (Chapter 2)

17.2.1 Chapter 2 of the ES identifies policy and legislative frameworks relating to renewable energy development and specifically onshore wind in a Welsh, UK, and international context. It does not assess the proposed development against these policies and legislation (which is the purpose of the Planning Statement), instead describing the context in which the proposed development is put forward.

17.2.2 Chapter 2 demonstrates that from international through to regional policy and legislation, there is broad support for the development of renewable energy, and a recognition of the speed and scale with which it needs to be achieved in order to avert the worst impacts of climate change.

17.2.3 Local policy and legislation in particular recognises the need to balance renewable energy development with potential impacts of large scale onshore wind. However, even here there is acceptance of the need for rapid deployment of green energy at scale to enable a myriad of goals, from de-carbonising industry and the transport network to improving air and water quality in areas where historic industry has affected these assets.

17.2.4 The relevant planning policy and legislative provisions are also identified and considered in greater detail within the Planning Statement, which assesses the proposed development against them.

Approach to EIA (Chapter 3)

17.2.5 Chapter 3 describes the EIA process. That has resulted in this ES, and the approach taken to identify and evaluate the impacts and associated effects of the proposed development.

17.2.6 While the chapter describes the general EIA methodology taken throughout this ES, methodologies for specific disciplines can be found in their related chapters and appendices.

17.2.7 The process described in Chapter 3 is as follows:

- **baselines** established through desk-based assessments, consultation with statutory and non-statutory consultees, and field surveys and monitoring;
- **scoping** report prepared to identify the likely significant environmental effects of the proposed development, and agreement sought with consultees on scope of the ES;
- the prediction and evaluation of **impacts and effects** through examination of potential changes to the baseline environment that could result from the construction, operation and decommissioning of the proposed development;
- consideration of the **cumulative impacts** and effects of wind and non-wind sites within the vicinity of the proposed development. The cumulative criteria for each discipline are outlined in their relevant chapters and appendices; and
- identification of **mitigation** for significant effects and monitoring of this to ensure its continued effectiveness.

Site Selection and Design Evolution (Chapter 4)

17.2.8 Chapter 4 outlines the site selection process and design evolution of the proposed development.

17.2.9 The development potential of the site has been appreciated by the UK wind industry and Welsh Government since at least the early 2000s. In June 2005 Technical Advice Note 8 (TAN 8) refined seven Strategic Search Areas (SSAs) identified as being appropriate for large scale onshore wind development and the proposed development is within SSA F Coed Morgannwg[1]. SSAs identified through TAN 8 have been superseded by Pre-Assessed Areas (PAAs). Future Wales: The National Plan was published in February 2021 which defined 10 PAAs across Wales as benefitting from a presumption in favour of large-scale onshore wind energy development and the associated landscape change, subject to specific criteria being met. All five turbines of the proposed development in the north section are located within PAA 9[2].

17.2.10 In 2018 Natural Resources Wales (NRW) (acting as land manager) brought the site to market for tender proposals. As part of preparing the tender proposal the applicant worked with expert consultants to conduct site visits to gather constraints data to inform a design workshop.

17.2.11 Following the tender award to Coriolis and ESB in 2019 the evolution of the site design and layout continued through the EIA, in the context of the emergence of a new generation of 5-7 megawatt (MW) + turbines coming onto the market, which it is clear from history and the trends in planning application data will quickly come to dominate the economics for delivery of lowest 'levelised cost of energy' (LCOE) in a 'subsidy-free' environment.

17.2.12 Formal scoping, consultation, meetings and discussions took place with both relevant County Borough Councils, NRW and key consultees to agree the survey methodologies and opportunities to share information from the EIA process. The outcomes of these meetings and discussions coupled with public exhibitions and engagement have

[1] Available from - https://apps.caerphilly.gov.uk/LDP/Examination/PDF/W66-TAN-8-Renewable-Energy.pdf (Page 21) [Accessed 30/05/2023]

[2] Available from - https://datamap.gov.wales/layers/inspire-wg:ndf_preassessed_areas_for_wind_energy [Accessed 30/05/2023]

played an important role in shaping both the Y Bryn Wind Farm design, and the scope and content of the ES. The consultation responses received are included in Appendix 3.3.

17.2.13 Chapter 4 sets out the extent and scale of how the proposed development was refined over the course of the design process including turbines being reduced in number and tip height, and site boundary updates across multiple iterations. The design evolved as it did largely to address perceived landscape, heritage and ecological issues (particularly impacts on dwellings and settlements) but also to reduce the overall impacts of the proposed development to an acceptable level, whilst optimising the economic production of green energy. It concludes that a focused and cohesive design has been produced capable of making a significant contribution to the Welsh Government's onshore wind energy targets. This correlates with the Well-being of Future Generations (Wales) Act 2015 goals of a prosperous and a globally responsible Wales[3].

17.2.14 Decisions on turbine size and number required consideration of various commercial and technical constraints, including forestry, wind resource and the separation between turbines needed to limit turbulence effects, as well as turbine availability and likely earliest economic deliverability. These considerations and on-site factors such as topography, ground conditions, existing infrastructure, ecological sensitivities, proximity to dwellings and public rights of way, and archaeological features have all affected the size and the location of the turbines and other infrastructure proposed for Y Bryn Wind Farm.

Project Description (Chapter 5)

17.2.15 Chapter 5 outlines the details of the proposal, including specifications of turbines, access tracks and electrical infrastructure. It also describes the general construction methodology, timescales and typical construction equipment likely to be used for Y Bryn Wind Farm. Operation and decommissioning phases are also detailed.

17.2.16 Construction would be over approximately 24 months and will require temporary construction compounds consisting of portable accommodation buildings, vehicle parking and machinery storage.

17.2.17 The construction methods detailed in this section will ultimately be detailed in the Construction Environmental Management Plan (CEMP), built on best practice methodologies developed at other wind farms, and comply with all Health and Safety requirements for construction operations.

Biological Environment

Ecology (Chapter 6)

17.2.18 Chapter 6 outlines baseline information, identifies potential impacts of the proposal on the ecology of the area, assess the significance of those impacts, describes mitigation measures to avoid, reduce, remedy or compensate for those impacts, and assess the significance of the residual effects based on the magnitude of the impact and the sensitivity of the receptor. This chapter also discusses the ongoing management and monitoring measures that may be required.

17.2.19 Bat activity is assessed as part of the EIA and guidelines for clearance from forest edge to turbine blades will be followed. It is considered unlikely that the proposed development will have any significant effects on the integrity of bat populations within Margam Park as the magnitude of impacts were assessed to be low negative, identified through the construction, operation and decommissioning phases of the development. Cumulative impacts are assessed for bats as the only non-avian species/habitats for which a greater than negligible residual impact is predicted.

The main areas of vegetation interest were avoided during the design evolution of the development resulting in non-significant effects on habitats.

17.2.20 The 'footprint' of the proposed development has a direct impact on forestry habitat, and the soils underneath, however the magnitude of impact is considered to be low, and therefore not significant. Through the Habitat Management Plan (HMP), the applicant proposes a suite of measures including restoration of broadleaved woodland, creation of open ground, bracken control, pond creation, wet woodland creation and removal of invasive species to mitigate for any impact.

17.2.21 The overall conclusion is that the development will not have a significant effect on the wildlife and habitat across the proposed development and its surrounding area. The proposed habitat improvement and restoration will mitigate any impacts and create new opportunities to improve ecosystem resilience within the site boundary and will result in significant biodiversity net benefit, which is in line with the Well-being of Future Generations (Wales) Act 2015 goals of a resilient Wales[3].

Ornithology (Chapter 7)

17.2.22 The assessment in Chapter 7 considers the various potential impacts arising from the construction, operation and decommissioning of the proposed development, and evaluates the significance of these impacts on the identified key species of interest in the context of their conservation value, sensitivity to wind farm development and the scale of the potential effects.

17.2.23 The proposed development is not located within any statutory sites designated for ornithological interest.

17.2.24 Potentially significant effects on birds were avoided during the design phase of the development. The vantage point surveys recorded flight lines from a total of 15 target species.

17.2.25 Following survey, the species considered to be important ornithological features (IOFs) in the context of the proposed development, and following guidance, were then assessed for disturbance/displacement and/or collision risk. The following species were assessed; nightjar (disturbance/displacement, collision), herring gull (collision only), goshawk (disturbance/displacement, collision), and passerines of conservation concern (disturbance/displacement only).

17.2.26 Cumulative impacts are assessed for IOFs. No significant cumulative disturbance/displacement or collision effects are concluded for any IOFs.

17.2.27 No significant effects are anticipated upon ornithological features. However, additional controls will be put in place during construction through creation of a site-specific CEMP, HMP and Species Protection Plan (SPP). The improvements proposed as a result of the HMP correlates with the Well-being of Future Generations (Wales) Act 2015 of a resilient and prosperous Wales[3].

Physical Environment

Seascape, Landscape and Visual Impact Assessment (Chapter 8)

17.2.28 Chapter 8 of the ES assesses the likely effects of the proposed development on seascape, landscape, and visual resources in a defined study area. The Seascape, Landscape and Visual Impact Assessment (SLVIA) takes account of the effects of the proposed development inside and outside Y Bryn site boundary, as the proposal may affect the landscape character and visual amenity of locations at some distance beyond the site boundary. A study area of 45 km offset from the outer most turbines, as well as a more detailed study area 15 km offset from the outer most turbines, was agreed with consultees. The SLVIA includes a Residential Visual Amenity Assessment (RVAA), and an Aviation Lighting Assessment. All assessment methodologies are fully described in Appendix 8.

17.2.29 Methodologies for all elements of the SLVIA, viewpoints to be used for the visual and aviation lighting assessments, and wind farms to be included in the cumulative assessment, were agreed in consultation with Neath Port Talbot

[3] *Well-being of Future Generations (Wales) Act 2015 – The Future Generations Commissioner for Wales*. (2022) Available from - https://www.futuregenerations.wales/about-us/future-generations-act/ [Accessed 30/05/2023]

County Borough Council (NPTCBC), Bridgend County Borough Council (BCBC), and NRW (as a statutory consultee).

17.2.30 Baseline conditions were established through desk-based study, site-based investigations and surveys. Baseline conditions for individual effects include operational wind farms in the 45 km study area. The cumulative assessment examines two baseline scenarios: one where the baseline does not include any windfarms (as per consultation with LVIA consultant representing NPTCBC and BCBC); and the other in which operational windfarms are considered part of the baseline, in line with GLVIA3 and generally accepted guidance.

17.2.31 During the construction phase, no significant effects are predicted on seascape/landscape character or visual amenity.

17.2.32 During the operational phase, significant effects on landscape character are predicted on 18 Landscape Character Areas (LCAs), with significant cumulative effects from wind farm developments predicted on 6 of those, and significant cumulative effects from non-wind developments on 2 of those.

17.2.33 Significant visual effects during the operational phase are predicted from 17 viewpoints (VPs), with significant cumulative effects from wind farm developments predicted at 11 of those, and significant cumulative effects from non-wind developments at 3 of those.

17.2.34 Other features predicted to experience significant effects during the operational phase are Margam Special Landscape Area (SLA), Western Uplands SLA, Foel Trawsnant SLA, Foel y Dyffryn SLA, Margam Country Park, Margam Mountain Landscapes of Special Historic Interest in Wales (LOSHIW), St Illtyd's Walk and the Ogwr Ridgeway Walk recreational routes.

17.2.35 No significant effects on seascape/landscape character or visual amenity are predicted during the decommissioning phase.

17.2.36 The Aviation Lighting Assessment concludes that there are no significant effects for seascape, landscape and viewpoints within 15 km assessed due to significant light pollution already present in the current built environment. While the proposed development would add somewhat to this light pollution, degrees of impacts are tempered substantially by the physics of light propagation over distance and comparison to other existing light sources (as described in Appendix 15.2). In addition, if a proximity activated lighting system (as described in Appendix 15.1) were to be approved by the Civil Aviation Authority (CAA) by the time of condition discharging then this could ensure that the lighting scheme would be activated approximately only 0.25% of the periods of official night (sunset +30 minutes until sunrise -30 minutes).

17.2.37 The RVAA concludes that, while 120 properties are likely to experience significant effects as a result of the proposed development, none of those properties (assessed in site visits either to individual properties or a property representative of a larger group) in fact breached the RVA threshold, meaning that none of the proposed turbines would be unacceptably overwhelming in main views from the assessed properties.

Cultural Heritage (Chapter 9)

17.2.38 Chapter 9 of the ES assesses the effects of the proposed development on the historic environment. It does so by identifying historic assets that could be impacted by the proposed development, assessing their importance, and the potential impact of the proposed development on them, describing mitigation for potential adverse effects, assessing residual effects, and assessing cumulative impacts.

17.2.39 Elements including methodologies and scope of assessments for the main chapter and appendices were agreed through consultation with Planning and Environment Decisions Wales (PEDW), Glamorgan Gwent Archaeological Trust (GGAT), Cadw, BCBC and NPTCBC. Full details can be found in Chapter 9 and Appendix 3.3.

17.2.40 The proposed design has been influenced by cultural heritage considerations, particularly to reduce the impact of the proposed development on Margam Country Park and associated receptors, and scheduled monuments. Full details of the way cultural heritage concerns influenced the current layout can be found in Chapter 4.

17.2.41 An inner study area based on the site boundary plus a 2 km buffer, and an outer study area 20 km offset from the site boundary, was agreed with consultees.

17.2.42 During the construction phase, potential adverse effects are predicted to four non-designated assets and one designated historic asset, however none of these effects are expected to be significant. A programme of archaeological monitoring and recording during construction will mitigate the impacts on these assets. Other mitigation proposed for the construction phase include:

- pre-commencement and post felling surveys to locate and identify assets; and
- fencing off assets to protect from physical disturbance.

17.2.43 During operation, significant effects are predicted on one asset, Mynydd Margam Registered Landscape, however, these impacts are fully reversed upon decommissioning. Mitigation of operational phase impacts can only be achieved through design and is described fully in Table 17.1.

17.2.44 Decommissioning effects have been scoped out of the assessment as the decommissioning phase will not create new physical impacts on top of those created by construction. Decommissioning will also return the setting of the historic assets to their baseline conditions.

17.2.45 The only predicted significant residual effect is to Mynydd Margam Registered Landscape during the operational phase of the wind farm. This effect will be reversed on decommissioning.

17.2.46 Cumulative effects were assessed using two baseline scenarios. Scenario 1 examined the impact of the proposed development using a baseline of operational and consented windfarms, and Scenario 2 used a baseline of operational, consented and submitted wind farms. The cumulative effects of the proposed development and relevant non-wind schemes was assessed separately. All cumulative effects were assessed to be not significant.

Hydrology, Geology and Hydrogeology (Chapter 10)

17.2.47 Chapter 10 of the ES assesses potential impacts on the hydrological, geological and hydrogeological environment, and resultant significant effects.

17.2.48 The study area can be seen in Figure 10.1 Hydrology Overview and includes the site boundary, and both upper and lower reaches of watercourse catchments present within that boundary.

17.2.49 Surveys were undertaken to help establish the baseline. These included walkover surveys where hydrologists inspected proposed watercourse crossings and other hydrological features, and two rounds of peat surveys to confirm presence and depth of peat on site. Site surveys were also undertaken as part of the Coal Mining Risk Assessment (CMRA), which can be found in Appendix 10.2.

17.2.50 Measures to mitigate impacts on Hydrological receptors are fully described in Table 17.1.

17.2.51 The majority of the proposed development is located within the catchment of the Ffrwd Wyllt and the River Avan/Afon Afan, which are susceptible to flooding downstream. Potential risk of increased flooding downstream will be mitigated through design of supporting drainage and watercourse crossing upgrades, and implementation of good management practices, including sustainable drainage systems (SuDS). In addition, certain measures under consideration for the HMP (including new ponds, wet woodland and riparian planting) could provide natural flood management benefits.

17.2.52 There are no public water resources within the vicinity of the site boundary. NPTCBC and BCBC identified 60 properties with the potential to use Private Water Supplies (PWS) within 3 km of Y Bryn site boundary, and 2 km of the proposed access routes from the M4 and between the north and south sections. Forty-two of these were screened out in a desk-based exercise, and the remaining 18 were contacted via a questionnaire for further details. Four of these have been identified as potentially requiring post-consent mitigation measures.

17.2.53 Based on the peat surveys carried out, it is concluded that the site is underlain by soils with peat content and contains very little peat. Where peat of a depth of ≥0.5 m is present, it is situated away from areas of infrastructure.

There is no peat requiring excavation and handling, and so a peat management plan has been scoped out. Good practice soil handling and management will be applied in the construction phase to mitigate impacts on soils.

17.2.54 Chapter 10 outlines mitigation that would be included in a detailed CEMP, to be implemented during the construction phase to protect the surface and groundwater environment. These measures will form the basis of a full CEMP to be implemented by the construction contractor during the construction phase.

17.2.55 The CMRA concludes that, without mitigation, there is potential for significant effects on the proposed development, as a result of historic coal mining. However, through mitigation such as micrositing, treatment of workings, and/or deepening of foundations beneath zones of workings/collapse, the significance of effects will be reduced to be non-significant. Further investigative works will be carried out prior to construction, and it is expected that a related planning condition will form part of the consent of the proposed development. The assessment also flags the need to give consideration to landslides in the area in relation to the stability of the proposed access track from the M4/Brombil Farm.

17.2.56 Following the successful design and implementation of mitigation measures the magnitude of impact of construction effects on all identified receptors are predicted to be not significant. The assessment of predicted operational effects has determined that the magnitude of impact of effects on all receptors to be of no significance.

17.2.57 Potential effects during the decommissioning phase are predicted to be less than those identified in the construction phase and are therefore predicted to be not significant.

17.2.58 Cumulative effects are predicted to be negligible during construction, operational and decommissioning phases following successful implementation of mitigation measures.

17.2.59 No residual effects are predicted from the proposed development.

Population and Human Health Environment

Traffic and Transport (Chapter 11)

17.2.60 Chapter 11 of the ES examines any potential effects that would arise on road infrastructure and its use. Baseline conditions were established through consultation and use of available traffic survey data, and potential traffic impacts have been identified and assessed, and where relevant, mitigation measures identified.

17.2.61 Two scenarios were assessed:

- Scenario 1 – Expected Construction. This scenario was based on the most likely construction methods, programme and sequencing. This scenario considered all stone to be sourced on site and all foundation concrete would be produced at on-site batching plants; stone required for foundation concrete has been assumed to be imported; and
- Scenario 2 – Worst Case Construction. This scenario is a worst case scenario which assumes the top layer of stone would need to be imported onto site and all foundation concrete would be imported to site in ready-mix lorries.

17.2.62 The traffic impacts associated with the abnormal load deliveries were also assessed. An Abnormal Indivisible Load (AIL) Route Survey including swept path analysis at particular pinch points has been prepared demonstrating the viability of the proposed abnormal load route.

17.2.63 Two preliminary Traffic Management Plans (TMPs) for Heavy Goods Vehicles (HGVs) and AILs were prepared.

17.2.64 In relation to potential cumulative impacts, these would be dependent on whether other developments are constructed concurrently. If the construction of the proposed development coincided with another, using the same transport routes, then communication with the other developers will take place with the aim to mitigate effects to a non-significant level. This will be delivered through the construction TMP.

17.2.65 The assessment concludes; the highest residual effects on public road network users and local settlements could potentially be moderate as a result of the proposed development, and it is predicted residual effects from AIL deliveries on driver delay is considered to be not significant.

17.2.66 Overall, with the incorporation of suitable mitigation measures secured through a construction TMP, it is predicted that there will be no significant traffic effects associated with the proposed development.

Noise (Chapter 12)

17.2.67 This chapter assess the potential noise effects that would occur as a result of Y Bryn Wind Farm, assuming a worst-case scenario in relation to turbine choice.

17.2.68 It concludes that the appropriate cumulative limits for assessing the noise impact associated with the operation of the proposed development are as follows:

- Amenity Hours: the greater of 40 dB L_{A90} or Background + 5 dB; and
- Night-time Hours: the greater of 43 dB L_{A90} or Background + 5 dB.

17.2.69 Operational and consented wind farms have been identified as resulting in a breach of the proposed alternative noise limits suggested by NPTCBC and BCBC Noise Consultant. Therefore, it is proposed that the levels suggested within ETSU-R-97 are adopted.

17.2.70 On such a basis, the proposal can meet the noise limits set out above for amenity and night-time hours.

17.2.71 Noise associated with the construction of the proposal has been found to conform to the guideline values set out within BS 5228-1:2014. The locations adopted for the assessment are representative of neighbouring noise sensitive receptors to the proposal. A majority of properties will experience sound levels associated with construction that are no greater than existing ambient sound levels.

17.2.72 Guidance with respect to blasting associated with the borrow pits is provided. It is not expected that vibration associated with the winning of aggregate will result in unacceptable vibration levels.

17.2.73 Therefore overall, no significant additional residual effects in relation to noise are identified for Y Bryn Wind Farm.

Forestry (Chapter 13)

17.2.74 This chapter assess the potential effects of the proposed Y Bryn Wind Farm on forested land managed by NRW. This section describes the forest, and then explains the ways in which it may be affected by the proposed development and what the likely effects will be.

17.2.75 The applicant has worked with NRW (as land manager) to reduce the area of forest directly impacted by agreeing a keyhole felling approach rather than coupe felling. The total felling required for the proposed development is estimated to be 119.24 ha (which represents 4.7% of the study area). 14.48 ha will be replanted on site, resulting in an estimated total net forestry loss of 104.76 ha. However, as a result of Welsh Government implementing supplementary planting under the compensatory fund, there will be no net loss of trees owing to the proposed development.

17.2.76 Impacts on Low Impact Silviculture Systems (LISS) managed forest areas have been kept to a minimum with only two turbines being located within LISS area and an additional turbine having a felling area that is partly contained within LISS. A further area which is required for a borrow pit is within LISS designated forest however this area was largely clear felled in 2016.

17.2.77 There will be no Ancient Woodland lost as a result of the proposed development.

17.2.78 The felling for the proposed development is shown to be of a smaller scale than existing approved felling across the approved period in the NRW felling plan. The felling areas are relatively small compared with existing felling

coupe design, although they are concentrated within the elevated parts of the study area. It is considered therefore that the impact on the forest from the felling is of minor significance.

Health and Public Safety (Chapter 14)

17.2.79 Chapter 14 of the ES examines the following aspects of the proposed development in terms of health and public safety:

- Historic Coal Mining;
- Shadow Flicker;
- Ice Throw;
- Lightning;
- Air Quality; and
- Health and Safety.

17.2.80 A CMRA was undertaken to evaluate risks to health and public safety from historic coal mining. This has been discussed previously in Paragraph 17.2.49.

17.2.81 A preliminary shadow flicker assessment was undertaken to evaluate the potential effects of shadow flicker on surrounding properties due to the proposed development. This predicted that in a worst-case scenario, two of the 10 receptor locations modelled would exceed the commonly accepted shadow flicker limit of 30 hours per year. A third receptor was found to experience cumulative effects with the proposed development and Foel Trawsnant wind farm. However, shadow flicker effects at this receptor are shown to be caused almost exclusively by Foel Trawsnant, which is subject to a planning condition limiting actual impacts to no more than the guidance thresholds. Commitments specific to the proposed development include verifying receptors through an on-site assessment, and the installation of shadow modules/sunshine sensors to mitigate the effects of shadow flicker. The full report can be found in Appendix 14.1. It is expected that a planning condition limiting shadow flicker to below 30 minutes a day and/or 30 hours per annum for any properties existing or with planning permission at the time of consent will form part of the consent for the proposed development. This condition will result in effects of shadow flicker being not significant.

17.2.82 Discussions have been held with Public Rights of Way (PRoW) officers from NPTCBC and BCBC to agree mitigation of risks from ice throw to the public. Details of these discussions can be found in Appendix 3.3. It has been agreed that details of ice monitoring and/or de-icing systems and/or protocols for all turbines located within tip height distance of any registered public footpaths on the definitive map will be provided to local planning authorities (LPAs) prior to operation. Procuring turbines with appropriate anti-icing/de-icing technologies, good practice site management, and the protocol described above mean effects of ice throw on health and public safety are not significant.

17.2.83 Turbines considered for the proposed development will be equipped with lighting protection conforming to IEC 61400-24:2019[4]. This will mitigate the effects of lightning strikes on users of PRoW near the proposed development, resulting in effects being not significant.

17.2.84 An Air Quality Assessment (AQA) has been undertaken to examine the effects of construction traffic relating to the proposed development on human health, focussing on the NPTCBC Air Quality Management Area (AQMA). The assessment concludes that the effects on human health of traffic associated with construction of the proposed development are not significant. The assessment highlights possible cumulative effects from the proposed development and the Wildfox Resort but could not assess these as that development has no publicly available construction phase traffic volumes. Any potential significant effects will be mitigated through a robust TMP, developed in collaboration with relevant highways authorities and agreed prior to the construction phase on either project. The full assessment and its conclusions can be found in Appendix 14.2.

17.2.85 During the construction and decommissioning phase, the construction site would be managed according to all relevant health and safety regulations. Full details of these can be found in Chapter 14. Measures to manage any diversions to PRoW would also be put in place where required.

17.2.86 During the operational phase, public safety would be ensured as the use of wind turbines and components would be conforming to either BS EN IEC 61400-1:2019[5] or IEC 16400. These turbines contain sensors that detect instabilities and unsafe operation and shut down under these circumstances. Therefore, no safety risks are expected as a result of public access to the vicinity of the proposed wind farm.

Aviation (Chapter 15)

17.2.87 The aviation assessment includes: a desktop study where relevant aviation policy and legislation documents were reviewed and considered; identification of aviation bodies and consultation with such bodies; assessment of the potential impacts of the proposed development on all aspects of aviation, and identification of any potential mitigation measures that may need to be employed.

17.2.88 A reduced lighting scheme, in which 13 of the 18 turbines will be fitted with lights, has been approved by the Civil Aviation Authority (CAA) and by aviation operators using the night low level airspace. An estimation has also been provided for the potential reduction in associated impacts should a proximity activated lighting system to be approved in future by the CAA.

17.2.89 The aviation assessment concludes that there are no significant effects on aviation generated by the proposed development as a stand-alone development. When cumulative effects with other wind farms are considered, the assessment concludes that the effect on the provision of air traffic radar services by Cardiff Airport is minor to moderate and therefore potentially significant. The applicant is in discussions with Cardiff Airport on the nature and scale of the effects of the proposed development on their provision of air traffic services and on a range of potential mitigation measures, should these be deemed necessary, to render the effects not significant.

Existing Infrastructure (Chapter 15)

17.2.90 This chapter provides an assessment of the potential impacts of the proposed development on the following:

- Telecommunications: microwave fixed links, other radio communication networks and television, and amateur radio;
- Utilities – electricity, water, gas and underground assets;
- Public Rights of Way (PRoW) and permissive routes; and
- Other recreation routes.

17.2.91 Baseline conditions were identified in consultation with link operators, public rights of way officers and relevant consultees.

17.2.92 With regard to impacts on amenity and use of the forest, the construction phase will result in a short-term closure of some sections of permissive routes including mountain bike trails, and as such, will have short term significant effects on them and on other forms of recreational access to areas of the forest. The applicant will work with the relevant LPAs and NRW (as land manager) to mitigate any impacts and to explore ways to enhance these sections of the routes/trails. In some instances, the applicant will provide temporary alternative routes. Further, the applicant is committed to providing a range of enhancement measures under an Access Management and Enhancement Plan (AMEP), including upgrades to existing mountain biking trails on-site and to PRoWs both on- and off-site, by agreement with relevant LPAs and NRW.

[4] IEC 61400-24:2019 Wind energy generation systems - Part 24: Lightning protection - Available from - https://webstore.iec.ch/publication/32050 [Accessed 30/05/2023]

[5] BS EN IEC 61400-1:2019Wind energy generation systems - Design requirements - Available from - https://shop.bsigroup.com/products/wind-energy-generation-systems-design-requirements/standard [Accessed 30/05/2023]

17.2.93 No significant effects are predicted during the operational phase on existing infrastructure.

Socioeconomic (Chapter 16)

17.2.94 Chapter 16 of the ES assesses the potential socioeconomic effects of the proposed development at local, Welsh, and UK levels. The baseline was informed by publicly available Office for National Statistics (ONS) data.

17.2.95 Regarding tourism, there are potential for effects on local tourism focussed businesses relating to restricted access during the construction phase. However, it is predicted that these would be mitigated through the AMEP, to be agreed with LPAs and NRW (as land manager) prior to construction, and through communication with recreational users through relevant channels. Current research, referenced in the chapter, shows that there is no evidence to suggest wind farms have a negative economic impact on tourism. The proposed development is likely to improve public access to the site, which could help increase the tourism benefits to the area.

17.2.96 In terms of direct economic benefits, Chapter 16 demonstrates that the proposed development could create 113 jobs at a local level and 338 at a Welsh level during the construction phase, and 31 jobs at a local level and 43 at a Welsh level during the operational phase. There is also likely to be indirect economic benefit from the proposed development due to the multiplier effect, where local workers and suppliers not directly linked to the proposed development derive income from it, which is then spent in the local economy.

17.2.97 In terms of community benefits, the proposed development is creating a community benefit fund worth £8,000 per MW per year, giving £1.04 million per year over the proposed 50-year lifespan of the proposed development. In addition, the proposed development is offering shared ownership of up to 20% of the capital expenditure (CAPEX). This will comprise of 10% offered to local individuals or groups, and 10% available for local public sector bodies.

17.2.98 Overall, the chapter concludes that the proposed development will have little impact on tourism in the local area and will have a positive socioeconomic benefit over the course of its lifespan at local, Welsh, and UK levels. In line with the Well-being of Future Generations (Wales) Act 2015, Y Bryn will result in a more prosperous and globally responsible Wales by improving the economic well-being of Wales, generating wealth and providing employment opportunities[6].

17.3 RESIDUAL EFFECTS, MITIGATION AND ENHANCEMENT

17.3.1 Table 17.1 summarises the mitigation measures incorporated into the design of the wind farm, and those proposed for the construction, operation and decommissioning phases of the proposed development and contains a schedule of environmental enhancement.

Table 17.1: Summary of residual effects, mitigation measures and enhancement for Y Bryn Wind Farm

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
Ecology	Design evolution	• A minimum distance of 50 m has been maintained between the proposed development and watercourses, with the exception of utilising existing tracks that already cross, or already run within 50 m of, watercourses. Any new watercourse crossings will be constructed, where possible, to be sympathetic to existing natural geomorphological conditions and to allow the safe passage of fish and otters. • The layout of the proposed development has avoided impacts to sensitive habitats where possible (e.g. the areas of soil with the highest peat content). Where avoidance has not been possible, the infrastructure will be constructed in such a way as to maintain the integrity and connectivity of the hydrology of hydrologically sensitive habitats. Access tracks will be designed in keeping with good practice. • Trees in the vicinity of turbines will retain a safe buffer distance for bats between blade tip and forest edge, for all turbines of 30 m.		Not significant.
	Pre-construction and Construction	• Pre-construction surveys for protected species. • Where possible an allowance of 50 m micrositing of infrastructure will be undertaken to ensure construction does not impact on the most sensitive habitats and any other identified ecological constraints and will be completed in consultation with the Environmental Clerk of Works (ECoW). • Any land degraded by construction and not required for the operation of the proposed development, such as temporary crane pads and borrow pits, would be restored as soon as possible after construction is completed. • Site activities have the potential to cause pollution through dust, siltation, leaks and spillages associated with plant and materials during the construction and operational phases mitigated through the CEMP. • Pollution incidents may occur during construction as well as within the operational phase during maintenance works, mitigated via CEMP. • Accidental or incidental injury and mortality of protected species during construction, mitigated via SPP and CEMP. • Loss of habitat compensated via biodiversity net benefit included in the HMP.	SPP produced as part of the CEMP secured via planning condition. Presence of ECoW on site secured via planning condition.	Not significant.

[6] *Well-being of Future Generations (Wales) Act 2015 – The Future Generations Commissioner for Wales*. (2022) Available from - https://www.futuregenerations.wales/about-us/future-generations-act [Accessed 30/05/2023]

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
	Operation	• There will be little on-site activity during the operational phase, where potential effects exist, control measures will be incorporated into an OMP. In particular, the potential for pollution incidents during routine maintenance activities will be minimised by adoption of good practice guidance. • Any routine maintenance works will take place during the day where practicable to minimise the potential for disturbance to protected species within the proposed development in accordance with the HMP (since these are mostly nocturnal/crepuscular). • The OMP will detail any mitigation measures required during the operational phase relating to protected species to ensure ongoing compliance with relevant environmental legislation.	OMP & HMP secured via planning condition.	Not significant.
	Decommissioning	• Good practice measures as described in the construction stage will be followed, including specific guidance for the restoration and decommissioning of wind farms. New guidance available at the decommissioning phase would be adopted if appropriate, and a decommissioning plan will be drafted for agreement by consultees prior to commencement of decommissioning.	Complete decommissioning in line with specific up to date guidance.	Not significant.
Ornithology	Design evolution	• The layout has been designed to minimise the potential for any negative effects associated with the proposed development, as well as potentially providing positive effects in the longer term. • Various measures will be proposed to provide compliance with legislation, and to follow good practice guidance and consultation recommendations with regard to breeding birds. • Where experience of developing projects of this nature has shown that embedded mitigation is sufficient to prevent significant adverse effects on Important Ornithological Features (IOFs), this has been built into the assessment in order to produce an Ecological Impact Assessment (EcIA) which is proportionate to the risks posed by the proposed development.		Not significant.
	Pre-construction and Construction	• Prior to the start of construction, contractors will be made aware of the ornithological sensitivities within the area of the proposed development (particularly with regard to the potential presence of Schedule 1 breeding species) during toolbox talks as part of the CEMP. • Legal compliance regarding breeding birds will be adhered to including good practice via timing of works and pre-construction surveys will be necessary to reduce the possibility of illegal damage, destruction or disturbance to occupied bird nests during the construction phase. • Felling of trees, and construction of turbine bases, access tracks and other structures will lead to direct habitat loss, mitigated via CEMP and enhanced via biodiversity net benefit in the HMP. • Disturbance and displacement - potential impacts of associated noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. The potential impacts associated with construction activities are only likely to occur for as long as the construction phase continues. They are thus short-term and can be readily mitigated by avoiding sensitive areas (through the implementation of appropriately defined buffer zones), and by timing construction activities to avoid periods where sensitive species are present (if and where possible) such as the breeding season. • SPP will detail embedded mitigation measures required prior to and during construction for protected bird species potentially breeding at the proposed development site, particularly in the vicinity of historic nests or suitable nesting habitat.	HMP secured via planning condition. SPP produced as part of the CEMP secured via planning condition. Presence of ECoW on site secured via planning condition.	Not significant.
	Operation	• The operation of turbines and associated human activities for maintenance purposes also has the potential to cause disturbance and displace birds from the development. Disturbance impacts during the operational phase may be less than during the construction phase, as species may become habituated to turbines and disturbance due to human activities will be considerably reduced. • Collision risk.	OMP & HMP secured via planning condition.	Not significant.

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
		• With the exception of the operation of the wind turbines and general maintenance of the turbines, there will be little on-site activity during the operational phase and therefore levels of disturbance will be considerably reduced relative to the construction period.		
	Decommissioning	• Turbine, or other infrastructure, removal may cause disturbance to birds breeding, foraging or roosting within the proposed development., mitigated via decommissioning plan. • Good practice measures as described in the construction stage will be followed, including specific guidance for the restoration and decommissioning of wind farms. New guidance available at the decommissioning phase would be adopted if appropriate, and a decommissioning plan will be drafted for agreement by consultees prior to commencement of decommissioning.	Complete decommissioning in line with specific up to date guidance and agreed with LPAs.	Not significant.
SLVIA	Design evolution	• Design aimed to avoid overly complex or visually confusing layout and minimise overall impact when viewed from local settlements. • Key design consideration was relationship between proposed development and existing, operational wind farms in the surrounding area. Design also aimed to reduce potential cumulative effects between proposed development and relevant consented, in-planning and pre-application wind farms. • To reduce the Landscape and Visual effects of the proposed development on key receptors, particularly Bryn village and Margam Park, the following changes were made throughout the design evolution process: • Overall reduction number of turbines from 26 (scoping design) to 18 (design freeze). • Reduction in tip heights of a number of turbines; from all turbines being 250 m to tip (scoping), to final design featuring 4 turbines 250 m to tip; 2 turbines 230 m to tip; and 12 turbines 206 m to tip. • 'Exclusion zones' to feature no turbines. One directly north of Bryn village to reduce perceptions of encirclement from that settlement, and others within 1.5 km of Margam Park boundary to avoid turbines being sat directly behind Margam Castle in views looking back from the grassland to its south-east side. • Relocation of turbines to reduce visual impacts from settlements and communities surrounding the turbines, particularly Bryn village, Cwmafan, Maesteg, Llangynwyd, Port Talbot and Margam Park. • A reduced lighting scheme that fulfils the requirements of the CAA while reducing light pollution from the proposed development as far as possible.		Significant effects on 18 LCAs, of which significant cumulative effects from wind farm developments on 6 of those, and significant cumulative effects from non-wind developments on 2. Significant visual effects from 17 VPs, of which significant cumulative effects from wind farm developments on 11 and significant cumulative effects from non-wind developments on 3. Significant effects on Margam Special Landscape Area (SLA), Western Uplands SLA, Foel Trawsnant SLA, Foel y Dyffryn SLA, Margam Country Park, Margam Mountain Landscapes of Special Historic Interest in Wales (LOSHIW),St Illtyd's Walk and the Ogwr Ridgeway Walk recreational routes.

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
Cultural Heritage	Design evolution	• As per SLVIA Design evolution mitigation described above. These changes will reduce the operational effects of the proposed development on cultural heritage receptors		Significant effect on Mynydd Margam registered landscape.
	Pre-construction and Construction	• archaeological monitoring and recording of groundworks to off-set any potential significant effects by improving archaeological knowledge. • Fencing off assets to protect them from accidental damage. • Pre-commencement and post felling surveys to locate and identify assets	A written scheme of investigation (WSI) which will be submitted to GGAT for approval.	
Hydrology, Geology and Hydrogeological	Design evolution	• All mapped watercourses marked as a constraint and a 50 m buffer applied where possible to protect them from disturbance and potential effects on water quality during construction and operation. • Phase 1 and Phase 2 peat surveys were completed, and areas of deep peat avoided where practical. • Use of existing access tracks where possible to minimise impact on peat resource. • Ground Water Dependant Terrestrial Ecosystems (GWDTE) were also identified and avoided where possible. • Borrow pits and associated search areas located across the site and close to proposed infrastructure to minimise transportation movements of stone. They will be restored after use. All of the proposed borrow pits and search areas are located over 50 m away from watercourses marked on a 1:50,000 scale OS map.		
	Pre-construction and Construction	• Detailed site specific CEMP • SuDS Approval Body (SAB) approved drainage design and Natural Flood Management to ensure flood risk downstream of proposed development is not increased. • Detailed Private Water Supply Monitoring Plan and Method Statement (PWSMP) to be prepared following the completion of the pre-construction investigations. • Baseline surface and ground water monitoring programme	CEMP secured by planning condition. SAB approval for SuDS design. PWSMP secured by planning condition. NFM contained in HMP, to be secured by planning condition. Baseline monitoring programme to be agreed with NRW, NPTCBC and BCBC prior to commencement.	
Traffic and Transport	Design evolution	• Through the design evolution process a transport route has been investigated and assessed to minimise negative effects associated with the proposed development.		Not significant.
	Pre-construction and Construction	• Forest felling vehicle movements mitigated in the construction TMP & CEMP. • There will be increased traffic flows and slow moving vehicles on the highway links utilised by vehicles associated with the proposed development, mitigated via construction TMP. Measures include: ○ Scheduling AIL and HGV deliveries to avoid peak times; ○ Temporary signage to direct drivers to the proposed development and advise of routes not permitted; ○ Temporary signage to warn other road users and pedestrians; ○ Scheduling construction activities, with focus on concrete and AIL deliveries to reduce deliveries whilst key activities are occurring; ○ Reduced speed limits; ○ Trial run for AIL movements including convoys, holding points and specific laybys; and	CEMP secured via planning condition. Construction TMP (AIL & HGV) secured via a planning condition.	Not significant.

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
		○ Consultation with highway authorities and police to coordinate AIL deliveries, including local community via media outlets and individuals. • If the need was identified cumulative construction TMPs for the proposed development and other relevant cumulative developments would be agreed through discussion between the developers and other relevant parties (including the roads authorities).		
	Operation	• With the exception of the operation of the wind turbines and general maintenance of the turbines, there will be little on-site activity during the operational phase and therefore traffic volumes will be considerably reduced relative to the construction period.	OMP secured via planning condition.	Not significant.
	Decommissioning	• Decommissioning would be managed in accordance with a decommissioning plan to be agreed with relevant authorities at the time.	Complete decommissioning in line with specific up to date guidance and agreed with LPAs.	Not significant.
Noise	Design evolution	• The layout of the proposed wind farm, turbine sizes and the turbines proposed has reduced the impacts of noise on potential residential receptors.		
	Pre-construction and Construction	• Noise associated with the construction of the proposed development has been predicted and found to conform to the guideline values set out within BS 5228-1:2014. The locations adopted for this assessment are representative of neighbouring noise sensitive receptors to the proposed development. Most properties will experience sound levels associated with construction that are no greater than existing ambient sound levels. • Blasting, if needed in the process of creating borrow pits would follow BS 5228 guidance to formulate good blast design and minimise vibration to be included in the CEMP. • It is not expected that vibration associated with the winning of aggregate will result in unacceptable vibration levels.	CEMP secured via planning condition. Compliance with relevant guidance including BS 5228 and ETSU-R-97.	
	Operation	• Operational cumulative noise level predictions determined compliance with the requirements of ETSU-R-97. Mitigation to specific turbines (dependent on final chosen turbine model) may be needed to achieve proposed noise limits at all neighbouring noise sensitive receptors.	Compliance with relevant guidance - ETSU-R-97. Compliance with agreed noise limits secured via condition.	
	Decommissioning	• Anticipated noise levels will be similar to those generated through construction without the potential blasting.	Complete decommissioning in line with specific up to date guidance and agreed with LPAs.	Not significant.
Forestry	Design evolution	• Through the design evolution process a key holing approach to felling was agreed with NRW (as land manager) as the best approach to reduce the impacts on forestry as a result of the proposed development.		Not significant.
	Pre-construction and Construction	• Forest felling managed via CEMP and FMP agreed with NRW as land manager.	CEMP secured via planning condition. FMP secured through planning condition.	Not significant
	Operation	• The operational phase will not require any tree felling works unless either maintenance, wind resource, environmental, or health and safety requires the areas immediately around the turbine bases (already cleared of trees) to be cleared of any natural re-growth. Vegetation in this area will likely be low and of no significance to the FRP. • Open ground assigned as part of the HMP and bat buffers will need to be maintained to be kept clear of vegetation as part of the FMP. • Routine NRW felling operations will be ongoing as part of the NRW FRP conducted under their own guidance.	HMP secured though planning condition. FMP secured through planning condition.	Not significant.

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
		• Compensatory planting will be funded by the developer resulting in no net forestry loss.		
	Decommissioning	• Decommissioning may require the immediate areas around the turbines to be clear of vegetation.	Complete decommissioning in line with specific up to date guidance and agreed with LPAs.	Not significant.
Health and Public Safety	Pre-construction and Construction	• Coal mining impacts mitigated through micrositing, the treatment of workings and/or the deepening of foundations beneath zones of workings/collapse. Intrusive site investigation to establish exact situation regarding the coal mining legacy on site, and remediation works identified carried out to satisfaction of the LPA in consultation with the Coal Authority. • Scheme to alleviate shadow flicker at any affected premises lawfully in existence at the date of this permission to within the guidance thresholds to be agreed with the LPAs prior to commissioning. • Lightning protection equipment fitted to project turbines. • TMP developed in collaboration with relevant highways authorities to mitigate significant effects on air quality. • Construction Management Plan to mitigate traffic risks to site workers and general public. • Clearly marked diversions on PRoW where required to protect public from construction related risks.	Coal mining and landslide risk mitigation secured through planning condition. Shadow Flicker mitigation secured through planning condition. Lighting mitigation secured through conformance to accordance with IEC 61400-24:2019. TMP and construction management plan secured through planning condition.	Not significant
	Operation	• Ice monitoring and/or de-icing systems and/or protocols applied to all turbines located within 1 x tip-height distance of any registered public footpaths. Details of this system to be agreed with the relevant LPAs.	Ice throw control system secured through planning condition.	Not significant.
Aviation	Design evolution	• Through the design evolution process helicopter operators and CAA were consulted on an aviation lighting scheme which is proposed as the turbines will be taller than 150 m (in line with CAA guidance) as a safety precaution for low flying and night flying aircraft.		Not significant.
	Pre-construction and Construction	• N/A	N/A	
	Operation	• Aviation lighting scheme. • Potential cumulative impacts on Cardiff Airport radar have been identified however a mitigation strategy has not yet been formalised and the applicant will continue to progress discussions with other developers and Cardiff Airport on ways in which internal capabilities of the radar can be deployed most effectively to mitigate any cumulative effects the proposed development may have on provision of air traffic services in this section of airspace.	Aviation lighting scheme to be secured via condition. Once strategy agreed radar mitigation to be secured via condition.	Not significant. The effect on the provision of air traffic radar services by Cardiff Airport may be minor to moderate and therefore potentially significant until mitigation measures agreed.
	Decommissioning	• N/A	N/A	
Existing Infrastructure	Design evolution	• Through the design evolution process effects on utilities and telecommunications have been minimised on links, pipes and lines by placing turbines and other infrastructure away from existing infrastructure also with consideration to limit disruption to public access a blade length buffer from all registered footpaths has been applied.		Not significant.
	Pre-construction and Construction	• Pre-construction checked would be completed to confirm all baseline data was still correct nearer the time of construction. • For health and safety some public access routes through the site will be closed during various phases of the construction. This will be managed by an AMEP.	AMEP secured via planning condition.	Not significant.

ES Chapter	Phase	Considerations for Mitigation/Enhancement	Commitment securing mechanisms for Mitigation/Enhancement	Residual Effect
	Operation	• As part of the AMEP the applicant aims to offer enhancement measures in the form of improving recreational infrastructure within and local to the proposed development.	AMEP secured via planning condition.	Not significant.
	Decommissioning	• Decommissioning would be managed in accordance with a decommissioning plan to be agreed with relevant authorities at the time.	Complete decommissioning in line with specific up to date guidance and agreed with LPAs	Not significant.
Socioeconomics	Pre-construction and Construction	• Access Management and Enhancement Plan will maximise the availability and viability of recreational infrastructure within the site boundary to reduce impacts on tourism and tourism related businesses.	AMEP agreed with LPAs and NRW (as land manager) prior to construction, and through communication with recreational users through relevant channels.	Not significant.

Source: Natural Power

17.4 SYNERGISTIC EFFECTS

17.4.1 Synergistic effects results when several individual impact factors combine to influence a receptor which is greater than the sum of the individual impacts. The structure of the ES demonstrates this approach with grouping of assessments on the biological environment (Ecology and Ornithology) physical environment (Seascape, Landscape and Visual, Cultural Heritage and Hydrology, Geology and Hydrogeology) and population and human health environment (Traffic and Transport, Noise, Forestry, Health and Public Safety, Aviation, Existing Infrastructure and Socioeconomic). The inclusion of Population and Human Health in EIAs was introduced in The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. It is acknowledged that there are some potential overlaps between the biological environment, the physical environment, and the human environment. As such, impacts which may be non-significant in isolation may have an additive effect, and lead to an overall negative impact even if each impact in isolation is considered unlikely to do so.

17.4.2 This assessment considers the potential synergistic effect of related residual effects during construction, operation, and decommissioning of the proposed development. A synergistic effect during decommissioning is considered to be of similar or less significance than that created during construction and therefore they are discussed together.

Construction and Decommissioning

17.4.3 During the construction and decommissioning phases, potential adverse synergistic effects are limited to areas which are within or close to the proposed development where there will be heavy plant operations, earth works, forestry operations and vehicle movements. These could result in potential synergistic effects upon physical and biological receptors including where there are overlaps between ecology, ornithology, hydrology, hydrogeology and geology, and forestry. These effects would be temporary in nature, and will be mitigated against through a CEMP, TMPs, Decommissioning Plan, HMP, and SPP. In isolation, these effects have been assessed in the ES as not significant after mitigation is applied. These potential effects will also be monitored by an ECoW. Given the limited number and extent of receptors, the limited effects predicted, and their temporary nature, the synergistic effects during construction and decommissioning phases are considered not significant.

Operation

17.4.4 Potential synergistic effects during the operational phase relate primarily to overlaps between physical and human receptors and are limited to areas which are within or close to the proposed development where there may be a combination of potential visual, noise and shadow flicker effects.

17.4.5 The ES predicts that there are no residual significant effects in isolation for noise, shadow flicker, and aviation lighting. Significant effects are predicted for residential visual amenity. While no properties are considered as having the potential to reach the RVA threshold, 120 properties are identified as being likely to experience significant effects. 17 receptors/locations are common to the noise, shadow flicker and residential visual amenity assessments, and these are listed and assessed in Table 17.2. These receptors are predicted to experience effects across all three assessments in isolation. To note, some property names differ across all three assessments, however, they have been grouped where proximity makes it possible for synergistic effects to occur.

17.4.6 Individual effects could combine to result in a synergistic effect on these receptors. Shadow flicker and noise effects at these receptors will be not significant individually due to specific mitigation proposed for these factors, as well as their temporary nature (experienced for a short amount of time). In the professional judgement of Natural Power, those receptors that were assessed individually as not significant, still remain as not significant when considering synergistic effects. However, where residential visual effects were identified as significant individually, these will remain as significant as no further mitigation can be applied.

Table 17.2: Receptors included in individual assessments with potential for synergistic effects

Receptor Name (RVA/Noise/Shadow Flicker)	Synergistic significance of effects after mitigation
Highland Heights/ Noise Monitoring Location (NML)1/ Receptor (R) 13	Significant
The Pines/ NML2/ R15	Significant
Station Terrace/ NML6/ R5	Significant
Troed y Glyn/ NML 5/ R4	Not significant
Hafod Farm/ NML8/ R10	Significant
Garn Wen/Tonna Farm/ R1/ R21	Not significant
Lluest Wen/ NML9/ R12	Not significant
Penrhiw/ NML7/ R6	Not significant
1 Old School Court/ Bryn Village Central/R24	Significant
Cynonville/NML4/R2	Not significant
Tair Waun place Maesteg/NML10/R17	Significant
Dyffryn West/R9/R2	Not significant
Caerau West/Tudor Estate/R23	Not significant
Penylan Farm/R2/R20	Not significant
Garn Wen Farm/NML03/R19	Not significant
Rhiwlas/Rhiwlas(2)/R14	Significant
Cae Cwm Duffryn/Gallt-y-cwm/R8	Not significant

Source: Natural Power

17.4.7 Sections of both St Illtyd's Walk and the Ogwr Ridgeway Walk are predicted to have significant visual effects where they pass near to the turbines. Short sections of both routes come within areas of greater noise propagation from the proposed turbines, particularly St Illtyd's Walk as it passes through the proposed development in close proximity to the turbines, although neither the direct views nor noise would prevent use of these amenities. Ice-throw and lighting strikes could also potentially feed into synergistic effects on this receptor. However, the presence of lighting protection equipment on turbines, and the adoption of an ice-throw mitigation protocol, would reduce these effects to not significant.

17.4.8 The HMP proposed by the applicant, which will include restoration of broadleaved woodland, creation of open ground, bracken control, pond creation, wet woodland restoration and removal of invasive plant species will likely create a positive synergistic effect with the surrounding area, including natural flood management benefits. However, it is not possible to directly identify the resulting expected benefits in the same way as can be done for onsite habitat management. The same can be said in respect of any AMEP enhancements.