



Cyngor Castell-nedd Port Talbot
Neath Port Talbot Council



Llywodraeth Cymru
Welsh Government

A Global Centre of Rail Excellence in Wales

Environmental statement volume I

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Contents

	Page	
1	Introduction	1-1
2	Environmental Impact Assessment	2-1
3	Proposed development	3-1
4	Alternatives/design evolution	4-1
5	Traffic and transport	5-1
6	Ground conditions	6-1
7	Biodiversity	7-1
8	Archaeology and cultural heritage	8-1
9	LVIA	9-1
10	Noise and vibration	10-1
11	Water resources	11-1
12	Socio-economics	12-1
13	Health and Wellbeing	13-1
14	Air quality	14-1
15	Climate change	15-1

1 Introduction

1.1 Planning application overview

- 1.1.1** The Welsh Government is submitting a cross boundary outline planning application (with all matters reserved), to both Powys County Council (PCC) and Neath Port Talbot County Borough Council (NPTCBC) for the development of a Global Centre of Rail Excellence (GCRE) at the site of Nant Helen Surface Mine, Onllwyn. At this site coaling operations are coming to an end and final restoration by Celtic Energy was consented in June 2020 under a section 73 application 19/1899/REM.
- 1.1.2** In April 2020, Celtic Energy submitted two planning applications reference 20/0738/FUL (Powys) and P/2020/0362 (Neath Port Talbot) (both consented in July 2020) for a complementary earthworks scheme to provide a comprehensive, flexible and adaptable landform across the entire site that could support a wide range of future uses which included the GCRE, establishing the earthworks formation and associated drainage and landscaping for two of the key components of the rail testing facility, namely the high speed and infrastructure test loops and rail line connections.

1.2 Site location and context

- 1.2.1** The proposed development site is within the Dulais Valley, straddling the Neath Port Talbot and Powys border, with the Brecon Beacons National Park Authority boundary immediately to the north. It consists of areas within the Nant Helen Open Cast mine with ground levels that vary between 220m and 335m AOD, plus the Onllwyn Washery and Distribution Centre (58ha), which serves as a preparation and washery facility.
- 1.2.2** The project site has been extensively worked as an open cast coal mine and therefore currently consists of brownfield restored land, overburden mounds, coal stocking areas, barrel wash and plant maintenance areas, site office facilities and a void which is currently being mined. Much of the site has been revegetated. The planning development boundary is shown on Figure 1.1 and within the regional context in Figure 1.2.
- 1.2.3** The site's existing topography is such that previous mining activities have been screened from view from within the nearby settlements of Onllwyn, Seven Sisters, Ystradgynlais, Caehopkin, Abercrave or Coelbren.
- 1.2.4** An existing rail connection is located to the south. The southern area of the site is crossed by high voltage overhead lines and pylons running roughly parallel to each other, the northern line carries

Western Power Distribution's (WPD) 132kV cables, the southern line carries National Grid's (NG) 400kV cables.

1.3 Common land and PRow

1.3.1 Common land (BCL78-Mynydd-y-Drum) extends across the southern section of the site, as shown in Figure 12.2.

1.3.2 There are also a number of Public Rights of Way (PRow) that cross the site although the majority of these have been temporarily suspended for the duration of the existing coaling operations.

1.3.3 More details on what the Common Land and PRow Strategy is for this proposed development are included in Chapter 12: Socioeconomics.

1.4 Why is GCRE needed?

1.4.1 The UK does not possess anything approaching such a high-quality facility as that planned at GCRE. Both public and private sector organisations frequently use test facilities in Europe and the USA, supporting jobs and building competing expertise in other countries. Moreover, these other facilities are often owned and operated by a single commercial entity, which stifles access to testing and innovation. With projects such as HS2, CrossRail2, Northern Powerhouse Rail and the Cardiff Valleys transformation approaching, together with the soon to be time-expired status of the majority of the UK's signalling infrastructure (in itself an estimated £35 bn renewals programme from 2025), the need for safe and efficient testing to drive performance and cost-efficiency has never been greater. Operational independence and full open-market access is critical to allow competition and innovation to flourish.

1.4.2 GCRE will address a number of specific issues:

- Supporting UK train manufacturers and encouraging the establishment of further UK manufacturing facilities and testing capacity.
- Supporting the development of a UK digital railway industry by providing high quality and safe testing facilities for digital signalling, train control and asset management technologies.
- Delivering high-tonnage endurance testing of railway infrastructure particularly track and structures; such a facility will enable infrastructure to be rapidly tested and verified and would be unique in Europe, potentially attracting customers from around the world – Network Rail has a strong and confirmed interest in this element.
- Removing risk from the introduction of new trains and other assets by allowing them to be thoroughly tested prior to deployment. This would avoid the need for new trains being tested on the

national network or rushed into service before all performance risks had been dealt with (note issues with new inter-city trains; certain electrification assets; and projects such as Crossrail). With infrastructure and rolling stock testing in a single location, more robust systems integration testing can be conducted.

- Tackling ever-rising costs across the rail sector by allowing new technologies to be effectively tested and commissioned rather than committing them to operations before they are fully developed.
- Generating high quality employment and economic opportunities for communities in South West Wales.
- Providing further opportunities for sustainable technologies associated with the rail sector (electric, battery, links to sustainable generation).

2 Environmental impact assessment

2.1 Introduction

2.1.1 Environmental Impact Assessment (EIA) is required for certain categories of projects and involves a process of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects which must be considered before development consent (planning permission) is granted.

2.1.2 The EIA process leads to the presentation of information about the proposed development, along with its associated environmental effects, within an Environmental Statement (ES) for the consideration by the determining authority in deciding whether planning permission should be granted.

2.1.3 The EIA process itself includes key characteristics:

- **Systematic** – the EIA is comprised of a series of tasks that are defined by regulation and practice;
- **Analytical** – the EIA must be used to inform the decision making rather than promote the project itself;
- **Consultative** – the EIA process must allow for and provide opportunity for interested parties and statutory consultees to provide feedback on the project and assessments undertaken; and
- **Iterative** – the EIA process should allow for environmental concerns to be addressed during the planning and design stages of the project.

2.2 Regulatory context

2.2.1 The site of the proposed development is more than 1 hectare in area and constitutes major development as defined within the Town and Country Planning (Development Management Procedure) (Wales) Order 2012 (as amended). Subsequently, there is a requirement to undertake an EIA as prescribed in the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (the EIA Regulations).

2.2.2 Schedule 4 of the EIA Regulations lists the information that should be included in an EIA. This is outlined in Table 2.1 below together with details of where this information can be found in the ES.

Table 2.1 Schedule 4 Requirements for inclusion with EIA

Schedule 4 Requirement	Where assessed/ included in the ES
A description of the development, including details of the location, the physical characteristics of the whole development and the land use requirements during the construction and operational phases, a description of the main operational phase characteristics and an estimate of the type and quantities of emissions and residues.	Chapter 3
A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant with an indication of the main reasons for the choice, taking into account a comparison of environmental effects	Chapter 4
A description of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development.	Chapters 5-17
A description of factors likely to be significantly affected by the proposed development. To include consideration of population, human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, and landscape.	Chapters 5-17
A description of the likely significant effects of the development on the environment and, where appropriate, any proposed monitoring arrangements.	Chapters 5-17
A description of forecasting methods or evidence used to identify and assess the effects on the environment including any details of difficulties encountered compiling the information.	Chapters 5-17
A description of measures designed to avoid, reduce or, if possible, offset any significant adverse effects on the environment along with a description of measures designed to enhance beneficial effects.	Chapters 5-17
A description of potential significant effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters.	Considered within each of the assessment chapters where relevant.
A non-technical summary.	This has been prepared as a separate document and also included in the front end of the ES for completeness.
A reference list detailing the sources used for the descriptions and assessments included in the EIA.	References have been included in each of the ES chapters as footnotes.

2.3 EIA guidance

2.3.1 The EIA has been undertaken in accordance with best practice including:

- IEMA Quality Mark** – this is run by the Institute of Environmental Management and Assessment (IEMA) and is based around a set of EIA Commitments, which organisations registered to the scheme agree to comply with. Arup are registered with the Quality Mark. The IEMA EIA

Quality Mark provides registrants with a benchmark for their EIA activities and allows them to demonstrate their commitment to effective practice; and

- **Welsh Office Circular 11/99 Environmental Impact Assessment (EIA)** – this sets out guidance on what information and approach should be taken for an EIA. Whilst now over 20 years old, it is still relevant, providing helpful guidance.

2.4 EIA Scoping and pre-application consultation

2.4.1 Scoping is the identification, at the early stages of a project, of the likely potential significant issues that may arise as a result of a proposed development. As part of this process the planning authority (PCC and NPTCBC) was asked for its formal opinion on what information should be included within the ES. Scoping helps to ensure that issues and potential effects are assessed at the appropriate level of detail within the EIA.

2.4.2 A request for a scoping opinion was submitted to both PCC and NPTCBC Planning Departments on 27th September 2019. This request also formally informed the Planning Authorities that an ES would be submitted along with the planning application for GCRE. A joint scoping opinion from both planning authorities was subsequently adopted on 25th October 2019 (Appendix 2A). This includes feedback from Statutory consultees.

2.4.3 Scoping establishes what assessments will be carried out for the EIA and for what phases of the development they would apply to. This EIA considers potential impacts that may arise during the construction and operational phases. The proposed development is intended to have a life span of decades, and therefore there is little to be gained from including consideration of any impacts considered likely during any decommissioning phase. Should the proposed development site be returned to its current baseline state in the future, this would be assessed at that time.

2.4.4 Assessment topics covered in the ES, as confirmed during scoping include:

- Traffic and transport
- Hydrology and flooding
- Ground conditions
- Biodiversity
- Air quality
- Noise and vibration
- Archaeology and cultural heritage
- Socio-economics

- Health and well-being
- Landscape and visual assessment
- Climate change
- Materials
- Cumulative effects assessment

2.5 Assessment methodology

2.5.1 Once the scope of the EIA had been established, individual environmental topics were subject to survey and investigation to establish the baseline conditions. This was followed by assessment to identify and predict the significance of the likely environmental impacts of the proposed development. The assessment methodologies applied are based on recognised best practice and guidance specific to each topic area; relevant details of assessment methodologies are provided in the appropriate assessment chapters of this ES.

2.5.2 The technical studies that have been undertaken for each topic area have generally followed the same approach:

- Collection and collation of existing baseline information of the study area in addition to any supplementary survey work required to fill any data gaps or to update any outdated information;
- Frequent consultation with both internal specialists within the team and relevant external consultees. This has been both within and across topic areas;
- Consideration of the potential effects of the Hendre Lakes proposal on the existing baseline, followed by identification of possible design changes that would lead to the avoidance or reduction of predicted adverse effects (and likewise the enhancement of any positive effects);
- Assessment of the final scheme design and evaluation of the significance of any residual and cumulative effects; and
- Compilation of the relevant ES chapter.

2.5.3 Many of the environmental effects are relevant to more than one topic area and therefore, attention has been paid to the interrelationship between them where they exist. For example, the biodiversity assessment, has received input from the water resources and air quality assessments. In this way ‘in-combination’ effects have been considered throughout the assessment chapters.

2.6 Additional consenting regulatory regimes

2.6.1 In addition to the EIA Regulations, other regulatory frameworks have been observed. These include:

- Habitat Regulations Assessment (HRA) – The UK Habitats Regulations are used to implement the EU Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora). Following a review of designated sites within the study area, it was concluded that an HRA would not be required;
- The Water Framework Directive (2000/60/EEC) - The Project will aim to attain the highest achievable level of water quality standards. This would be achieved with the incorporation of Sustainable Drainage Systems (SUDS) into the design to improve the quality of the runoff from the proposed site; and
- The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018. The SuDS must be designed and built in accordance with statutory SuDS standards¹.

2.7 Identification and significance of effects

- 2.7.1 Schedule 4 of the EIA Regulations sets out the information that must be included within an ES. This includes aspects of the environment likely to be affected by the development; a description of the likely significant effects on the environment; and a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- 2.7.2 Developments may affect different environmental elements to varying degrees, and as agreed at Scoping, not all impacts arising from a development are of sufficient concern to require detailed investigation or assessment within the EIA process.
- 2.7.3 Within each chapter of this ES, definitions are given for what environmental receptors (or receiving environments) are being assessed along with a description of what changes the proposed development is likely to cause the affected receptors. This represents the scope of the assessment.
- 2.7.4 In broad terms, significance of an effect is defined to be a function of:
- Resource value (international, state or local level importance)/receptor sensitivity;
 - Magnitude of effect (either adverse or beneficial); and
 - Temporal scale (temporary or permanent)
- 2.7.5 Each topic chapter defines what criteria have been used to establish resource value/sensitivity and magnitude of effect.

¹ Statutory SuDS Standards for designing, constructing, operating and maintaining surface water drainage systems

2.7.6 Unless otherwise specified within the assessment chapter, the definitions of timescales that have been used include:

- Short term: Up to 1 year:
- Medium term: 1-3 years; and
- Long term: greater than 3 years.

2.7.7 Professional judgement, along with relevant and accepted guidance is used within each assessment chapter to assess the interaction between receptor value (i.e. its importance or sensitivity) and the predicted magnitude of change to identify whether an effect is significant and what level of significance should be assigned (e.g. high, medium, low or negligible significance). In some cases, this is based on quantitative assessment whereas in others, it is only possible to use professional judgement and qualitative descriptions. In all cases, clear justification for the assessment approach has been set out along with all assumptions and limitations.

2.7.8 Where there are no topic specific standards/guidance for assessing significance, the criteria set out in Table 2.2 for sensitivity of receptor, and Table 2.5 for magnitude of effect, have been used within the assessments

Table 2.2 Definitions of sensitivity

Level of sensitivity	Definition of sensitivity examples
High	Environment is subject to major change(s) due to impacts: e.g. species present in nationally important numbers, or globally threatened; Special Area of Conservation; National Park; World Heritage Site; a panoramic viewpoint
Medium	Environment clearly responds to effect(s) in a quantifiable and/or qualifiable way: e.g. species present in locally important numbers; people travelling on roads; lowland agricultural landscape; an archaeological feature that is not unusual but cannot be considered common.
Low	Environment responds in a minimal way, or not at all, to effect(s) such that only minor, or no, changes are detectable: views from softwood commercial plantation; an archaeological feature that is common, or has been mostly destroyed; common, widespread species

2.7.9 The magnitude of the effect on the baseline can then be assessed considering the scale, extent of change, nature and duration of effect.

Table 2.3 Definition of magnitude

Level of magnitude	Definition of magnitude
High	Total loss or major alteration to key elements/ features/ characteristics of the baseline (pre-development) conditions such that post development character/composition/attributes of baseline will be fundamentally changed.

Level of magnitude	Definition of magnitude
Medium	Partial loss or alteration to one or more key elements/ features/ characteristics of the baseline (pre-development) conditions such that post development character/ composition/ attributes of baseline will be partially changed
Low	Minor loss of or alteration of the baseline. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of the baseline condition will be similar to pre development circumstances/patterns
Negligible	Very minor loss or alteration to one or more key elements/features/characteristics of the baseline (pre-development) conditions. Change barely distinguishable, approximating to the “no change” situation.

2.7.10 Using these definitions, a combined assessment of sensitivity and magnitude can then be undertaken to determine how significant an effect is, as demonstrated in Table 2.4. Where effects are classified as being of moderate and/or major significance (either beneficial or detrimental), the effect is considered significant in EIA terms.

2.7.11 Table 2.5 provides a description for each of these criteria definitions.

2.7.12 The majority of assessments have used these criteria; however, where there is deviation, this is explained and justified within each of the topic assessment chapters.

Table 2.4 Significance matrix

	SENSITIVITY			
		Low	Medium	High
MAGNITUDE	High	Moderate	Major or Medium	Major
	Medium	Minor or Moderate	Moderate	Major or Moderate
	Low	Minor	Minor or moderate	Moderate
	Negligible	Negligible	Negligible	Negligible

Table 2.5: Definition of significance levels

Significance	Criteria Definition
Major	These effects are likely to be key factors or important considerations at a regional or district scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process. They are generally, but not exclusively associated with sites and features of national importance and resources/features which are unique and which, if lost cannot be replaced or relocated.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design of the project.
Negligible	Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

2.8 Future baseline for site

2.8.1 Celtic Energy, which currently owns the Nant Helen mine, has submitted a s73 (Town and Country Planning Act, 1990) application to Powys County Council for an amendment to the site restoration plans that were initially approved as part of a 2011 planning application to extend the coal working area of the site.

2.8.2 The restoration of the site would take place once the mine ceases operation in 2020. As the restoration will not be completed before the commencement of the assessments, obtaining data on baseline conditions of a restored site will not be possible. The EIA will therefore consider the existing (i.e. pre-restoration) conditions, although where relevant, future baseline (post restoration) will be considered based on information about the restoration plans known at the time of assessment. Each topic chapter will define this clearly within the assessment methodology sections, providing clear justification for which baseline is considered. Figure 2.1 shows the redline boundary overlain on Celtic Energy's proposed restoration plan.

2.9 Cumulative effects

2.9.1 Cumulative effects are defined as those that result from incremental changes caused by other past, present or reasonably foreseeable actions/developments, in combination with the proposed development. They may result in effects that are more than, or less than the sum of the individual effects. For the purpose of this project, two developments were considered in relation to cumulative effects:

2.9.2 Nant Helen Restoration works (committed development)

- 2.9.3 As the restoration is committed, the baseline for this assessment is, in most cases, the restored site.
- 2.9.4 Consequently, the assessment for GCRE already includes consideration of the restoration works in the assessment. No further assessment is required to identify cumulative effects.
- 2.9.5 Nant Helen Earthworks (committed development)
- 2.9.6 As the earthworks are committed, the baseline for this assessment is, in most cases, the restored site.
- 2.9.7 Consequently, the assessment for GCRE has already included consideration of the restoration works in the assessment. No further assessment is required to identify cumulative effects.
- 2.9.8 In-combination effects are different types of effects that interact and are experienced by the same receptor. For example, one residential receptor may experience noise and air quality effects at the same time, which in-combination may result in an effect that is greater than the sum of effects. These kinds of effects are addressed within each of the topic where appropriate.

2.10 Assumptions and limitations

- 2.10.1 It has been assumed that information provided by third parties, including publicly available information and databases is correct at the time of publication.
- 2.10.2 Assumptions and limitations specific to environmental aspects are discussed in the relevant topic assessment chapters of this ES.

2.11 Project team

- 2.11.1 A multidisciplinary team from Arup has provided advice on the development proposals, identifying and addressing environmental issues that might arise. This team has been responsible for preparing the Environmental Statement.
- 2.11.2 It is best practice to provide statements of competency for each of the environmental experts that have led each of the assessments within the ES. These are provided in Appendix 2B.

2.12 ES Structure

- 2.12.1 The ES contains the environmental information that is required by the EIA Regulations and comprises a number of elements that are outlined in the sections below:

- **Non-technical summary (NTS)** – a report which summarises the findings of the EIA written in non-technical language. This is included as a standalone document in addition to at the front of the main ES: Volume I.
- **Environmental Statement Technical Assessments** – Main ES document including introductory chapters and the EIA topic chapters (4 - 16).
- **Environmental Statement Appendices** – includes the technical reports and data that accompany the technical assessments of the ES.
- **Environmental Statement Figures** – includes all the figures that are referenced within this ES, however some figures relating to the description of development are integrated into the main text for ease of reference.

2.13 Application documents

2.13.1 Due to the cross-boundary nature of the proposed development site, the ES is being submitted to Powys County Council and Neath Port Talbot County Borough Council for determination as part of the planning application for GCRE. Table 2.6 lists other documents submitted.

Table 2.6: Documents submitted with the planning application

Application documents
Planning, Design and Access Statement
Environmental Statement
Transport Assessment
Flood Risk Assessment and Drainage Strategy

3 Proposed development

3.1 Description of the proposed development

3.1.1 The Welsh Government is proposing to develop a rail testing, maintenance, research, development and storage facility, known as the Global Centre of Rail Excellence (GCRE) at the site of the Onllwyn Washery and Nant Helen Open Cast mine where coaling operations are coming to an end and final site restoration by Celtic Energy is consented.

3.1.2 The site for the proposed development is approximately 475ha and includes the components listed in Table 3.1 and represented on Figure 1.1. These are described in more detail within this chapter of the ES and form the basis of the Environmental Impact Assessment that has been carried out for the scheme.

3.1.3 GCRE aims to meet a number of objectives which have been developed to address the issues and needs of the UK rail industry:

- To deliver a UK-based modern and comprehensive rail testing facility to provide the capacity and capabilities for rigorous testing of rolling stock, infrastructure and integrated systems from prototype to implementation.
- To act as a catalyst for the creation of a rail technology hub in Wales, providing a flexible, open-market platform for leading R&D activity that drives innovation.
- To provide opportunities to work with industry to support skills development through high-quality employment in fair, secure and sustainable jobs that contribute to reducing regional inequality and promoting regeneration in Wales.
- To develop and test rail sector principles, standards and specifications which improve the UK's competitive strengths as a world leader in achieving carbon neutrality, contributing to an overall decrease in carbon emissions across the rail industry

3.1.4 GCRE would be developed over three phases. The phase in which each element of the facility would most likely be developed is identified in Table 3.1; however, for the purpose of the EIA, the development of all phases is considered (i.e. the whole development). Where necessary, the assessments take account of any temporary development that occurs in the intermediate phases of development. More detail of the construction phasing is set out in Section 3.2.

Table 3-1 Project components

Project component [x] refers to features on Figure 1.3	Description summary	Phase of development
[1] Large railroad test track (outer track)	Electrified high speed outer rail testing track (6.9 km) which would extend around the perimeter of the site to enable the testing of moderate and higher-speed trains up to a maximum 110 mph.	Phase 2
[2] High tonnage infrastructure test track (inner track)	Electrified low speed test track (4.5km) for testing of rail infrastructure, including track systems, civil structures, ancillary lineside equipment, signalling, power and telecommunications equipment. Trains able to run up to a line speed of 40mph.	Phase 1
[3] Dual platform station environment	a dual platform station environment (typical of the UK rail network) for the testing of train – platform interfaces. The platforms will have sufficient length to serve 230m trains and will likely take the form of modular, pre-cast concrete units constructed off-site.	Phase 2
[4] Warm and Cold Storage Sidings	Sets of storage roads for the medium-long term storage of train fleets. Storage capacity for up to 400 vehicles with connections to shore supply units located incrementally along sidings	Phase 1,2 and 3
[5] Infrastructure research and development centre	The centre would provide opportunities for research, development, education and training/conference facilities including laboratory space.	Phase 3
[6] 4-road rolling stock maintenance shed	4-road rolling stock maintenance shed for trains undergoing testing at the facility. Capacity for 2no. 400m trains and 2no. 230m trains simultaneously with provision of headshunt road at shed rear for increased operational flexibility. Internal provision of light and heavy maintenance roads.	Phase 2
[7] An operations & control centre/office Plus separate staff accommodation	A multi-storey control building from which testing activities would be managed. Separate staff accommodation which would also act as a general hub for site personnel.	Phase 2 (but temporary provision in a combined building in Phase 1)
[7] Carriage wash and CET spine facility	A carriage wash facility to service trains up to 400m in length. Controlled Emission Toilet (CET) point	Phase 2

Project component [x] refers to features on Figure 1.3	Description summary	Phase of development
	with canopy to control wash equipment, water and cleaning materials.	
Site Access	Access to the external highway network is proposed to be taken from existing junctions of the A4109 Wembley Avenue with Onllwyn Road, the A4221 Celtic Energy – Nant Helen access road, and the A4221 Washery and Distribution centre access which will be used by HGVs only.	Phase 1 and 2
Decommissioning facility	This is a facility which allows for the decommissioning of rolling stock.	Phase 3
Associated development	Across the site associated development would include access routes, staff car parking, drainage, lighting, mobile and land based communications ‘hyper connectivity’, CCTV, fencing (including acoustic mitigation as required), Neath and Brecon Branch Line connection and signalling upgrade.	Phase 1 and 2

Rolling Stock test track

- 3.1.5** The rolling stock test track, comprised of one loop of 6.9km length, has the primary function of performance testing of diesel, electric and hydrogen trains. There is space for a second track should there be a future market demand; however, this application does not include a second track. An overhead 25kV AC traction power system is included as part of the core scheme, with scope for additional DC 3rd / 4th rail system inclusion at later design.
- 3.1.6** The OLE system will likely take the form of a series of cantilever structures at approximately 40m intervals around the test track, most likely with piled or shallow pad foundations, the latter being a mitigation for the settlement expected as part of the track corridor earthworks.
- 3.1.7** The test track includes a dual platform station environment, typical of the UK rail network, for the testing of train – platform interfaces. The platforms will have sufficient length to serve 230m trains and will likely take the form of modular, pre-cast concrete units constructed off-site. The test track will have a vehicular access track around its entirety as a means of access for maintenance staff and will be

contained within a 2.1m palisade fenceline along both corridor boundaries, or appropriate acoustic mitigation where required.

- 3.1.8 Once operational, trains will be able to travel at speeds of up to 110mph. The test track will connect to the existing branch line and washery area via a bi-directional delta junction. It is anticipated most rolling stock would access the facility via the Neath & Brecon Branch Line and Swansea Burrows Sidings beyond, although some trains may be transported to site via road.

High tonnage infrastructure test track

- 3.1.9 The high tonnage infrastructure test track, comprised of a single 4.5km loop, has the primary function of testing rail infrastructure under high axle loads. It is envisaged that a single heavily-loaded freight train will occupy the loop permanently. An overhead 25kV AC traction power system is included as part of the core scheme, which will likely take the form of a series of cantilever structures at approximately 40m intervals around the test track, most likely with piled or shallow pad foundations, the latter being a mitigation for the settlement expected as part of the track corridor earthworks. As per the rolling stock test track, the test track will connect to the existing branch line and washery area via a bi-directional delta junction. An infrastructure testing R&D facility will be constructed for the collation and assessment of testing results, as well as lay-down areas for equipment being tested. Once operational, the trains used for infrastructure testing will be able to travel at a line speed of 40mph.

Central control building

- 3.1.10 The 2-storey control building (upto (l)10m x (w)30m x (h)10m with a floorspace of 600m²) would manage all the testing activities. A central points control system would be used for the control of the upgraded points which would allow for control via video display units. Multiple lineside cabinets would be required (assumed to be one, per set of points).

Staff facilities and overnight accommodation

- 3.1.11 The staff facilities building during Phase 1 would be modular style, one storey, up to (L)20m x (w)6m x (h)15m and provide male and female accessible toilets, typical mess facilities (running hot water, fridge, microwave), a fully ventilated PPE storage room, and male and female changing rooms, provided at the location shown on Figure 1.3.
- 3.1.12 For Phase 2 these temporary buildings would be replaced with permanent lay-down and mess facilities which would include overnight accommodation provision for ten staff (including those using the testing facilities). Accessible toilet and wash facilities would

be provided. The permanent staff facilities building would be a maximum of 30m x 10m x 15m in size, with a floorspace of 900m².

Infrastructure testing research and development centre

3.1.13 During Phase 1, the research and development centre would be (l)20m x (w)12m x (h)10 m (2 storeys) in size and provide opportunities for research and development, conferencing, exhibition space, teaching and general staff facilities. During Phase 2 this building is to be relocated.

3.1.14 The final building to be constructed during Phase 3 would be up to (l)50m x (w)10m x (h)10m (2 storeys) and would continue to provide research and development facilities.

3.1.15 Staff parking would be provided at this location. The number of spaces will be determined on standard allowance for number of staff.

4-road rolling stock maintenance sheds

3.1.16 4-road rolling stock maintenance shed for trains undergoing testing at the facility.

3.1.17 The two storey sheds would be divided into two “roads” with mirrored facilities. Two roads would be (h)12m x (w)20m x (l) 400m and two roads would be (h)12m x (w)20m x (l)250m to allow multiple operators to use the shed simultaneously.

3.1.18 The 250m-long roads would allow for the servicing and maintenance of most rolling stock currently operating on the UK Rail Network and would include:

- Facility for changing wheelsets/underframe components;
- A single pitted road to allow underframe inspections;
- Jacking equipment on all remaining shed roads;
- CET provisions for all rolling stock - diesel, water and compressed air supplies;
- Multiple LV power supplies – 100V, 240V, etc;
- Multiple 23m raised access gantries to provide full roof access;
- 5-10 tonne crane on at least one road;
- Vehicle weighing facilities, software testing facilities, fire testing and emissions testing all within static testing area; and
- Rolling stock decommissioning siding to be accessible by a static crane, together with a 1 car shed for covered cleaning
- Maintenance facility for trains undergoing testing at the facility. Full roof and underframe access. Heavy jacks for lifting trains. See sketch for more details:

Decommissioning facility

- 3.1.19 A decommissioning shed of one storey (up to (l)35m x (w)10m x (h)12m) used for contaminant and asbestos removal of old train carriages once the basic internal furniture has been removed by heavy machinery.
- 3.1.20 Where rolling stock needs to be maintained this would require the following steps:
- Once on site, each carriage would be stripped down to remove seats and steps and the wheelsets removed (externally). This would be done using a combination of heavy machinery and operators using hand tools. Carriages are lifted from wheelset using crane.
 - Carriages would be lifted into the single-carriage-length shed for contaminants and asbestos removal within the contained shed.
 - The remaining metal carriage shell would be cut up using heavy machinery, sorted, and taken to the relevant recycling locations.

Warm and cold storage sidings

- 3.1.21 Warm and Cold Storage Sidings – sets of storage roads for the medium-long term storage of train fleets.
- 3.1.22 These would be sets of uncovered storage roads for the medium-long term storage of train fleets and would have a storage capacity for approximately 400 vehicles. These would be provided with connections to shore supply units located incrementally along sidings with shore supplies supported by lineside equipment and substations.
- 3.1.23 2.5km of bollard lighting or floodlights and associated cabling would be provided along alternate sidings with an assumed bollard spacing of 8m (approx. 1A per bollard along 4.1km of track).
- 3.1.24 The development of the warm and cold storage sidings would be spread across all 3 phases of development.

Carriage wash facility and plant room

- 3.1.25 The carriage wash facility would be available for use for the cleaning of all rolling stock having heavy moving machinery for cleaning. It would be one storey up to (l)35m x (w)10m x (h)12m, and able to service trains up to 400m. It would include a CET point with canopy housing heavy, moving machinery. The plant room would be up to 20m x 4m and water would be heated for cleaning.
- 3.1.26 The carriage wash would only be used during the daytime (0700-2300) in order to minimise noise breakout to local residents.

Site Access

- 3.1.27** Access to the external highway network is proposed to be taken from existing junctions of the A4109 Wembley Avenue with Onllwyn Road, the A4221 Celtic Energy – Nant Helen access road, and the A4221 Washery and Distribution centre access which will be used by HGVs only.
- 3.1.28** A network of internal access roads would be provided which are shown on Figure 1.4. These include a maintenance track around the perimeter of each of the rail testing loops.

Associated infrastructure

- 3.1.29** Associated infrastructure would be required for GCRE and would include components listed in Table 3-2. The phase in which these would be brought forward is also indicated.

Table 3-2 Associated infrastructure

Project component	Description summary	Phase of development introduced	Included in full facility (i.e. on completion of Phase 3)
Maintenance tracks	Gravel vehicle maintenance tracks would be provided running in parallel with each rail.	Phase 1 and 2	Yes
Substations	A total of five substations would be provided: One primary substation; two substations for site supplies; and two substations for shore supplies. The location of these is not yet determined, but would be within the washery site close to other buildings.	Phase 1, 2 and 3	Yes
Shunters cabin	During phase 1, all movements would be controlled remotely from a shunters cabin which is likely to be a portacabin with basic amenities from which the shunter will move around the facility opening / closing hand points to enable train movements. Situated at a satellite location near sets of points to increase	Phase 1	Yes

Project component	Description summary	Phase of development introduced	Included in full facility (i.e. on completion of Phase 3)
	efficiency of train movements. Small cabin of approximately 10mx3m.		
Security measures	Security measures would include: CCTV; 7,200m of 2.1m palisade fencing, approximately 2m away from track, to be located around the perimeter of the outer track and maintenance track.	Phase 1	Yes
Civils works	drainage ditches, ponds and culverts, retaining walls in the south of the site; and 3 No bridge crossings	Phase 1	Yes

Network Rail upgrades

- 3.1.30** On the rail approach to the Washery from the south west, prior to the proposed GCRE track connecting point, additional sidings are proposed. The existing rail track running from the south west through Seven Sisters terminates within the Washery site, and generally follows the line of the A4109 with the road to the south.
- 3.1.31** Network Rail (NR) are upgrading this existing branch line signalling for Mainline Neath and Brecon Branch. The upgrade should allow 1 train to pass at a time using an electronic token system and may involve moving the gateline (the gate between NR controlled infrastructure and third party infrastructure) to the GCRE site. This work is outside the scope of this project although the movement of the gateline that is required to facilitate this work is within the scope. This would involve the moving of the existing entry gate by a few hundred meters to the south.
- 3.1.32** There may be a requirement to upgrade level crossings to allow for increased branch line usage but this will only be required if more trains than existing utilise the branch line. At present it is anticipated that there would be a maximum of 1 train movement per day into the site from the branch line which is not an increase on current frequency. Should this increase in the future, the level crossings would need to be upgraded, in line with NR requirements.

Acoustic barriers

- 3.1.33 In order to minimise noise breaking out from the rolling stock testing track to nearby communities, acoustic barriers of height 2m above the test track rail level would be installed on the northern, eastern and southern sides of the track – except where the earthworks are high enough to provide equivalent noise shielding. The communities to the west are much further from the track and hence acoustic barriers are not required.
- 3.1.34 Acoustic barriers will also be provided along the southern perimeter of the washery, and to the south of the new railway sidings, to minimise noise from activities and train movements within the facility.
- 3.1.35 The acoustic barriers are marked on the Figures associated with the noise assessment (Figures 10.x)

Earthworks

- 3.1.36 The earthworks required for the creation of the inner and outer test track have been consented under a separate planning approval from Powys County Council (Nant Helen Complementary Restoration Earthworks (20/0738/FUL in Powys and P/2020/0362 in NPT). These constitute a combination of cuttings and embankments to create level beds for the test tracks. A landscape bund has also been included to the east of the track to provide visual and noise screening of the facility to communities to the east of the facility.

Demolition

- 3.1.37 Within the washery area, existing buildings would need to be demolished along with areas of existing hardstanding which would need to be removed. Figure 1.5 identifies the approximate location of these buildings.

Landscaping

- 3.1.38 Planting across the site has been incorporated to function as visual screening and to integrate the proposed development into the surrounding landscape. Landscape planting is shown on Figure 9.14 and details would be developed at detailed design in agreement with the Local Authorities.

Biodiversity

- 3.1.39 The project offers significant opportunities to provide further ecological enhancements within the scheme design post construction, for operation, and in doing so meet the requirements of PPW and the Environment Act (Wales) 2016, for biodiversity enhancement and the

promotion of ecosystem resilience. This will also support the resilience of ecosystems to likely future threats of climate change.

- 3.1.40 Retained and newly created habitats within the Washery would be enhanced through long-term management. In addition, track embankments within the Nant Helen part of the site, would allow acid grassland to establish. This would also provide a pioneering habitat for fungi, lichen and heathland. More details are set out in Chapter 8, Biodiversity.

Overhead Line Equipment (OLE)

- 3.1.41 OLE structures would be single-track cantilevers around the high tonnage test track and twin-track cantilevers around the railroad test track to future proof for a potential second track. There would be approximately 200 structures in total, each of which would be c. 9m tall.

Site Drainage

Foul water

- 3.1.42 The existing Washery site is served by foul drainage and the proposed depot that would be at this location would require foul drainage provision as detailed in the following sections.
- 3.1.43 Foul drainage would be generated from the site from staff facilities such as canteens, toilets and welfare facilities. Based on a staff population of up to 118, the proposed peak flow is estimated to be 1.87 l/s.
- 3.1.44 A pre planning application was made to DCWW to ascertain if sufficient capacity exists within the local network to facilitate the proposed development based on the above peak flow. DCWW have subsequently advised that sufficient capacity exists within the combined sewer to cater for the development. Therefore, it is proposed to convey the foul drainage from the development to the existing connection to the DCWW combined sewer.

Trade effluent

- 3.1.45 It is anticipated that the depot works would produce trade effluent from train carriage washing facilities. The quantity and flow rates for such facilities are currently unknown at this stage of the scheme. As part of the pre planning application to DCWW, it was highlighted that discharge of pre-treated carriage wash may require a connection to the DCWW network. DCWW have advised in the pre planning response that a discharge consent would be required.

Storm water drainage

- 3.1.46 The rail track would primarily be drained by filter drains within the ballast. Elsewhere, the stormwater runoff would be captured and conveyed within the catchments utilising engineered cut-off ditches, swales, culverts, cascades and attenuation ponds. The sequential drainage elements would provide treatment of the storm water prior to discharging to existing watercourses.

Lighting

- 3.1.47 The test tracks would not require lighting, except potentially at the test station platforms. A variety of lighting will be proposed as necessary to aid site safety and security and orientation and facilitate winter and any working outside of daylight hours. Given the proximity to the National Park and its International Dark Skies Reserve accreditation, it will be important to restrict external lighting to the minimum necessary and use directional low lux lighting. Lighting would be required at the depot site for safety as this is where the staff personnel would be based.

Construction access

- 3.1.48 The existing access into the washery site from the A4221 would be the main access into/out of the site during construction for HGVs only with additional access from Onllywn Road (which runs north into the site from A4109).

Construction traffic

- 3.1.49 Deliveries to the site are likely to be made via a mix of road and rail vehicle movements. Whilst the exact split of deliveries is not known at this stage, a logical approach has been taken to generate assumptions around the split of vehicles. It has been assumed that equipment associated with the track works (formation, ballast, sleepers, rails, clips etc.) and other rail infrastructure (overhead line equipment, switches and crossings etc.) will primarily be delivered by rail.
- 3.1.50 Table 3.3 sets out the estimated one-way road and rail deliveries to site along with the estimated numbers of workforce for each stage of the development.

Table 3.3 Road and rail deliveries to site during construction

Phase	Workforce	One-way deliveries by road	One-way deliveries by rail
Phase 1	152	258	34

Phase 2	175	437	16
Phase 3	225	640	27

Construction Environmental Management

3.1.51 Construction activities would be managed through the implementation of a Construction Environmental Management Plan (CEMP) which sets out what environmental protection measures need to be put in place and monitored by the contractor/s. An outline CEMP has been prepared for the construction of GCRE (Appendix 3A) which would be developed with more detail by the contractor/s and approved by NPTCBC/PCC prior to the commencement of works.

3.1.52 For the purpose of the EIA, it has been assumed that the measures set out in the outline CEMP would be followed. These mitigation measures have therefore been considered ‘assumed construction practices’ and accounted for within the assessment of environmental effects.

Construction working hours

3.1.53 Working hours would be 8am-6pm Monday to Fridays and 8am-1pm Saturdays. These are standard construction working hours.

3.2 Construction phases

3.2.1 It is likely that the delivery of the project will be phased with development being dependent upon the requirements of the industry and the market demand. However, it is likely that the following phasing set out in Table 3.4 would be followed.

Table 3-4 Proposed construction phasing

Phase	Components included	Construction duration
Phase 1 – High tonnage infrastructure testing (operational 2023):	High tonnage infrastructure 4.5km test track with 25kV overhead line electrification. Bi-directional rail access from N&B branch line. 12 full-length stabling roads. 1 shunters cabin (probably a portacabin with basic amenities) from which the shunter will move around the facility opening / closing hand points to enable train movements. Staff facilities – modular site cabin buildings with mess facilities, changing rooms, storage, IT.	12 months

Phase	Components included	Construction duration
	<p>Infrastructure testing R&D facility – modular site cabin buildings with advanced IT for monitoring of infrastructure tests.</p> <p>External storage space – concrete hardstanding area with vehicle access for storage of materials & equipment for testing.</p>	
Phase 2 – Rolling Stock Testing (operational 2024)	<p>6.9km rolling stock test track with 25kV overhead line (and potential 3rd rail DC) electrification. Bi-directional rail access from N&B branch line.</p> <p>12 full-length stabling roads.</p> <p>Rolling stock maintenance shed. 2 roads at 400m length, 2 roads at 250m length. Internal and external storage spaces.</p> <p>Carriagewash.</p> <p>Improved (permanent) staff facilities. Those introduced in phase 1 will be removed. Provision of overnight accommodation, in addition to all previous functions.</p> <p>Upgrade of all points to electric points.</p> <p>Central control centre – panel from which all train movements are controlled. Points are changed electronically.</p> <p>Infrastructure testing R&D facility – relocated to location shown on Figure 1.3</p>	12 months
Phase 3 – Aspirational inclusions (operational 2025)	<p>Rolling stock R&D / education facility.</p> <p>Stationary testing facilities and associated laboratories.</p> <p>Rolling stock maintenance facility.</p> <p>10 ‘through’ sidings, south of the N&B branch line</p>	18 months

3.3 Operational details

3.3.1 The majority of the rolling stock & infrastructure testing at GCRE would be undertaken during the daytime (defined as 0700-1900). However, to provide the flexibility necessary to enable the facility to attract clients and ensure the viability of the business, planning permission is also being sought for some evening (1900-2300) and night-time (2300-0700) operation. Evening and/or night-time testing would be offered to clients only when necessary to meet tight testing deadlines.

3.3.2 In order to reflect a *reasonable worst-case* scenario for assessment in this environmental impact assessment as part of the planning application, it has been assumed that both test tracks would be operational during the daytime for seven days per week, for four evenings each week and for two nights per week. The facility operator will, however, make reasonable efforts to minimise evening and especially night-time testing where possible.

3.3.3 The facility could, subject to demand, be operational 24/7 with personnel on site at all times. Table 3.5 sets out the potential maximum frequency of train movements and operations on the site.

Table 3.5: Operational details for GCRE

Operation	Details
Train movements on rolling stock track (outer loop)	<p>When trains are being tested a train would be running continuously around the rolling stock testing track at speeds up to 110mph, albeit with speeds being restricted on the tighter (eastern) curve to 85mph. Typically this would mean that 20 laps of the track would be completed each hour. Factoring this number of 20 up by the assumed operating hours of five days, three evenings and two nights per week, this results in the following assumed maximum train laps per time period as follows:</p> <p>Day - 175 Evening – 35 Night – 50</p> <p>The test track itself will be single-train working, meaning that in the occurrence of 2 users at the facility at once, while one customer’s train is on the loop, the other will likely be in the maintenance shed. This will ultimately increase the overall test track usage since there are two parties alternating. An assumption has been made that, on average over a year, the rolling stock test track would be in use for five days per week during the daytime (7am to 7pm). For evenings (7pm to 11pm) and night-times (11pm to 7am), it has been assumed that it would operate on average over a year for three evenings and two night-times per week.</p> <p>Likely train types: Likely to mostly be powered electrically (25kV OLE) but potentially could be some diesel / bi-mode stock and potentially some hydrogen trains in the future. If electric, trains will require hauling up N&B branch line using diesel locomotive but will be able to move between sidings and test facilities (as these will be electrified). Alternatively, electric trains could be transported to site by road</p>
Train movements on inner track (infrastructure testing)	<p>A train would be running continuously at linespeed (40mph) between 07:00 – 19:00 / Evening 19:00-23:00 / 23:00-0700. This result in 14 completed laps/hour with a maximum number of journeys being:</p> <p>Day – 170 Evening – 25 Night – 30</p> <p>At night time only trains with electric traction would be used as standard, with any diesel traction being used only in exceptional circumstances. More likely to be used on an ad-hoc basis, with frequency of users less than for the rolling stock testing. An assumption has been made that the track would be in use seven days out of seven during the daytime. For evenings (7pm to 11pm) and night-times (11pm to 7am), it has been assumed that the track would operate on average over a year for three evenings and two night-times per week.</p> <p>Likely train types: initially diesel locomotives hauling wagons carrying old ballast (up to 500m with locomotive at both ends which produces vehicle of approximately 2000t). In the future trains are likely to be</p>

Operation	Details
	electric and hydrogen locomotives. An assumption has been made that in the first 2 years of the testing the train types would be approximately 70% electric, 20% hydrogen, 10% diesel. It is assumed that once on the test track, the vehicle will remain and not be required to move around the sidings area.
Train movements on siding	<p>A maximum of 1 train per day transported up the branch line onto the sidings for storage (from outside the facility). Likely to be 10-12 cars long (250m-300m long) travelling 15-30mph.</p> <p>10-16 movements within the facility from one siding to another at speeds of max. 5mph. Train movements would not take place in evenings or night-time.</p> <p>Likely train types: As above, it is likely the mix of trains would be approximately 70% electric, 20% hydrogen, 10% diesel in the first 2 years of testing.</p>
Stabled trains on warm storage sidings	The sidings would be used for longer-term train storage, rather than overnight stabling for next-day service (such as a typical depot). The reduced urgency of any works required to trains means all activities would be completed during the day.
Rolling stock maintenance area	<p>Once on site, each carriage would be stripped down to remove seats and steps and the wheelsets are removed (externally). This would be done using a combination of heavy machinery and operators using hand tools. Carriages are lifted from wheelset using a crane. Carriages are then lifted into the single-carriage-length shed for contaminants removal within the contained shed. The remaining metal carriage shell would then be cut up using heavy machinery, sorted, and taken to the relevant recycling locations.</p> <p>Decommissioning/maintenance activities would not take place during evening or night-time.</p>
Maintenance works	The maintenance facility would be able to host multiple train operators / manufacturers simultaneously, meaning the likelihood of continuous maintenance is increased. It is possible that maintenance would be carried out 24/7.
Carriage wash facility	Only day washing would be required by trains undergoing testing, this would account for <5% on-time during the 24hr day. Assuming that the stabled trains require use, this could account for another 10% on-time at night (worst-case). Additionally, trains being stored on the sidings will require washing even more infrequently, accounting for <5% daily. All washing can be carried out during daytime.
Staff car park	The staff car park would be located north of the staff facilities building

Operation	Details
Lighting on trains	In order to minimise disturbance from light, any test trains running after dusk would have their train interior lights switched off.

4 Site selection and design evolution

4.1.1 Schedule 4(2) of the EIA Regulations requires the following in relation to consideration of alternatives for a proposed development:

4.1.2 *‘A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant or appellant which are relevant to the proposed development and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects’.*

4.1.3 This section provides an overview of reasons for the selection of the site and how the design has evolved to reach the current outline planning application design.

4.1 Site selection

4.1.4 The Nant Helen site was selected for this project because it has a number of important advantages:

- It is large enough to accommodate the needs of the rail industry on a single site;
- It is in single ownership with no requirement to use compulsory purchase powers;
- The natural termination of existing coaling use (Celtic Energy is decommissioning the site in 2021), means it is available and a new industrial legacy can be simultaneously created;
- Good access to the rail network, strategic road network and to deep water ports; and
- Strong potential for local regeneration, and an opportunity to avoid the long-term socio-economic issues that can otherwise occur when mines close.

4.1.5 Due to the scale of the project there were very few alternative site options. Sites at Llanwern and St Athans were considered however the constraints were deemed more difficult to overcome than those presented at Nant Helen. Llanwern was deemed too narrow to accommodate the large tracks required while St Athans posed major challenges regarding land ownership and acquisition and was considered to be too close to highway and residential receptors.

4.2 Design Evolution

4.1.6 The proposed GCRE project has been shaped through engagement with the rail industry, rail academic and other institutions over a

period of nearly 2 years. This engagement with the rail industry has shaped the illustrative layout and the components of the project which are described in more detail in Chapter 3.

4.1.7 The evolution of the scheme and ultimately the illustrative masterplan that encapsulates the output has been influenced and driven by the environmental assessment work that has been carried out in parallel with the development of design proposals. This has led to a scheme design which embeds environmental considerations, identified throughout the ES as ‘embedded mitigation’.

4.1.8 Key constraints and considerations have included:

- Surrounding context in terms of proximity to the National Park;
- Ecological sensitivities;
- Proximity of settlements and residential receptors;
- Topography and ground conditions;
- Connections into the existing railway line;
- Utilities, predominantly overhead powerlines;
- Public Rights of Way;
- Common land;
- Heritage assets;
- Rail industry consultation requests for facilities and the number and size thereof; and
- Technical high speed and infrastructure testing requirements

4.1.9 The preliminary design was developed in September 2018 and included seven base loop options which varied in speeds between 80 and 125mph. These plans were further developed, adding in initial plans to include ancillary testing facilities and track connections.

4.1.10 In November 2018, following Steering Group review, a number of options were dropped for the main loop alignment, leaving only the 95, 110 & 125mph outer loop options. These were developed for the constraints workshop held on 11th of November 2018. This review considered the development of different tracks and loops within the loop which led to the conception of the ‘Squeal track’. The ‘Squeal track’ was a concept of a test track with extreme geometry to test the performance of rolling stock through difficult scenarios such as, tight and reverse curves or steep gradients. These are designed to mimic constraints seen in the wider rail network.

4.1.11 A constraints meeting was held on the 17th of January 2019. TfW and the WG wished for the 95mph loop to be dropped, placing emphasis

on the 125mph line. In the business case for the scheme, a separate storage for train fleets was also discussed.

- 4.1.12 On the 20th of February 2019 industry engagement was held. The 125mph line was dropped as it was deemed unnecessary and would require difficult earthworks requirements and 1,000m straights on the main loop were added to allow for effective brake testing for most rolling stock. Network Rail suggested adding an infrastructure testing track as this would add value to the project, due to the lack of this type of facility in the UK. The eastern curve radius was reduced from 840m to 600m to reduce the earthwork requirement.
- 4.1.13 A High Tonnage Loop and Vehicle Performance Loop were developed and added to the 110mph loop option. Currently Network Rail must test high tonnage loads on the live network or to a test centre outside the UK, which adds risk and cost to the testing. The Vehicle Performance Loop was an extension of the 'Squeal Track', to test rolling stock's performance in extreme circumstances.
- 4.1.14 Calculations showed an unacceptable cut and fill balance when the design contained both the High Tonnage and Vehicle Performance Loops, thus the Vehicle Performance Test loop was omitted from the design.
- 4.1.15 Following conversation with Siemens, in order to brake test their fleet of rolling stock, additional straight lengths are required (up to 2140m). After discussions regarding earthwork requirements the Impact Track was omitted and the eastern curve radius was reduced to 530m (reducing line speed by 5mph). This reduction was to avoid the National Grid overhead lines.
- 4.1.16 On the 4th of April 2019 the washing facilities were relocated to the south east to allow the inclusion of the carriage wash.
- 4.1.17 Appendix 4B provides plans and more description of the design iterations.

5 Traffic and transport

5.1 Introduction

- 5.1.1 This chapter of the ES assesses the potential construction and operational traffic and transport related impacts of the proposed development. The assessment focuses on the potential transport impacts (defined as a change resulting from the proposed development) and effects (defined as a consequence of an impact) associated with the construction and operational phases. It considers and assesses the effects and extent of the environmental impacts arising from the proposed development on safety, capacity and the operation of the transport network within the vicinity of the site, including walking, cycling and public transport.
- 5.1.2 The assessment draws closely on the findings of a comprehensive Transport Assessment (TA) prepared by Arup (TA – Volume III, Appendix 9.1), which has been submitted with the planning application.

5.2 Review of proposed development

- 5.2.1 The proposed development is described in detail in Chapter 3 of this ES. This section provides an outline review of the transport related proposals associated with the proposed development during construction and once operational.
- 5.2.2 There are seven existing access routes to/from the development which are listed below that may be used for deliveries and by employees for both construction and operation of the GCRE. All routes make use of A and B class roads. Assumptions have been made in regard to distribution, as summarised in Section 1.6, and further explained in the TA (TA – Volume III, Appendix 9.1).
- 5.2.3 The potential routes are:
- Route 1: Via A4109 South to/from Seven Sisters/Neath;
 - Route 2: Via A4067 South to/from Ystradgynlais;
 - Route 3: Via A4067 North to/from Mid-Wales;
 - Route 4: Via B4242 North to/from Pontneddfechan/Rhigos;
 - Route 5: Via B4242 South to/from Glynneath;
 - Route 6: Via A465 North to/from Heads of the Valleys/A470; and
 - Route 7: Via A465 South to/from Neath/Swansea and M4.

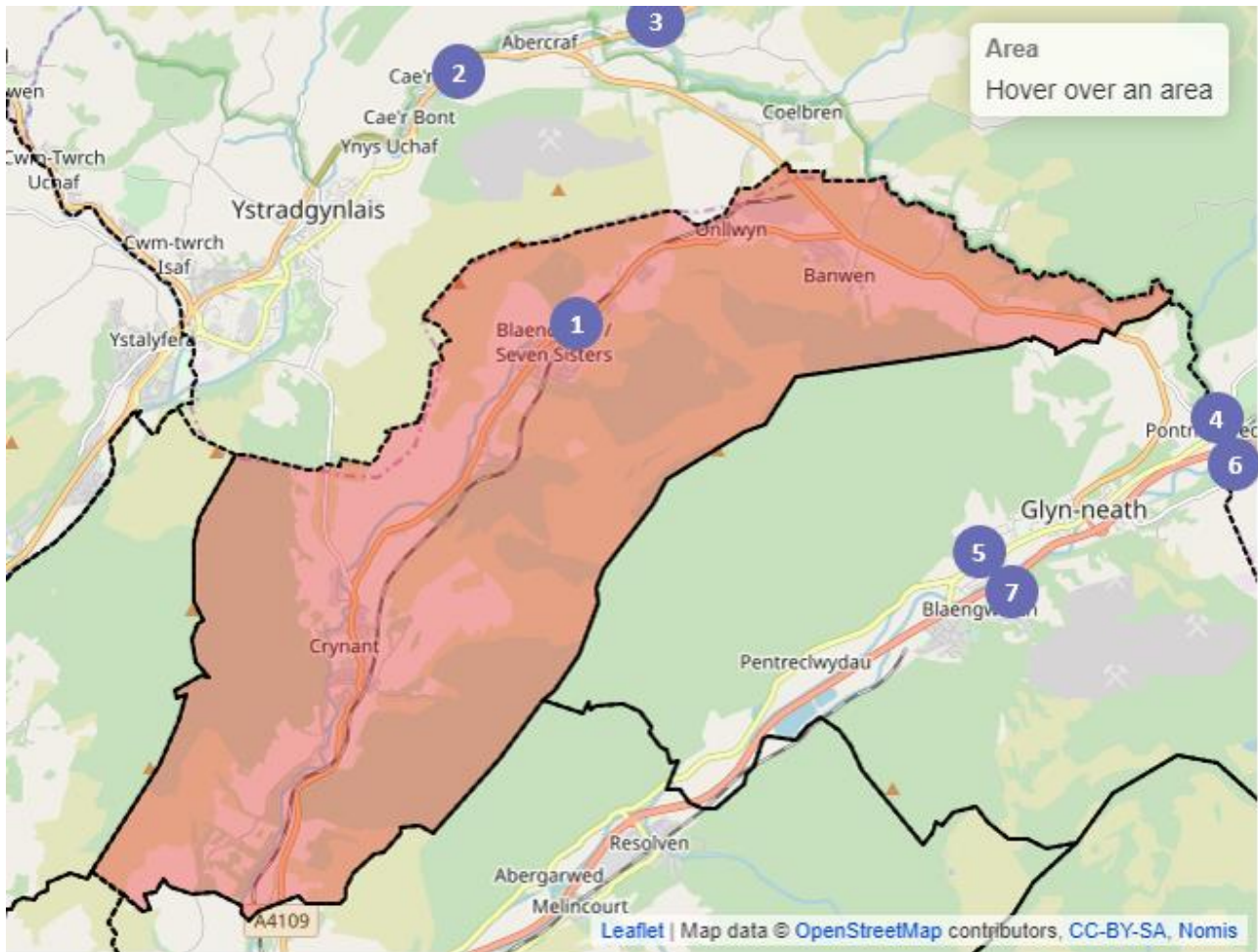


Figure 5-1: Potential traffic routes (Neath Port Talbot MSOA)

- The outline transport strategy for the proposed development, as detailed in the TA seeks to encourage journeys to be made to the development by sustainable modes of transport. The strategy has been refined with reference to the Welsh Government's Sustainable Transport Hierarchy¹, which requires new development to prioritise walking, cycling and public transport ahead of private motor vehicles.

¹ Welsh Government (2018) Planning Policy Wales Edition 10

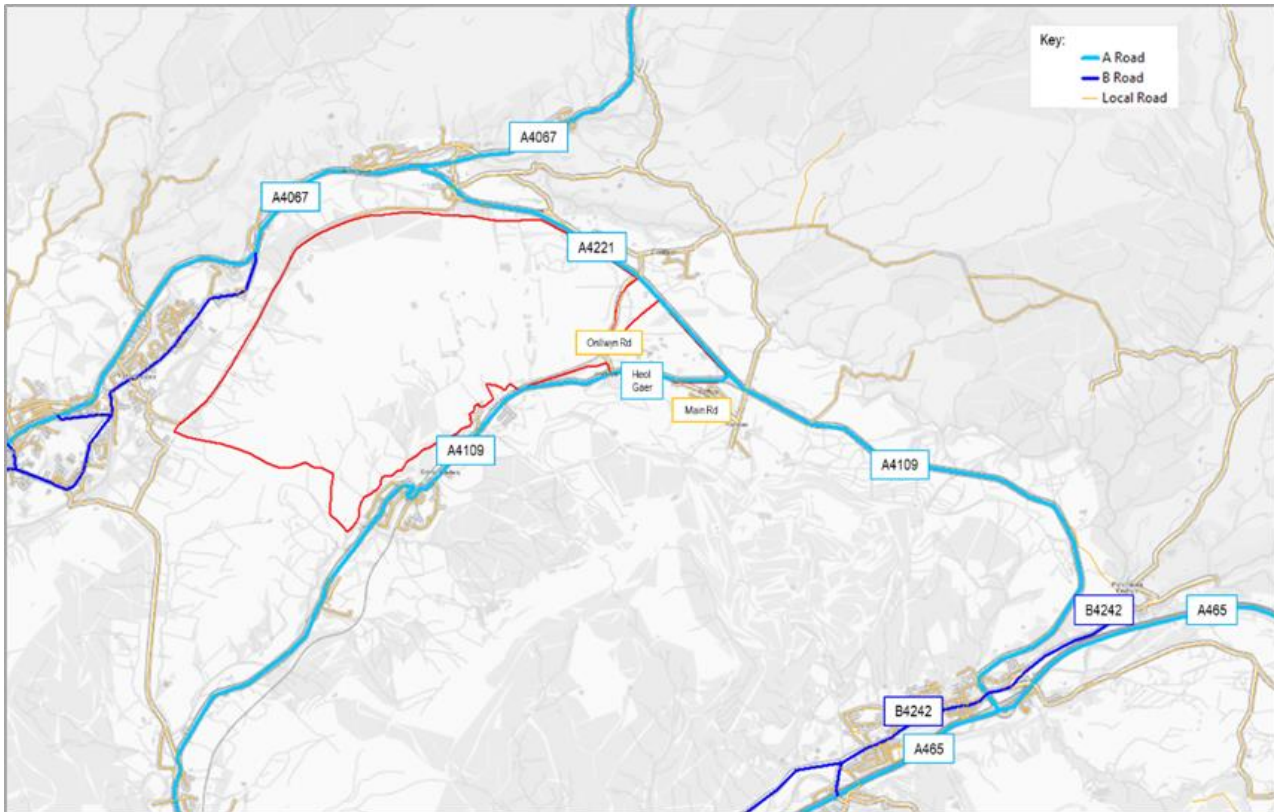


Figure 5-2: Highway Network

5.3 Legislative and Policy Context

5.3.1 The following national and local planning policy and legislation have been considered relevant during the preparation of this assessment, as summarised below and further analysed in the TA (TA – Volume III, Appendix 9.1).

National legislation, Policy and Guidance:

- Taking Wales Forward 2016-2021 - To create a prosperous and secure Wales, Welsh Government will support rural transport, and invest in transport to ensure that people can travel easily to jobs.
- Well-being of Future Generation (Wales) Act, 2015 - The 2015 Act places a duty on public bodies in Wales and those listed in the Act to work to improve the economic, social, environmental and cultural well-being of Wales.
- Wales Transport Strategy, 2008 - The overarching aim of the Wales Transport Strategy is to promote sustainable transport networks that safeguard the environment whilst strengthening the country's economic and social performance.
- Active Travel Act 2013 and Interactive Mapping - The National Assembly for Wales, the Active Travel (Wales) Act 2013 requires local authorities in Wales to map and plan for suitable routes for active travel, and to build and improve their infrastructure for walking and cycling every year. It creates new duties for highways authorities to consider the needs of walkers and cyclists and make better provision for them.

- Technical Advice Note 18: Transport, 2007 – TAN 18 reaffirms the importance of a sustainable transport systems and describes how to integrate land use and transport planning. It explains how transport impacts should be assessed and mitigated.
- Planning Policy Wales, Edition 10, 2018 – The primary objective of the policy is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, environmental and cultural well-being of Wales.
- Network Rail Welsh Route Study, 2016 – provides a strategic vision for the railway in Wales between 2019 – 2043 to identify long term priorities for rail.

Regional legislation, Policy and Guidance:

- Joint Transport Plan (JTP) for South West Wales (2015-2020) - The Regional Transport Strategy for the study area has been replaced by the South West Wales Joint Transport Plan (JTP). The JTP focuses on those transport improvements that lie within the remit of the following local authorities: Carmarthenshire County Council, Neath Port Talbot County Borough Council, Pembrokeshire County Council (PCC) and City and County of Swansea.
- The JTP sets out a strategic framework for improvements to transport for a 20-year period and a five-year programme of projects.

Local legislation, Policy and Guidance:

- Neath Port Talbot Local Development Plan 2011 – 2026 (Adopted 2016) – The Local Development Plan (LDP) guides future development in the Neath Port Talbot area providing a clear vision setting out where, when and how much new development can take place between 2011-2026. The overarching policies relate to matters considered to be of primary importance for the whole of the County Borough.
- Neath Port Talbot Local Development Plan 2011- 2026, Parking Standards, Supplementary Planning Guidance (adopted 2016) - The supplementary planning guidance (SPG) sets out the Council’s guidance on the provision of car and cycle parking including standards for different land uses.
- Powys County Council Local Development Plan 2011-2026 (adopted 2018) – The LDP supports transport infrastructure improvements that support sustainable growth, maximise the efficiency and safety of the transport systems, improve public and private transport integration and encourage passenger and freight rail operations.
- Powys County Council Local Development Plan 2011 – 2026, Supplementary Planning Guidance (adopted 2018) - The type of planning obligation is assessed on the developments individual merits and there are no set thresholds. Developments may be subject to planning obligations where there is a requirement to mitigate the identified development impacts in respect to transport or traffic requirements.

5.3.2 Other relevant guidance used in the production of this assessment includes:

- “Guidelines for the Environmental Assessment of Road Traffic” Institute of Environmental Assessment (IEA) 1993. (IEA now known as the Institute of Environmental Management and Assessment (IEMA))

5.4 Scoping and Consultation

- 5.4.1 A formal Environmental Scoping Report (September 2019) was submitted to Neath Port Talbot CBC and Powys County Council in order to agree the scope of the ES.
- 5.4.2 The report included a high-level summary of the baseline situation, a summary of key potential effects, a high-level approach in terms of assessment methodology and a summary of planned consultation.
- 5.4.3 A formal Scoping Opinion was received in November 2019 and the pertinent points in relation to the assessment of transport effects are summarised in **Table 5-1**, with a response as to how the advice received has been taken onboard within this assessment.
- 5.4.4 Additional liaison with Powys County Council has also taken place, and responses have been included below.

Table 5-1: Response to scoping opinion

Scoping opinion	Response
Neath Port Talbot Internal Consultees	
Public Rights of Way Note that the majority of the network (in NPT), whilst located within the site is unaffected by the proposals – unless they want to remove all the network from the site to make the area secure. Provides comments in respect of potential impacts on 3 rights of way, namely: Bridleway 26 and Footpaths MO ANO2 and Fp33.	The development will not affect existing PROWs and will provide safe pedestrian infrastructure if there is conflict between the PROWs and the proposed development or proposed rail alignment.
Head of Engineering & Transport (Highways) advises that in principle there is no highway objection to the proposal subject to a full and detailed Traffic Impact Assessment (TIA) in accordance with TAN 18 be submitted to and approved in writing by the LPA. Suggest that a meeting between all stakeholders take place at the earliest convenience.	A full and detailed Traffic Impact Assessment (TIA) in accordance with TAN 18 has been provided as part of the EIA.
Powys County Council Internal Consultees	
<p>Countryside, Access and Recreation (Rights of Way) The application site is located across the county border of Powys and Neath Port Talbot. This response relates to public rights of way in Powys.</p> <p>The application site is located on a number of public rights of way in Powys. These are footpath 40, bridleway 45 (which becomes bridleway 66), footpath 19, footpath 50 (which becomes footpath 90), footpaths 11, 17, 52 and 76, footpath 49 and footpath 7. A plan of the paths is attached.</p> <p>Use of public rights of way across the Nant Helen Opencast Coal site is suspended for the duration of coaling works, via an Order under the Opencast Coal Act 1958. If the proposed development would not be compatible with the public rights of way being used on the alignments that are currently recorded on the Definitive Map, once the suspension is revoked, then the paths will need to be legally diverted.</p> <p>Planning permission does not, in itself, grant authority for a public right of way to be diverted. A separate legal diversion process must be completed, before development is commenced over the public rights of way.</p> <p>Even if the paths do not need to be permanently diverted, consideration will need to be given to management of the paths both during and after construction. For further information about applying to divert a public right of way and the options for managing them during and after construction, please contact the Countryside Services and Outdoor Recreation team.</p>	The development will not affect existing PROWs and will provide safe pedestrian infrastructure if there is conflict between the PROWs and the proposed development or proposed rail alignment. Upon further investigation at a later stage, If a PROW is required to be diverted then the Countryside Services and Outdoor Recreation team will be contacted by GCRE.

Highways No response received to date	n/a
Powys County Council consultation via email	
<p>Discussion with Justin & Delyth from N&PT in relation to the current planning application and acknowledge the importance of maintaining a level of consistency for highway responses across both boundaries.</p> <p>Whilst I have no issue with the count locations agreed with Justin, there are 2 other points of access to the site from within the PCC boundary that should also be included/considered, particularly the main access to the north east corner of the site from the A4221. The other potential point of access (although conditioned not to be used as part of the current consent covering the site) is via the C0197 which links to the A4221 via the Coelbren crossroads. Measures need to be included to ensure that this particular route is not used as part of the redevelopment proposals. Both PCC & N&PT officers agree that surveys should cover a minimum 7 day period for any collected data to be reflective of existing highway conditions.</p> <p>Whilst potential traffic movements could be considered against the existing movements associated with the extant consent, I understand that there are potentially multiple additional uses being considered on the site. Are there any plans to factor in any of these potential uses are part of the highway considerations covering this element?</p>	<p>Coelbren crossroads, located on the northern end of Onllwyn Road (priority junction with A4221) will not be used. It is anticipated that only the southern end of this road will be used (priority junction with A4109) with traffic generated from GCRE turning in and out of the site via this junction and has been included within this EIA for a worst case scenario and any mitigation required has been considered. Surveys will have a minimum of 7-day period – ATC traffic count data has been collected. All options for GCRE have been considered which include the various uses of the site. The worst-case operation scenario, Option C, has been used for a robust assessment.</p>

5.5 Assessment Methodology

5.5.1 The methodology presented in this section has been prepared in accordance with The Guideline for the Environmental Assessment of Road Traffic produced by the Institute of Environmental Assessment (IEA) (now Institute of Environmental Management and Assessment (IEMA)) in 1993, hereafter known as the IEMA guidelines.

5.5.2 A forecast of the future travel demand expected to be generated by the proposed development during the construction and operational phases of the development will be determined. These form the basis for understanding how demand will be spread across the traffic and transport networks. The vehicular trip forecasts will also enable the impact of the proposed development to be quantified at each of the junctions to be assessed.

5.5.3 The methodology used for this assessment is based upon a comparison of predicted traffic flows along affected roads using the IEMA guidelines on the environmental impacts of road traffic. This assessment is structured around the consideration of potential environmental effects relating to traffic and transport, which includes the following:

- Noise and vibration;
- Visual impacts;
- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;
- Accidents and safety;

- Hazardous loads;
- Air pollution; and
- Dust and dirt.

5.5.4 The environmental effects associated with visual amenity are addressed in Chapter 9, Chapter 14 assesses the effects associated with air quality and dust and dirt, and the effects associated with noise and vibration are assessed in Chapter 10. Hazardous loads are not considered to be relevant for this scheme and have therefore not been scoped into the assessment.

5.5.5 This chapter presents the following:

- The methodology behind the assessment of transport effects, including the criteria for the determination of sensitivity of receptor and magnitude of change from the existing of ‘baseline’ condition;
- An explanation as to how the identification and assessment of potential transport effects has been reached; and
- The significance criteria and terminology for the assessment of transport residual effects.

Methodology for establishing Baseline conditions

5.5.6 To understand and quantify the future impacts of the proposed development, an assessment of existing local highway characteristics and trends has been undertaken, including:

- A 2019 traffic count survey conducted on a weekday to represent a typical day of traffic as agreed with NPTCBC to assess existing traffic levels, locations of which are shown in Figure 5-7.
- Site visits to assess surrounding areas and the proximity of any residential dwellings or receptors to the potential construction traffic routes;
- Liaison with NPTCBC; and
- Desktop studies to gather local highway accident records and the nature of the highways likely to be affected sourced from publicly available information produced by Welsh Government, TfW and DfT. This includes public transport, and active travel routes.

5.5.7 The study area for the transport chapter of this assessment broadly reflects that of the TA and will encompass all highways, walking and cycling routes that surround the site. To establish the baseline conditions, multi modal traffic data was collected at the following junctions:

1. A4067 and A4221 priority-controlled T-Junction;
2. A4221 and CPL South Wales Coal priority-controlled T-Junction;
3. A4221 and A4109/Heol Gaer priority-controlled T-Junction;
4. Onllwyn Road and A4109 priority-controlled T-Junction;
5. A4109 and A465 priority-controlled T-Junction; and
6. A4109 and B4242 signalised junction.

5.5.8 Two different peak periods were looked at which were the worst-case scenarios based on the 2019 Traffic Count Data weekday AM peak hour and weekday PM peak hour. The traffic flows were then predicted for the following seven scenarios;

- Year 2020 Traffic Flow;
- Year 2024 Traffic Flow;
- Year 2024 Traffic Flow with Phase Two Construction Traffic;
- Year 2026 Traffic Flow;
- Year 2026 Traffic Flow with Operational Development Trips;
- Year 2031 Traffic Flow; and
- Year 2031 Traffic Flow with Operational Development Trips.

5.5.9 A baseline year of 2020 has been adopted for the purposes of this assessment and junction assessments are carried out for the construction and operational phases. Links near sensitive receptors have been assessed if the traffic flow increase (traffic impacts) is greater than 10% as in accordance with best practice IEMA guidelines.

5.5.10 In addition, other links have been assessed where traffic flows increase by 30%. IEMA guidelines also recommend a link should be assessed where there is a significant increase in HGV flows. As noted in paragraph 4.39 of the IEMA guidelines, a significant change would be where the HGV component of traffic flow is halved or doubled. Therefore, a link has also been assessed if the HGV component of traffic flow increases by 100%.

5.5.11 During the construction stage, the proposed development will likely generate a regular flow of HGVs during the hours of construction activity. While the Noise and Vibration assessment (ES Chapter 10) is based upon 18-hour Annual Average Weekday Traffic (AAWT) flows, the Air Quality assessment (ES Chapter 14) is based upon the use of 24-hour AADT flows.

Methodology for assessment of effects from construction

5.5.12 Both the distribution and assignment of staff and deliveries have been assessed.

5.5.13 The construction phase of the proposed development will result in an increase in the number of HGVs on some links within the study area. The routing for construction vehicles will include the primary highway routes in the region. Construction traffic movements have been estimated on the basis of the volume of materials and deliveries to the site, as well as the rate of construction as defined by a high-level phasing plan. The estimated construction traffic movements are based on a worst-case scenario and analysed with junction movements that are already trafficked.

5.5.14 Deliveries to the site are likely to be made via a mix of road and rail vehicle movements. Whilst the exact split of deliveries is not known at this stage, a logical approach has been taken to generate assumptions around the split of vehicles.

5.5.15 Distribution of delivery vehicles during the construction phase have been estimated based on the likely spread of construction materials. The assignment of development traffic has been determined by examination of the highway network. This exercise has been undertaken by attributing each set of trips to the destination via the most likely route. Where several feasible routes could be used, the development trips have been

split accordingly. The delivery vehicle distribution calculations are summarised in Table 5-8.

5.5.16 The forecasted volume of traffic generated has been assessed against baseline traffic flows to calculate the uplift in traffic because of the planned construction and the effect that these additional trips would have on the network.

5.5.17 Six key junctions were assessed and industry-standard software, LinSig, was used to assess key junction capacities. Theoretically, junctions have a maximum capacity, which is dependent on junction geometry, vehicular flow, proportion of HGVs and traffic signal timing. LinSig estimates vehicle delay through a junction and hence, by testing each junction in the baseline and with development scenario, it is possible to estimate increased vehicle delays.

5.5.18 Routing specifications will be formally agreed with the contractor once appointed. A plan showing the proposed access to site for construction vehicles is shown in Figure 5-3.

Methodology for assessment of effects from Operation

5.5.19 Both the distribution and assignment of staff and deliveries have been assessed.

5.5.20 Once operational, the proposed development is forecast to result in additional vehicle movements on the local highway network. An assessment of employment potential was carried out within the Outline Business Case (OBC) for the proposed development. This considers the direct on-site employment that the various options could support.

5.5.21 The mode split breakdown for the site will be derived through reference to 2011 Census Travel to Work Data for the Neath Port Talbot 002 Mid-layer Super Output Area (MSOA).

5.5.22 The operational phase of the development will also generate delivery vehicle trips on an ad-hoc basis, such as the delivery of rolling stock vehicles for testing. Whilst it is not possible to quantify these deliveries in detail at this stage of the project, a high-level assumption of delivery vehicles per day is assumed during each of the AM and PM peak hours for a robust analysis.

5.5.23 Significance Criteria

Significance of Receptors

5.5.24 In accordance with the EIA Regulations, the likely environmental effects of the project have been identified and their significance determined. Evaluation of their significance has been based upon specific criteria for each type of receptor and impact. This process considers the following:

- Impact likelihood, extent and magnitude;
- Impact nature (whether beneficial or adverse, direct or indirect, primary or secondary, permanent or temporary);
- Importance and sensitivity of the environmental receptor;
- The number of receptors that are impacted;

- Impact duration (whether short, medium or long term); and
- Whether it is a stand-alone impact or is cumulative.

5.5.25 Unless specified otherwise, the following terms have been used to assess the overall significance of effects:

- Major beneficial or adverse – where the proposed development is likely to cause a significant improvement or deterioration to the future baseline environment;
- Moderate beneficial or adverse – where the proposed development is likely to cause a noticeable improvement or deterioration to the future baseline environment;
- Minor beneficial or adverse – where the proposed development is likely to cause a barely perceptible improvement or deterioration to the future baseline environment; and
- Negligible – no discernible improvement or deterioration to the future baseline environment.

5.5.26 Paragraph 2.5 of the IEMA guidance indicates the followings user groups are susceptible to being impacted by changes in traffic conditions:

- People at home;
- People in workplaces;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations, e.g. hospital, churches, schools, historical buildings;
- People walking;
- People cycling;
- Open spaces, recreational sites, shopping areas;
- Sites of ecological/nature conservation value; and
- Sites of tourist/visitor attraction.

5.5.27 Table 5-2 below presents the receptor sensitivity based on paragraph 2.5 of the IEMA guidelines and adapted using professional judgements.

Table 5-2: Receptor Sensitivity Terminology

Receptor Sensitivity	Receptor Type
Very High	Receptors of greatest sensitivity to traffic flow including roads without footways, rural settlements containing a high number of community and public services and facilities, areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads, not constructed to accommodate frequent use by HGV. This usually includes areas that include schools/colleges/playgrounds, historic hotpots and retirement homes.
High	Receptors sensitive to traffic flow including roads with limited/narrow footway or unsegregated cycleways, congested junctions, intermediate sized rural settlements containing community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B roads, capable of regular use by HGV. These areas usually include GPs/hospitals/shopping areas with roadside frontages, parks and recreational facilities.
Medium	Receptors with some sensitivity to traffic flow including small rural settlements with few community or public facilities/services, areas with little or no traffic calming, or traffic management measures and trunk of A-class roads constructed to accommodate significant HGV movements. These areas

	may also include residential streets with suitable footway provision, places with ecological/nature/heritage value and tourist/visitor attractions
Low	Receptors with low sensitivity to traffic flow including roads with no adjacent settlements including new strategic trunk roads or motorways that would be little effected by additional traffic and suitable for abnormal loads and those located sufficiently away from affected roads and junctions.

Potential Receptors

5.5.28 For the purpose of this environmental statement, receptors are defined as physical (i.e. roads) or user groups that would be affected by the project impacts. The sensitivity of a receptor is defined by the degree of which it responds to change in its environment. In this assessment, it will be related to the effect in an increase in traffic flow.

5.5.29 For the purpose of this assessment receptors have been identified along the following road links, that may experience potential impacts from the increase in traffic flow:

- A4221 - Single carriageway
- A4067 North - Single carriageway
- A4067 South- Single carriageway
- A465 – Dual carriageway
- A4019 - Single carriageway
- B4242/A4109 signalised junction
- B4242 – Single carriageway
- Onllwyn Road
- Heol Gaer Road
- Main Road
- Pedestrian level crossings/footbridges along the existing railway line

Assessment Criteria

5.5.30 Magnitude is determined by predicting the scale of any potential change in the baseline conditions. Where possible, magnitude has been quantified; however, where this has not been possible a fully defined qualitative assessment has been undertaken.

5.5.31 To assess the magnitude of impact arising from an increase in HGV movements, the following impacts have been considered:

- Severance – the IEMA Guidance states that, “severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery”. Further, “changes in traffic of 30%, 60% and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ (or minor, moderate and major) changes in severance respectively”. However, the Guidelines acknowledge that “the measurement and prediction of severance is extremely difficult”;
- Driver delay – the IEMA Guidelines note that these delays are only likely to be ‘significant (or major) when the traffic in the network surrounding the development is already at, or close to, the capacity of the system.’;

- Pedestrian delay – similar to driver delay, a major impact is likely to occur when the traffic or network surrounding the development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross the road and would be considered ‘major’;
- Pedestrian amenity – the IEMA guidelines suggests that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its HGV Component) is halved or doubled.;
- Fear and intimidation – there are no commonly agreed thresholds for estimating levels of fear and intimidation, from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow of 30%, 60% and 90% are regarded as producing ‘minor’, ‘moderate’ and ‘major’ changes in severance respectively; and
- Accidents and safety – professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

5.5.32 There are other potential impacts that could arise from the increase in traffic from the Proposed Development; such effects are discussed in: Chapter 7: Biodiversity, Chapter 9: Landscape and Visual Impact Assessment, Chapter 10: Noise and Vibration and Chapter 14: Air Quality.

Magnitude of Impact

5.5.33 Table 5-3 outlines the criteria by which potential impacts have been assessed. The IEMA guidelines have been used for developing the assessment criteria to determine the magnitude of impact caused by either a general increase in traffic flow or HGVs.

Table 5-3: Assessment criteria to determine magnitude of impact

Impact	Assessment Criteria			
	Negligible	Minor	Moderate	Major
Severance – results from the creation of new barriers such as roads combined with increased traffic flows along existing routes. Magnitude is based on IEMA Guidelines	Change in traffic flow of up to 30%	Change in traffic flow of 30% to 60%	Change in traffic flow of 60% to 90%	Change in traffic flow of over 90%
Pedestrian delay - results from increase in traffic flow, speed or composition along existing routes.	To be assessed on a case by case basis, with consideration given to the sensitivity and vulnerability of the receptor.			
Pedestrian amenity - relates to the relative pleasantness of a journey and can be affected by increase in traffic	To be assessed on case by case basis using professional judgement with consideration given to changes to traffic flow.			
Fear and intimidation - a pedestrian’s level of fear and indication is linked to the volume of traffic on the local road network.	Change in traffic flow of up to 30%	Change in traffic flow of 30% to 60%	Change in traffic flow of 60% to 90%	Change in traffic flow of over 90%
Driver delay - often caused by the impact of the works on the local road network, along with increase in overall traffic flow along existing routes.	To be assessed on case by case basis using professional judgement and the results of the junction modelling assessments.			

<p>Accidents and Safety - the impact of the proposed development through an increase in vehicles could influence the accidents and safety of the surrounding road network.</p>	<p>To be assessed on case by case basis using professional judgement with consideration given to accident assessment included within the TA and the forecast increase in traffic flows resulting from the development</p>
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5.5.34 As a guide to inform the assessment, but not as a substitute for professional judgement, an overall impact of significance matrix used for determining the significance of traffic related effects is set out in Table 5-4 and has been developed by combining receptor sensitivity and the magnitude of the impact.

Table 5-4: Significance of effects matrix

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Minor	Moderate	Major
Very High	Minor	Moderate	Major	Major
High	Negligible	Minor	Moderate	Major
Medium	Negligible	Negligible	Minor	Moderate
Low	Negligible	Negligible	Negligible	Minor

5.5.35 Potential effects are therefore categorised as either Major, Moderate, Minor or Negligible significance. Major and moderate significance represents effects considered to be significant in IEMA guidelines.

5.6 Limitations and assumptions of methodology

Limitations

Traffic Count Data

5.6.1 WebTAG sets out neutral months most likely to be representative of daily traffic. The timescales associated with data processing and preparation of this EIA have dictated the survey period within a non-neutral month, and as such an uplift factor has been calculated to account for seasonality.

Traffic Growth

5.6.2 In order to generate traffic flows for the future assessment years of 2024, 2026 and 2031, background traffic growth factors have been derived from the DfT’s Trip End Model Presentation Program (TEMPro) version 7.2b. The geographical area has been set at the Neath Port Talbot local authority area. Origin/Destination growth rates for Car Driver trips have been obtained for the AM and PM peak hours and the adjusted local growth figure for NPTCBC has been calculated.

Assumptions

Construction: Traffic increase assessment

5.6.3 Vehicular trips associated with staff and delivery of construction materials have been estimated for each of the three construction phases. A breakdown of estimated duration, delivery and staffing requirements for each construction element is summarised in Table 5-5.

Table 5-5: Summary of Construction Workforce and Delivery Estimates

Phase	Construction Element	Workforce (Personnel)	On-way Vehicle Deliveries	On-way Train Deliveries
Phase 1	Earthworks (for Track)	10	0	0
	Power	15	15	0
	Staff Facilities	10	10	0
	Train Storage	48	39	12
	High Tonnage Infrastructure Test Loop	60	51	10
	Signalling	6	8	0
	Infrastructure, Access Roads & Rail Crossings	6	8	0
	Miscellaneous	35	3093	0
Phase 2	Earthworks (for proposed trackwork)	10	0	0
	Power	5	6	0
	Rolling Stock and Infrastructure Testing	60	276	0
	Large Railroad Test Loop	133	358	27
	Carriage Wash Facility	5	7	0
	Central Control Centre	6	7	0
	Staff Facilities	5	8	0
	Additional Track - Testing Facilities	20	14	2
	Train Storage	46	37	11
	Access Roads and Rail Crossings	47	21	0
Phase 3	Earthworks (for proposed trackwork)	10	0	0
	Switches and Crossings Upgrades	5	6	0
	Additional Infrastructure	16	38	0
	Rolling Stock Decommissioning	6	21	0
	Train Storage	55	431	12

5.6.4 It has been assumed that equipment associated with the track works (formation, ballast, sleepers, rails, clips etc.) and other rail infrastructure (overhead line equipment, switches and crossings etc.) will primarily be delivered by rail.

5.6.5 There may be opportunities for the appointed contractor(s) to explore the potential for the delivery of other construction materials for buildings and civils works to also be delivered by rail, but for the purposes of generating a worst-case scenario for highway junction capacity assessment, it is assumed that these construction materials will be delivered by road. Additionally, Phase Two is used to assess construction trips, as it represents the most intense period in terms of workforce on site and frequency of delivery vehicles.

5.6.6 Below is a summary of Phase Two trip generation, which is the worst phase and is used as the worst-case scenario to assess the impact from construction. A Passenger Car Unit (PCU) is a vehicle unit for expressing highway capacity. A car is considered one PCU and an HGV is considered 2.3 PCUs. All HGVs are converted to PCUs to represent a robust worst-case assessment of the impact of the facility on surrounding transport networks.

Table 5-6: Phase Two Construction Vehicle Trip Generation

Time Period	Staff		Deliveries (PCUs)	
	Arrivals	Departures	Arrivals	Departures
AM Peak Hour (08:00-09:00)	95	0	76	76
PM Peak Hour (15:00-16:00)	0	95	76	76

5.6.7 Translating overall staff and delivery estimates into daily trip generation requires several assumptions which are listed in section eight of this chapter. Again, several of these assumptions involve an element of robustness to ensure that worst-case scenario in traffic terms has been developed.

5.6.8 The relevant assumptions for construction traffic are summarised as follows:

- AM and PM peak hours correspond with surrounding highway network peak hours of 08:00-09:00 and 15:00-16:00 respectively;
- Deliveries of construction materials will be primarily undertaken by road, with typical rail infrastructure delivered by train;
- Extant trips associated with the Celtic Energy site have been removed from the network based on closure of this facility;
- No committed development sites within the study area;
- Seasonality factor of +23% applied to observed January 2020 traffic counts to account for difference in traffic flows during January survey period; and
- Traffic flows for with and without development scenarios calculated for the following future year scenarios using TEMPro traffic growth factors:
 - 2020 Base Year;
 - 2024 Construction Phase;
 - 2026 Opening Year; and
 - 2031 Future Year Assessment.
- Assumed that all delivery vehicles are OGV2 for purposes of PCU conversion.
- Junction Assessments will be carried out assuming that all staff trips during construction will be made by car, representing a worst-case for junction assessment.
- The assignment of development traffic has been determined by examination of the highway network. This exercise has been undertaken by attributing each set of trips to the destination via the most likely route. Where several feasible routes could be used, the development trips have been split accordingly.
- Assumptions on the distribution of construction staff have been determined through reference to 2011 origin/destination census data from the WU03EW location of usual

residence and place of work by method of travel to work census category, with place of work set to Neath Port Talbot 002 MSOA.

Table 5-7: Staff Trip Distribution and Assignment Summary

#	Route	Percentage
1	Via A4109 South to/from Seven Sisters/Neath	62%
2	Via A4067 South to/from Ystradgynlais	5%
3	Via A4067 North to/from Mid-Wales	20%
4	Via B4242 North to/from Pontneddfechan/Rhigos	1%
5	Via B4242 South to/from Glynneath	5%
6	Via A465 North to/from Heads of the Valleys/A470	7%
7	Via A465 South to/from Neath/Swansea and M4	0%

5.6.9 It is assumed that delivery vehicles will be routed via the M4 and A465 South. The delivery vehicle distributions are summarised in Table 5-8.

Table 5-8: Construction and Operational Trip Distribution and Assignment Summary

#	Route	Construction Deliveries	Operational Deliveries
1	Via A4109 South to/from Seven Sisters/Neath	20%	-
2	Via A4067 South to/from Ystradgynlais	-	-
3	Via A4067 North to/from Mid-Wales	10%	-
4	Via B4242 North to/from Pontneddfechan/Rhigos	-	-
5	Via B4242 South to/from Glynneath	-	-
6	Via A465 North to/from Heads of the Valleys/A470	30%	-
7	Via A465 South to/from Neath/Swansea and M4	40%	100%

Site Access

5.6.10 It is proposed to provide access from the external highway network at three locations:

- The existing junction of the A4109 Wembley Avenue with Onllwyn Road;
- The existing A4221 Celtic Energy – Nant Helen access road; and
- The existing A4221 Washery and Distribution centre access (HGVs only).

5.6.11 The three access points are shown in Figure 5-3.

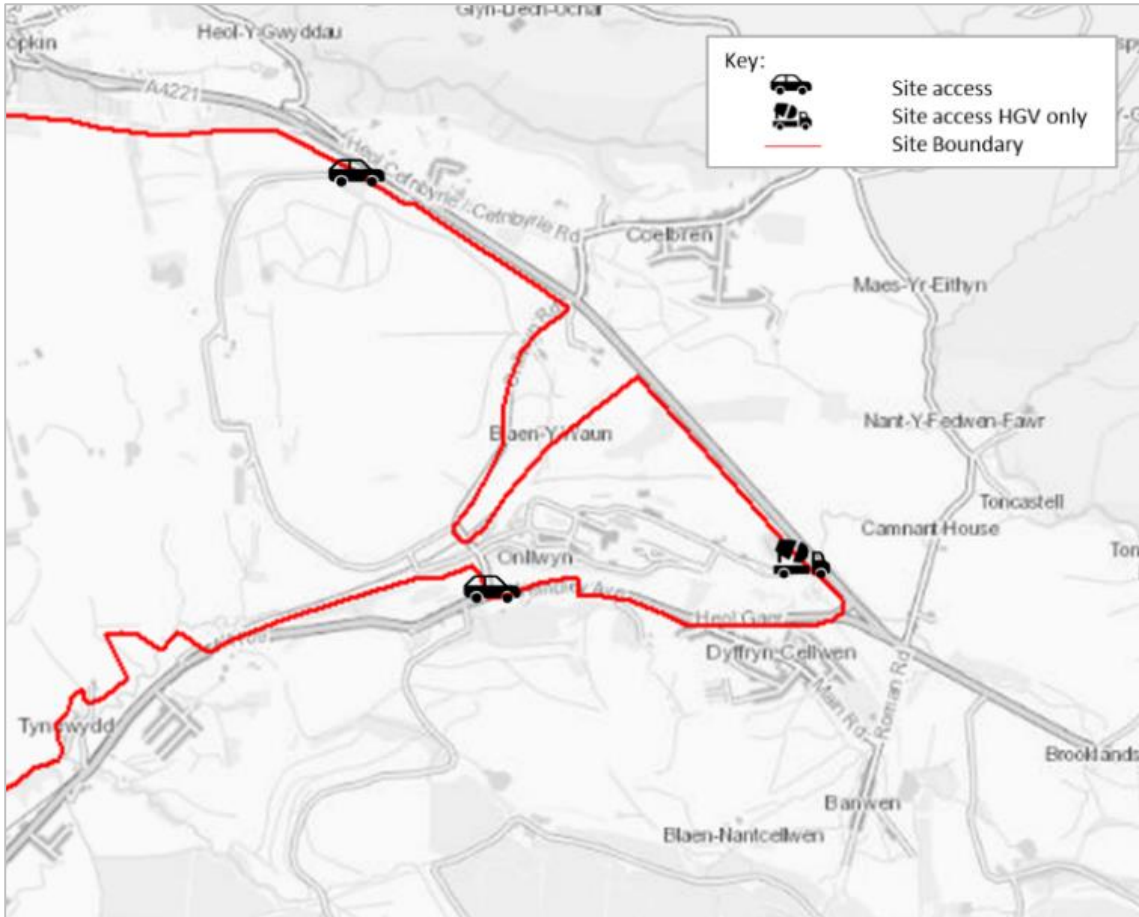


Figure 5-3: Site Access

Operational: Traffic increase assessment

5.6.12 An assessment of the employment potential of GCRE has been made within the Outline Business Case (OBC) for the proposed development. This considers the direct on-site employment that the various options could support.

5.6.13 For the purposes of the vehicular trip generation, the upper estimate of 118 staff has been used which represents a robust worst-case assessment of the impact of the facility on surrounding transport networks.

Table 5-9: OBC On-site Operational Staff Estimation

Staff Category	Staff Estimate		
	Option A	Option B	Option C
Support Staff	29	29	29
R&D/Technical Staff	32	72	89
Total	61	101	118

5.6.14 The assignment of development traffic has been determined by examination of the highway network. This exercise has been undertaken by attributing each set of trips to the destination via the most likely route. Where several feasible routes could be used, the development trips have been split accordingly. The delivery vehicle distribution calculations are summarised in Table 5-10.

Table 5-10: Staff Trip Distribution and Assignment Summary

#	Route	Percentage
1	Via A4109 South to/from Seven Sisters/Neath	62%
2	Via A4067 South to/from Ystradgynlais	5%
3	Via A4067 North to/from Mid-Wales	20%
4	Via B4242 North to/from Pontneddfechan/Rhigos	1%
5	Via B4242 South to/from Glynneath	5%
6	Via A465 North to/from Heads of the Valleys/A470	7%
7	Via A465 South to/from Neath/Swansea and M4	0%

5.6.15 Assumptions on the distribution of operational staff have been determined through reference to 2011 origin/destination census data from the WU03EW location of usual residence and place of work by method of travel to work census category, with place of work set to Neath Port Talbot 002 MSOA. Modal split data is presented in Table 5-11.

5.6.16 A mode share analysis was carried out for operational staff. Whilst the mode share is likely to be around 20% lower based on the mode share analysis, for the purposes of junction assessment it is assumed that all staff trips will be made by car, representing a worst-case for junction assessment.

Table 5-11: Existing Mode Split - Neath Port Talbot 002 MSOA

Travel Mode	Existing Mode Share
Driving a car or van	80.1%
Passenger in a car or van	8.1%
On foot	5.7%
Bus, minibus or coach	3.7%
Bicycle	0.8%
Motorcycle, scooter or moped	0.8%
Train	0.6%
Taxi	0.2%
Total	100.0%

Baseline Situation

Local Highway Network

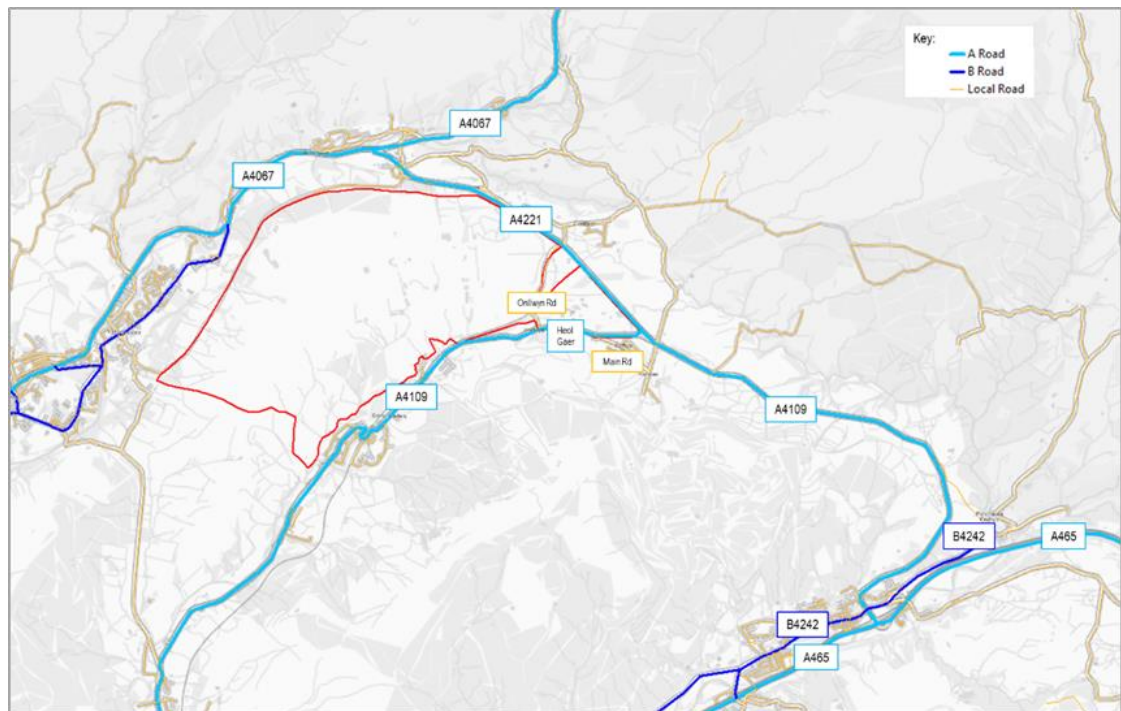


Figure 5-4: Highway Network

- 5.6.17** The north of the site is bounded by the A4221 with a posted speed limit of 40mph. To the west, the A4221 joins the A4067 at a priority junction near Caehopkin. The A4067 runs roughly parallel to western site boundary separated by woodland and connects south to Swansea and the M4 at Junction 45, and north to the Brecon Beacons.
- 5.6.18** The A4221 continues east of the site meeting the A4109 to the north of Banwen, with a posted speed limit of 30mph. From this point the A4109 to the southeast passes the primary site access at Onllwyn Road and 15km to the south connects to the A465 at Tonna providing an onward route to Junction 43 of the M4. The A4109 is crossed by a rail link with an underbridge vehicle height limit of 4.6m north of the Onllwyn Road junction. Onllwyn Road has a 7.5 tonne weight restriction north of the washery site access and several minor junctions connecting to private entries.
- 5.6.19** To the southwest of the junction at Banwen the A4109 connects to the A465 at Glyneath from where the A465 provides an onward route to destinations towards Merthyr Tydfil.

Public Transport

Bus

- 5.6.20** There are two bus stops known as Coelbren Turn on either side of A4019 at the Onllwyn Rd T junction located within 400m of the existing washery southern site access from Onllwyn Road. Each bus stop includes a waiting shelter but there is no timetable information present.

5.6.21 Four bus services serve these bus stops and provide access to Crynant, Seven Sisters, Neath and Swansea that stop at the Coelbren Turn and other services that do not serve the site directly.

5.6.22 There are no busses that provide accessibility east and west cross valley that operate within vicinity of Onllwyn Road Junction.

Rail

5.6.23 There are no passenger services to the site but the Neath and Brecon branch line remains open to freight trains with access via Neath and Brecon Junction. Trains accessing the branch line are currently required to travel to Swansea docks and shunt to the Neath and Brecon Junction or travel to Swansea Burrows sidings to turn around. .

5.6.24 The single-line branch line route operates using a physical token-block signalling system up-chainage from Neath & Brecon Junction.

Public Footpaths and Cycle Paths

Walking

5.6.25 From the A4109/Onllwyn Road junction a continuous footway (part of the highway) adjoins the eastern carriageway of the A4019 south towards Severn Sisters. Footways also adjoin both carriageways to the north of the junction towards Banwen.

5.6.26 At the T junction with Main Road and A4109, approximately 752 m northeast from A4109/Onllwyn Rd junction the footway continues on the eastern carriageway into Banwen and on the western carriageway towards the A4221 which terminates at the A4109/ Heol Gaer Overbridge.

5.6.27 There are several Public Rights of Way (PRoW) which pass through the site. These PRoW’s link east to west connecting a number of villages including Penrhos and Onllwyn onto Banwen and north to south between Caehopkin and Severn Sisters. The PROW through and near the proposed site are shown in **Figure 5-5**.

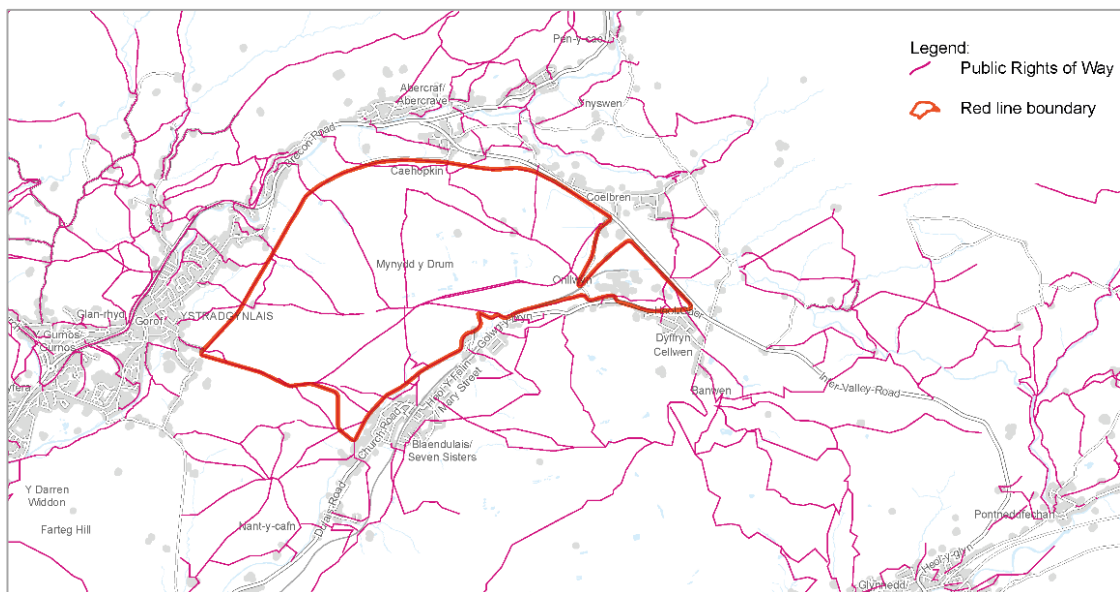


Figure 5-5: Public Right of Way (PRoW) within vicinity of the project.

Cycling

5.6.28 National Cycle Network (NCN) 43 connects the site to Swansea via an on and off-road cycle route. The route runs along the north and western boundary of the study area and through Ystalyfera, Cilmaengwyn, Pontardawe, Clydach and along the River Tawe through Swansea where it connects with NCN 4, as illustrated in Figure 5-6.

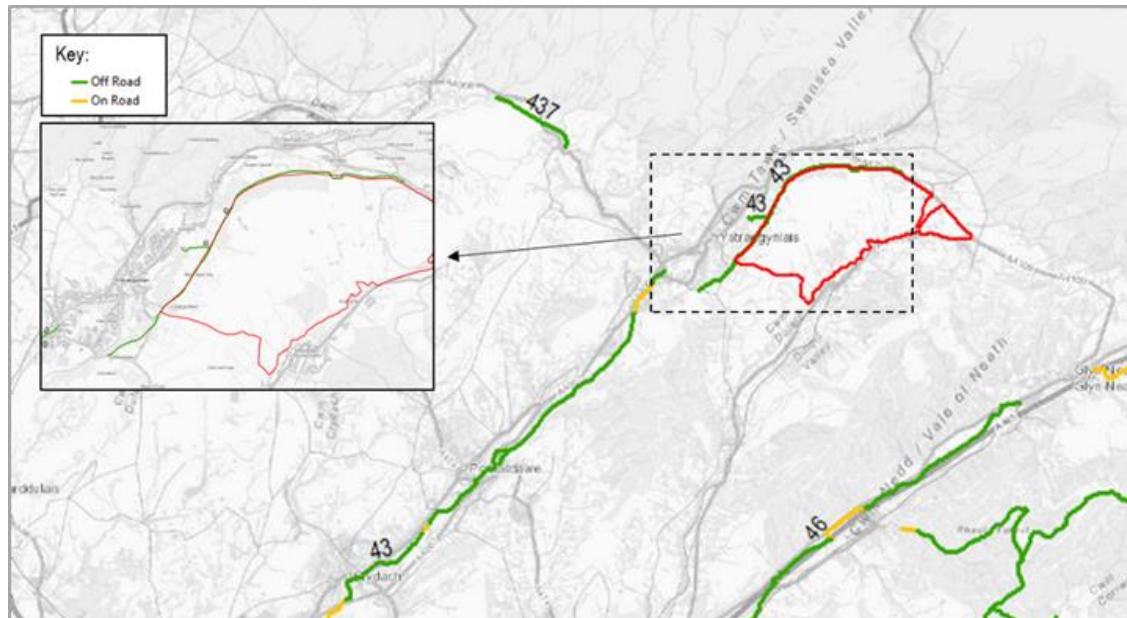


Figure 5-6: National Cycle Network (NCN)

5.6.29 Existing Traffic Flows

5.6.30 To understand the pattern of existing traffic movements on the network, traffic surveys were carried out on Tuesday 7th January 2020. The type and location of counts were agreed in advance with NPTCBC and are illustrated in Figure 5-7. The survey showed that the AM and PM peak hours were 08:00-09:00 and 15:00-16:00, respectively. Summary of the baseline traffic flows is detailed in Table 5-12.

5.6.31 Automatic Traffic Count (ATC) were carried out over a 24-hour period at the following locations:

- ATC 1: A4109, west of Onllwyn Road;
- ATC 2: A4109 Main Road, west of Heol Bryn Seion;
- ATC 3: A4221, south of Onllwyn Road; and
- ATC 4: A4109 Inter-Valley Road, east of Roman Road.

5.6.32 Junction Turning Counts (JTC) and Queue Length surveys were also carried out for the time period 07:00-19:00 on at the following locations:

- JTC 1: A4067 and A4221 priority controlled T-Junction;
- JTC 2: A4221 and CPL South Wales Coal priority controlled T-Junction;
- JTC 3: A4221 and A4109/Heol Gaer priority controlled T-Junction;
- JTC 4: Onllwyn Road and A4109 priority controlled T-Junction;

- JTC 5: A4109 and A465 priority controlled T-Junction; and
- JTC 6: A4109 and B4242 signalised junction.

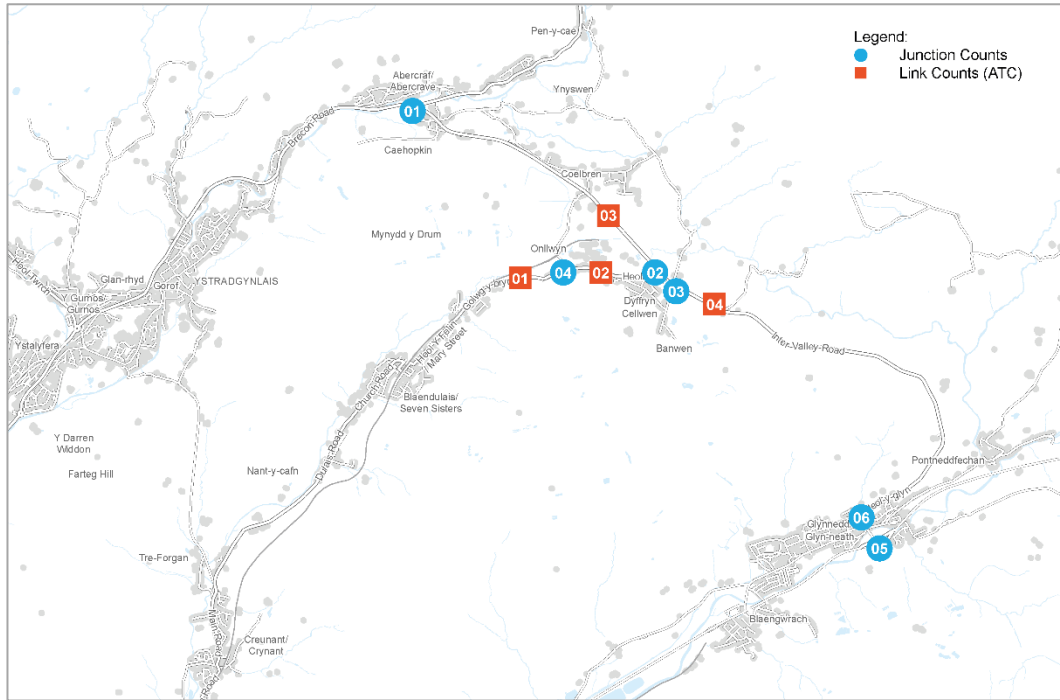


Figure 5-7: Traffic count survey locations

Table 5-12: Baseline Traffic flows

Survey Point	AM Peak (PCUs) / HGV (%)	PM Peak (PCUs) / HGV (%)	Average Annual Daily (PCUs) / HGV (%)
ATC 1: A4109, west of Onllwyn Road	171 / 13%	142 / 17%	2,057 / 11%
ATC 2: A4109 Main Road, west of Heol Bryn Seion	115 / 17%	156 / 13%	1,550 / 13%
ATC 3: A4221, south of Onllwyn Road	326 / 17%	276 / 17%	3,366 / 15%
ATC 4: A4109 Inter-Valley Road, east of Roman Road	360 / 16%	338 / 16%	4,157 / 14%
JTC 1: A4067 and A4221 priority-controlled T-Junction	618 / 15%	550 / 10%	6,720 / 8%
JTC 2: A4221 and CPL South Wales Coal priority-controlled T-Junction	326 / 27%	313 / 23%	3,423 / 18%
JTC 3: A4221 and A4109/Heol Gaer priority controlled T-Junction	351 / 14%	374 / 17%	4,012 / 12%

JTC 4: Onllwyn Road and A4109 priority controlled T-Junction	183 / 8%	219 / 10%	2,158 / 7%
JTC 5: A4109 and A465 priority controlled T-Junction	740 / 9%	837 / 12%	9,114 / 7%
JTC 6: A4109 and B4242 signalised junction	456 / 10%	483 / 13%	5,439 / 8%

5.6.33 A Passenger Car Unit (PCU) is a vehicle unit for expressing highway capacity. A car is considered one PCU and a HGV is considered 2.3 PCUs.

5.6.34 Road Traffic Collision Assessment

5.6.35 Whilst the IEMA guidelines suggest using existing link road accident data, they also recommend that professional judgement is exercised to gain an understanding of the likely number of accidents following the opening of any development. Furthermore, the guidelines suggest that local circumstances or factors that may elevate or decrease levels of accidents should be taken into consideration.

5.6.36 The number of Personal Injury Accidents (PIA) in the study area that occurred between 2014 and 2018 have been obtained from DfT road safety data (STATS19), as compiled by Crashmap. This represents the most recent five-year period which data is available.

5.6.37 Majority of incidents that have occurred during 2014 to 2019 have been slight incidents along the various A roads, three serious incidents and two fatal incidents along the A4109, east of Banwen, at different locations. These serious accidents have no common theme in location.

5.6.38 Receptor Sensitivity Classification

5.6.39 Using the receptor sensitivity criteria presented in Table 5-2, a sensitivity classification has been carried out on the links at baseline condition. 'Sensitive' links are those deemed to have a High or Very High sensitivity classification and are highlighted in Table 5-13.

5.6.40 All receptors that have been identified in section 5.5.4 along the road links have been taken into account to determine the sensitivity of receptor classification.

Table 5-13: Sensitivity Classification of Receptors

Ref	Road Link/Receptor	Location	Receptor Sensitivity	Justification
1	A4221	North of site	Medium	Has no footpath or frontages, but some residents north of Onllwyn Road/A4221 junction
2	A4067 North	A4067 runs roughly parallel to the sites north western boundary	Medium	Abercraf/Ynyswen Residential frontages, and some local amenity frontages i.e. a church and small corner shop
3	A4067 South	South of A4067 and A4221 junction	Low	Residents of Ystradgwynlias surround this A road, however, it is assumed that

Ref	Road Link/Receptor	Location	Receptor Sensitivity	Justification
				traffic generated from the development will unlikely pass through area
4	A465	South of A4109	Low	Dual Carriageway – no footpaths or frontages
5	A4019	East of A4221	Medium	Some residential frontages, one of which being a small summer camp
6	B4242/A4109 junction	South of A4109	Medium	Residential frontages in Glyneath town and local amenities i.e. supermarkets, bank, petrol station and leisure centre along the B4242 South
7	B4242	Parallel to A465	Low	Residential frontages in Glyneath town and local amenities i.e. supermarkets, bank, petrol station and leisure centre along the B4242 South surround this A road. However, it is assumed that traffic generated from the development will unlikely pass through area
8	Onllwyn Road	Connects A4221 and A4109	Low	Three residential frontages
9	Heol Gaer	East of the A4109	Medium	Some Dyffryn residential frontages.
10	Main Road	South of Heol Gaer, leading to Banwen	High	Residential frontages and some local amenities i.e. pharmacy and Post office. Main access to Banwen
11	Pedestrian level crossings	Various locations along the existing railway line towards Swansea	High	Dependant on train frequency, but pedestrian and cyclists who are unaware of this change are at risk when crossing the railway.

5.7 Assessment of Construction Effects

5.7.1 A capacity analysis was carried out on vehicular trip forecast to assess the impact of the proposed development on six key junctions surrounding the site as shown in Figure 5-7 for all seven future year scenarios. The trip forecast is detailed in the TA – Volume III, Appendix 9.1, Chapter 5.

5.7.2 It is anticipated that Phase Two of construction will have the highest increase in HGVs. Majority of links show a percentage change above 50% in HGVs. This is depicted in Figure 5-8 which shows the worst-case scenario of HGV percentage impact of the construction traffic on all links within the study area.

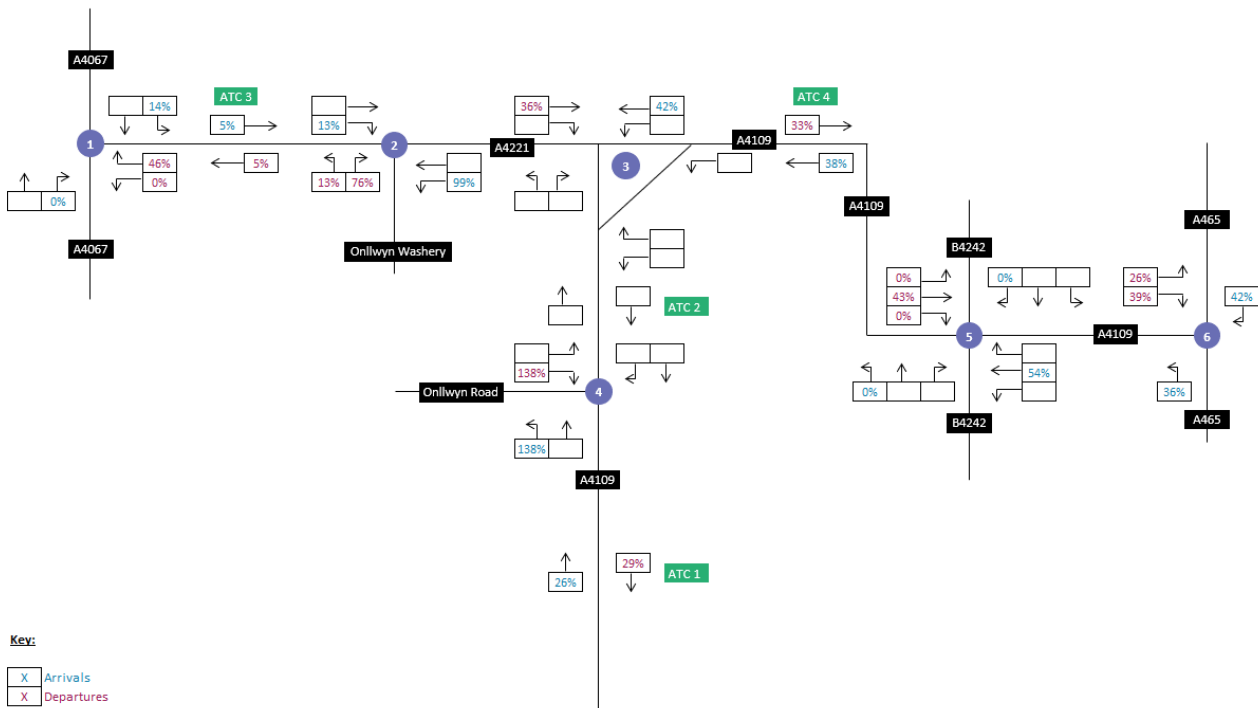


Figure 5-8: Construction Delivery HGV percentage increase from baseline, AADT

Severance

5.7.3 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery. It can be quantified by the percentage change in traffic. An increase in traffic of 30% or less is deemed to have a negligible impact with regards to severance.

Table 5-14: Construction traffic HGV increase in peak hours.

Ref	Road Link	Receptor Sensitivity	Percentage Increase (HGV)
1	A4221	Medium	5%
2	A4067 North	Medium	46%
3	A4067 South	Low	0%
4	A465	Low	42%
5	A4019	Medium	38%
6	B4242/A4109 junction	Medium	54%
7	B4242	Low	0%
8	Onllwyn Road	Low	138%
9	Heol Gaer	Medium	0%
10	Main Road	High	0%
11	Pedestrian level crossings	High	0% (train frequency anticipated to remain the same as present)

5.7.4 Onllwyn Road has a low environmental sensitivity classification given the number and type of receptors along the link. Construction traffic is expected to increase by 138% in the AM Peak and the PM Peak, which is classified as a Major impact. Therefore, it is predicted that any environmental effects associated with severance would be **minor** with regards to severance.

5.7.5 The impact of construction traffic on all other links in the study area is predicted to have environmental effects that are envisaged to be **negligible** with regards to severance.

Driver delay

- 5.7.6 With predicted traffic growth and additional construction traffic, all six junctions that were assessed continue to operate within capacity and without any noticeable queues. The predicted forecast of traffic has a negligible impact on the junctions for all scenarios assessed showing that the junctions operate within practical capacity. The magnitude of impact of construction traffic on all road links are deemed ‘not significant’ as per the IEMA guidelines. Therefore, the predicted adverse environmental effects associated would be **negligible** regarding driver delay. The full junction analysis is detailed in the TA – Volume III, Appendix 9.1.

Pedestrian and cycle delay

- 5.7.7 Pedestrian and cycle delay are predicted to occur where the two-way traffic flow exceeds 1,400 vehicles an hour, providing there are no controlled pedestrian crossings. No link exceeds this threshold in the peak hour which was assessed as being the worst-case scenario, and therefore has a negligible impact on all receptors.
- 5.7.8 The B4242/A4109 junction has controlled pedestrian crossings, however due to site visit observations of the low number of pedestrians using the crossing, and the existing high HGV usage at this junction, it is predicted that the increase in HGVs from construction could have a minor impact. Therefore, the predicted adverse environmental effects associated would be **negligible**.

Pedestrian amenity

- 5.7.9 The IEMA guidelines suggest that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its HGV component) is halved or doubled. In addition, the guidelines indicate that pavement width and separation from traffic are also key factors.
- 5.7.10 The receptor link, A4067 North could have a temporary HGV increase of 46% in the peak hours in the worst-case scenario. Within Ynyswen town, along the A465 northbound, there are segregated pedestrian paving alongside the road in this residential area.
- 5.7.11 At the A4067/A4221 junction there are no existing footways and limited verge for pedestrians, however this junction is considered to not be used by pedestrian and cyclists.
- 5.7.12 The impact is therefore deemed to be moderate. Given both the A4067 north and the junction sensitivity is medium, it is predicted that any environmental effects associated with pedestrian and cycle amenity would be **minor adverse** and therefore not significant.
- 5.7.13 The receptor link A465 will experience an estimated 42% HGV increase during Phase two of construction. Given the receptor sensitivity is low, and the nature of a dual carriage way which is not typically used by pedestrians or cyclists, it is deemed to environmental effects that are **negligible**.
- 5.7.14 Where there are residential frontings on the A4019 there are segregated narrow footpaths along the road on the northern side, and segregated pedestrian footpaths along each side of the road within the Glynneath area. There are no cycle provisions along this

route. The temporary impact on pedestrian and cycle amenity is therefore considered moderate with an HGV increase of 38%. The sensitivity link is medium, and therefore the predicted environmental effects associated would be **minor adverse** and therefore significant.

5.7.15 Similarly, the B4242/A4109 junction has controlled pedestrian crossings and narrow pavements on each side of the road. Given the junction sensitivity is medium, and a potential HGV increase of 54% is considered significant, however due to site visit observations of the low number of pedestrians using the crossing, the predicted environmental effects associated with pedestrian amenity would be **minor adverse**.

5.7.16 Where there are residential frontings on Onllywn Road South of the A4019 junction there are segregated narrow footpaths along both sides of the road with a bus stop that has a service of five busses per day. Onllwyn Road is estimated to have an increase of 138% in HGVs and therefore classed as significant. However, the construction traffic would access Onllwyn Road from the south, and therefore not pass the residential dwellings located north. There is however a lack of pedestrian/cycle crossing facilities at the southern end of the road which forms a priority junction with A4109. Therefore, the impact on pedestrian and cycle amenity is major, but given the link sensitivity being low, the overall environmental effect would have a **minor** adverse effect.

Fear and intimidation

5.7.17 An increase in HGV movements can have an adverse effect on pedestrian fear and intimidation. The suggested threshold presented in the IEMA guidelines proposes a small impact if the average HGV flow is around 1,000-2,000 vehicles and negligible if the HGV flow is below 1,000 (18-hour AAWT). The guidance also recommends other factors are considered such as road speed and footway width/separation.

5.7.18 With majority of HGV construction access to be taken from the Onllwyn washery access on the A4221, the 18-hour AAWT HGV flow on all other links is predicted to be below 1,000 HGVs. Therefore, on all links it is predicted that any environmental effects associated with fear and intimidation would be **negligible**.

Accidents and safety

5.7.19 An analysis of Crashmap data has been undertaken within the study area. No correlations were identified between highway layout, design or condition that were considered contributory factors in the pattern of collisions. However, the cause of accident is unknown, therefore it is considered that any increases in traffic resulting from the proposed development are anticipated to have a **minor** effect with regards to accidents and safety along the A4109, east of Banwen.

Summary

5.7.20 The temporary increase in the HGV component of traffic flow in the busiest phase of construction is deemed to have a significant effect on severance on Onllwyn Road. Minor adverse effects are also anticipated with regards to severance, pedestrian and cycle delay, fear and intimidation, driver delay and accident and safety.

- 5.7.21 It is proposed that a Construction Traffic Management Plan (CTMP) be secured with a planning condition to ensure that all reasonable steps are taken to minimise and mitigate the predicted adverse effects of the construction process.
- 5.7.22 The identified access routes make use of roads with ‘negligible’ receptor sensitivity. It is proposed that construction traffic is monitored as part of the CTMP to review compliance.

5.8 Assessment of Operational Effects

- 5.8.1 A capacity analysis was carried out on vehicular trip forecast to assess the impact of the proposed development on six key junctions surrounding the site as shown in Figure 5-7. **Figure 5-7: Traffic count survey locations** for all seven future year scenarios. The trip forecast is detailed in the TA – Volume III, Appendix 9.1.
- 5.8.2 Figure 5-9, presents the percentage impact of the operational traffic on all links within the study area in the peak hours.
- 5.8.3 The traffic impacts associated with the proposed development are deemed to reflect a worst-case, with some assumptions made as detailed in section 1.6. Interventions such as the Travel Plan are proposed to increase the proportion of journeys made to the site by sustainable modes of transport.

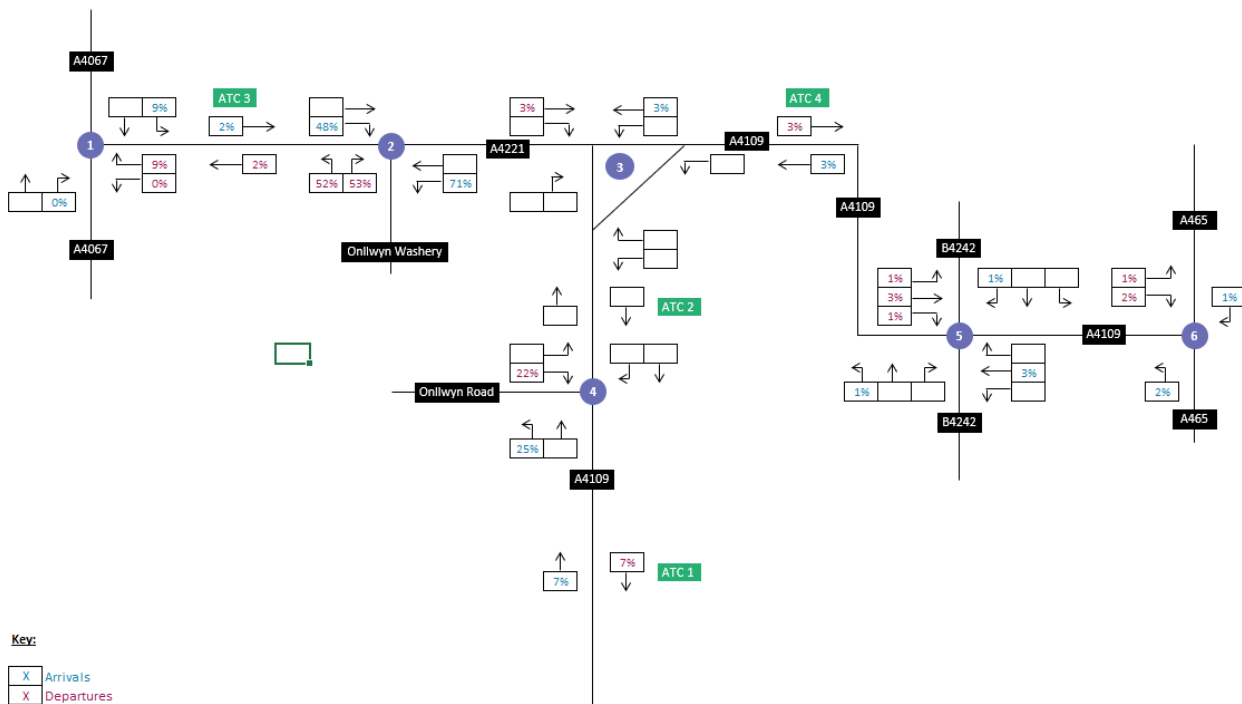


Figure 5-9: Operational traffic percentage increase from baseline (Staff + deliveries), AADT

Severance

- 5.8.4 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery. It can be quantified by the percentage change in traffic. An increase in traffic of 30% or less is deemed to have a negligible impact with regards to severance.

Table 5-15: Operational traffic PCU increase in peak hours.

Ref	Road Link	Receptor Sensitivity	Percentage Increase (traffic)
1	A4221	Medium	2%
2	A4067 North	Medium	9%
3	A4067 South	Low	9%
4	A465	Low	2%
5	A4019	Medium	3%
6	B4242/A4109 junction	Medium	3%
7	B4242	Low	1%
8	Onllwyn Road	Low	25%
9	Heol Gaer	Medium	0%
10	Main Road	High	0%
11	Pedestrian level crossings	High	0% (train frequency anticipated to remain the same as present)

5.8.5 Onllwyn Road has a low environmental sensitivity classification given the number and type of receptors along the road. Operational traffic is expected to increase in both AM and PM Peak, which is classified as a negligible impact. Therefore, it is predicted that any environmental effects associated with severance would be **negligible**.

5.8.6 The impact of construction traffic on all other links in the study area is predicted to have environmental effects that are envisaged to be **negligible** with regards to severance.

Driver delay

5.8.7 With predicted traffic growth and additional operational traffic, all six junctions continue to operate within capacity and without any noticeable queues. The predicted forecast of traffic has a magnitude of impact that is negligible on the junctions for all scenarios assessed showing that the junctions operate within practical capacity. The magnitude of impact of operational traffic on all road links are deemed 'not significant' as per the IEMA guidelines. Therefore, the predicted adverse environmental effects associated would be **negligible**.

Pedestrian delay

- 5.8.8 Pedestrian and cycle delay are predicted to occur where the two-way traffic flow exceeds 1,400 vehicles an hour, providing there are no controlled pedestrian crossings. No link exceeds this threshold in the peak hour which was assessed as being the worst-case scenario and therefore the predicted adverse environmental effects associated would be **negligible**.

Pedestrian amenity

- 5.8.9 The IEMA guidelines suggest that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its HGV component) is halved or doubled. In addition, the guidelines indicate that pavement width and separation from traffic are also key factors.
- 5.8.10 Where there are residential frontings on Onllwyn Road South of the A4019 junction there are segregated narrow footpaths along both sides of the road with a bus stop that has a service of five busses per day. Onllwyn Road is estimated to have an increase of 25% in traffic and therefore classed as significant. However, the operational traffic would access Onllwyn Road from the south, and therefore not pass the residential dwellings located north. There is however a lack of pedestrian/cycle crossing facilities at the southern end of the road which forms a priority T junction with A4109. Therefore, the impact on pedestrian and cycle amenity is major, but given the link sensitivity being low, the overall environmental effect would have a **minor adverse** effect.

Fear and intimidation

- 5.8.11 An increase in HGV movements can have an adverse effect on pedestrian fear and intimidation. The suggested threshold presented in the IEMA guidelines proposes a Small impact if the average HGV flow is around 1,000-2,000 vehicles and negligible if the HGV flow is below 1,000 (18-hour AAWT). The guidance also recommends other factors are considered such as road speed and footway width/separation.
- 5.8.12 With majority of HGV construction access to be taken from the Onllwyn washery access on the A4221, the 18-hour AAWT HGV flow on all other links is predicted to be below 1,000 HGVs. Therefore, on all links it is predicted that any environmental effects associated with fear and intimidation would be **negligible**.

Accidents and safety

- 5.8.13 An analysis of Crashmap data has been undertaken within the study area. No correlations were identified between highway layout, design or condition that were considered contributory factors in the pattern of collisions. However, the cause of accident is unknown, therefore considered that any increases in traffic resulting from the proposed development are anticipated to have a **minor** effect with regards to accidents and safety along the A4109, east of Banwen.

Summary

- 5.8.14 The review of potential effects on the study area established that there are unlikely to be any significant adverse effects resulting from the operation of the proposed

development. It is considered that no further detailed assessment is required, and no mitigation measures are deemed necessary to alleviate specific environmental effects, however it is proposed that soft measures are adopted for the site in the form of Travel Plans to mitigate and minimise the vehicular traffic to align with the Well-being of Future Generations (Wales) Act and advised by the Technical Advice Note18.

5.8.15 Therefore, from this assessment no residual environmental effects with respect of traffic and access are considered likely, however, interventions such as the Travel Plan should be considered to increase the proportion of journeys made to the site by sustainable modes of transport.

5.9 Mitigation

5.9.1 Construction Mitigation

5.9.2 To manage impacts arising from the construction of the proposed development, a CTMP will be prepared that outlines a range of measures to minimise potential traffic impacts arising from the construction of the proposed development. It is anticipated that the CTMP will include details of the following:

- **The CTMP will seek to enable safe walking within and surrounding the development:** All PROWs will be protected from all construction activity. Alternative walking routes will be provided with appropriate signage and crossings where necessary to ensure safe accessibility.
- The provision of facilities for pedestrians regarding the level crossings along the existing railway should also be specified within the CTMP and aim to minimise disruption during construction of the GCRE and ensure safe passing for pedestrians.
- **The CTMP should encourage active travel accessibility to/from the development:** this is to lessen the number of vehicles to and from site. Temporary cycle storage facilities should be provided for construction workers who live within cycling distance.
- **The potential provision of bus services for construction workers should be specified within the CTMP.** GCRE should collaborate with existing bus operators and NPTCBC to provide a service that benefits construction workers in key neighbouring towns if existing services do not satisfy demand to encourage use of public transport and lessen the number of vehicles to and from site. If possible, GCRE will co-ordinate with the existing bus service timetable to minimise disruption during construction and the existing bus operations.
- **Through correct traffic management, the CTMP should ensure correct signage and wayfinding.** This will aim to minimise highway disruptions during construction of the GCRE.
- **Parking measures detailed in the CTMP** to minimise any disruption this may cause. During construction of the development, a temporary car park will be made available on site and of suitable size as deemed necessary within the CTMP to support the operation of construction.
- Given the above, it is proposed that a CTMP is prepared to ensure that all reasonable steps are taken to minimise and mitigate any possible adverse effects of the construction process.

- Monitoring of the traffic associated with the proposed development during the construction period will also be undertaken as part of the CTMP. It is anticipated that monitoring of traffic in the operational phase will be undertaken as part of the implementation of the full Travel Plans.

5.9.3 Operational Mitigation

- 5.9.4 In addition to the physical measures proposed as part of the scheme, it is proposed that soft measures are adopted for the site in the form of Travel Plans. When the proposed development becomes operational, Travel Plans will be implemented to mitigate and minimise the vehicular traffic impacts of the proposed development. The aim of the Travel Plans associated with GCRE will be to potentially reduce car usage and increase the use of public transport by staff. It is unlikely that active travel such as walking and cycling would be attractive to staff given the rural location, however these have still been considered for a holistic sustainable approach given the potential future visitors to GCRE and proximity to the NCN.
- 5.9.5 It is anticipated that this will be achieved through the identification of specific proposals and mechanisms to be implemented that will maximise the accessibility of the site by means other than the private car.
- 5.9.6 Surrounding and within the study area is a mix of footpaths and bridleways, that do not conform to the active travel infrastructure standard. The development will not affect existing PROWs and will provide safe pedestrian infrastructure if there is conflict between the PROWs and the proposed development or proposed rail alignment.
- 5.9.7 The main pedestrian access to the site will be from Onllwyn Road which lacks good pedestrian infrastructure. Appropriate footpaths will be provided along Onllwyn Road to the site entrance, allowing for a safe pedestrian crossing around Onllwyn Road and Wembley Avenue priority junction.
- 5.9.8 Within the site, pedestrian footpaths will be provided with clear wayfinding signage. Footpaths will be kept separate from the internal road and rail network, allowing for a safe pedestrian crossing where necessary.
- 5.9.9 The provision of facilities for pedestrians should be specified within the Travel Plan to promote Active Travel to/from the GCRE.
- 5.9.10 The development will connect with the existing NCN 43 and the local network of cycling routes to enable better cycling accessibility. A direct shared pedestrian/cycle route from Ystradgynlais to Onllwyn should be provided, making use of the existing PROWs within the site area, and be designed to active travel standards. Safe pedestrian/cycling infrastructure will be provided if there is conflict between the proposed rail alignment.
- 5.9.11 The site will provide cycle parking at all points of pedestrian access excluding the existing A4221 Washery and Distribution centre access which will be used by HGVs only. The number of cycle stands should be determined by NPTCBC parking standard guidance as a minimum which is included in the Transport Assessment (TA – Volume III, Appendix 9.1). Cycle parking will include covered cycle parking, light and CCTV to cater for long stay parking requirements.

- 5.9.12 This development will also make provisions for employers and clear wayfinding signage within the site. The provision of facilities for cyclists should be specified within the Travel Plan to encourage active travel to/from the GCRE.
- 5.9.13 GCRE will collaborate with existing bus operators, NPTCBC, PCC to provide a service that benefits employers in key neighbouring towns if existing services do not satisfy demand. This will be detailed within the Travel Plan that will also specify the provision of facilities for bus users to enable better public transport accessibility to/from the GCRE.
- 5.9.14 Vehicle access to site will remain the same as the existing vehicle access to the current site for operation of GCRE. The A4221 Washery and Distribution centre access will be used by HGV only. The provision of facilities for vehicle users including clear way finding signage should be specified within the Travel Plan to support the operation of the proposed development given its rural location.
- 5.9.15 The development will provide a carpark within the site boundary of suitable size and according to local standards due to the rural location of the development.
- 5.9.16 Car parking standards are assessed on land use of the proposed development as assessed in Transport Assessment (TA – Volume III, Appendix 9.1). As the development will be a new employment premises, the recommended proportion is 5% of the total car park capacity should be dedicated for blue badge holders.
- 5.9.17 The car park facilities will encourage the use of Ultra Low Emission Vehicles (ULEVs) and will have a minimum of 10% of car parking spaces to have ULEV charging points as encouraged by PPW Edition 10.

5.10 Residual Effects

- 5.10.1 Table 5-16 and Table 5-17 presents the residual traffic impacts on all receptors of the development during construction and once operational respectively.
- 5.10.2 **Construction**
- 5.10.3 Residual effects are the predicted effects of a project on the environment after the proposed practicable mitigation measures have been adopted. In other words, the predicted actual effects of the project.
- 5.10.4 Subject to the successful implementation of the CTMP, it is considered that any residual effects associated with the construction phase will be of a temporary nature and the magnitude will be either ‘minor’ or ‘negligible’. It is therefore considered that the residual effects of the construction phase will not be significant.
- 5.10.5 The construction period would result in a change in vehicular composition proportions on the local road network and these would be temporary for the duration of the works.

Table 5-16: Residual Construction Traffic Impacts

Potential Effect	Receptor	Prior to mitigation			Mitigation Measure with CTMP	Following mitigation	
		Sensitivity of Receptor	Magnitude of effect	Overall Sig. of Impact		Magnitude	Significance
Severance	Onllwyn Road	Low	Major	Minor	The rail and road split of deliveries is yet to be determined. It is envisaged that rail will be used where possible over road. Therefore, the overall significance impact may be subject to change to reflect this at a later date.	Minor	Negligible
Pedestrian Amenity	A4067 North	Medium	Moderate	Minor	The timings and number of HGV deliveries will be confirmed, and unlikely to occur all within the AM or PM peak hour.	Minor	Negligible
Pedestrian Amenity	A4019	Medium	Major	Moderate	The timings and number of HGV deliveries will be confirmed, and unlikely to occur all within the AM or PM peak hour.	Moderate	Minor
Pedestrian Amenity	B4242/A4 109 junction	Medium	Moderate	Minor	The timings and number of HGV deliveries will be confirmed, and unlikely to occur all within the AM or PM peak hour.	Minor	Negligible
Pedestrian Amenity	Onllwyn Road	Low	Major	Minor	Facilities to be provided if deemed necessary by appointed contractor to ensure safe pedestrian and cyclist crossings to improve pedestrian and cycling amenity	Minor	Negligible
Accidents and Safety	A4109	Medium	Moderate	Minor	Traffic management plan will be put in place as well as specified routeing agreed by the contractor which will be communicated with drivers before and during construction.	Minor	Negligible
	Various pedestrian level crossings and footbridges along railway line towards Swansea				The number of deliveries made by rail is yet to be determined.		

5.10.6 Construction will have a short-term impact (approximately three years) on the surrounding highway network, with some localised impacts having little significant effect. CTMP measures are proposed for all effects not considered to be negligible.

5.10.7 Operational

The operational impact of the proposed development is not anticipated to have a significant adverse effect with regards to transport. The significance of effect for all receptors is either ‘minor’ or ‘negligible’. Subject to the successful implementation and monitoring of the Travel Plans for both the station and business district, it is considered that residual effects associated with the operational phase could be further mitigated.

Several beneficial effects are identified, most of which are of minor significance, but do represent an improvement to the local pedestrian and cycle infrastructure. A significant beneficial effect has been identified in relation to the accessibility to public transport for the local communities.

Table 5-17: Residual Operation Traffic Impacts

Potential Effect	Receptor	Prior to mitigation			Mitigation Measure with Travel Plan	Following mitigation	
		Sensitivity of Receptor	Magnitude of effect	Overall Sig. of Impact		Magnitude	Significance
Severance	Onllwyn Road	Low	Negligible	Negligible	To encourage sustainable modes of transport to/from the site	Negligible	Negligible
Pedestrian Amenity	Onllwyn Road	Low	Major	Minor	Facilities to be provided to ensure safe pedestrian and cyclist crossings, and better bus facilities within vicinity of the GCRE	Minor	Negligible
	Various pedestrian level crossings and footbridges along railway line towards Swansea				The number of deliveries made by rail is yet to be determined.		

5.10.8 Once the GCRE is operational, overall it is considered to have a negligible/minor and not significant effect on the surrounding highway network, however a Travel Plan should be produced to encourage sustainable modes of transport to and from GCRE for both employees and visitors.

5.11 Conclusion – Summary of Effects

- 5.11.1 Links near sensitive receptors were assessed as traffic impact is greater than 10%. IEMA guidelines also recommend a link should be assessed where there is a significant increase in HGV flows. In summary, highway infrastructure would continue to function within practical capacity with additional vehicles generated from construction and operation:
- 5.11.2 Due to the existing nature of the highway and HGV use in the area, a significant amount of the transport infrastructure for the local highway is already in place to deal with a large number of HGV/traffic. There is a frequent bus service providing north-south accessibility with a well-situated bus stop, a good cycling route to Swansea and many PRoW's outside of active travel standards within the area. The single line branch line route that operates to/from the proposed site location and Swansea is not open to passengers currently. A key element of success for the GCRE site is therefore to integrate with the facilities and better sustainable transport modes to maximise the benefits.
- 5.11.3 In addition, due to the site's rural location the development will include a car park for the land use of a multi-storey office space that is proposed for the site. The car park will also provide Ultra Low Emission Vehicles charging points. The number of parking spaces is still to be determined once designs are finalised.
- 5.11.4 The GCRE site will adopt a site wide Travel Plan and use this as a means of monitoring the transport situation and encouraging sustainable transport journeys.
- 5.11.5 During construction, deliveries to the site are likely to be made via a mix of road and rail vehicle movements. The effects of the traffic generated by the development on the local highway network have been tested using traffic models for a variety of scenarios with robust assumptions made for a worst-case scenario for buildings and civils works to be delivered by highway. The results indicate that Traffic and Transport impacts of the Proposed Development are deemed to be negligible or minor adverse and not significant. Where minor effects are identified, mitigation measures and recommendations have been included and are to be considered in preparation of the Full CTMP.
- 5.11.6 The CTMP will be used as a means of monitoring the transport situation during construction for health and safety, ensuring mitigation against any potential disruptions to the construction works being carried out or any disruptions to the local highway and community.
- 5.11.7 A sensitivity test was carried out and summarised in Table 5-18 and
- 5.11.8 Table **5-19** below which presents the residual traffic impact summary of the development during construction and once operational respectively.

Table 5-18: Construction Traffic Impact Summary

Potential Impact	Overall Significance of Impact	Mitigation Measure	Residual Impact after Mitigation
Severance	Negligible/minor	CTMP	Negligible - Not Significant
Pedestrian delay	Negligible	No mitigation necessary	Negligible - Not Significant
Pedestrian amenity	Minor/Moderate	CTMP	Negligible/Minor
Fear and intimidation	Negligible	No mitigation necessary	Negligible - Not Significant
Driver Delay	Negligible	No mitigation necessary	Negligible - Not Significant
Accidents and safety	Minor	CTMP	Negligible

Table 5-19: Operational Traffic Impact Summary

Potential Impact	Overall Significance of Impact	Mitigation Measure	Residual Impact after Mitigation
Severance	Minor/Negligible	Travel Plan	Negligible
Pedestrian delay	Negligible	No mitigation necessary	Negligible - Not Significant
Pedestrian amenity	Negligible/Minor	Travel Plan	Negligible
Fear and intimidation	Negligible	No mitigation necessary	Negligible - Not Significant
Driver Delay	Negligible	No mitigation necessary	Negligible - Not Significant
Accidents and safety	Minor	Travel Plan	Negligible

6 Ground conditions

6.1 Introduction

- 6.1.1 This chapter considers the baseline conditions present in the area of the proposed Global Centre of Rail Excellence (GCRE, the ‘proposed development’) and identifies the potential effects that construction and operation use may have on ground conditions focusing on geology, hydrogeology and impact of land contamination on soils and controlled waters.
- 6.1.2 The potential effects on hydrology from other aspects of the development including drainage are covered in Chapter 5: Hydrology and Flooding.
- 6.1.3 The Ground Conditions chapter sets out the legislative context specific to the assessment of ground conditions. It then presents baseline conditions within the proposed development. This includes the presentation of geological and hydrogeological setting, underlying ground conditions, site history including details on legacy of opencast and deep mine workings, and the conceptual site model for the assessment of impacts of land contamination. This is followed by assessment of potential effects on ground conditions resulting from construction activities and operation.
- 6.1.4 The chapter includes the following appendix:
- Appendix 6A – Global Centre of Railway Excellence Desk Study

6.2 Review of proposed development

- 6.2.1 The proposed development, as detailed in Section 3, would include construction of train testing infrastructure including railway tracks on a landform (embankments and cutting forming the testing loops) which is to be constructed as part of the Nant Helen earthworks planning consent. Therefore, no significant earthworks are proposed as part of this application. The landform design and construction also include undertaking mineworking risk assessment, hydrogeological impact assessment prior to treatment, if required. These also form part of the Nant Helen earthworks consented works and are excluded from this application.
- 6.2.2 However, some materials movement is anticipated particularly associated with the construction of foundations for the proposed structures and infrastructure. Therefore, a materials handling strategy will be developed which will include the reuse and storage of soils and overburden from within the redline boundary of the development. Detailed requirements with respect to management of materials during earthworks will be set out in the Earthworks Specification, which will

be derived for the proposed development. This will determine suitability for reuse criteria.

- 6.2.3** The proposed development also includes construction of platforms, station building, maintenance facilities, staff overnight accommodation and offices, and numerous sidings. The majority of these structures are likely to be founded on ground bearing shallow foundations e.g. rafts. In some cases, where loads are greater, or structures are sensitive to ground movement, deep piled foundations may be required. Foundation proposals will be developed as design progresses and additional information on ground conditions is obtained through intrusive investigations. Construction of the tracks and sidings will require track bedding comprising granular subbase.
- 6.2.4** Buildings and infrastructure associated with the existing open cast mine operations, including the area of the existing washery, will be demolished. All stockpiled materials including the washery by-products such as coal fines, etc, will be removed as part of the washery decommissioning works. Existing ponds/lagoons within the washery area will also be decommissioned and backfilled to allow for the proposed development.
- 6.2.5** The landscaping of the embankment and cut surfaces will be undertaken in accordance with landscaping proposals provided as part of the Nant Helen earthworks consent. These will include grass seeding to vegetate the restored areas. Some landscaping may be introduced in the area of proposed storage and maintenance facilities. These will be developed as the masterplanning design progresses.

6.3 Legislation, policy context and guidance

- 6.3.1** Legislation and policies specifically related to the assessment of ground conditions focusing on geology, hydrogeology and land contamination are described below.

Legislation

- 6.3.2** Geological sites of national importance are principally afforded protection under the Wildlife and Countryside Act 1981 (as amended) or the National Parks and Access to the Countryside Act 1949 by designation as a Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR).
- 6.3.3** Environmental legislation implemented as either Acts or Regulations provide separate legislative drivers to manage contamination. The main legislative drivers for managing risks to human health and the environment from land contamination are:
- Part IIA of the Environmental Protection Act 1990;
 - Contaminated Land (Wales) Regulations 2006 (as amended in 2012);

- Environment Act 1995; and
- Environmental Permitting Regulations 2016 (as amended in 2018 and 2019).

6.3.4 In Wales, Part IIA of the Environmental Protection Act 1990, as introduced by Section 57 of the Environment Act 1995, came into effect in September 2001 with the implementation of the Contaminated Land Regulations 2000 (now superseded by The Contaminated Land Regulations 2006/2012). Under Part IIA of the Environmental Protection Act, sites are identified as 'contaminated land' if they are causing, or if there is a significant possibility of causing significant harm to human health or significant pollution of controlled waters (as defined by Section 104 of the Water Resources Act 1991).

6.3.5 The Environment (Wales) Act 2016 sets out a framework for the sustainable management of natural resources. An accompanying Natural Resources Policy was published in 2017 is to drive the delivery of the Well-being Goals aimed at improving the environment as set out by the Well-being of Future Generation Act 2015, at the same time delivering economic objectives.

6.3.6 In general terms the legislation advocates the use of a risk assessment approach to the assessment of contamination and any remedial requirements.

6.3.7 A list of additional legislation considered within this assessment and relating to contamination and water environment includes:

- Water Resources Act 1991 as amended in Wales by the Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009;
- EU Water Framework Directive (WFD) 2000/60/EC (as amended by supplementary directives and decisions);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 which implement Water Framework Directive (2000/60/EC), and transpose aspects of the Groundwater Directive (2006/118/EEC) and the Priority Substances Directive (2008/105/EC).
- The Environmental Permitting Regulations 2016 (as amended), which amend the Environmental Permitting (England and Wales) Regulations 2010. The 2010 Regulations revoked the Groundwater Regulations (England and Wales) 2009, which originally implemented in the Groundwater Directive;
- Groundwater Daughter Directive (GWDD) (2006/118/EC);
- The Water Framework Directive (Standards & Classification) Directions (England and Wales) 2015;

- The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009; and
- Flood and Water Management Act 2010.

Policy context

National and Regional Policy

6.3.8 Planning Policy Wales Edition 10 (2018) (PPW10), Section 6.3 highlights the importance that geological features have in the natural environment. Specific reference is made to the protection, conservation and enhancement of:

- UNESCO Global Geoparks;
- Regionally Important Geological and Geomorphological Sites (RIGS); and
- Sites of Special Scientific Interest (SSSIs).

6.3.9 In addition, PPW10 encourages planning authorities to promote opportunities for the incorporation of geological features within the design of development.

6.3.10 PPW10, Section 6.9 covers both development on contaminated land and developments which may pose risks to health and the environment. Physical ground conditions and land instability are also considered within this section.

Local Planning Policy

6.3.11 The Powys Local Development Plan (LDP, 2011 – 2026) was adopted in April 2018. The Strategic Policy SP7 – Safeguarding of Strategic Resources and Assets identifies land designated for environmental protection at international or national level and conservation areas (including locally important site designations) as strategic assets. These assets are to be safeguarded from unacceptable development. The LDP provides a range of detailed Development Management Policies focusing on Natural Environment (DM2) and Contaminated and Unstable Land (DM10). These policies require:

- A demonstration of how geodiversity is protected and enhanced.
- That the Water Framework Directive objectives are met including achievement of Water Quality Standards.
- A demonstration that the proposed development will not result in any additional problems of ground instability or contamination, on or off site.
- remediation of any instability and land contamination.
‘Development proposals within areas of coal mining legacy will be required to give full consideration to coal mining information and,

where necessary, implement mitigation measures to the satisfaction of the Local Planning Authority’

- that protection of public health and safety is assured.

6.3.12 The Neath Port Talbot County Borough Council Local Development Plan (LDP, 2011-2026) was adopted in January 2016. The LDP provides a series of strategic policies, which are underpinned by policies. Two strategic policies SP15 Biodiversity and Geodiversity and SP16 Environmental Protection, are considered relevant to the proposed development. These policies state:

- Policy EN6 Important Biodiversity and Geodiversity Sites: Conservation will be required and, where possible, enhancement of natural heritage.
- Air, water and ground quality and the environment generally will be protected and where feasible improved.
- Policy EN8 Pollution and Land Stability: Proposals resulting in unacceptable adverse effect on health, biodiversity, or which would expose people to unacceptable risk due to contamination, water (including groundwater) pollution and/or instability, will not be permitted. Where contamination is likely to be present, the proposals for remediation and mitigation to show that no adverse effects will be caused at any stage of development, will be required. Development will need to minimise impact on water quality.

Relevant guidance

6.3.13 The assessment will be undertaken with due consideration of the following topic specific guidance:

- Model Procedures for the Management of Land Contamination (CLR11)¹. The guidance is currently under review and will be withdrawn during 2020 and replaced by the updated online guidance called ‘Land contamination: risk management’²;
- Construction Industry Research and Information Association (CIRIA) R132: A Guide for Safe Working on Contaminated Sites³;
- CIRIA SP73: Roles and Responsibility in Site Investigations⁴;
- BS5930: 2015: Code of Practice for Site Investigations including Amendment 2⁵;

¹ Model Procedures for the Management of Land Contamination (CLR11), Environment Agency and Defra, 2004.

² Environment Agency, Land contamination: risk management, <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>

³ A Guide for Safe Working on Contaminated Sites (R132), Construction Industry Research and Information Association (CIRIA), 1996.

⁴ Roles and Responsibility in Site Investigations (SP73), Construction Industry Research and Information Association (CIRIA), 1991.

⁵ BS5930:2015 Code of Practice for Site Investigations including Amendment 2, British Standards Institution, 2015.

- BS10175:2011 + A2 2017: Code of Practice for Investigation of Potentially Contaminated Sites⁶;
- Groundwater protection technical guidance⁷, including the Environment Agency’s approach to groundwater protection⁸ (adopted by NRW);
- Underground storage tanks: groundwater protection code, February 2017⁹
- CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice¹⁰;
- CIRIA 681: Unexploded ordnance (UXO) A guide for the construction industry¹¹;
- CIRIA 733: Asbestos in soil and made ground: a guide to understanding and managing risks¹²;
- CIRIA 765: Asbestos in soil and made ground: good practice site guide¹³;
- Definition of Waste: Development Industry Code of Practice¹⁴ sets out a framework for management of materials during construction. This is currently not obligatory for use in Wales, and therefore has not been referenced as a requirement that will be followed.
- Eurocode 7 (BS EN 1997-1:2004 & EN 1997-2:2007) and all relevant normatives;
- NRW Guidance for Pollution Prevention (these replace the withdrawn Pollution Prevention Guidance (PPG)) of relevance in relation to protection of soils and waters.

⁶ BS10175:2011+A2 2017 Code of Practice for Investigation of Potentially Contaminated Sites British Standards Institution, 2011.

⁷ Department for Environment and Rural Affairs, “Groundwater Protection,” 14 March 2017. [Online]. Available: <https://www.gov.uk/government/collections/groundwater-protection>. [Accessed May 2020].

⁸ Environment Agency, “The Environment Agency’s approach to groundwater protection,” February 2018. [Online]. Available: <https://www.gov.uk/government/publications/groundwater-protection-position-statements>. [Accessed May 2020].

⁹ Welsh Government, Groundwater protection codes for Wales, Underground storage tanks: groundwater protection code, February 2017

¹⁰ Contaminated Land Risk Assessment, A guide to good practice (C552), Construction Industry Research and Information Association (CIRIA), 2001

¹¹ Unexploded ordnance (UXO) A guide for the construction industry (C681), Construction Industry Research and Information Association (CIRIA), 2009

¹² Asbestos in soil and made ground: a guide to understanding and managing risks (C733), Construction Industry Research and Information Association (CIRIA), 2014

¹³ Asbestos in soil and made ground: good practice site guide (C765), Construction Industry Research and Information Association (CIRIA), 2017

¹⁴ Definition of Waste Development Industry Code of Practice. Version 2. In association with the Homes and Communities Agency, DEC UK and Hydrock. Contaminated Land: Applications in Real Environments (CL:AIRE), 2011.

¹⁵ BS EN 1997-1: 2004 and Amendment 1: 2013: Eurocode 7 Geotechnical Design. General Rules British Standards Institution, 2013.

¹⁶ BS EN 1997-2: 2007 UK National Annex to Eurocode 7 Geotechnical Design. Ground Investigation and Testing, British Standards Institution, 2007.

6.4 Scoping and consultation

Scoping

- 6.4.1 The scoping opinion responses relevant to this chapter have been received from Natural Resources Wales, Coal Authority and Powys County Council as summarised in Table 6-1.
- 6.4.2 The matters considered within the impact assessments relate to key issues identified at the scoping process such as land contamination associated with current and historical coal exploration activities and underlying geology. The assessments will incorporate a Preliminary Risk Assessment as requested by a scoping opinion response provided by NRW.
- 6.4.3 The aspects associated with ground hazards such as mining legacy would be considered as part of the engineering design, however the identification of the constraints such as mine entries or shafts will be included within the baseline conditions. This is to satisfy the scoping opinion response provided by the Coal Authority.

Table 6-1: Response to scoping opinion

Scoping opinion clause	Scoping Opinion	Response
NRW, Land contamination	Agree with the proposed methodology for establishing baseline conditions and advise that a Preliminary Risk Assessment (PRA) is undertaken. CLR11, Guiding Principles for Land Contamination (EA and adopted by NRW) and British Standards to be used for these assessments. If any piling is to be undertaken, the ES should include a piling risk assessment.	Preliminary risk assessments identifying plausible pollution linkages are presented in Sections 6.7, 6.9 and 6.10. Risk assessments will be updated as further ground conditions information is gathered as part of proposed ground investigations.
Coal Authority	Where mine entries are present on a site, they would expect the location of these to be established by intrusive investigations. They would expect that it is demonstrated that adequate separation between these features and their zone of influence and any structures is proposed. Building on top of these features or close proximity should be avoided.	The location of mine entries and other historical shallow mine workings have been reviewed as part of the desk study and will be further assessed through ground investigations. Appropriate mitigation will be put in to avoid or treat the risks posed by mine workings.
Powys County Council	The scope and level of detail of information included in the report would be considered sufficient for any environmental statement required for the proposed development.	Noted.

Consultation

- 6.4.4 No additional consultation was undertaken following receipt of scoping responses.

6.5 Methodology

Overview

- 6.5.1 The methodology for the ground conditions impact assessment includes a review of the existing baseline conditions to assess the potential impacts due to the construction and use of the area of the proposed development.

Methodology for establishing baseline conditions

- 6.5.2 The identification of baseline method included:
- Confirmation of information gathered from the relevant statutory bodies and the local planning authorities;
 - Review of current and historical plans;
 - Review of published geological maps and memoirs;
 - Review of published mineral resources plans and local development plans;
 - Review of Coal Authority data;
 - Site walkover survey; and
 - Discussions with current site owners Celtic Energy Ltd.
- 6.5.3 A desk study review of the above information has been completed to support the design of a testing track as part of the Global Centre of Railway Excellence proposal. This is presented in Appendix 6A of the ES. This desk study has also been submitted to support the consented Nant Helen Earthworks application. The desk study remains valid for the GCRE assessment as it covers the current baseline and discussed future baseline conditions.

Study Area

- 6.5.4 The study area that has been used for this assessment includes an area extending up to 250m away from the boundary of the proposed development area. This distance is considered to be appropriate in order to establish the current baseline for the ground conditions at the site, impact by historical mining activities and includes all those sites that have plausible pollutant linkages. Notwithstanding this, potential pollutant linkages have been considered on a case by case basis, for

example, if sources of contamination are identified outside the study area but there is potential for that contamination to migrate towards the proposed development area, for instance via groundwater then this has been included.

- 6.5.5 A study area of 1km has been used to identify sensitive controlled water receptors. This will cover, for example source protection zones or water abstraction points, that could be impacted by any potential contamination originating within the proposed development area.
- 6.5.6 The geology study area has been determined on the basis of the regional geology of the area, however it is considered that the proposed development would have an impact on geology only within the footprint of the development.

Assessment methodology

- 6.5.7 The assessment of risks associated with contaminated land will be based on the risk management framework provided in the Model Procedures for the Management of Land Contamination (CLR 11) to be replaced by new guidance ‘Land contamination: risk management’ during 2020. This will involve preparation of a Conceptual Site Model for the baseline conditions, which will form the basis for a Preliminary Risk Assessment followed by a Generic Quantitative Risk Assessment and, if required, a Detailed Quantitative Risk Assessment.
- 6.5.8 The impacts and effects on the geology/geomorphology and land contamination arising from construction of the proposed development will be assessed by review of baseline conditions in the context of the extent, method and programme of the proposed construction activities that will be required.
- 6.5.9 Assessment of the likely impact on the geology/geomorphology and land contamination arising from the operation of the proposed development will be undertaken by review of baseline conditions in the context of the final end use.
- 6.5.10 Potential interrelationships have been identified between the ES chapters concerned with water resources, nuisance (noise), air quality (dust) and climate change. The assessment of effects will take into account these interrelationships.

Significance Criteria

- 6.5.11 The significance of impacts will be assessed by attributing a value or sensitivity to each receptor impacted, in combination with the magnitude of impact that will occur to it. The sensitivity of each receptor will be assessed in line with Table 6.2 and the magnitude of impact in accordance with Table 6.3.

6.5.12 The significance of impact will be then assessed by considering the sensitivity of the receptor in combination with the magnitude of impact in accordance with Table 6.4.

Table 6.2: Criteria and EIA Definitions of Sensitivity or Value

Value (sensitivity)	Typical Descriptors
Very high	<p>Geology: Very rare and of very high national and regional geological/geomorphological importance with no potential for replacement (e.g. designated sites of national importance).</p> <p>Groundwater: Groundwater with a high quality and rarity on a regional or national scale with limited potential for substitution (e.g. principal aquifer/(high productivity) providing potable water to a large population).</p> <p>Surface water: European Community (EC) Designated Salmonid/Cyprinid fishery Water Framework Directive (WFD) Class 'High' Site protected/designated under EC or UK wildlife legislation (SAC, SPA, WPZ, Ramsar Site, salmonid water)/species protected by EC legislation.</p> <p>Land Contamination: Human health (High sensitivity land use scenario e.g. residential with gardens and allotments).</p>
High	<p>Geology: Of medium national and high regional geological/ geomorphological importance with limited potential for replacement (e.g. GCR sites, regionally important site).</p> <p>Groundwater: Groundwater with a high quality and rarity on a local scale with limited potential for substitution, or attribute with a medium quality or rarity on a regional or national scale with limited potential for substitution (e.g. principal aquifer/(high productivity) providing potable water to a small population and/or large resource potential).</p> <p>Surface water: WFD Class 'Good' Major Cyprinid Fishery Species protected under EU or UK habitat legislation</p> <p>Land Contamination: Human health (Lower sensitivity land use scenario e.g. mixed use (residential without gardens), public open space)</p>
Medium	<p>Geology: Of low regional and high local geological/ geomorphological importance with some potential for replacement (e.g. allocated RIGS or recommended RIGS).</p> <p>Groundwater: Groundwater with a medium quality and rarity on a local scale with limited potential for substitution, or attribute with a low quality and rarity on a regional or national scale with limited potential for substitution (e.g. secondary aquifer unit supporting abstraction for agricultural or industrial use and/or moderate resource potential).</p> <p>Surface Water: WFD Class 'Moderate'</p> <p>Contamination:</p>

Value (sensitivity)	Typical Descriptors
	Receptor which is of regional importance. Human health (Low sensitivity land use scenario e.g. commercial, industrial)
Low (or Lower)	<p>Geology: Of local geological/geomorphological importance with potential for replacement (e.g. non-designated exposure).</p> <p>Groundwater: Groundwater with a low quality and rarity on a local scale with limited potential for substitution (e.g. non-aquifer unit that does not afford protection to underlying water bearing units).</p> <p>Surface Water: WFD Class 'Poor'</p> <p>Land Contamination: Human health (Lower sensitivity land use scenario e.g. construction site). Receptor which is of local importance.</p>
Negligible	<p>Geology: Of little local geological/geomorphological interest.</p> <p>Land Contamination: Receptor with low importance and rarity.</p>

Table 6.3: Criteria and EIA Definitions of Impact Magnitude

Magnitude of Impact	Typical Criteria Descriptors
Major	<p>Geology: The proposals are very damaging to the geological environment/soils resource of the area. May result in loss or damage to areas designated as being of regional or national geological interest. Loss of resource and/or quality and integrity of resource. Severe damage to key characteristics, features or elements. Impacts cannot be mitigated for (e.g. destruction of a designated site (RIGS)). (Adverse)</p> <p>Controlled Waters (aquifers/surface water): Reduction of water quality rendering groundwater or surface water unfit to drink and/or substantial adverse impact on groundwater dependent environmental receptors. Discharge of hazardous substances to groundwater. (Adverse)</p> <p>Land Contamination: Major effect upon receptor. Severe or irreversible effect on human health. Temporary severe or irreversible effect on ground/surface water quality. (Adverse).</p>
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	<p>Geology: The proposals may adversely affect the geological/hydrogeological conditions/soils resource existing at the site but will not result in the loss of, or damage to, areas designated as being of regional or national geological interest. Loss of resource, but not adversely affecting the integrity. Partial loss of/damage to key characteristics, features or elements. Some mitigation may be possible but will not prevent scarring of the geological environment, as some features of interest will be lost or partly destroyed. (Adverse)</p>

Magnitude of Impact	Typical Criteria Descriptors
	<p>Controlled Waters (aquifers/surface water): Reduced reliability of a supply at a groundwater or surface water abstraction source. Discharge of non-hazardous substances to groundwater and surface water resulting in pollution (i.e. contaminants present above the EQS) (Adverse)</p> <p>Land Contamination: Moderate effect upon receptor. Long term or short term moderate effect on human health. Moderate effect on ground/surface water quality, reversible with time. (Adverse)</p> <p>Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).</p>
Minor	<p>Geology: The proposals will not affect areas with regional or national geological interest/soils resource but may result in the loss of, or damage to, areas of local geological/soils resource interest. Cannot be completely mitigated for but opportunities exist for the replacement of lost or damaged areas which may be of similar local geological/soils interest. (Adverse)</p> <p>Controlled Waters (aquifers/surface water): Marginal reduced reliability of a supply at a groundwater or surface water abstraction source. Discharge of non-hazardous substances to groundwater and surface water not resulting in pollution (i.e. contaminants present below the EQS) (Adverse)</p> <p>Land Contamination: Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). Slight effect on ground/surface water quality, reversible with time. (Adverse)</p> <p>Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).</p>
Negligible	<p>Geology: The proposals will result in very minor loss or damage to local area of geological interest/soils resource such that mitigation is not considered practical. Very minor loss or detrimental alteration to one or more characteristics, features or elements. (Adverse)</p> <p>Controlled Waters (aquifers/surface water): Non-measurable change to quality, level and flow. (Adverse)</p> <p>Land Contamination: Results in no discernible change or an impact on attribute of sufficient magnitude to affect the use/integrity. (Adverse) E.g. Soil contaminants present, but risk assessment suggests negligible/ low risk to human health. (Adverse)</p> <p>Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).</p>
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

6.5.13 The criteria for assessing the significance of the impact takes account of the following factors:

- The value of the resource (international, national, regional and local level importance);

- The magnitude of the impact;
- The duration involved;
- The reversibility of the effect; and
- The number and sensitivity of receptors.

6.5.14 The level of significance that merits further consideration / mitigation are taken as those where the significance of the effect is 'moderate' negative or greater.

Table 6.4: Approach to Evaluating Significance of Effect

		Magnitude of Impact				
		No Change	Negligible	Minor	Moderate	Major
Value/ Sensitivity	Very high	Neutral	Slight	Moderate or large	Large or Very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or Large	Large or Very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral	Neutral or slight	Neutral or slight

6.6 Limitations and assumptions

Limitations

6.6.1 Limited intrusive ground investigations have been undertaken within the proposed development area. No chemical testing on soils has been undertaken.

6.6.2 Sufficient published information is however available to create a preliminary ground model and identify the required mitigation measures. This is considered sufficient at the initial design stage and to inform the environmental impact assessments. Ground investigations will be required to support the detailed geotechnical design and to refine mitigation measures for the proposed development.

Assumptions

6.6.3 It is assumed that during construction, or any intrusive maintenance works, good health and safety management and pollution control will be undertaken in accordance with current legislation, and as set out in the outline CEMP presented in Appendix 3A. It is assumed that

measures would include groundwater management during excavations and measures aiming at reduction of dust generation.

- 6.6.4 It is assumed that chemical testing of made ground, and ponds/lagoons sediments and water will be undertaken to inform the identification of adequate health and safety mitigation measures. Alternatively, health and safety risk assessments will consider reasonable worst-case scenarios.
- 6.6.5 It is assumed that only materials confirmed suitable for use within the proposed development will be imported and used within the construction of the proposed development.
- 6.6.6 It is assumed that materials constituting on-going sources of contamination, if encountered, will be removed/remediated as part of the development construction in line with current legislation.
- 6.6.7 It is assumed that any discharge into the ground or controlled water environment during construction will be undertaken in line with regulatory requirements and any relevant consents and permits and will not pose a risk to controlled water quality. Treatment and monitoring prior and during discharge would be undertaken, if required.
- 6.6.8 It is assumed that geotechnical and foundations design of the structures would be undertaken in accordance with appropriate engineering codes and would be informed by results of intrusive investigations.
- 6.6.9 It is assumed that appropriate ground gas protection measures identified through ground gas risk assessments that will be completed based on intrusive ground investigations as part of the design. The protection measures will be designed in accordance with BS8485:2015 or equivalent.
- 6.6.10 It is assumed that where piled foundations are proposed, a foundations works risk assessment would be undertaken in accordance with the published guidance (namely Environment Agency, Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention, National Groundwater & Contaminated Land Centre report NC/99/73, Atkins 2001). This will ensure that the selected piling technique does not pose unacceptable risk to controlled waters and human health.
- 6.6.11 Professional judgement has been applied where necessary in assignment of sensitivity and magnitude of effects in line with definitions provided in Table 6.1 and Table 6.2.
- 6.6.12 Notwithstanding the limitations and assumptions, sufficient information has been available for the completion of the assessment of ground conditions.

6.7 Baseline Environment

- 6.7.1 This section of the chapter presents the baseline conditions with respect to geological setting and resources within the site. It also describes the conceptual site model in relation to potential sources, pathways and receptors of contamination and their linkages.
- 6.7.2 The centre of the site is located at approximate National Grid Reference SN 821 112, approximately 1.5km north west of the village of Onllwyn, South Wales. It is located on top of a hill, known as ‘Mynydd y Drum’ with the valleys of the Dulais and the Tawe Rivers to the south and north of the proposed development area respectively.
- 6.7.3 The site boundary is shown on Figure 1.1. For ease of identification, the proposed development has been split into the “main” and the “washery” portions. The “main” portion refers to the central body of the site which contains the proposed rail test tracks whereas, the “washery” portion refers to the extension of the site to the southeast incorporating the Onllwyn Washery.
- 6.7.4 Earthworks associated with the construction of the embankment and cuttings are to be completed as part of a separate consent – Nant Helen Complementary Restoration Earthworks- and will form baseline to these assessments.

Topography

- 6.7.5 The boundary of the site sits at approximately 250m AOD with the land generally rising inwards towards the centre of the site. The main portion of the site sits at around 295m AOD. The “washery” portion of the site sits lower than the main portion of the site at roughly 230mAOD. Site topography is shown on Figure 6.1.
- 6.7.6 The site has been extensively worked through opencast coal mining operations since c.1946 with opencast activities still ongoing within the Nant Helen Extension site. As a result of these activities, the topography of the site has been constantly altered over the last century. Currently a large ‘overburden storage area’ is located within the south east of the site, formed with excess material that has been excavated during opencast mining activity. The current maximum height of the spoil material within the storage area is approximately 80m above the natural ground surface with the top of the overburden storage area sitting at approximately 335m AOD. This point represents the highest location within the site.
- 6.7.7 The base of the active Nant Helen Extension opencast site is typically 150m lower than the site surface level with the base of the excavation currently sitting at approximately 90m AOD. The lowest projected level of excavation within the Nant Helen Extension site is anticipated to reach ~76mAOD. This point is not located within the site however,

the batter slopes of the excavation are located within the western extremity of the opencast excavation.

- 6.7.8** A series of access tracks are present across the site. These access tracks provide access to the site and connect the current open cast workings in the west with the Onllwyn Washery located in the east of the site. The washery site is accessed from the A4221 via a separate entrance, and comprises several buildings, conveyer belts and material sorting facilities.
- 6.7.9** The opencast mining activity within the Nant Helen Extension will cease operation in 2021 and restoration activities will infill to approved contours and landscape the existing workings. This will be undertaken as part of the Nant Helen Complementary Restoration Earthworks consent. As part of the restoration works, embankments and cuttings accommodating the proposed tracks will also be constructed.

Published Geology

- 6.7.10** The geology beneath the site has been interpreted through a review of published geological sources. These sources include the BGS 1:10,560 geological mapping¹⁷, the BGS 1:50,000 geological mapping¹⁸ and the BGS GeoIndex online viewer¹⁹. The mapped solid geology and superficial geology are shown on Figures 6.2 and 6.3 respectively.
- 6.7.11** In addition to the geological mapping sources reviewed, two editions of the geological memoirs for 1:50,000 Sheet 231 have been reviewed to provide additional detail on the geology beneath the site; the first is memoir was published in 1904²⁰ and the second in 1988²¹.
- 6.7.12** **Made Ground**
- 6.7.13** Made ground deposits are anticipated to be encountered beneath the majority of the proposed track route and within the washery portion of the site. A large region of artificial ground is shown to be present in the north of the main site. Based on review of documents provided by Celtic Energy, this is anticipated to be made ground associated with the backfilling of the Abercrave/Gwaunton opencast coal mine (refer to the Coal Mining section below and Figure 6.5).

¹⁷ British Geological Survey (BGS), Geological Survey of Great Britain (England and Wales), 1:10,560 scale geological map, SN 81 SW, 1979

¹⁸ British Geological Survey (BGS), Geological Survey of Great Britain (England and Wales), 1:50,000 series, Merthyr Tydfil, Sheet 231, Solid edition (online), <http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001724>, Date accessed 20/11/2019

¹⁹ British Geological Survey (BGS), Geoindex online viewer (online), <http://mapapps2.bgs.ac.uk/geoindex/home.html>, Date accessed May 2020

²⁰ British Geological Survey (BGS), The geology of the South Wales Coalfield: being an account of the region comprised in sheet 231 of the map, Strahan. A. et al., 1904

²¹ British Geological Survey (BGS), Geology of the South Wales Coalfield, Part V, the country around Merthyr Tydfil, Sheet Memoir 231, Barclay. W.J. et al., 1988

- 6.7.14 Although not shown on published geological mapping sources, based on the known extent of other phases of opencast mining located within the site boundary, other areas backfilled with made ground are anticipated to be present beneath much of the proposed development area, refer to Figure 6.5. Based on review of site walkover photos, this material is anticipated to be the non-coal bearing arisings excavated during the opencast mining activity. This material is likely to comprise a mixture of weathered fragmented rock (mudstones, siltstones and sandstones) and superficial deposits.
- 6.7.15 The depth of the made ground fill material is likely to vary between opencast areas and is likely to correspond somewhat to the ultimate depth of excavation that pertains to each individual site.
- 6.7.16 Based on the descriptions provided in the logs reviewed, the made ground material anticipated to be encountered beneath the washery site is likely to comprise a mixture of varied granular backfill material within a cohesive clay matrix. The various gravel inclusions within the made ground were noted to be mudstone, sandstone, coal, clinker and wood. The thickness of this material is anticipated to range between 0.25m and 7m, although locally thicker deposits could be encountered in the locations of any stockpiles/spoil heaps within the washery site.
- 6.7.17 **Drift (Superficial Deposits)**
- 6.7.18 Geological mapping sources show that the majority of the site is void of superficial material. Localised areas of till are shown to be present in the west and south of the site. Deposits of Devensian Till and peat are also shown to be present beneath a small section of the washery portion of the site. Glacial Till typically comprises a heterogenous mixture of clay, sand and gravel with large cobble and boulder inclusions of various size and shape. The 1904 geological memoir for sheet 231 describes the glacial till deposits within the Dulais valley as “...*Old Red (sandstone) in a stiff bluish matrix (clay)*”.
- 6.7.19 In addition to the localised pockets of Glacial Till, a minimal deposit of peat is shown to be present within the centre of the site on the published geological mapping sources. Peat typically comprises a partially decomposed mass of vegetation that has grown under anaerobic conditions, usually found in bogs or swamps.
- 6.7.20 It should be noted that given the known extent of opencast workings, much of the Glacial Till shown to be present in the western portion of the site has likely been removed during the excavation of the opencast void. The same can be said for the localised extent of peat shown to be present within the central portion of the site; this deposit directly coincides with a portion of the Nant Helen (1999) opencast site, shown on Figure 6.5 and the large overburden storage area, shown on Figure 6.1. Although the geotechnical properties of peat are unfavourable, there is a possibility that these may have remained in place beneath the stockpiles.

- 6.7.21 The geological map shows glacial till deposits to be present in the eastern end of the washery portion of the site. Peat deposits are shown to encroach into the north of the washery site, but it is considered likely that these materials would have been removed from beneath developed areas.
- 6.7.22 **Solid (Bedrock)**
- 6.7.23 The western half of the site is underlain by solid geology denoted as South Wales Middle Coal Measures Formation and the eastern half of the site is shown to be underlain by South Wales Lower Coal Measures Formation. Refer to Figure 6.2.
- 6.7.24 The South Wales Coal Measures generally comprise rhythmic sequences of mudstones (commonly containing pyrite), siltstones, sandstones, grits, fireclays and coal. The coals found in these measures tend to be the thickest and most economically significant in South Wales. Nodular masses of pyrite, up to 0.15m thick, are often present within the Middle and Lower Coal Measures formations.
- 6.7.25 From review of dip angles presented on the 1:10,560 geological mapping, the solid geology is anticipated to dip in a west south-west direction and angles ranging between 5° and 15°. Various localised syncline and anticline features are shown to be present beneath the site and as a result dip angles vary accordingly in these locations.
- 6.7.26 **Linear Features**
- 6.7.27 Five faults, three of which are named, are shown to cross through or close to the site along a NNW to SSE alignment, as presented on Figure 6.3. The easternmost fault, the Glyncorwg Fault, is shown to pass through the washery portion of the site. The geological memoir from 1904 suggests that the fault has a downthrow of “forty yards” (~36.6m) to the west.
- 6.7.28 Moving westwards, there is an unnamed fault (potentially associated with the Glyncorwg Fault), which crosses into the eastern half of the site and also downthrows to the west. The Chapel Fault is situated beneath the eastern half of the site and is recorded to downthrow by “sixteen yards” (~14.6m) to the east.
- 6.7.29 The Pwllau Bach Fault is located centrally and is roughly orientated along a NNW to SSE alignment. The downthrow of the Pwllau Bach Fault is considerable and is suggested to be “eighty yards” (~73.2m) to the west within the 1904 geological memoir.
- 6.7.30 The Glyncorwg, Chapel and Pwllau Bach Faults form part of a horst and graben formation which is shown to be located beneath the eastern half of the site. The final fault, which is shown to cross into the north-western corner of the site, is unnamed. The fault is shown to downthrow to the east.

6.7.31 In addition to the extensive faulting, which is shown to be present beneath the site, numerous coal seams are shown to outcrop within the boundary of the site. Refer to Figure 6.3. A review of the coal resource shown to be present beneath the site and the associated mining activities, both surface and sub-surface, is detailed within a latter section of this chapter (refer to the Coal Mining section below for details).

Geological Designated Sites

6.7.32 There are no statutory designated areas specifically of geological interest present within the proposed site boundary. However, as identified from review of Lle Welsh Government Sites of Special Scientific Interest (SSSI) data sets²², the Nant Llech SSSI is located approximately 110m to the north of the site as shown on Figure 6.4.

6.7.33 The Nant Llech SSSI covers a mountain stream that flows through a steep-sided valley of which is of special interest on account of its rich variety of woodland species, cliff plant communities and Westphalian rock exposure. The site has been deemed critical for understanding the stratigraphy of the South Wales Coalfield due to the exposed sequence of over 120m of rock strata.

6.7.34 As highlighted on the Joint Nature Conservation Committee (JNCC) website²³, the Nant Llech has also been identified as a ‘Geological Conservation Review’ (GCR) site. GCR sites are sites that have been identified to be of national and international importance and show key scientific elements of the earth heritage of Britain.

6.7.35 There are no ‘Regionally Important Geological and Geomorphological Sites’ (RIGS) within a 1km radius of the site.

Geomorphology

6.7.36 Three Geological Landscape Areas are present within the study area, as shown on Figure 6.4. These have been identified through review of Natural Resources Wales LANDMAP²⁴. The three Geological Landscape Areas include:

- Ystradgynlais – Upland valley slope (Outstanding)
- Seven Sisters – Upland plateau (Moderate)

²² Welsh Government, Natural Resources Wales (NRW), Lle – A Geo-Portal for Wales, Sites of Special Scientific Interest (SSSI), <http://lle.gov.wales/catalogue/item/ProtectedSitesSitesOfSpecialScientificInterest/?lang=en> , Date accessed 20/11/2019

²³ Joint Nature Conservation Committee (JNCC), UK, UK Geoconservation, Geological Conservation Review, GCR Database, Nant Llech (Westphalian) (online), <http://archive.jncc.gov.uk/default.aspx?page=4174&gcr=1417> , Date accessed 20/11/2019

²⁴ Natural Resources Wales (NRW), Interactive Maps, LANDMAP (online), <https://landmap-maps.naturalresources.wales/> , Date accessed 20/11/2019

- Banwen – Mountain and Upland Valley (High)

- 6.7.37 The Ysradgynlias area has been evaluated to be of ‘Outstanding’ value on account of the Upper Carboniferous stratigraphy within the Nant Llech SSSI being located within the area covered. Principal management recommendations state that the upper carboniferous measure exposures must be conserved.
- 6.7.38 The Seven Sisters area has been evaluated to be of ‘Moderate’ value on account of the glacial drift deposits which cover extensively worked productive coal measures. The moderate valuation concerns the areas research value, historical value and rarity/uniqueness.
- 6.7.39 The Banwen area has been evaluated to be of ‘High’ value on account of the glacial drift deposits which extensively cover the coal measures. The high valuation is based on both the research value and the educational value of the area.

Ground Conditions

- 6.7.40 The anticipated ground conditions beneath the site have been interpreted through review of published geological information and borehole and trial pit logs from previously undertaken ground investigations. The majority of these logs do not pertain to exploratory holes carried out within the site. A total of 8No. boreholes were undertaken within the main body of the site prior to the construction of the large overburden storage area. The logs for these boreholes do not provide detailed material descriptions but provide indicative stratigraphy, highlighting the likely thicknesses of material anticipated to be encountered beneath the site.
- 6.7.41 The likely material composition has been assumed through review of more detailed logs pertaining to boreholes progressed within the Onllwyn washery site and through interpretation of published geological sources.
- 6.7.42 The locations of the boreholes which have been reviewed are shown on Figure 6.2. The logs have been sourced from information provided by Celtic Energy and are presented within Appendix 6A.
- 6.7.43 Natural superficial deposits of peat and glacial till were encountered beneath the southern portion of the site. Peat deposits up to 1.6m thick were encountered. The glacial till material encountered had a thickness range between 1.0m and 3.1m.
- 6.7.44 The depth to rockhead varies greatly depending on location. The borehole logs reviewed noted between 1.8m and 3.6m of superficial material before encountering the head of bedrock. However, the depth to bedrock in the locations that have been previously opencast and subsequently backfilled is likely to be far greater and is likely to depend on the depth of opencast mining activity pertaining to each site. Refer to section on Coal Mining below.

- 6.7.45 Firm to stiff grey/brown clay with various mudstone, siltstone and sandstone gravel inclusions was encountered beneath the made ground deposits within the washery portion of the site. Based on the description and the published geological mapping, these materials are anticipated to be glacial till. Where encountered, the glacial till material beneath the washery portion of the site ranged between 0.2m and 2.4m thick. In some locations within the washery portion of the site, no natural superficial materials were encountered; in these locations the made ground material was encountered directly overlying the weathered bedrock.
- 6.7.46 Detailed descriptions from boreholes progressed within an adjoining site suggests that the mudstones and siltstones are slightly to moderately weathered and are moderately weak to strong. The materials are generally grey to dark grey in colour and occasionally micaceous. Where encountered close to surface, the bedrock was recovered as highly weathered fragments of mudstone and sandstone within a clay matrix.

Site History

- 6.7.47 Historical Ordnance Survey (OS) mapping sets (1876 - 2019)²⁵, acquired from Groundsure, and historical aerial photography (1945 – 2019), acquired from the Welsh Government, have been reviewed to identify particularly relevant features and constraints that pertain to the study area. The source material reviewed is presented within Appendix 6A.
- 6.7.48 In general, the site has been subject to extensive surface and sub-surface coal mining activities over the past century and therefore, the majority of features identified are related to coal mining. Refer to Figure 6.5 for locations.
- 6.7.49 Several historical collieries have been identified along the northern and southern boundaries of the site. The majority of the collieries were located on the lower slopes of Mynydd Drum and extracted coal via numerous drift and shaft mines. The Abercrave and Gwaunclawdd Collieries were present on the earliest historical mapping from 1876/77 and the last evidence of the collieries disappeared following the absence of the Onllwyn Colliery on the mapping from 1977.
- 6.7.50 The first evidence of opencast workings was identified on the 1951 aerial photography which appears to show the partial backfilled workings believed to be associated with the first Onllwyn opencast site. This site is believed to have been licenced between 1946 and 1949. The subsequent aerial photographs show evidence of the second Onllwyn, the Abercrave/Gwaunton, the Nant Helen and the Nant Helen Extension opencast sites.

²⁵ Groundsure, Historical Mapping set, Report ref.: GS-6396071, 14/10/2019

- 6.7.51** Various rail tracks and tramways are shown to have crossed through and run along the boundaries of the site. The earliest of which was marked as an ‘Old Tramway’ on the historical mapping from 1876/77; The ‘Old Tramway’ has been identified to refer to a section of the Brecon Forest Tramroad that passed through the site known as “Claypon’s Extension”²⁶ and is a scheduled ancient monument. The tramroad was constructed circa 1827 and fell into disuse at some point prior to 1876. The location is shown on Figure 6.6.
- 6.7.52** The Neath and Brecon Railway line was shown to pass along a northeast to southwest alignment to the south of the southern site boundary, as show on Figure 6.6. A spur from the Neath and Brecon Railway, the Neath and Brecon Railway Junction Line, ran along the northern boundary of the site. Both lines were shown on the earliest historical mapping set from 1876; the Junction Line is shown up until the 1975 where it is no longer shown on aerial photographs. Whereas, a portion of the main line remains to the current day and links the Onllwyn Washery site to Neath.
- 6.7.53** The Onllwyn Washery (the washery portion of the proposed development) remained largely undeveloped until 1945 when the washery infrastructure and railway sidings were introduced in addition to an existing tramway link between the Onllwyn Colliery to the Neath and Brecon Railway line. The washery grew in size over the 1960s and 1970s, with numerous pond features shown on the 1977 aerial photography. The 2019 aerial photography shows the ‘washery’ portion of the site to contain a varied array of coal processing infrastructure with a limited network of rail lines running along an east to west alignment towards the north of the site.

Coal Mining

- 6.7.54** **Coal outcrops**
- 6.7.55** As identified in the Published Geology section above, the site is primarily underlain by South Wales Middle Coal Measures Formation and South Wales Lower Coal Measures Formation. These formations contain numerous coal seams of varying thickness and have been heavily mined, both sub-surface and opencast, in the past and present.
- 6.7.56** The site is roughly split in half by the Pwllau Bach Fault (PBF) along a north to south centrally located axis. Outcropping coal seams are shown to the west of the PBF on the published geological mapping sources. The outcrop of the seams to the west of the PBF within the Middle Coal Measures (‘Soap’ through to ‘Brass’) are shown on Figure 6.3.

²⁶ Fforest Fawr Geopark, Understanding, Archaeology and industrial heritage, Transport by road, rail and water, The Brecon Forest Tramroad (online), <https://www.fforestfawrgeopark.org.uk/understanding/archaeology-and-industrial-heritage/transport-by-road-rail-and-water/the-brecon-forest-tramroad/>, Date accessed 21/11/2019

- 6.7.57 To the east of the PBF, the partially observed and inferred outcropping pattern of the ‘Nine Feet’ and ‘Brass’ seams are shown to initially follow a north to south alignment the fault and then in the south along the side of the Dulais River valley.
- 6.7.58 To the east of the Chapel Fault the “Nine Feet” and “Brass” seam outcrops are once again shown to be present within the site boundary. The alignments of both are shown as observed and are believed to have been mapped during the opencast mining activity located in the eastern half of the main portion of the site.
- 6.7.59 The outcrops of the “Upper Bluers”, “Middle”, “Lower” and “Bryn” seams are shown in the north-eastern corner of the site. An anticlinal axis is shown to manipulate the alignment of the “Upper Bluers” seam at outcrop. All of these seams are located within the South Wales Lower Coal Measures Formation.
- 6.7.60 To the east of the Glyncoirwg Fault the inferred outcrops of the “Upper Bluers”, “Grey” and “New” coal seams are shown to be present beneath the washery portion of the site. These inferred outcrops are shown to be situated along an approximate southeast to northwest alignment.
- 6.7.61 **Mine Entries**
- 6.7.62 Based on review of the Coal Authority online viewer²⁷ a total of 64No. mine entries have been identified to be present within the “main” site and 31No are shown to be present within the “washery” portion of the site. The approximate locations of the majority of these entries, determined through review of Celtic Energy opencast completion plans, have been marked on Figure 6.5. However, the entry locations within the washery site were not shown on the source material provided by Celtic Energy.
- 6.7.63 Many of these mine entries, especially those located within the north-eastern corner of the site and to the south of the site, have been identified to have shallow depths (~4m) and are located within close proximity of each other along coal outcrops. Aerial photographs from 1944 show surface depressions roughly along the location of coal outcrops in the south east of the site. These are indicative of ‘bell pitting’ coal extraction methods.
- 6.7.64 The mine entries within the washery portion of the site include eight recorded shafts and twenty-three recorded adits. No depths were provided for the shafts identified on the Coal Authority viewer.
- 6.7.65 **Underground mine workings**

²⁷ The Coal Authority, Interactive viewer, Coal mining data (online), <https://mapapps2.bgs.ac.uk/coalauthority/home.html> , Date accessed 20/11/2019

- 6.7.66 A total of eight collieries have been identified to have worked the seams beneath study area through various drift and seam entries.
- 6.7.67 The Abercrave, International and Gwaunclawdd collieries were located along the lower northern slopes of Mynydd Drum and through review of the Welsh Coal Mines website²⁸ worked various seams within the Middle and Lower Coal Measures including the “Four Feet”, “Nine Feet” and “Brass” seams within the Middle Coal Measures; these seams are anticipated to contain the shallowest underground workings in this region.
- 6.7.68 The Onllwyn, Dulais and Seven Sisters collieries were located within the Dulais valley to the south of Mynydd Drum and are believed to have worked the “Nine Feet” and “Brass” seams. These seams have been identified to contain workings, believed to be related to the three collieries, within 20m of rockhead beneath the southern half of the site (refer to Figure 6.5).
- 6.7.69 The Glynllech Colliery (also described as the Cwm Tawe Colliery) was shown to be located within the site on the historical mapping between 1914 and 1948. A collection of mine entries, identified through review of Celtic Energy’s opencast completion plans, have been identified to be present in the approximate location of the Glynllech Colliery. Based on the outcrops shown in this portion of the site, the Glynllech Colliery is anticipated to have worked the “Bluers”, “Middle” and potentially “Lower” seams within the Lower Coal Measures Formation.
- 6.7.70 The Hendre Ladis Colliery (later absorbed by the Ynyscedwyn Colliery) was located approximately 1km to the west of the site boundary. Both these collieries are anticipated to have worked the “Nine Feet” and “Brass” seams. However, given the extent of opencast working undertaken in this region in the 21st century, much of these workings are likely to have been worked out where previously located beneath the site.
- 6.7.71 **Opencast mine working**
- 6.7.72 The site has been subject to extensive opencast coal mining activity from as early as 1946. A total of six opencast sites have been identified to be present within the site. The depth of opencast working appears to have increased from the earliest Onllwyn site (1946-49) which reached a maximum depth of ~15m to the ~150m excavations present within the current day Nant Helen Extension opencast site.
- 6.7.73 The depths of excavation provide indicative figures for the depth of fill material which is now present within the opencast sites that have been backfilled post completion of opencast activity. The backfill

²⁸ Welsh Coal Mines, Collieries, Brecon (online), <http://welshcoalmines.co.uk/Photo.htm> , Date accessed 20/11/2019

material is likely to comprise the non-coal bearing site won rock arisings which have been excavated during opencast working.

Hydrology

- 6.7.74 The site overlaps with three principal river catchments: the Tawe catchment, the Dulais catchment and the Pyrddin catchment. Refer to the Water Environment Chapter 5 for details.
- 6.7.75 The northern half the site sits within the Tawe catchment and contains several small unnamed streams which drain in a northerly direction towards the River Tawe. The River Tawe is the largest watercourse within the vicinity of the site and flows roughly from east to west approximately 500m to the north of the site boundary.
- 6.7.76 The Nant Llech, located to the north east of the site, a tributary of the River Tawe, flows from east to northwest where it feeds into the Tawe and passes within 300m of the north-eastern site boundary. A collection of small unnamed stream features to the northeast of the main portion of the site are shown to drain in a north-easterly direction towards the Nant Llech.
- 6.7.77 The southern half of the site sits within the Dulais catchment. The River Dulais flows roughly from east northeast to west southwest and runs through the washery portion of the site and along a portion of the south-eastern boundary of the main site. The Dulais is fed by several tributaries most of which are unnamed. One of the tributaries, the Nant Ystalwyn, originates in the southwestern corner of the site and flows in a south-westerly direction towards its convergence with the Dulais. A collection of other unnamed tributary streams, which originate within the southern and central portions of the site, flow in a southerly direction to their respective convergences with the River Dulais.
- 6.7.78 The Nant Ystalwyn, another tributary of the Dulais, is shown to be fed by a selection of ponds which are located at the base of the large overburden storage area which is centrally located within the body of the main site. These ponds have been identified as water treatment areas and are fed by the drainage features present on the southern face of the large overburden storage area.
- 6.7.79 A small portion of the eastern half of the main portion of the site is shown to sit within the Pyrddin catchment. However, the drainage features within this portion of the site are anticipated to contribute to flows within the Dulais and not the Pyrddin. The drainage features identified appear to be man-made and initially flow in an easterly direction. The alignment of these features then turns to flow south-westwards and feed into a collection of ponds located within the washery portion of the site. These ponds are located at the apparent source of the Dulais and based on the contours of the area are likely to feed into the Dulais.

- 6.7.80 One unnamed stream is shown to be located to the south of the washery portion of the site. From review of information presented within the Groundsure EnivoInsight report, this stream flows in an easterly direction before being culverted beneath the A4109 that borders the washery site to the south. The stream is then shown to re-emerge within the washery site before passing through another culvert beneath a section of the washery site. The stream eventually converges with the Camnant which in turn is a tributary of the Pyrddin.
- 6.7.81 In addition to the numerous watercourses, several small pond/lake features are shown to be located within the boundary of the site. A number of these are 'water treatment ponds' and appear to treat the water from various man-made drainage features which are currently present within the site. A collection of other ponds, which are present in the central southern portion of the site appear to represent an attempt to create marsh/bog type habitat as part of past restoration activity of the original Nant Helen opencast site.

Hydrogeology

- 6.7.82 The information presented below has been based on review of the BGS 1:125,000 Hydrogeological Map of South Wales²⁹.
- 6.7.83 Glacial till, which is likely to be present locally beneath the site where mining activities have not taken place, is typically described as a variable deposit of boulder clay and morainic drift. The principal lithology is unsorted stones of gravel, cobble and boulder within a silty clay matrix (also known as diamicton). However, in places lenses of stratified sand and gravel are present. These predominantly granular lenses can act as aquifers however the predominant hydrogeological importance of glacial till material is in limiting recharge to underlying formations and confining water within. Rainwater tends to drain through surface run-off that form collects and issues that feed streams. These are present to the south and north of the proposed development, as detailed in sections above.
- 6.7.84 The Middle and Lower Coal Measures that are present beneath the site tend to have lower porosities than the overlying Upper Measures with the highest values of porosity occurring in areas of intensive folding and faulting. The groundwater that is contained within the Middle and Lower Measures tends to contribute towards baseflow of rivers and usually emerges as springs at the bases of the subordinate sandstones.
- 6.7.85 Two springs have been identified within the study area. One spring is located approximately 430m to the north (at approximately 135mOD) and the second one, approximately 420m to the south-west (at approximately 250mOD). The first spring is likely to emerge from the

²⁹ British Geological Survey (BGS), Hydrogeological Map of South Wales, 1:125,000 scale (online), <http://www.largeimages.bgs.ac.uk/iip/hydromaps.html?id=south-wales.jp2>, Date accessed 20/11/2019

sandstone or marine band outcropping in that area. Considering the dip of the rock of approximately 5 degrees to the south-south-east, these bands are likely to be under a considerably depth beneath the proposed development area. The second spring is likely to emerge from an outcrop of a band of sandstone present at a relatively shallow depth within the proposed development.

6.7.86 **Aquifer Designations**

6.7.87 The aquifer designations have been determined through review of the Groundsure EnviroInsight³⁰ report purchased for the site.

6.7.88 The glacial till deposits shown to be present in the southern and western portion of the site are designated as ‘Secondary Aquifer Undifferentiated’. A ‘Secondary Aquifer’ designation is attributed to a stratum where it has not been possible to differentiate between a ‘Secondary (A)’ or ‘Secondary (B)’ designation.

6.7.89 The deposits of peat shown to be present within the site are designated as ‘unproductive strata’.

6.7.90 The South Wales Coal Measures Formations (both Middle and Lower) shown to be present beneath the entirety of the site are both designated as ‘Secondary (A) Aquifers’. Secondary (A) Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale.

6.7.91 From review of the Groundsure EnviroInsight report purchased for the proposed development area, there are no active groundwater abstraction licenses that pertain to boreholes located within 1km of the site boundary. However, dewatering operations of the current Nant Helen Extension opencast site is known to be being undertaken through consultation with Celtic Energy.

6.7.92 There is one known Private Water Supply in Caehopkin located approximately 250m to the north of the proposed development.

6.7.93 **Groundwater Levels**

6.7.94 The hydrogeological regime beneath the site is anticipated to be complex and highly varied across the site. Significant underdraining through abandoned workings is likely to dictate the groundwater levels within the areas that have been previously opencast.

6.7.95 The groundwater levels beneath the site have been interpreted through ground investigation logs held by the BGS and review of documents provided by Celtic Energy. It should be noted that the groundwater data presented on the logs held by the BGS is limited in nature and only pertains to the washery portion of the site.

³⁰ Groundsure, EnviroInsight report, Report ref.: GS-6396069, 14/10/2019

6.7.96 Extensive exploratory drilling was undertaken by British Coal in the late 1990s in the location of the Nant Helen Extension opencast³¹, overlapping with the western end of the proposed development. Only a small proportion of these boreholes is located within or close to the proposed development and majority pertains to the land immediately to the west of the proposed development. The boreholes were progressed to known workings within the “Nine Feet” and “Brass” seams and the water levels within each were recorded. The groundwater level within these workings sat approximately at between 119m OAD and 126m AOD (and typically at 124-125mAOD) beneath the proposed development area, which coincides with the eastern part of the International Colliery. The groundwater levels varied depending on the colliery area, as summarised in Table 6.4 below, with groundwater within the western part of the International Colliery measured at between 99mAOD and 104mOAD (typical 99-100 mOAD), which are similar to those measured in Ynyscedwyn Colliery to the west. Groundwater levels in Gwaun Clawdd Colliery were measured at between 107 and 109mOD. This may indicate that the workings and drainage associated with these collieries significantly influence the groundwater levels. There are three known drainage adits associated with the abovementioned collieries, as summarised in Table 6.5 below. The location is marked on Figure 6.5.

Table 6.5: Historical collieries -adits and groundwater levels

Colliery	1990s groundwater levels (pre-Nant Helen extension), mAOD	British Coal piezometers monitoring 2003 – 2016, mOAD	Adit Outfall	Adit outfall elevation, mAOD
International (eastern part)	119 – 127 (typical 124-125)	-	Yard	122.5
International (western part)	99 - -104 (typical 99 – 100)	-	Unknown; possibly connected with Ynyscedwyn Collier adit – Cwm Du	-
Ynyscedwyn	95 – 104 (typical 98- 100)	98.3 - 103.6 (average 100.7)	Cwm Du	93.6
Gwaun Clawdd	107 - 109	97 - 110.1 (average 106.3)	Gwaun Clawdd	106.1

6.7.97 These levels are corroborated by long term monitoring of two piezometers, which were installed within two of the boreholes progressed as part of the investigation by British Coal, one in the area of former Gwaun Clawdd Colliery and another in the area of former Ynyscedwyn Colliery area. Monitoring of these piezometers between

³¹ Nant Helen Remainder – Environmental Statement, Volumes 1 to 3, Celtic energy Ltd, 2011

2003 and 2016 (with an additional measurement taken in 2020) indicate that the groundwater level sits between 97m AOD and 110.1 mAOD with an average of 106.3m AOD; and between 98.3m AOD and 103.6m AOD with an average of 100.7m AOD, respectively.

- 6.7.98 Significant reductions of flow from the Yard and Gwaun Clawdd Addits were measured since 2010 and 2007, respectively, corresponding with the Nant Helen pumping operations. No change was noted in flows from the Cwm Du Adit.
- 6.7.99 Based on current LiDAR elevation data, the levels above put groundwater at significant depth of between 130-200m bgl within the site area. It is however anticipated that groundwater will be present at shallower depth within isolated bands of sandstone, where bedrock has not been disturbed by historical deep or opencast mining.
- 6.7.100 The British Geological Survey, pertaining to the washery portion of the proposed development indicate shallower groundwater levels within the superficial and artificial material present in this region. Where recorded, groundwater strikes were predominantly minimal in nature and potentially indicate areas of perched groundwater sat above the relatively impermeable bedrock. There is the potential that similar conditions may exist beneath the main site where no open cast exploration took place.

Unexploded Ordnance

- 6.7.101 A preliminary risk assessment for the presence of buried unexploded ordnance (UXO) beneath the site has been undertaken in accordance with CIRIA C681 during the preparation of the desk study for the Global Centre of Rail Excellence.
- 6.7.102 No previous military land use was identified within a 10km radius of the site. The collieries and rail infrastructure present surrounding the site at the time of WWII do represent a potential target for WWII Luftwaffe bombing raids. However, given the localised nature of Luftwaffe bombing raids in Wales (primarily concentrated on Swansea, Cardiff and Milford Haven), it is unlikely that the collieries surrounding the site would have been targeted.
- 6.7.103 The firm nature of the superficial geology and reported lack of superficial geology in some areas of the site, means that had any aerially delivered ordnance been dropped it is highly likely to have detonated upon impact. Also, given the general absence of soft superficial deposits it is likely that any UXO would have been discovered on the ground surface and dealt with.
- 6.7.104 The extensive nature of post WWII development to the site, primarily regarding opencast mining activity, further reduces the risk of UXO encounter. This is particularly relevant when considering that the majority of cuttings currently proposed pass through areas of previously backfilled opencast sites, all completed after the WWII.

The remaining cuttings are proposed through areas where superficial deposits are anticipated to be minimal to absent.

- 6.7.105 Based on the preliminary UXO risk assessment detailed above, the risk of UXO encounter beneath the site is considered negligible.

Land Contamination

- 6.7.106 The following sections set out a baseline Conceptual Site Model, which considers potential sources of contamination and pathways via which this contamination may impact the identified receptors. For the risk to exist all three components, source – pathway – receptor, need to be in place.

Sources (Baseline)

- 6.7.107 The following potential sources of contamination have been identified within the Study Area. Refer to Figure 6.6 for location.

Made Ground

- 6.7.108 Made ground deposits are anticipated to be encountered beneath the majority of the proposed track route. The made ground materials are anticipated to be composed of colliery spoil - the non-coal bearing rock arisings used to backfill the areas of opencast working, see Figure 6.5 for the opencast working area extent. This material is likely to comprise gravels, cobbles and occasional boulders of mudstone, siltstone and sandstone mixed with superficial deposits.
- 6.7.109 In the area of the washery, based on the available ground investigation information the made ground materials comprise a mixture of varied granular backfill material within a cohesive clay matrix. The various gravel inclusions within the made ground were noted to be mudstone, sandstone, coal, clinker and wood. Coal and clinker are potential sources of contamination with metals and PAHs. The thickness of this material is anticipated to range between 0.25m and 7m, although locally thicker deposits could be encountered in the locations of any stockpiles/spoil heaps within the washery site.
- 6.7.110 No chemical testing on the made ground materials has been undertaken. However, this material is unlikely to be impacted by significant contamination. Leachable metals and sulphates may be present within possibly acidic leachates generated from the colliery spoil fill materials, although this has not been reported as an issue in the past site operation. In addition, given the extensive usage of motorised plant in opencast mining activities over the past 75 years there is the potential to encounter localised pockets of contamination as a result of fuel spillages and arising from demolition of mining infrastructure.

Coal mining

- 6.7.111 As previously highlighted, the site has been impacted by both sub-surface and surface coal mining activities. The Abercrave/Gwaunton opencast mine excavated the area previously occupied by the Abercrave, International and Gwaunclawdd Collieries. There is the potential that contaminants associated with coal mining activities could be encountered within the backfill in these locations. Contaminants arising from the coal mining infrastructure and activity in the area may be present; typical contaminants may include various metals, metalloids, sulphates, PAHs, TPHs and asbestos.

Settlement ponds/lagoons

- 6.7.112 Water used as part of the washery activities is collected and treated in water treatment areas within the washery area comprising ponds and settlement lagoons. The sediments may be impacted by contaminants such as metals, metalloids, sulphates, PAHs and TPHs.

Rail/tram Lines

- 6.7.113 The Neath and Brecon Railway (main and junction lines) have been identified to have run adjacent to the northern (junction line) and southern (main line) site boundaries through review of historical mapping and historical aerial photographs. In addition, three tramways (including the Brecon Forest Tramroad) have been identified to have run adjacent to the northern (junction line) and southern (main line) site boundaries through review of historical mapping and historical aerial photographs. In addition, three tramways (including the Brecon Forest Tramroad) have been identified to have crossed into the site through review of historical mapping and historical aerial photographs. Potential contaminants associated with rail/tram lines typically include various metals, TPHs, PCBs, PAHs, herbicides, ferrous residues, metal fines, ash, sulphates and asbestos. Given the age of the historical features, the levels of residual contamination are unlikely to be significant.

Fuel Tanks

- 6.7.114 A group of four large cylindrical tanks are currently present close to the site compound and offices centrally located within the site. The tanks are above ground however, there is the potential that spillages and leakages may have occurred and as a result the soils and groundwater present in this location could potentially be impacted by hydrocarbon contamination.

Pollution Incidents

- 6.7.115 From review of the Groundsure EnviroInsight report, four pollution incidents have been recorded by the NRW within the site or <5m away from the site boundary. All were located within or within the direct vicinity of the washery portion of the site. The pollution incidents are detailed below in order of distance from site:

- In 2013 a pollution incident was recorded within the washery portion of the site (E: 283823, N: 210346). The pollutant was identified as ‘Coal’ and the impact to water was categorised as Category 2 (significant impact). No impact to land or air was recorded (both Category 4).
- In 2001 a pollution incident was recorded within the washery portion of the site (E: 285452, N: 210250). The pollutant was identified as ‘Sewage Materials’ and the impact to water was categorised as Category 3 (minor impact). No impact to land or air was recorded (both Category 4).
- In 2014 a pollution incident was recorded 1m to the south of the washery portion of the site (E: 285288, N: 210222). The pollutant was identified as ‘Construction and Demolition Materials and Wastes’ and the impact to both land and air was categorised as Category 3 (minor impact). The impact to water was not categorised.
- In 2001 a pollution incident was recorded 4m to the northeast of the washery portion of the site (E: 285503, N: 210298). The pollutant was identified as ‘Sewage Materials’ and the impact to water was categorised as Category 3 (minor impact). No impact to land or air was recorded (both Category 4).

6.7.116 The pollution incidents presented above are anticipated to have had a localised impact to the soils and groundwater beneath the washery portion of the site. However, given the categorisation of these incidents the level of contamination is anticipated to be minor.

Landfill and waste management sites

6.7.117 No landfill sites have been identified within the Study Area. Table 6.6 details historical landfills located within 0.5km of the site based on the review of the Groundsure EnviroInsight report.

Table 6.6: Historical landfill and waste management sites – NRW Dataset

Name	Direction and distance from site	Type of Waste Accepted	Year of Closure
Moorside Villas	473m (NW)	Commercial Household	1974
Historical refuse tip 1961 map	Adjacent (S)	Unknown	Unknown
Waste transfer station	211m (NE)	Unknown	Unknown
Historical refuse tip 1961/62 map	290m (S)	Unknown	Unknown
Historical refuse tip 1962 map	350m (S)	Unknown	Unknown
Historical refuse tip 1962-1987 maps	470m (NW)	Unknown	Unknown

6.7.118 As neither of these sites impact the site directly, the risk of encountering potential contamination associated with these locations within the development area is considered to be negligible.

Receptors (Baseline)

6.7.119 Potential receptors to the identified sources of potential contamination within the study area are as follows:

- Human receptors
 - Opencast mine workers who operate plant and occupy the office facilities within the Celtic Energy site;
 - Residents surrounding the site in the towns/villages, particularly residents of Onllwyn, Seven Sisters and Caehopkin;
 - Users of public right of way paths and footpaths in a close vicinity of the opencast site e.g. dog walkers, ramblers.
- Environmental receptors
 - Surface watercourses that appear to originate within the site and feed the main watercourses that surround the site
 - Groundwater within the Coal Measures, classified as a Secondary A aquifer
 - Restored artificial marsh/bog pond/lake features located within the site

Pathways (Baseline)

6.7.120 The preliminary pathways between identified sources of contamination and receptors are as follows:

- Human health
 - Ingestion of soils and dust
 - Inhalation of dust, fibres and volatile hydrocarbon contamination
 - Accumulation and inhalation of gases (open cast site offices or other confined spaces within the open cast mine site area)
 - Dermal contact with soils, dust and groundwater
 - Gas migration from made ground (fill) into near surface
- Controlled Waters
 - Vertical and lateral migration of contaminants released to the ground through spillage or leaks; particularly from the opencast workings within the site and the potential for vertical or lateral migration through the underlying strata where permeable material is present.
 - Leaching of contaminants from Made ground (fill) materials into the underlying groundwater, in the non-restored areas, that are currently present on site. Where these materials are exposed at surface and subjected to rainwater infiltration; the groundwater is

likely to flow towards and discharge into surface water features associated with the active dewatering.

Plausible Pollution Linkages (Baseline)

- 6.7.121 Opencast workings have the potential to be directly exposed to soils and dust generated from exposed made ground fill materials within the areas of opencast workings.
- 6.7.122 There may be localised areas of made ground/fill that has been impacted by contamination as a result of the open cast mine operation over the decades.
- 6.7.123 Residents surrounding the site could be impacted by potentially contaminated dusts arising from the workings within the active opencast workings and dusts generated from transport of materials off-site.
- 6.7.124 The risk to residents surrounding the site is likely to be negligible as the materials arising from the site are unlikely to be generally impacted by significant levels of contamination. Dust generation as nuisance and air pollution issue is considered in the Air Quality chapter.
- 6.7.125 Existing made ground (fill) exposed at the surface has the potential to generate leachates which can leach to groundwater via vertical infiltration migration and impact the Secondary (A) Aquifer beneath the site. Once within the groundwater, this leachate could then laterally migrate into the base-flow of the many streams that originate within the site. Contamination impacted soil leachate can also migrate towards the surface water receptors via surface run-off.

6.8 Design mitigation

- 6.8.1 The following section outlines inbuilt mitigations considered within this proposed development, i.e. design mitigation.
- 6.8.2 The geotechnical design of the landform on which the proposed testing tracks would be built (and which will be constructed as part of the Nant Helen earthworks consent) will be undertaken to ensure slope stability of the ground, cuttings and embankments is adequate for the proposed development. That design will also consider ground hazards associated with historical mine workings and subsidence due to potential change in groundwater conditions.
- 6.8.3 Materials reuse would be managed in accordance with an earthwork specification developed at the detailed design stage. This would set out limiting values for materials reuse and import that are protective

of human health in a context of the proposed development and controlled waters.

- 6.8.4 A number of assumptions have been made with respect implementing legislation and good practice during construction as detailed in Section 6.6, which constitute design mitigation. These include appropriate health and safety, materials management and pollution prevention systems applied during the works.

6.9 Assessment of effects - Construction

Assessment of effects from construction - Geology and geomorphology

- 6.9.1 No designated sites are located within the study area. The site is however located within three Geological Landscape Areas, non-statutory designated sites of regional importance due to the geomorphological value considered to be of medium sensitivity due to moderate to outstanding evaluation.
- 6.9.2 Considering the historical exploitation of the open cast area, the features characterising these non-statutory designated sites have been removed and replaced by mine spoil and overburden materials. The geology features of importance are therefore located outside the study area. Consequently, the sensitivity of geological and geomorphological features within the study area is considered to be negligible. The proposed works will result in no change to geological value with a *neutral* significance of effect.

Assessment of effects from construction - Hydrogeology

- 6.9.3 The baseline conditions review indicated that the main groundwater level may be at least 100m below ground level as it is controlled by underground mine workings drainage. Therefore, the proposed development is unlikely to have an impact on either groundwater levels or flows and consequently no impact on groundwater dependent features such as springs or abstractions. Where sandstone bands are intercepted during the excavations, some increased groundwater inflows may occur requiring localised dewatering. The proposed development is to require only shallow excavations for the construction of the buildings and track bed and therefore the impact is likely to be negligible.
- 6.9.4 The sensitivity of hydrogeological features within the study area is considered to be medium on account of aquifer designation of the underlying bedrock. The proposed works will result in a negligible impact on hydrogeological value with a *neutral* significance of effect.
- 6.9.5 Refer to Chapter 11 on Water Environment for the assessment of potential impacts on Groundwater Dependent Terrestrial Ecosystems.

Assessment of effects from construction - Land contamination

- 6.9.6 The construction works would introduce new pollution linkages into the baseline conceptual site model. The revised conceptual site model is detailed below.
- 6.9.7 The review of the identified potential sources, receptors and pathways and plausible pollution linkages, as detailed in sections below, allows for assessment of the likely impacts of construction on land contamination.

Potential Sources (construction)

- 6.9.8 The potential baseline sources of contamination identified in relation to the study area are presented in Section 6.7 Baseline Environment, Land Contamination. The construction works would introduce the following additional sources as a result of construction activities:
- Accidental spillages of fuel or oils while operating or maintaining machinery.
 - Areas of unexpected contamination that would be encountered and excavated as a result of construction works.
 - Dust derived from areas of made ground created during construction.

Potential Receptors (construction)

- 6.9.9 Potential baseline receptors to the identified sources of potential contamination within the study area are presented in relevant sections in Section 6.7 Baseline Environment, Land Contamination. The construction works would introduce the following additional receptors:
- Construction workers: It has been assumed that the construction workers include adults and also apprentices aged 16 and above.

Potential Pathways (construction)

- 6.9.10 The preliminary potential baseline pathways between identified sources of contamination and receptors are presented in Section 6.7 Baseline Environment, Land Contamination. The construction works would introduce the following additional pathways:
- Direct exposure to soils and washery by-products (remaining post decommission), such as ingestion, dermal contact and/or inhalation of vapours, during excavation works.
 - Direct exposure to pond/lagoon water and sediments, such as such as ingestion, dermal contact and/or inhalation of vapours, during ponds/lagoons removal.
 - Surface run-off where made ground is exposed during excavation works.

- Discharge of water removed from the ponds/settlement lagoons within the washery area.
- Vertical migration along piles

6.9.11 The proposed development is likely to require only shallow excavations. Considering the regime beneath the proposed development site (i.e. significant depth to the groundwater and potential for minor isolated perched groundwater at shallower depth or isolated sandstone bands), no significant pumping or removal of groundwater is anticipated.

Plausible Pollution Linkages (construction)

6.9.12 Construction workers have the potential to be directly exposed to soils and dust from exposed made ground materials, and should removal of the ponds and settlement lagoons be required, to water and sediments. Providing that health and safety measures are in place in accordance with current legislation and good practice, as assumed in Section 6.6, is unlikely to pose a risk to construction workers. There is however an increased risk due to encountering unexpected contamination, particularly in the area of the washery site.

6.9.13 Considering the low sensitivity of the construction worker as a receptor, based on exposure scenario, short-term and temporary with a minor magnitude of impact of encountering unexpected contamination prior to implementation of the Action Plan, the significance of effect on construction workers is likely to be *slight adverse*.

6.9.14 The proposed development will result in potentially increased dust generation rate primarily as a result of site clearance and excavation works allowing for the construction of the maintenance facilities and infrastructure, which may migrate towards the residents of nearby settlements. This would be a temporary impact. However, the nearest residential properties in Onllwyn are located at higher ground and are separated from the proposed development by a green belt of woodland, which is likely to significantly reduce the amount of dust migrating off-site. Therefore, the magnitude of impact on the residents from dust and potential contaminants is considered to be negligible adverse. Considering very high sensitivity of the residents as potential receptors to contamination, the significance of effect on the site neighbours is likely to be *slight adverse*.

6.9.15 Breaking the ground, moving materials within the study area, temporary storage, may result in contaminant mobilisation due to increased exposure to rainfall and consequent increased rate of contaminants leaching into the underlying groundwater or surface run-off into watercourses. Encountering unexpected contamination during the works may also pose a risk to controlled water receptors as a result

of mobilisation of contamination due to disturbance or exposure to rainfall.

- 6.9.16 Decommissioning of the ponds/lagoons will require draining of the water. If removed water would be discharged to the wider site drainage or ground, this could potentially impact the receiving controlled water receptors. As stated in Section 6.6, it is assumed that such discharge would only be permissible if there is no detrimental impact on the receiving water quality and where required, treatment would be undertaken.
- 6.9.17 Piles may be required to provide a suitable founding solution for some of the proposed structures with large loads or sensitive to ground movement (e.g. a crane). The foundation solution will be confirmed by intrusive investigations. Subject to a selected piling technique, piles may create preferential flow paths allowing for vertical migration of potentially contaminated soil leachate/shallow perched groundwater into the underlying aquifer. This will be assessed on confirmation of the design by a foundation works risk assessment.
- 6.9.18 The proposed development is located within a sensitive setting with respect to controlled waters, with surface water receptors being assigned high value and groundwater medium, as detailed in the ES Water Environment chapter (Chapter 11). The magnitude of impact is considered to be negligible on account of the environmental monitoring being in place, a requirement to set out an Action Plan as per the Outline CEMP and a foundation works risk assessment, with a potential *slight adverse* significance of effect. This is due to the potential mobilisation of contaminants contained within the fill materials during general earthworks and also as a result of disturbing areas of significant unexpected contamination.

6.10 Assessment of effects - Operation

Assessment of effects from operation - Geology and geomorphology

- 6.10.1 It is considered that the proposed development will have negligible impact on geology and geomorphology during operation with a *neutral* significance of effects. This is due to minimal maintenance requirements or need to undertake any works that would disturb ground.

Assessment of effects from operation - Hydrogeology

- 6.10.2 The proposed development would incorporate permanent drainage in the area of the proposed tracks. Where the tracks are located within a cutting that permanent drainage would have a potential to intercept groundwater. Baseline conditions review indicated that the main groundwater level may be at least 100m below ground level as it is

controlled by underground mine workings drainage. Therefore, the proposed permanent drainage is unlikely to be intercepting the main groundwater body and have an impact on either groundwater levels or flows and consequently no impact on groundwater dependent features such as springs or abstractions.

- 6.10.3** Groundwater may however be present within sandstone bands that form part of the bedrock sequence. Where sandstone bands are present at shallow depth and intercepted by the cuttings, groundwater contained within these bands may be intercepted and the groundwater flows and levels within that band impacted consequently impacting features e.g. springs that directly rely on this groundwater. Geology plans identify sandstone bands that outcrop within the proposed scheme area. The cuttings are located within these outcrop areas, as shown on Figure 6.2.
- 6.10.4** The baseline conditions study identified a number of groundwater dependent features, as shown on Figure 6.2. Two springs and a Private Water Supply that are likely to be associated with the sandstone bands have been identified within the study area; the first spring and a private water supply are both located in Caehopkin approximately 250m to the north of the proposed development and the second approximately 440m to the south-west. Considering the geology beneath the study area, sandstone bands outcropping to the north are likely to be at significant depths beneath the site due to the 5-15 degrees dip in a south westerly direction. Also, the proposed development will be positioned on an embankment. Therefore, the proposed development would have no impact on these sandstone bands and associated groundwater. The second spring is however located within the area of the same sandstone outcrop as that within the cutting. The base of the cutting is proposed to be approximately at 250mOD. The spring is located at approximately 255mOD. This indicates that groundwater is likely to be intercepted by the drainage at the base of the cutting and therefore impact groundwater flows and levels within that band. The magnitude of impact is likely to be minor. This is due to the distance between the spring and the proposed development. In addition, the proposed development has a potential to impact only a small proportion of the outcrop and therefore not significantly reducing the catchment of the spring.
- 6.10.5** The sensitivity of hydrogeological features within the study area is considered to be medium on account of aquifer designation of the underlying bedrock and sensitivity of the Dulais River tributaries. The proposed development will result in no change to hydrogeological value of the main groundwater body with a *neutral* significance of

effect. However, the proposed development has a potential to have a *slight adverse* significance of effect on the spring.

Assessment of effects from operation - Land contamination

- 6.10.6 The operation of the proposed development would introduce new pollution linkages into the baseline conceptual site model. The revised conceptual site model is detailed below.
- 6.10.7 The review of the identified potential sources, receptors and pathways and plausible pollution linkages, as detailed in sections below, allows for assessment of the likely impacts of construction on land contamination.

Potential Sources (operation)

- 6.10.8 The potential baseline sources of contamination identified in relation to the study area are presented in Section 6.7 Baseline Environment, Land Contamination. The completion phase would not introduce additional sources. Only materials deemed safe with respect to human health and controlled waters would be reused within the development. Materials impacted by significant contamination would have been removed or remediated.

Potential Receptors (operation)

- 6.10.9 Potential baseline receptors to the identified sources of potential contamination within the study area are presented in Section 6.7 Baseline Environment, Land Contamination. On completion this would introduce the following additional receptors:
- End users of the development such as railway testing facilities workers and visitors, based both on site and in the offices. It has been assumed that the workers and visitors of the railway testing facility would include adults and also apprentices aged 16 and above.

Potential Pathways (operation)

- 6.10.10 The preliminary potential baseline pathways between identified sources of contamination and receptors are presented in Section 6.7 Baseline Environment, Land Contamination. On completion this would remove or change the following pathways:
- Direct exposure to soils and dust would be significantly reduced due to landscaping and introduced vegetation; this will significantly reduce dust generation and off-site migration, albeit some dust generation may occur.
 - The development workers (e.g. where vegetation maintenance is required or intrusive repair works to tracks) may still come to

dermal contact with soils, this will however be likely to be infrequent, short-term and temporary.

- Migration of volatile hydrocarbon vapours and ground gases into confined spaces or structures.
- No exposure to groundwater is likely as part of normal operation or maintenance works.
- Introduction of vegetation in areas of landscaping will reduce rainwater infiltration and therefore the rate of contaminant leaching into the underlying groundwater would be reduced.
- Vertical migration along piles.

Plausible Pollution Linkages (operation)

- 6.10.11** The development workers are unlikely to be exposed to dust from soils via inhalation and to a lesser extent via dermal contact or ingestion of soil. Providing that health and safety measures are in place in accordance with current legislation and good practice, as assumed in Section 6.6, is unlikely to pose a risk to maintenance workers.
- 6.10.12** Significant dust generation and off-site migration is unlikely to be a viable pathway on completion, significantly reducing the exposure of residents from nearby villages. This would present a beneficial impact in relation to baseline conditions.
- 6.10.13** If encountered during the earthworks, significant contamination is likely to have been removed and therefore have a beneficial impact on underlying groundwater. Buildings and vegetation introduced in landscaped areas would reduce rainwater effective infiltration and leachate generation and migration towards the controlled water receptors. This would have a beneficial impact.
- 6.10.14** Piles may be required to provide a suitable founding solution for some of the proposed structures with large loads or sensitive to ground movement (e.g. a crane). The foundation solution will be confirmed by intrusive investigations. Subject to a selected piling technique, piles may create preferential flow paths allowing for vertical migration of ground gas into confined spaces within the structures/buildings. This will be assessed on confirmation of the design by a foundation works risk assessment.
- 6.10.15** Made ground is a potential source of ground gas, which may migrate into the buildings through its foundations (shallow or deep) and accumulate within confined spaces or poorly ventilated areas. This may pose a risk of asphyxiation. The design will consider appropriate ground gas protection measures for the proposed development and therefore eliminate the pathway.
- 6.10.16** Based on the medium sensitivity of the testing track facilities workers, and a negligible magnitude of impact as a result of a short-term and

temporary dermal exposure to made ground, the significance of effect on end users is likely to be *neutral*. On completion there is likely to be a *moderate beneficial* significance of effect on nearby residents (very high value with minor magnitude of impact) due to reduction in soil dust generation in comparison with the baseline scenario. Based on the design incorporating appropriate ground gas mitigation measures, if required, and therefore eliminating the potential impact from ground gas migration, the significance of effect on end users is likely to be *neutral*.

- 6.10.17 The site is located within a sensitive setting with respect to controlled waters, with surface water receptors being assigned high value and groundwater a medium value, as detailed in the Water Environment Chapter 5. The magnitude of impact is considered to be minor, with a potential overall *slight beneficial* significance of effect.

6.11 Mitigation and enhancement

- 6.11.1 This section sets out measures that are to prevent, reduce and where possible offset any significant adverse effects on the environment.

Mitigation of effects from construction

- 6.11.2 The proposed development is likely to have neutral significance of effect on geology and geomorphology and neutral-slight adverse significance of effect as a result of contamination. Therefore, no mitigation measures are required in addition to measures presented within the Outline CEMP.
- 6.11.3 Detailed requirements with respect to management of materials during earthworks will be set out in the Earthworks Specification, which will be derived for the proposed development at the detailed design stage. This will determine suitability for reuse criteria protective of the end site user's health and controlled waters.

Mitigation of effects from operation

- 6.11.4 The proposed development is likely to result in slight adverse to moderate beneficial significance of effect and therefore no mitigation measures are required.

6.12 Residual effects

- 6.12.1 This section identifies the effects of the development on the environment after taking account of mitigation measures.

Residual effects from construction

- 6.12.2 The construction of the proposed development may have temporary moderate negative effect on the water environment and therefore in-

build mitigation measures have been identified, as presented in the Outline CEMP. On implementation of the mitigation measures the residual effect on the water environment is likely to be slight adverse, as the release of pollutants may still occur at levels not causing pollution.

Residual effects from operation

- 6.12.3 The proposed development is likely to result in neutral to moderate beneficial significance of effect and therefore no mitigation measures are required.

6.13 Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Construction								
Construction of testing tracks, maintenance facilities and infrastructure	Geology and geomorphology	Medium	Negligible	Neutral	n/a	n/a	Neutral	n/a
	Hydrogeology	Medium	Negligible	Neutral	n/a	n/a	Neutral	n/a
Unexpected contamination during construction	Construction workers	Low	Minor	Slight adverse	None in addition to measures presented in Outline CEMP	n/a	Slight adverse	n/a
	Controlled waters	High	Negligible	Slight adverse		n/a	Slight adverse	n/a
Mobilisation of contaminants during earthworks (leaching, dust migration); discharge of water drained from ponds/lagoons	Controlled waters	High (surface water) Medium (groundwater)	Negligible	Slight adverse	None in addition to measures presented in Outline CEMP	n/a	Slight adverse	n/a
	Residents of nearby villages	Very high	Negligible	Slight adverse		n/a	Slight adverse	n/a
Operation								
Operation of testing tracks, maintenance facilities and infrastructure	Geology and geomorphology	Medium	Negligible	Neutral	n/a	n/a	Neutral	n/a
	Hydrogeology	Medium	Negligible	Neutral	n/a	n/a	Neutral	n/a
Exposure to made ground containing contaminants	End users of the development	Medium	Negligible	Neutral	n/a	n/a	Neutral	n/a

Reduction in exposure to dust	Residents of nearby villages	Very high	Minor	Moderate beneficial	n/a	n/a	Moderate beneficial	n/a
Reduction in leachability of contaminants	Controlled waters	High (surface water) Medium (groundwater)	Minor	Slight beneficial	n/a	n/a	Slight beneficial	n/a

7 Biodiversity

7.1 Introduction

- 7.1.1 This chapter of the ES assesses the likely significant effects of the proposed development on the ecological resources within the site and surrounding vicinity. The assessment has been carried out in accordance with guidance set out in the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (Chartered Institute of Ecology and Environmental Management's (CIEEM), 2019) ('the CIEEM Guidelines')¹.
- 7.1.2 A full description of the proposed development is given in Chapter 3: Project description but in summary: the Welsh Government is proposing to develop a rail testing, maintenance, research, development and storage facility, known as the Global Centre of Rail Excellence (GCRE). The project 'red line' boundary considered in this assessment is shown in Figure 7.1. and is hereafter referred to as the 'Site'.
- 7.1.3 This Chapter documents survey work undertaken in relation to habitats and species in addition to reporting the value of receptors and assessing the effects arising from the site construction (and associated enabling works such as vegetation clearance), and the operation of the proposed development. This Chapter also documents measures to mitigate and compensate these effects. Enhancement measures, which go beyond mitigating effects, are also identified. The residual effects following the inclusion of these measures are then assessed. Decommissioning has been scoped out of the Project's EIA, since it is anticipated that the proposed development would remain in perpetuity, and therefore will not be considered in this Chapter of the ES.
- 7.1.4 This Chapter has been informed by the baseline ecology survey data, reports and associated drawings included in Appendices A-N, Volume 2, in addition to existing ecology reports produced in association with Celtic Energy's 2011 ES. Ecology surveys were completed between November 2018 and November 2019.

7.2 Review of the Proposed Development

- 7.2.1 The following are considered key issues that will be considered in detail within the ecology chapter of the ES:
- The presence of statutory and non-statutory designated sites, which could be indirectly affected during construction and on completion.

¹ CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.1. Chartered Institute of Ecology and Environmental Management.

- The presence of notable habitats² within the Site, which could be directly and or indirectly affected during construction and operation including from disturbance, degradation, fragmentation and loss.
- The presence of protected and or notable species, which could be directly and or indirectly affected during construction and operation including from harm, mortality, disturbance, habitat loss / degradation and fragmentation / physical barriers to species movements.

7.2.2 As detailed in Section 2.7 of this ES, the baseline will consider the Nant Helen Complementary Restoration Earthworks (in accordance with the planning application reference no. 20/0738/FUL), which facilitates a suitable landform for GCRE and the restoration works (in accordance with the planning application (reference no. 19/1899/REM, which amends a 2011 application that were initially approved to extend the coal working area of the site). It is assumed that the earthworks and restoration works will have commenced / completed at the time of the GCRE project commencing.

7.3 Legislation, policy context and guidance

Legislation

7.3.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This is described in the following sections.

Conservation of Habitats and Species Regulations 2017 (as amended)

7.3.2 The Conservation of Habitats and Species Regulations 2017 (as amended) (the ‘Habitats Regulations’) transpose the requirements of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) into law within England and Wales. These regulations provide for the designation and protection of sites of European importance know as European or Natura 2000 Sites.

7.3.3 European Sites comprise:

² ‘Notable’ species and habitats considered in this report include species and habitats of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales listed in response to the requirements of Section 7 of the Environment (Wales) Act 2016, in addition to any species considered to be of significance for nature conservation such species listed in red data books, the Royal Society for the Protection of Birds (RSPB) ‘Birds of Conservation Concern’ lists and or Local Biodiversity Action Plans (LBAPs).

1. Special Areas of Conservation (SACs), including candidate sites, designated under the Conservation of Habitats and Species Regulations 2017 (as amended)³.
2. Special Protection Areas (SPAs) including candidate sites, designated under the Wildlife and Countryside Act 1981 (as amended)⁴.
3. Ramsar Sites designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 are also considered as European Sites as a matter of UK Government policy along with proposed SACs and SPAs.

7.3.4 The Habitats Regulations require that consideration is given to the implications of plans and projects (developments) on European Sites. Specifically Regulation 63(1) states:

1. "A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which:

(a) is likely to have a significant effect on a European site or European marine site (either alone or in combination with other plans or projects), and;

7.3.5 (b) is not directly connected with or necessary to the management of that site.

2. must make an appropriate assessment of the implications for that site in view of that site's conservation objectives".

7.3.6 The formal consideration of effects on European Sites is therefore undertaken by the determining authority such as the Local Planning Authority under the Town and Country Planning Act 1990. The determining authority is known as the Competent Authority with the Regulations.

7.3.7 The Habitats Regulations also convey special protection to a number of species, which are listed in Schedule 2 of the Regulations and are referred to as European Protected Species (EPS). Those relevant to the Scheme include:

1. All UK resident bat species;
2. Common dormouse (*Muscardinus avellanarius*);
3. Great crested newt (*Triturus cristatus*);
4. Otter (*Lutra lutra*);

³ The Habitats Regulations transposes the requirements on Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora in to UK law.

⁴ The Wildlife and Countryside Act 1981 transposes the requirements of Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive) in to UK law. The Birds Directive has been updated through Directive 2009/147/EC on the Conservation of Wild Birds.

5. Marsh fritillary butterfly (*Euphydryas aurinia*).

7.3.8 Regulation 43 makes it an offence to:

1. Deliberately capture, injure or kill any wild animal of a EPS;
2. Deliberately disturb wild animals of such a species;
3. Deliberately take or destroy the eggs of such a species;
4. Damage or destroy a breeding site or resting place of such an animal.

7.3.9 Disturbance in the context of the offences above is disturbance, which is likely to impair the ability of the animals to survive, to breed or reproduce, to nurture their young, to hibernate, to migrate; or to affect significantly the local distribution of the species.

7.3.10 Licences can be granted by the relevant Statutory Nature Conservation Organisation (SNCO) for developments (sometime referred to as EPS Licences or Derogation Licences) providing the purposes of the licence is for "preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment".

Ramsar Convention 1971

7.3.11 Wetlands of International Importance (Ramsar Sites) declared under the Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 are considered European Sites as a matter of UK and Local Government Policy.

Wildlife and Countryside Act 1981 (as amended)

7.3.12 A network of nationally designated sites has been established through the designation of Sites of Special Scientific Interest (SSSIs) under the Wildlife and Countryside Act 1981. The protection afforded by the Act means it is an offence to carry out or permit to be carried out any operation listed within the notification without the consent of the Statutory Nature Conservation Organisation (Natural Resources Wales). The protection afforded to SSSIs is used to underpin the designation of areas at a European Level.

7.3.13 The Wildlife and Countryside Act also places obligations on Welsh Ministers and other public bodies with regard to the conserving and enhancing of the features of SSSIs in the exercise of their functions.

7.3.14 The Wildlife and Countryside Act 1981 provides protection to both EPSs and other species including wild birds, water voles and reptiles.

7.3.15 All wild birds, their nests and eggs are protected, with some rare species afforded extra protection from disturbance during the breeding season (these species are listed in Schedule 1 of the Act). It is illegal to take any wild bird or damage or destroy the nests and eggs of

breeding birds. There are certain exceptions to this in respect of wildfowl, game birds and certain species that may cause damage.

7.3.16 In England and Wales water voles are listed on Schedule 5 of the Wildlife and Countryside Act 1981, receiving full protection since 2008. The Wildlife and Countryside Act 1981 together with amending legislation, lists the following offences:

1. Intentionally killing, injuring or taking a water vole by any method.
2. Intentionally or recklessly damaging or destroying a water vole place of shelter or protection.
3. Intentionally or recklessly damaging disturbing a water vole whilst it is occupying such a structure or place it uses for shelter or protection.
4. Intentionally or recklessly obstructing access to a water vole's place of shelter or protection.
5. Selling, offering for sale, or possessing or transporting for the purposes of sale, any live or dead water vole, or any part or derivative, or advertising any of these for buying or selling.

7.3.17 All native reptile species in the UK are subject to partial protection from intentional or reckless killing or injury only.

7.3.18 The Act also includes provisions for the control of invasive non-native species (INNS). Under these provisions it is an offence to:

1. Release or allow to escape into the wild any animal which is not ordinarily resident or a regular visitor to Great Britain, or is included in Schedule 9 of the Act.
2. Plant or otherwise cause to grow in the wild any plant which is included in Schedule 9 of the Act.

7.3.19 People undertaking works in proximity to invasive non-native plant species should take all reasonable steps and exercise all due diligence to avoid committing an offence.

The Invasive Alien Species (Enforcement and Permitting) Order 2019

7.3.20 The order came into effect on the 1st December 2019 to allow for enforcement of EU Regulations (Regulation (EU) No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species in England and Wales) also known as the IAS Regulations.

7.3.21 It lists 66 species which are of European Union concern. There are currently 19 species listed in the Order (16 of these species are found in Wales). Species include:

- Chinese mitten crab (*Eriocheir sinensis*)

- Red Swamp crayfish (*Procambarus clarkii*)
- Crayfish signal (*Pacifastacus leniusculus*)
- Spiny cheek crayfish (*Orconectes limosus*)
- Muntjac deer (*Muntiacus reevesi*)
- Ruddy duck (*Oxyura jamaicensis*)
- Egyptian goose (*Alopochen aegyptiacus*)
- Grey squirrel (*Sciurus carolinensis*)
- Himalayan balsam (*Impatiens glandulifera*)
- Fanwort (otherwise known as Carolina water shield) (*Cabomba caroliniana*)
- Giant hogweed (*Heracleum mantegazzianum*)
- Water hyacinth (*Eichhornia crassipes*)
- Parrots Feather (*Myriophyllum aquaticum*)
- Floating pennywort (*Hydrocotyle ranunculoides*)
- Floating water primrose (*Ludwigia peploides*)
- Water Primrose (*Ludwigia grandiflora*)
- Giant rhubarb (*Gunnera tinctoria*)
- Curly waterweed (*Lagarosiphon major*)
- Nuttall's waterweed (*Elodea nuttallii*)

7.3.22 This Order allows for the enforcement of, including the relevant licences, permits and rules for keeping invasive alien species.

7.3.23 The amendments remove these Invasive Alien Species (IAS) of Union concern from the ambit of the provisions relating to invasive non-native species in sections 14 and 14ZA of the Wildlife and Countryside Act 1981. This is to make the legislation more transparent and easier to use by bringing all the offences relating to species of Union concern into one place.

7.3.24 Criminal offences are introduced for breaches of the main restrictions of The IAS Regulation, as well as offences relating to:

- False statements;
- Altering, or not meeting, the conditions of permits and licences;
- Attempts to commit offences;

- Obstruction; and
- Offences for companies and partnerships.

7.3.25 It is also an offence to:

- Allow the escape or release into the wild an animal that is not normally a resident or regular visitor to Great Britain, or an animal listed in Part 1 of Schedule 2, including species of crabs, ducks and squirrel.
- Plant, or allow to grow in the wild, plants listed in Part 2 of Schedule 2.
- Sell, or be involved in the sale of, any plant listed in Part 3 of Schedule 2, including Water Primrose and Floating Pennywort.

7.3.26 If found guilty of an offence a person may be liable to imprisonment of up to two years, or a fine. Permits and licences may be made void where an offence is committed and a person may be banned from being granted a permit or licences again for up to 5 years.

7.3.27 The legislation in relation to the remaining species listed in Schedule 9 of the Wildlife and Countryside Act 1981 remains unchanged.

National Park and Access to the Countryside Act 1949 (as amended)

7.3.28 Local Nature Reserves (LNRs) can be given protection against damaging operations through powers within the National Parks and Access to the Countryside Act 1949. However, this protection is usually conveyed through inclusion of protection within local planning policy relating to these sites and other non-statutory sites such as Sites of Importance for Nature Conservation.

The Protection of Badgers Act 1992

7.3.29 Badger (*Meles meles*) and their setts are protected under the Protection of Badgers Act 1992 which makes it an offence to kill, injure or take a badger, or interfere with a sett.

7.3.30 Interference with a sett includes damaging or destroying it, obstructing access to it, causing a dog to enter it, or disturbing the badgers which are occupying it.

Hedgerow Regulations 1997

7.3.31 The Hedgerow Regulations 1997 set out a framework for the protection of hedgerows against removal where they are deemed to be important either due to their age, ecological or archaeological features. Approval is required from the local authority prior to the removal of hedgerows. Local authorities can enforce the retention of Important Hedgerows through the issuing of Retention Notices.

Salmon and Freshwater Fisheries Act 1975 (as amended)

- 7.3.32 The Salmon and Freshwater Fisheries Act (SAFFA) is legislation that aims to protect freshwater fish, with a particularly strong focus on salmon and trout. The legislation covers a broad range of topics, but of particular relevance to development are those sections covering water pollution, habitat disturbance and fish migration routes.
- 7.3.33 Under Section 2 (4) it is an offence to wilfully disturb spawn, spawning fish or spawning areas and under Section 4 (1) it is an offence to knowingly permit the flow of poisonous matter and polluting effluents into river courses that are poisonous or injurious to fish or the spawning grounds, spawn or food of fish.
- 7.3.34 Sections 9 to 15 are concerned with fish passage and migration routes. It is the duty of the waterway owner that when constructing dams, screens or sluices to provide and maintain a facilitating fish pass for migrating salmon or trout. Section 9 allows the regulator to serve notice on the owner or occupier of a dam or obstruction, to install a fish pass where necessary. This section applies to dams which are either new or have been altered to create an increased obstacle to the passage of migratory salmonids. It is also applicable where dams in a state of disrepair have been rebuilt over at least one half of their length.

Eels (England and Wales) Regulations 2009

- 7.3.35 This implements Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel. The regulations are focussed on the management of commercial eel fisheries (licences, catch returns and restocking) and the passage/migration of eels. The regulations afford powers to the regulators (Environment Agency and Natural Resources Wales) to implement eel recovery measures in all freshwater and estuarine waters in England and Wales.
- 7.3.36 Part 4 of the regulations is concerned with the passage of eels and makes it a legal requirement to notify the regulator of the construction, alteration or maintenance of any structure likely to affect the passage of eels. This include water intakes and outfalls, dams and weirs, sluices or any other in-river obstruction. Where any such structure exists, the owner, occupier or person in charge of the land on which the dam, structure or obstruction lies may be required to construct and operate an eel pass to allow the free passage of eels.

Wild Mammals (Protection) Act 1996

- 7.3.37 This Act operates in parallel with the legislation listed above conferring specific protection on rare or threatened mammal species by protecting all wild mammals from any action intended to cause unnecessary suffering.

Natural Environment and Rural Communities (NERC) Act 2006

- 7.3.38 The Act is primarily intended to implement key aspects of the Government's Rural Strategy published in July 2004; it also addresses a wider range of issues relating broadly to the natural environment. The Act also makes provision in respect of biodiversity, pesticides harmful to wildlife and the protection of birds, and in respect of invasive non-native species. It alters enforcement powers in connection with wildlife protection and extends time limits for prosecuting certain wildlife offences. It addresses a small number of gaps and uncertainties which have been identified in relation to the law on sites of special scientific interest. It also amends the functions and constitution of National Park authorities, the functions of the Broads Authority and the law on rights of way (DEFRA website September 2016).

The Environment (Wales) Act 2016

- 7.3.39 The Environment (Wales) Act 2016 replaces the duties on public bodies in Wales to conserve and enhance biodiversity in the exercise of their functions. This duty includes consideration of the resilience of ecosystems in terms of their diversity, connectivity, adaptability, scale and condition. The Act also reinforces the duties in relation to the lists of species and habitats of importance and duties to conserve and enhance those species and habitats. Within this Chapter these are referred to as Section 7 Habitats and Species, although revised lists have not been published to date.

The Well-being of Future Generations (Wales) Act 2015

- 7.3.40 The Well-being of Future Generations Act requires public bodies in Wales to consider the long-term impacts of decisions on the social, cultural, environmental and economic well-being of both current and future generations.
- 7.3.41 In particular the Act includes a number of goals including to maintain and enhance a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change.

EIA Directive 2014/52/EU

- 7.3.42 The Directive 2014/52/EU states that EIAs shall identify, describe and assess the direct and indirect significant effects of climate change relevant to the project. The regulations implementing this directive were transposed into UK legislation in May 2017; The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations, 2107.

Policy Context

- 7.3.43 The Neath Port Talbot County Borough Council (NPTCBC) Adopted Local Development Plan (LDP) 2011-2026 includes a number of policies relating to nature conservation, in particular:
- 7.3.44 Policy EN 6 Important Biodiversity and Geodiversity Sites
Development proposals that would affect Regionally Important Geodiversity Sites (RIGS), Local Nature Reserves (LNRs), Sites of Interest for Nature Conservation (SINCs), sites meeting SINC criteria or sites supporting Local Biodiversity Action Plan (LBAP) or S42 habitats or species (now referred to as Section 7 habitats and species, in response to the requirement of the Environment (Wales) Act 2016) will only be permitted where:
1. They conserve and where possible enhance the natural heritage importance of the site; or
 2. The development could not reasonably be located elsewhere, and the benefits of the development outweigh the natural heritage importance of the site.
- 7.3.45 Mitigation and / or compensation measures will need to be agreed where adverse effects are unavoidable.
- 7.3.46 5.3.34. “Where harm to biodiversity sites is unavoidable, effective mitigation measures will be required to ensure that there is no reduction in the overall value of the area or feature. Where mitigation is not possible, compensation measures will normally be required to offset harm as far as practicable. However, compensation measures are considered to be a last resort option”.
- 7.3.47 5.3.35. “The Biodiversity Supplementary Planning Guidance (SPG) will indicate how biodiversity should be taken into account in the planning process and will also give details of the procedure for providing off-site compensation if necessary.”
- 7.3.48 Policy EN 7 Important Natural Features: “Development proposals that would adversely affect ecologically or visually important natural features such as trees, woodlands, hedgerows / field boundaries, watercourses or ponds will only be permitted where:
1. Full account has been taken of the relevant features in the design of the development, with measures put in place to ensure that they are retained and protected wherever possible; or
 2. The biodiversity value and role of the relevant feature has been taken into account and where removal is unavoidable, mitigation measures are agreed.”
- 7.3.49 The Powys County Borough Council (PCBC) LDP includes a number of policies relating to nature conservation, in particular:

- 7.3.50 Policy DM2 – The Natural Environment: “Development proposals shall demonstrate how they protect, positively manage and enhance biodiversity and geodiversity interests including improving the resilience of biodiversity through the enhanced connectivity of habitats within, and beyond the site”.
- 7.3.51 “Development proposals which would impact on the following natural environment assets will only be permitted where they do not unacceptably adversely affect:
1. The important site designations, habitats and species afforded the highest levels of protection through European legislation including:
 - A. European Sites (SAC, SPA and Ramsar).
 - I. Development proposals likely to have a significant effect on a European site, when considered alone or in combination with other proposals or plans, will only be permitted where it can be demonstrated that:
 - a) The proposal is directly connected with or necessary for the protection, enhancement and positive management of the site for conservation purposes; or
 - b) The proposal will not adversely affect the integrity of the site.
 - II. Where it cannot be demonstrated that development proposals would not adversely affect the integrity of the site and there is no satisfactory alternative solution, permission will be refused unless:
 - a) There are imperative reasons of over-riding public interest; and
 - b) Appropriate compensatory measures are secured.
 - B. European Protected Species afforded strict protection by the Conservation of Habitats and Species Regulations 2017 (Habitats Directive Annex IV Species).”
- 7.3.52 “Development proposals likely to have an adverse effect on a European Protected Species will only be permitted where it can be demonstrated that:
- I. The proposal is for the purposes of preserving public health or public safety or there are imperative reasons of over-riding public interest; and
 - ii. There is no satisfactory alternative; and

- iii. The action authorised will not be detrimental to the maintenance of the habitat or population of the species concerned at a favourable conservation status in their natural range.
2. The important site designations, habitats and species afforded levels of protection in line with national policy and legislation including:
- A. National Nature Reserves and Sites of Special Scientific Interest;
 - B. Protected Species including those listed in Wildlife and Countryside Act 1981 (as amended) and the Protection of Badgers Act 1992;
 - C. Habitats and Species of principal importance for the purpose of maintaining and enhancing biodiversity conservation in Wales as listed in Section 7 of the Environment (Wales) Act 2016; and
 - D. National Biodiversity Action Plan Habitats and Species.”

7.3.53

“Development proposals likely to have an adverse effect on the conservation value of nationally protected sites, habitats or species, either directly, indirectly or in combination, will only be permitted where it can be demonstrated that:

- i. The proposal contributes to the protection, enhancement or positive management of the site, habitat or species; or
- ii. There is no suitable alternative to the proposed development; and
 - a) It can be demonstrated that the benefits from the development clearly outweigh the special interest of the site, habitat or species; and
 - b) Appropriate compensatory measures are secured; and
 - c) The population or range and distribution of the habitat or species will not be adversely impacted.

3. The locally important site designations, habitats and species including:

- A. Local Nature Reserves;
- B. Local Biodiversity Action Plan Habitats and Species; and
- C. Regionally Important Geodiversity Sites and Geological Conservation Review Sites.”

7.3.54

“Development proposals likely to have an adverse impact upon these sites, habitats or species will only be permitted where it can be demonstrated that:

i. They conserve and where possible enhance the natural heritage importance of the site, habitat or species; or

ii. The development could not reasonably be located elsewhere; and

The benefits of the development outweigh the natural heritage importance of the site, habitat or species; and

7.3.55 Mitigation and/or compensation measures are provided where adverse effects are unavoidable.

7.3.56 Policy DM7 – Dark skies and External lighting: “Development proposals involving external lighting will only be permitted when a lighting scheme has been provided that demonstrates that the lighting will not individually or cumulatively cause:

1. Unacceptable levels of light pollution especially in the countryside.
2. An unacceptable adverse effect on the visibility of the night sky.
3. A nuisance or hazard to highway users including pedestrians, and local residents.
4. An unacceptable disturbance to protected species.”

7.3.57 4.2.48 “Thought needs to be given on how external lighting schemes can avoid potential impacts to nocturnal wildlife, particularly protected species, such as bats, otters and badgers. Dark wildlife movement corridors should be left, e.g. no external lighting of boundary habitat features, wildlife corridors, and watercourses.”

7.3.58 4.2.49 “Protected species are a material planning consideration. The way in which protected species are considered in the planning process is detailed in TAN 518. The LDP does not repeat this guidance on how to deal with protected species and in this instance relies upon national guidance.”

Planning Policy Wales (PPW)

7.3.59 Planning Policy Wales⁵ (WG, 2018) sets the national policies in relation to development control through the Town and Country Planning Act 1990. This is supported by a series of Technical Advice Notes (TAN), of particular relevance is Technical Advice Note 5 (WG, 2009) which sets out the consideration of nature conservation in the determination of planning applications.

7.3.60 PPW 10 sets out that “planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means that development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity” (para 6.4.5). This policy and subsequent

⁵ Welsh Government (2018) Planning Policy Wales, Edition 10.

policies in Chapter 6 of PPW 10 respond to the Section 6 Duty of the Environment (Wales) Act 2016.

- 7.3.61 A recent letter from WG to Local Planning Authorities (LPAs) clarified that in light of the PW 10, and the Environment (Wales) Act 2016, where biodiversity enhancement is not proposed as part of an application, significant weight will be given to its absence, and unless other significant material considerations indicate otherwise it will be necessary to refuse permission

United Kingdom Biodiversity Action Plan (UK BAP)

- 7.3.62 In 1992 the UK signed the Convention on Biological Diversity at the Rio Convention pledging the UK to develop national strategies for the conservation and sustainable use of biological diversity. The UK Government subsequently produced Biodiversity: The UK Action Plan in 1994, which described the biological resources of the UK as a whole and in turn led to the production of Biodiversity Action Plans for individual habitats and species.

- 7.3.63 Biodiversity policy within the UK has been revised through the publication of the UK Post-2010 Biodiversity Framework (JNCC, 2012) which covers the period from 2011 to 2020. A total of 65 Priority Habitats and 1150 Priority Species have been identified as the most in need of protection. Such species and habitats present in Wales have been listed as species and habitats of principal importance for conservation in response to the requirements of the Environment (Wales) Act 2016. They are hereafter referred to as Section 7 (S7) species.

Wales Action Plan for Pollinators (2013)

- 7.3.64 The Action Plan for Pollinators in Wales recognises that: ‘Pollinators are an essential component of our environment. Honey bees and wild pollinators including bumblebees, solitary bees, parasitic wasps, hoverflies, butterflies and moths and some beetles are important pollinators in Wales, for crops such as fruit and oil seed rape, clovers and other nitrogen fixing plants that are important to improving the productivity of pasture systems for livestock grazing, and wild flowers.’
- 7.3.65 The Welsh Government has worked with industry and stakeholders to look in more detail at the evidence and issues around pollinators and their conservation in Wales. Following consultation, an 'Action Plan for Pollinators in Wales' was launched setting the strategic vision, outcomes and areas for action to halt and reverse pollinator decline in Wales. This plan aims to reduce and reverse the decline in wild and managed pollinator populations, which includes bees, some wasps, butterflies, moths and hoverflies, some beetles and flies. A pollinator

task force comprising of key stakeholders is now active and a draft implementation plan is in place.

Powys Local Biodiversity Action Plan

- 7.3.66 The Powys Local Biodiversity Action Plan⁶ was published by the Carmarthenshire Biodiversity Partnership. It includes 17 Habitat and 28 Species Action Plans with a number of actions relating to the protection of biodiversity within the county.

Neath Port Talbot Biodiversity Action Plan

- 7.3.67 No information is currently available on the Neath Port Talbot LBAP. The report is unpublished, due to containing confidential information on partners, and currently being revised to tie in with WG's new Nature Recovery Plan. As such the NPTCBC ecologist has recommended using the published list of habitats and species of principal importance for the purpose of maintaining and enhancing biodiversity conservation in Wales, in response to Section 7 requirements of the Environment (Wales) Act 2016 (i.e. Section 7 habitats and species).

Relevant guidance

- 7.3.68 A range of guidance documents are available for biodiversity, but the principal assessment sources include:
- Guidelines for Ecological Impact Assessment in the UK and Ireland, Versions 1.1 (CIEEM, 2019)¹.
- 7.3.69 Guidance for specific species, groups and other ecological features is discussed in individual relevant sections or is provided in the ecological baseline reports (ES Appendices 7A-7N).

7.4 Study Area

- 7.4.1 The Study Area used for all ecological baseline reports encompasses the majority of land within the Onllwyn and Nant Helen open cast operational site, and the area surrounding and adjacent to this.
- 7.4.2 The development footprint for the project, is shown in Figure 7.1. As the Study Area encompasses and is larger than the Project Site, it provides an adequate baseline for the surveys detailed in this report, and for further assessment in the EIA.

⁶ <https://en.powys.gov.uk/article/2553/Local-biodiversity-action-plan>. Accessed online 12/11/2019.

7.5 Scoping

- 7.5.1 Consultation has taken place with PCC and NPTCBC, and NRW as detailed in Section 7.6 below on the scope and timing of ecological surveys, required for the Project.
- 7.5.2 A formal scoping opinion request was submitted on 27th September 2019 to PCC/NPTCBC. Their scoping opinion is detailed below in Table 7-1 along with the response to address these comments.

Table 7.1: Formal scoping opinion for the proposed application for GCRE with accompanying response from EIA ecologist

Scoping opinion clause	Comment	Response
<p>PCC ecologist</p>	<p>PCC ecologist has reviewed the information submitted and the proposed and is satisfied that the proposed scope of the surveys identified is appropriate and the approach/methodologies identified in Chapter 11 is in accordance with current guidelines and best practice.</p> <p>The Scoping Report identifies the presence of a European designated site within 5km of the proposed development - Coedydd Nedd a Mellte SAC identified by the Scoping Report as approximately 3km east of the proposed development - sufficient information will need to be provided within the ES to enable the competent authority to determine whether there would be a potential for an impact to the SAC as a result of the construction and/or operation phase of the proposed development, should the assessment identify the potential for an impact to the SAC and or its associated features then sufficient information will be required to be submitted to enable the competent authority to undertake a Habitats Regulations Assessment of the proposed development. The first stage of this - Screening Stage - is to determine whether there would be a likely significant effect (in the absence of mitigation) if a likely significant effect either alone or in combination with other plans or projects cannot be ruled out then it will be necessary for the proposed development to be subject to an Appropriate Assessment to determine whether there would be an adverse effect to the integrity of the designated site in light of its conservation objectives.</p> <p>Further information regarding the HRA process in relation to DNS and required information can be found at https://gov.wales/sites/default/files/publications/2019-08/developments-ofnational-significance-guidance-habitats-regulations-assessment.pdf Section 11.6 of the Environmental Scoping Report identifies potential mitigation that may need to be implemented during the construction phase of the proposed development, I appreciate that these are indicative at this time as not all surveys have been completed and the full extent of potential impacts to biodiversity have not yet been identified. Having reviewed the proposed potential mitigation measures I note that these generally refer to mitigation required during the construction phase of the proposed development the ES will also need to include mitigation measures in relation to the operation phase of the proposed development.</p> <p>Chapter 17 of the Report considers assessment of Cumulative Effects of the proposed development in relation to other projects known to the planning system or are already consented (but not yet built). I note that with regards to biodiversity the zone of influence for assessments has been identified as the 'footprint of construction works and immediately adjoining land' however with regards to air quality a Zone of Impact (ZoI) of 200m of the development boundary and in relation to water resources a Zone of Impact (ZOI) of 500m has been identified - as both of these are linked to condition of biodiversity features then it is</p>	<p>A Statement to inform a Habitat Regulations Assessment will be issued to the LPA, as the competent authority; who will undertake a formal assessment of the likely significant impacts on European sites and their qualifying features which may be affected by the Project.</p> <p>The Zone of Impact used in this assessment is between 1 km and 15 km, for the various potential ecological receptors, with the exception of Invasive species, which are not a valued receptor but include within the assessment due to the legal protection they are afforded.</p> <p>The impacts on ecological receptors in this assessment include construction impacts and operational impacts. Enhancement measures are detailed for all ecological receptors within this Chapter including LBAP and S7 species and habitats.</p>

Scoping opinion clause	Comment	Response
	<p>considered that the ZoI in relation to assessment of cumulative effects to biodiversity should also be extended to take these factors into account.</p> <p>I welcome the statement within the Biodiversity section of the Scoping Report that 'Measures to enhance biodiversity in the area affected by the Project and those which help to deliver local and national policy targets would also be identified; including measures which enhance Section 7 species and habitats, which the local authorities and public bodies are required to seek 'to maintain and enhance biodiversity' in addition to maintaining 'a resilient ecosystem' under the Environment (Wales) Act 2016.' The requirement to identify enhancements for biodiversity through development proposals has been further clarified by the letter from Welsh Government to Wales LPA Heads of Planning dated 23rd October 2019 which states that 'where biodiversity enhancement is not proposed as part of an application, significant weight will be given to its absence, and unless other significant material considerations indicate otherwise it will be necessary to refuse permission.'</p>	
<p>NPTCBC ecologist</p>	<p>Advises that the ecology section of the scoping report provided appears to be largely appropriate; however, a few items, set out below, will also need to be addressed as part of the EIA:</p> <ul style="list-style-type: none"> • The list of surveys that are being undertaken to inform the scheme appear appropriate. It should however be particularly noted that the surveys should include the identification of the presence of S7 Environment (Wales) Act (S42 NERC Act 2006)/ LBAP habitats and species, sites that meet SINC criteria, in addition to protected species. • A balance of S7/LBAP/SINC habitat loss/gain to the scheme should be included. • It is welcomed that it is intended to include an assessment of the impacts upon areas identified as sites of importance for nature conservation (SINC) but it should also be noted that in line with the NPT LDP and Biodiversity & Geodiversity SPG all areas that would meet the criteria of a SINC should also be assessed and considered in the same way. NB details of identified SINC are available from SEWBReC and the criteria are available from the Wales Biodiversity Partnership website. • No mention of an assessment of ecosystem resilience (Section 2 Environment (Wales) Act 2016) is included, it is recommended that an assessment is undertaken to ensure the aspects of ecosystem resilience are able to be appropriately considered in line with the Act; this shall particularly consider: <ul style="list-style-type: none"> (a) diversity between and within ecosystems; (b) the connections between and within ecosystems; (c) the scale of ecosystems; (d) the condition of ecosystems (including their structure and 	<p>S7 / SINC / UKBAP habitats have been considered in this ES chapter, as well as Powys LBAP. NPTCBC currently do not have a published LBAP report due to containing confidential information and also, being updated to reflect WGs Nature Recovery Plan.</p> <p>The requirement of habitat loss / gain will be included in an Ecological Protection Plan and Habitat Management Plan.</p> <p>The design of habitats, together with their long-term management and monitoring, aims to protect and enhance ecosystem resilience, in accordance with the Environment (Wales) Act 2016.</p>

Scoping opinion clause	Comment	Response
	<p>functioning);</p> <p>(e) the adaptability of ecosystems.</p> <ul style="list-style-type: none"> • Also, an assessment of impacts upon bird habitat (Section 9a Conservation of Habitats and Species Regulations 2010 as amended); should be included. It is welcomed that up to date surveys are being undertaken to ensure appropriate data is available to inform this assessment. • In relation to the significance criteria to be used for the assessment please note the NPT LDP policy requirements and the requirements of the Environment (Wales) Act 2016 in relation to what the LPA needs to consider as part of planning submission. For example all S7 habitats/SINCs/LBAP habitats and species impacted by the scheme will require mitigation as well as protected species and designated sites. These should not be ruled out too early in the assessment process on the basis of criteria applied. 	
NRW	<p>Confirmed that the ecological evaluation should include: direct and indirect; secondary; cumulative; short, medium and long term; permanent and temporary; positive and negative, and construction, operation and decommissioning phase and long-term site security impacts on nature conservation resource, landscape and public access.</p> <p>Any maps, drawings and illustrations that are produced to describe the project should be designed in such a way that they can be overlaid with drawings and illustrations produced for other sections of the ES such as biodiversity.</p> <p>We would advise that information is provided to the local authority considering how the restoration works will work alongside the new proposal.</p> <p>Any habitat surveys should accord with the Nature Conservation Committee (NCC), Phase 1 survey guidelines (NCC (1990) Handbook for Phase 1 habitat survey. NCC, Peterborough). We advise that Phase 1 surveys are undertaken and completed during the summer to ensure the best chance of identifying the habitats present.</p> <p>We advise that all targeted species surveys comply with current best practice guidelines and in the event that the surveys deviate or there are good reasons for deviation that full justification for this is included within the ES. Should protected species be found during the surveys, information must be provided identifying the species-specific impacts in the short, medium and long term together with any mitigation and compensation measures proposed to offset the impacts identified. We advise that the ES set out how the long-term site security of any mitigation or compensation will be assured, including management and monitoring information and long term financial and management responsibility.</p> <p>Where a European Protected Species is identified and the development proposal will contravene the legal protection they are afforded, a licence should be sought from NRW. The ES must include consideration of</p>	<p>The impact assessment is undertaken in accordance with CIEEM guidance, and considers the various types of impacts i.e. direct and indirect etc.</p> <p>Plans include details of the Project i.e. red line boundary.</p> <p>This ES chapter considers the impacts from restoration works (recently revised submission by Celtic Energy) and the earthworks, as well as impacts from GCRE.</p> <p>All targeted species surveys have been undertaken in accordance with relevant best practice guidance, and any limitations are detailed within each survey report.</p> <p>Where impacts on EPS (or species protected under the Wildlife and Countryside Act 1981 (as amended)) are confirmed, a licence will be obtained from NRW.</p> <p>The ES details the requirements for a Habitat management plan to ensure the long-term maintenance of habitat and species mitigation / compensation.</p> <p>A search with the local biodiversity records centre has been undertaken, in addition to desk top review of existing ecological reports and interrogation of online sources, to identify potential ecological receptors.</p>

Scoping opinion clause	Comment	Response
	<p>the requirements for a licence and set out how the works will satisfy the three requirements as set out in the Conservation of Habitats and Species Regulations 2017.</p> <p>We recommend that the developer consults the local authority Ecologists on the scope of the work to ensure that regional and local biodiversity issues are adequately considered, particularly those habitats and species listed in the relevant Biodiversity Action Plans and that are considered important for the conservation of biological diversity in Wales.</p> <p>We would expect the developer to contact other relevant people/organisations for biological information/records relevant to the site and its surrounds.</p> <p>We note that the design will need to avoid notable habitats, or habitats known to support protected/notable species, where possible. It is also noted that opportunities, where possible should be sought to enhance existing habitat features and create new habitats which are appropriate for the local area.</p> <p>It should be acknowledged that parts of the restored habitat within the proposed development fall within an area covered by the Ystradgynlais Marsh fritillary metapopulation (a section 7 species). It should be noted that a large part of the proposed development is on land is registered as part of Mynydd y Drum Common and that encouraging and facilitating appropriate cattle grazing regime within this area of the common could serve in part as positive habitat management for grassland and heath as well as enhance habitat for Marsh fritillary metapopulation.</p> <p>We observe that an area of high tonnage test loop appears to be proposed near bog/ fen/mire habitat and upon an area of deep peat according to our information. We would advise that the appropriate surveys be carried out with regards to deep peat and negative impact on the deep peat avoided where possible.</p>	<p>The presence of marsh fritillary has been considered in this Chapter.</p> <p>Deep peat is shown on the Geological Survey solid and drift geological map as occurring within the Project site (Figure 6.2). This area of deep blanket peat covering Mynydd y Drum was largely removed and disposed of during surface mining in the late 1980s and early 1990s. A small area of deep peat was salvaged in 1993 and used to create the current area of peatland and fen / mire in the restored workings. The impact on this feature, from habitat fragmentation is considered within the Nant Helen Complementary Earthworks, and further effects from potential habitat disturbance as a result of the GCRE Project in Sections 7.23, 7.24 and 7.25. Impacts from GCRE are considered to be limited to potential disturbance / degradation, since it will not be directly affected during the GCRE works.</p>

7.6 Consultation

- 7.6.1** Members of Natural Resources Wales (NRW) south Wales species team and the Ecologist at Neath Port Talbot Council (NPTCBC) were consulted during a meeting in connection with the GCRE project, held with members of the Arup project team, on the 10th December 2018. During the meeting, the survey scope was discussed. NRW confirmed all the surveys previously undertaken by Celtic Energy to inform the 2011 EIA (for the Site's restoration) would need to be updated for the Project. This included previous species surveys with negative results, due to the mobile nature of these species and presence of suitable habitat. In addition, they confirmed that an arboreal mammal survey would be required due to the presence of red squirrel (*Sciurus vulgaris*) 3 km from the Site.
- 7.6.2** The NPTCBC Ecologist was also consulted regarding the LBAP habitats and both the NPTCBC and PCBC Ecologists were consulted on the local SINC's on 21st November 2018. Specific consultation with the NPTCBC was undertaken on the 8th January 2020 to confirm the LBAP habitats and species. They confirmed that reference to Section 7 habitats and species would be satisfactory.
- 7.6.3** The above consultation comments are detailed in Table 7.2 below, along with how these comments have been incorporated into this ES Chapter, where relevant to the Project.

Table 7.2: Response to representations from stakeholders on scope of biodiversity assessment.

Stakeholder	Comment	Response
NRW and NPTCBC	Requested that all the ecological surveys undertaken to inform Celtic Energy's 2011 ES were repeated to inform the ES of the Project. In addition, that arboreal mammal surveys were undertaken.	Amphibian, arboreal mammals, bat roost (tree, buildings and structures), bat activity (static and transects), badger, breeding bird (including specialist surveys for goshawk and honey buzzard), dormouse, extended Phase 1 habitat, fungi, reptiles, National Vegetation Classification (NVC) (including bryophytes and lichen), riparian mammal (otter and water vole), wintering birds surveys have all been undertaken.

7.7 Methodology

Overview

- 7.7.1** The assessment presented within this Chapter is undertaken in accordance with the guidance for ecological assessment provided by

the Chartered Institute of Ecology and Environmental Management (CIEEM)¹.

7.7.2 The assessment considers the potential impacts on statutory and non-statutory nature conservation sites, habitats and species of conservation importance. The methodology for establishing baseline conditions is set out in the following sections along with the methods for evaluating receptors and assessing impacts.

7.8 Sources of Baseline Data

Table 7.3: Sources of baseline information including timing and survey effort. Further details on methods and results can be found in the respective ecological baseline reports in Appendices A-N.

Ecological Feature	Date	Summary of method	Survey boundary
Desk study (including review of up to date local biodiversity records centre, existing relevant reports and online sources)	November 2018	<p>A desk study was undertaken to identify any existing ecological information for the Site (i.e. red line boundary) and surrounding area.</p> <p>Existing ecological data that informed the 2011 Environmental Statement⁷, including previous desk study results, habitat and species surveys, were reviewed.</p> <p>A search was undertaken to identify statutory designated sites within 5 km of the Site boundary. Online searches were carried out using the Multi Agency Geographic Information for the Countryside (MAGIC)⁸, Natural Resources Wales website⁹ and the Joint Nature Conservation Committee (JNCC) website¹⁰.</p> <p>In addition to this, protected and notable¹¹ species, Schedule 9 invasive non-native species and non-statutory site data within 5 km of the Site centre point were obtained from the Biodiversity Information Service for Powys & Brecon Beacons National Park (BIS)¹² on 21st November 2018.</p> <p>The following reports (produced to meet conditions of the Celtic Energy 2011 ES) were also reviewed including: Update Habitat Survey (2016)¹³, National Vegetation Classification Survey (2013)¹⁴ and</p>	The Study Area as defined in 7.4.

⁷ Environmental Statement (2011), Celtic Energy.

⁸ <http://magic.defra.gov.uk/> Accessed online 12/11/2019.

⁹ <https://naturalresources.wales/conservation-biodiversity-and-wildlife/find-protected-areas-of-land-and-seas/designated-sites-search/?lang=en> Accessed online 21/11/2019.

¹⁰ <http://jncc.defra.gov.uk> Accessed online 12/11/2019.

¹¹ Notable' species and habitats considered in this report include species and habitats of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales, under section 7 of the Environment (Wales) Act 2016, in addition to any species considered to be of significance for nature conservation such species listed in red data books, the Royal Society for the Protection of Birds (RSPB) 'Birds of Conservation Concern' lists and or Local Biodiversity Action Plans (LBAPs).

¹² <https://www.bis.org.uk/home> Accessed online 12/11/2019.

¹³ Wardell Armstrong (2016). Nant Helen, Coelren. Update Habitat Survey. Letter Report.

¹⁴ URS (2013). Nant Helen Remainder. Survey of Grassland within Restored Area.

Ecological Feature	Date	Summary of method	Survey boundary
		Bryophyte and Lichen Survey (2012) ¹⁵ , and Further addendum to Original Environmental Statement and Supporting Information submitted under Planning reference 18/1070/REM including revised LVIA ¹⁶ .	
Extended Phase 1 Habitat survey	26 th November 2018, 25 th April 2019, 26 th April and 29 th May 2019	<p>An Extended Phase 1 Habitat survey¹⁷ and protected species walkover was completed of the Study Area in suitable conditions by two Suitably Qualified Ecologists (SQE). Further details are provided in the Extended Phase 1 report in Appendix 7A.</p> <p>Phase 1 habitat survey is a standard technique for rapidly obtaining baseline ecological information over a large area of land. It is primarily a mapping technique and uses a standard set of habitat definitions for classifying areas of land on the basis of the vegetation present.</p> <p>Incidental records of flora and fauna were also made during the survey including any invasive species listed under Schedule 9 of the wildlife and countryside act 1981 (as amended), in the form of Target Notes, and the habitats identified were evaluated for their potential to support protected species and other species of conservation concern, including those listed above.</p>	The Study Area as defined in 7.4.
NVC	June and July 2019	<p>The objective was to describe the plant communities in habitats judged to be of highest value for nature conservation using NVC methods¹⁸. The vegetation types initially selected for study were identified from a Phase 1 Habitat Survey report³¹. Other habitats were also present but considered less likely to be of nature conservation significance, and although initially not included in the scope for the NVC survey, some were later included.</p> <p>The survey was undertaken over several days in June and July 2019. A total of 127 quadrats were recorded. The quadrat areas were generally selected as being representative samples of the stand in which they occurred. The survey aimed to collect a minimum of five quadrats from each of the main plant communities, aiming to provide a reasonable representation of the vegetation type. Some unusual or poorly represented communities were sometimes described by just one or two quadrats.</p> <p>The quadrat data was analysed using the appropriate software and published reference sources, to determine NVC communities and sub communities present.</p> <p>Further details are provided in the NVC report in Appendix 7B.</p>	The Study Area as defined in 7.4.

¹⁵ Smith, P. L. (2012). Nant Helen Abercraf (Powys). Bryophyte and Lichen Survey.

¹⁶ Celtic Energy (2019). S73 Application for Variation of Condition 45 of planning application 18/1070/REM – further addendum to original Environmental Statement and supporting Information submitted under Planning Reference 18/1070/REM including revised LVIA.

¹⁷ Joint Nature Conservation Council (2010) Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit (ISBN 0 86139 636 7).

¹⁸ Joint Nature Conservation Committee (JNCC), 2006: National Vegetation Classification: A User’s handbook.

Ecological Feature	Date	Summary of method	Survey boundary
Fungi	September, October and November 2019	<p>A survey was undertaken to identify notable fungi species Three walk-over survey visits were spread between September and November 2019, and which coincided with the main fungi fruiting season. Each visit involved a walk-through survey of the fungi survey plots, through vegetation considered to be of highest potential value for grassland fungi, such as old, short-grazed, semi-improved acid grassland (especially where anthills were present, indicating a long history without disturbance).</p> <p>The survey was restricted to three target groups that are generally recognised as being good indicators of nature conservation value for grassland fungi; namely waxcap fungi (<i>Hygrocybe</i> spp.), earth tongues (<i>Geoglossaceae</i>) and fairy clubs (<i>Clavariaceae</i>).</p> <p>Other fungi were also noted incidentally during the survey, but as a lower priority and most were not identified to species level except where they were readily identifiable in the field.</p> <p>Further details are provided in the Fungi report in Appendix 7C.</p>	The Study Area as defined in 7.4.
Invertebrates	A walkover was undertaken on the 10 th May 2019. Four sampling sessions were undertaken in May, June July and September 2019.	<p>An initial site visit identified habitats likely to be of greatest importance for invertebrates. Sampling sessions were undertaken between spring and early autumn and timed to coincide with the peak periods of invertebrate activity.</p> <p>The main emphasis for more detailed invertebrate surveys was on those habitats likely to have the greatest invertebrate interest Other less promising habitat types were also surveyed in less detail, with the aim being to ensure complete coverage of the whole range of main invertebrate habitats represented across the site.</p> <p>In addition to general spot-searching techniques, some more specialised sampling methods were used to ensure all potentially important habitat features were sampled effectively including using sweep nets, pond nets and light traps.</p> <p>Where subsequent microscopic examination was required in order to ensure an accurate identification, specimens were collected into tubes with either ethyl acetate or iso-propyl alcohol.</p> <p>Further details are provided in the Invertebrate report in Appendix 7D.</p>	The Study Area as defined in 7.4.
Amphibians surveys	April 2019	<p>Seventy-six waterbodies within the Study Area were subject to a Habitat Suitability Assessment (HSI)¹⁹. Waterbodies scoring above 0.5 (equating to below average and above) were then sampled for the presence of great crested newt environmental DNA (eDNA) in accordance with the approved methodology endorsed by the Statutory Environmental Bodies²⁰. Ten waterbodies were subject to eDNA surveys.</p>	The Study Area as defined in 7.4.

¹⁹ Amphibian and Retile Groups of the UK (2010) Great crested Newt Habitat Suitability Index. Froglife.

²⁰ Biggs *et al.*, (2014) Using eDNA to develop a national citizen science-based monitoring programme for the great crested newt (*Triturus cristatus*), biological conservation.

Ecological Feature	Date	Summary of method	Survey boundary
		Further details are provided in the Amphibian report in Appendix E.	
Reptile survey	Seven checks of each refugia undertaken between 6 th June 2019 and 25 th September 2019.	<p>A reptile survey was carried with the aim of determining the presence or likely absence of reptiles within the Study Area. Habitats, which were considered most suitable for reptiles, were identified during the Extended Phase 1 Habitat survey³¹. 250 refugia (roofing felt) were deployed in late spring 2019.</p> <p>Seven checks were undertaken in suitable weather, with the last check at the end of September 2019. During each survey artificial refugia was carefully checked for signs of reptiles. In addition, any natural refugia within the area, were checked for signs of reptiles. This is in line with best practice survey guidance²¹</p> <p>Further details are provided in the Reptile survey report in Appendix 7 F.</p>	The Study Area as defined in 7.4.
Breeding bird survey	Transect surveys completed between April and June 2019.	<p>Breeding bird surveys were undertaken within the Study Area, by SQE, in accordance with current best practice including the CBC²² Techniques and Bird Monitoring methods²³. This comprised walking transects (the same as those used for bat surveys) to sample all accessible habitat and recording all signs of breeding using the BTO standard activity recording codes.</p> <p>Surveys were undertaken on three occasions between April and June 2019, between dawn and 10 am. One of the three visits was walked in the opposite direction, to balance any temporal variation in behaviour levels.</p> <p>All breeding bird surveys were carried out by a team of two surveyors, with at least one experienced in undertaking ornithological survey work and able to identify birds by calls and songs, as well as visually. The transect route is walked at a slow pace, with all birds seen and heard mapped in accordance with the BTO standard activity recording codes.</p> <p>Focused surveys were also undertaken for Goshawk (<i>Accipiter gentilis</i>) and Honey buzzard (<i>Pernis apivorus</i>) between March and July 2019.</p> <p>Further details are provided in the Breeding bird survey report in Appendix 7G.</p>	<p>The Study Area for breeding birds surveys as defined in 7.4, with the exception of Goshawk and Honey buzzard.</p> <p>Goshawk surveys comprised the Study area and a 1 km buffer zone. Honey buzzard surveys comprised a wide area around the Study area including the Crynant valley.</p>
Wintering bird survey	December 2018 to March 2019.	A wintering bird survey, comprising monthly visits between December 2018 and March 2019, was undertaken across the site. Transects were walked, and any bird species noted. This was undertaken in accordance with best practice survey guidance ^{22,23} .	The Study Area as defined in 7.4.

²¹ Froglife (1999) Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth.

²² Bibby, B.B., (2000). Bird Census Techniques. London: Academic Press.

²³ Gilbert, G.G., Gibbons, D.W. and Evans, J., (1998). Bird Monitoring Methods: A manual of techniques. Bedfordshire, RSPB.

Ecological Feature	Date	Summary of method	Survey boundary
		<p>All Wintering bird surveys were carried out by a team of two surveyors, with at least one experienced in undertaking ornithological survey work and able to identify birds by calls and songs, as well as visually. Further details are provided in the Wintering bird report in Appendix 7H.</p>	
Riparian mammal (otter and water vole) survey	Three surveys undertaken of suitable waterbodies in spring, summer and autumn 2019 (between May and September 2019)	<p>The otter/water vole field survey involved surveying all waterbodies (25 ponds and nine streams/ditches) present within the Study Area that had been identified during the Phase 1 habitat survey³¹ or Ordnance Survey data. Three otter/water vole surveys (spring, summer and autumn) were completed of each of these waterbodies between May and September 2019 (inclusive). Due to the cross-over in habitat requirements and survey methodology both species were surveyed for at the same time.</p> <p>The water vole survey was completed in accordance with the standard survey guidelines^{24,25} The survey comprised walking the ditch banks to search for signs of water vole presence, including but not limited to burrows, latrines, footprints, feeding remains and sightings of animals.</p> <p>The otter survey was conducted in line with relevant survey guidance²⁶. This involved accessing the watercourse and walking in-channel (where possible), to search for evidence of otter presence such as resting places, spraints, food remains, prints, slides and holts.</p> <p>Camera traps (Minox DTC 650) were installed at four locations within the Study Area to provide additional data on usage of identified features, or where a complete survey of waterbodies/courses was difficult (due to dense vegetation). The images obtained were checked for otter and water vole.</p> <p>Further details are provided in the Riparian mammal report in Appendix 7I.</p>	The Study Area as defined in 7.4
Bat roost survey (buildings/structures and trees)	Preliminary roost assessment survey undertaken in June and July 2019. Emergence and re-entry surveys undertaken between July and September 2019.	<p>All trees, buildings and structures within the Study Area were assessed for their suitability to support roosting bats as well as checking for signs of bats (such as dead specimens, droppings, urine splashes, fur oil -staining and/or squeaking noises by bat squeaking noises) in accordance with published guidance²⁷, in summer 2019.</p> <p>Potential roost features in either trees, buildings or structures were categorised as being of high, moderate or low suitability for use by bats in accordance with the Bats: Good Practice Survey Guidelines²⁴.</p> <p>Trees, buildings and structures with potential roosting features were subject to further assessment. Trees were subject to aerial inspections by bat licensed tree climbers, to inspect these features more closely. Buildings and structures were subject to nocturnal surveys i.e. either a dawn re-entry survey or a dusk</p>	The Study Area as defined in 7.4.

²⁴ Strachan R, Moorhouse T and M Gelling (2011). Water vole conservation handbook, Third edition, Wild Cru.

²⁵ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). The Mammal Society.

²⁶ Chanin, P. (2003). Monitoring the Otter *Lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10. English Nature. Peterborough.

²⁷ Bat Conservation Trust (2016). Bat Surveys for Professional Ecologists (3rd Edition); Good Practice Guidelines.

Ecological Feature	Date	Summary of method	Survey boundary
	Ground level inspection of trees in August 2019, and aerial inspections in September 2019.	emergence survey. Those assessed as having low potential were subject to one nocturnal survey, and those of moderate potential were subject to two nocturnal surveys (a minimum of two weeks apart). Further details are provided in the bat roost survey report in Appendix 7J.	
Bat activity (static and transects)	Monthly surveys between April and October 2019.	Bat transect surveys were undertaken monthly from April to October 2019 (inclusive) in accordance with best practice survey guidance ²⁷ . Five transect routes, which covered the Study Area, were walked each month, and all bat activity recorded using bat detectors (Echo Meter touch and bat loggers). Static bat activity monitoring was also undertaken between April to October 2019, in accordance with best practice survey guidance ²⁴ . Sixteen ultrasonic bat detectors are deployed in suitable habitat within the site and left in-situ for five consecutive nights to record calls by foraging/commuting bats within the site. Data recorded by the detectors (as Wildlife Acoustic Compression files i.e. .wac files), were downloaded and processed using Kaleidoscope Pro Software to produce audio files (.wav) and zero crossing files. The processing also included the automatic identification of bat species based on the classifiers developed by Wildlife Acoustics (Bats of Europe 3.0.0). these files were then reviewed by a bat specialist to ensure the correct identification of species. A Bat Activity Index (BAI) was then calculated for each bat species at each location during each session. Further details are provided in the bat activity survey report in Appendix 7N.	The Study Area as defined in 7.4.
Badger survey	16 th , 17 th and 22 nd May 2019	A badger survey was conducted within the Study Area, by SQE, to identify evidence of badger activity in accordance with the standard methodology ²⁸ and the principles of other published guidance ²⁹ . Dedicated searches were made for signs of badger activity such as sett holes, footprints, latrines, hairs and paths which constitute characteristic evidence of badger presence. Further details are provided in the badger survey report in Appendix 7K.	The Study Area as defined in 7.4.
Dormouse	Monthly checks between April and November 2019.	Dormouse surveys were undertaken using nest tubes and boxes (279 tubes and 20 boxes), installed in suitable habitat on site during spring 2019. The tubes and boxes were carefully checked on a monthly basis by a dormouse licenced ecologist to record dormice or their nests, if present, in accordance with best practice survey guidance ³⁰ .	The Study Area as defined in 7.4.

²⁸ Harris, S. Cresswell, P and Jefferies, D. (1989) Surveying Badgers. The Mammal Society Publication No. 9. Mammal Society.

²⁹ Neal, W. and Cheeseman, C. (1996) badgers. Published by Poyser. 1st Edition.

³⁰ Bright, P, Morris, P, & Mitchell-Jones, T. (2006). The Dormouse Conservation Handbook (2nd ed.). English Nature.

Ecological Feature	Date	Summary of method	Survey boundary
		Further details are provided in the badger survey report in Appendix L.	
Arboreal mammals	Transects were completed monthly between May and October 2019.	Transect and feeding stations were set up within suitable habitat identified during the Extended Phase 1 Habitat Survey ³¹ (i.e. woodland) in early summer 2019: surveys and associated baiting were undertaken monthly until October 2019, by SQE. Signs of target species (i.e. red squirrel, pine martin (<i>Martes martes</i>) and polecat (<i>Mustela putorius</i>)) were searched for during transects, and in video footage (including red squirrel nests, paw prints, pine martin scats, and sightings). Any mustelid scats identified were collected and sent for DNA analysis at EcoWarwicker Ecological Forensics ³² . Further details are provided in the Arboreal mammal report in Appendix 7M.	The Study Area as defined in 7.4.

³¹ Arup (2018). Nant Helen Complementary Restoration Works; Extended Phase 1 Habitat Survey.

³² https://warwick.ac.uk/fac/sci/lifesci/research/archaeobotany/ecological_forensics/.

7.9 Evaluation of Receptors and Assessment of Impacts

Zone of Impact for Ecological Features

7.9.1 All plant and animal species, habitats and integrated plant and animal communities that occur within the ‘zone of impact’ of the proposed development are defined as potential ‘ecological receptors’. The zone of impact for ecological features varies, depending on the nature and behaviour of the receptors, and the type of impact that may affect them. As a rule, in this Chapter, the assessment of individual receptors is considered for the whole of the site plus the distances listed in Table 7.4.

Table 7.4: Maximum Zone of Impact from Scheme Boundary for Ecological Features

Ecological Feature	Maximum Zone of Impact from the Site Boundary
Statutory designated European sites (including faunal species included as part of the designation), e.g. SAC.	5 km
Statutory designated European sites for which bats are a qualifying feature.	10 km
Statutory designated European sites for which marsh fritillary are a qualifying feature.	15 km
Statutory Nationally designated sites (including faunal species included as part of the designation), including Sites of SSSIs and National Nature Reserves (NNRs).	5 km
Non-statutory designated sites - LNRs and Site of Importance for Nature Conservation (SINCs).	1 km
Protected species	Up to 2 km (species dependant)
Notable species	Up to 2 km (species dependant)
Non-native Invasive species	Within the site only

7.9.2 The maximum zone of impact for international and national sites was established, in consultation with NRW and NPTCBC Ecologist (during an initial meeting), at 5 km due to potential hydrological impacts such as pollution of watercourses. For locally designated non-statutory sites a 1 km distance was chosen as a maximum zone of impact as these sites are designated for the value of their habitats, rather than mobile species which could be impacted upon over larger area e.g. bats. Regarding fauna, it is largely the behaviour of species, including movement in the landscape combined with the nature of the development, which determines the 2 km maximum zone of impact.

7.9.3 For marsh fritillary, the maximum zone of impact is 15 km, due to this species existing in metapopulations and being known to range up to 15 km from its primary habitat³³.

7.10 Determining Value

7.10.1 The CIEEM guidelines recommend that the value of ecological receptors or features is determined based on a geographic frame of reference. For this assessment, the following geographic frame of reference is used to determine the importance of ecological features³⁴:

Table 7.5: Criteria used for determining ecological value of a feature.

Importance of ecological feature	Criteria
International and European	<p>Natura 2000 sites including: SPAs; potential SPAs (pSPAs); SAC; candidate or potential SACs (cSACs or pSACs); and Wetlands of International Importance (Ramsar sites).</p> <p>Biogenetic Reserves, World Heritage Sites and Biosphere Reserves.</p> <p>Areas, which meet the published selection criteria for those sites listed above but which are not themselves designated as such.</p> <p>Resident, or regularly occurring, populations of species, which may be considered important at an International or European level.</p>
National	<p>Designated sites including: SSSIs; Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and National Nature Reserves (NNRs).</p> <p>Areas, which meet the published selection criteria for those sites listed above but which are not themselves designated as such.</p> <p>Areas of habitats of principal importance for conserving biodiversity (i.e. listed in response to the requirements of the Environment (Wales) Act 2016).</p> <p>Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory.</p> <p>Resident, or regularly occurring, populations of species, which may be considered important at National level.</p>
County	<p>Designated sites including: Sites of Nature Conservation Importance (SNCIs); County Wildlife Sites (CWSs); and Local Nature Reserves (LNRs) designated in the county or unitary authority area context.</p> <p>Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.</p> <p>Areas of habitats identified in the NPTCBC and or Powys Local Biodiversity Action Plan (LBAP)⁶, which are a priority for conservation within the County.</p>

³³ Warren M.S. 1994. The UK status and suspected metapopulation structure of a threatened European butterfly, the marsh fritillary *Eurodryas aurinia*. Biol. Conserv. 67: 239–249.

³⁴ Descriptions have been adapted from Interim Advice Note 130/10 - Ecology and Nature Conservation: Criteria for Impact Assessment (Highways Agency, 2010) which follows a similar geographic frame of reference as the CIEEM guidelines but includes further definition on criteria.

Importance of ecological feature	Criteria
	Resident, or regularly occurring, populations of species, which may be considered important at a County level.
Local	Designated sites including: LNRs designated in the local context. Trees that are protected by Tree Preservation Orders (TPOs). Areas of habitat; or populations / communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

7.11 Valuing Habitat and Species

- 7.11.1** In accordance with the CIEEM guidelines¹, in assigning a level of value to each habitat or species considered in the assessment, it is necessary to consider its distribution and status, including a consideration of trends based on available historic records. Rarity is an important consideration because of its relationship with threat and vulnerability although since some species are inherently rare, it is necessary to consider rarity in the context of status. A habitat or species that is rare or declining should be assigned a greater level of importance than one that is rare but known to have a stable distribution or population.
- 7.11.2** Those ecological features which have been identified as being of sufficient value to be material to decision-making (e.g. those considered to be of ‘Local’ importance or above), and which it is considered could experience significant effects as a result of the proposed development (i.e. effects that could adversely affect the integrity of the habitat or the favourable conservation status of a species’ local population), have been classified as ‘Important Ecological Features’ (IEF) (as outlined in CIEEM Guidelines), and thus will be considered in the detailed assessment. Other ecological features (i.e. those which are of less than ‘Local’ importance will be scoped out, and not subject to any further assessment within this document).
- 7.11.3** In accordance with the CIEEM Guidelines, where there is the potential for a breach of legislation in relation to protected species (regardless of their value), those species are also considered as IEF.
- 7.11.4** Following identification and valuation of the IEF, it is then necessary to investigate potential impacts on those features in order to understand how they might be affected by the proposed development.
- 7.11.5** **Predicting and Characterising Ecological Impacts**
- 7.11.6** In accordance with CIEEM guidelines, when describing impacts reference is made to the following:

- Positive or negative – an impact that either increases or reduces quality of the environment or factor being assessed;
- Magnitude – the size of an impact in quantitative terms where possible;
- Extent – the area over which an impact occurs;
- Duration – the time for which an impact is expected to last;
- Reversibility - a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible; and
- Timing and frequency – whether impacts occur during critical life stages or seasons and how often impacts occur.

7.11.7 Both direct and indirect impacts are considered: direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor, e.g. a pollution event reducing the food source for a species such as otter or water vole.

7.12 Significance Criteria

7.12.1 In accordance with the CIEEM guidelines, a significant impact, in ecological terms, is defined as ‘an impact (whether negative or positive) on the integrity³⁵ of a defined site or ecosystem and/or the conservation status³⁶ of habitats or species within a given geographical area, including cumulative and in-combination impacts’. It is important to note however that in accordance with the CIEEM guidelines, the actual determination of whether an impact is ecologically significant is made irrespective of the value of the receptor in question. In this respect the CIEEM methodology differs from some other approaches to EIA.

7.12.2 The value of a feature that will be significantly affected is used to determine the geographical scale at which the impact is significant, e.g. an ecologically significant impact on a feature of county importance will be considered to represent a significant impact at a county level. This in turn is used to determine the implications in terms of legislation, policy and / or development management.

³⁵ Integrity is the coherence of ecological structure and function, across a site’s whole area that enables it to sustain a habitat, complex of habitats and/or the levels of populations of species.

³⁶ Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

- 7.12.3 The assessment relies on professional judgement and guidance as provided within CIEEM Guidelines.
- 7.12.4 Any significant impacts remaining after mitigation (the residual impacts), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development management in determining the application.

7.13 Limitations and Assumptions

Limitations

- 7.13.1 The findings presented in this assessment represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors, which affect the presence of plants and animals, such as the time of year, migration patterns and behaviour.
- 7.13.2 The ecological surveys presented in this ES were conducted at the optimal survey periods and using methodologies that are accepted by NRW and other statutory bodies. The results of the ecological survey allow evaluation of nature conservation value, assessment of significance of potential impacts that may arise from the proposed development and consideration of appropriate mitigation measures. Every effort has been made to ensure that the findings in the ES study present, as accurate as possible interpretation, of the status of flora and fauna of the Site.
- 7.13.3 Limitations for specific species and surveys are detailed for each baseline report (Volume 2, Appendices A-R). None of the limitations are considered to be significant or to have compromised the validity of the surveys or assessment.

Assumptions

- 7.13.4 A number of assumptions have been made when undertaking the impact assessment. Professional judgement has been used at all times, including during the interpretation of desk study and survey results, assessment of potential effects, the significance of effects and the likely effects of mitigation measures.
- 7.13.5 The assumptions that have been made are as follows:
- The desk study and survey data collected is sufficiently robust for informing the evaluation and impact assessment of ecological receptors; and

- The evaluation and impact assessment of each ecological receptor is based on the likely ecological conditions at the time of construction and operation.

7.14 Baseline Conditions

- 7.14.1 This section describes the ecological baseline recorded during surveys in 2019, within the Study Area, including the Washery area. This information was also used to assess impacts from the Nant Helen Complementary Earthworks Project.
- 7.14.2 It is still relevant to the GCRE Project, despite the Nant Helen Complementary Restoration Earthworks and associated site clearance being underway at the time of the GCRE Project commencing (within the boundary of the GCRE Project, in the Nant Helen part of the site). Adjacent protected sites, notable habitats / species, and those in the wider area, will be retained and therefore potential impacts to these receptors will need to be considered in the assessment for GCRE, for example from disturbance during construction and operation. Furthermore, impacts to protected sites, habitats and species, have been considered for works within the area of the Washery, which lies within the boundary of the GCRE Project, but was not within the Nant Helen Complementary Restoration Earthworks application. As such, ecological receptors in the Washery, detailed in the existing baseline, are also relevant to this the GCRE assessment.
- 7.14.3 The existing baseline is described below, with distances to ecological receptors previously detailed in the Nant Helen Complementary Restoration Earthworks application, being re-calculated in respect of the GCRE Project which is the focus of this chapter. However the future baseline is also described in Section 7.15, since this is also relevant to this assessment.
- 7.14.4 The future baseline considers the Site at the time of the GCRE Project commencing, including new habitats which will be created as part of the Nant Helen Complementary Restoration Earthworks Project in addition to the ecological receptors, which will be retained and protected (and enhanced), and those in the Washery.
- 7.14.5 The majority of ecological receptors from the existing baseline, which will remain as part of the Nant Helen Complementary Restoration Earthworks Project and are therefore relevant to the GCRE Project, are only summarised in the Future baseline section, since they are described in detail in this existing baseline section.

Designated Sites

Statutory Designations

- 7.14.6 Fourteen statutory designated sites were identified within 5 km of the Site. They comprised two Special Area of Conservation (SAC) within

15 km, and 12 Sites of Special Scientific Interest (SSSI), one of which is also designated as a National Nature Reserve (NNR), within 5 km. They are detailed in Table 7.6 and 7.7 below and shown in Figures 7.2 and 7.3.

Table 7.6: European Statutory designated sites within 15 km of the Site.

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Coedydd Nedd a Mellte	SAC	<p>Annex I habitats that are a primary reason for selection of this site include Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles.</p> <p>Coedydd Nedd a Mellte is a very large and diverse example of old sessile oak wood in south Wales. The woods extend along a series of deeply incised valleys and ravines, and contain complex mosaics of sessile oak <i>Quercus petraea</i> woodland, ash <i>Fraxinus excelsior</i> woodland (some of which is referable to Annex I type 9180 <i>Tilio-Acerion</i> forests of slopes, screes and ravines), and transitions to lowland woodland types. The whole site is biologically rich, with many woodland plant communities represented and rich bryophyte and lichen assemblages. Notable higher plant species include wood fescue <i>Festuca altissima</i> and the ferns <i>Dryopteris aemula</i>, <i>Hymenophyllum tunbrigense</i> and <i>Asplenium viride</i>.</p>	2.9 km south-east
Cwm Cadlan	SAC	<p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caeruleae</i>) for which this is considered to be one of the best areas in the United Kingdom.</p> <p>Alkaline fens for which this is considered to be one of the best areas in the United Kingdom.</p>	9.5 km east
Blaen Cynon	SAC	The SAC comprises four compartments. The site is designated for its population of marsh fritillary and is known to contribute towards supporting a metapopulation of the marsh fritillary in the Penderyn/Hirwaun area.	9.2 km to the east (closest compartment)

Table 7.7: Nationally Statutory designated sites within 5 km of the Site

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Nant Llech	SSSI	<p>The Nant Lech, flowing off the Millstone Grit rocks and on to Coal Measure shales has carved a steep-sided valley of special interest on account of its rich variety of woodland and cliff plant communities. A range of woodland types has formed in response to variations in soil moisture content and soil chemistry.</p> <p>Bird life is rich and the uncommon soldier beetle (<i>Podabrus alpinus</i>) has been recorded from the wood.</p>	100 m north-east

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Gors Llwyn, Onllwyn	SSSI	<p>This site contains a range of peat-depositing vegetation communities. Peat deposition has been sufficiently great in part of the site to form a dome shaped mass of peat above the general water table, known as a raised mire. There are very few other examples of this formation known in mid and south Wales.</p> <p>North-east of the complex of mires is an area of acidic pasture. Drier ridges divide up a series of wet flushes which support a range of wetland species e.g. whorled caraway (<i>Carum verticillatum</i>), meadow thistle (<i>Cirsium dissectum</i>) and sharp-flowered rush (<i>Juncus acutiflorus</i>). These plants form a clearly defined community of extremely limited distribution in Europe, occurring only along the southern Atlantic seaboard.</p>	40 m east
Caeau Ton-y-Fildre	SSSI	<p>The site comprises two unimproved herb-rich pastures on the north bank of Nant y Bryn.</p> <p>The western field supports a wide range of species characteristic of damp, flushed peaty pasture, including globeflower (<i>Trollius europaeus</i>), meadow thistle, whorled caraway and marsh arrowgrass (<i>Triglochin palustris</i>).</p> <p>Notable species in the eastern field include greater butterfly-orchid (<i>Platanthera chlorantha</i>), saw-wort (<i>Serratula tinctorial</i>), dyer's greenweed (<i>Genista tinctora</i>) and petty whin (<i>G. anglica</i>). Over 100 species of flowering plants and ferns having been recorded. The area also supports invertebrates, especially butterflies.</p>	260 m east
Waun Ton-y-Spyddaden	SSSI	<p>A series of small, unimproved, herb-rich hay meadows lying on a very gentle slope. The site demonstrates well the effects of traditional management on the moorland vegetation to be found on the better soils in this part of Wales.</p> <p>A vivid gradation in plant communities can be seen as the slope descends from north to south. At the top end is a typical moorland community of mat-grass (<i>Nardus stricta</i>), heath rush (<i>Juncus squarrosus</i>), deergrass (<i>Scirpus cespitosus</i>) and sheep's-fescue (<i>Festuca ovina</i>). This changes into grass heath communities of brown bent (<i>Agrostis canina</i>), red fescue (<i>Festuca rubra</i>), lousewort (<i>Pedicularis sylvatica</i>) and heath spotted-orchid (<i>Dactylorhiza maculata</i> spp. <i>ericetorum</i>), which in turn grade into purple moor-grass/sedge associations.</p>	2.2 km north-east
Rhos Hen-Glyn-Isaf	SSSI	<p>This site comprises an extensive and varied area of damp/wet heathy pasture above the valley of the River Giedd, near Ystradgynlais. It is noted for its wide variety of plant species, including several that are uncommon in Brecknock.</p>	2.7 km north-west

Site Name	Designation	Features	Approximate Distance and Orientation from Site
		<p>A large part of the site supports a sward dominated by purple moor-grass, sedges and common cottongrass (<i>Eriophorum angustifolium</i>). Other species include bog pimpernel (<i>Anagallis tenella</i>), round-leaved sundew (<i>Drosera rotundifolia</i>), few-flowered spike-rush (<i>Eleocharis quinqueflora</i>), common butter-wort (<i>Pinguicula vulgaris</i>) and devil's-bit scabious (<i>Succisa pratensis</i>).</p> <p>Additional interest is provided by stands of alder (<i>Alnus glutinosa</i>) and by ditches which support species such as hemp-agrimony (<i>Eupatorium cannabinum</i>), bogbean (<i>Menyanthes trifoliata</i>), bog pondweed (<i>Potamogeton polygonifolius</i>) and the locally uncommon fern (<i>Osmunda regalis</i>).</p>	
Mynydd Du	SSSI	<p>This is an important upland site of special interest for its vegetation, open water and birdlife. In addition to the Old Red Sandstone there are significant outcrops of Carboniferous Limestone and Millstone Grit. The summit ridges are notable for their extensive grassland, dominated in the main by matgrass. Small areas still support heather <i>Calluna vulgaris</i> and bilberry <i>Vaccinium myrtillus</i>.</p> <p>The north and east facing cliffs of Bannau Sir Gaer and Bannau Brycheiniog support an interesting arctic-alpine flora, with such species as northern bedstraw (<i>Galium boreale</i>), dwarf willow (<i>Salix herbacea</i>), lesser meadow-rue (<i>Thalictrum minus</i>) and roseroot (<i>Sedum rosea</i>), together with a rich moss and liverwort flora.</p>	3 km north
Ogof Ffynnon Ddu	SSSI	<p>The site contains part of an extensive cave system which has at least 40 kilometres of passages, the largest length in any Welsh cave, situated within a vertical range of 300 metres, which is the greatest in any cave in Britain. A number of rare crustacean species restricted to subterranean habitats are of particular note.</p>	3.3 km north-east
Ogof Ffynnon Ddu - Pant Mawr	SSSI, NNR	<p>The undulating upland plateau above the cave system supports the finest limestone pavement in mid and south Wales. It is rich in plant species, including such rarities as lily-of-the valley (<i>Convallaria majalis</i>), soft-leaved sedge (<i>C. montana</i>), mountain melick (<i>Melica nutans</i>), lesser meadow-rue (<i>Thalictrum minus</i>) and the nationally rare hairy greenweed (<i>Genista pilosa</i>).</p> <p>These areas of sheltered, deep heather provide suitable habitat for nightjar (<i>Caprimulgus europaeus</i>), offering probably one of the last breeding localities in Brecknock for this summer-visiting bird. Also present within the site are a number of peat-bottomed pools with a well-developed upland dragonfly and damselfly population.</p>	3.3 km north-east
Nant y Rhos	SSSI	<p>The site consists of a single, gently sloping enclosure on the west side of the Nant y Rhos, 2.5 km south-east of Ystalyfera, at an altitude of 140 m above sea level. The geology of this area comprises Middle Coal Measure shales, overlain for the most part by boulder clay. The site is of special interest for its</p>	3.5 km south-west

Site Name	Designation	Features	Approximate Distance and Orientation from Site
		<p>species-rich fen meadow vegetation, which includes large populations of meadow thistle and whorled caraway.</p> <p>Most of the site supports vegetation that is dominated by purple moor-grass, accompanied by a range of characteristic associates including meadow thistle, flea sedge (<i>Carex pulicaris</i>), carnation sedge (<i>C. panicea</i>) and tawny sedge (<i>C. hostiana</i>).</p>	
Craig y Rhiwarth	SSSI	<p>The west-facing limestone escarpment of Craig y Rhiwarth on the east bank of the Afon Tawe, above Craig-ynos, supports some of the finest limestone plant communities in Brecknock. The limestone is covered in places by acidic boulder clay, where communities of plants demanding more acidic conditions are confined and contrast with the calcicolous communities elsewhere.</p> <p>Areas of acidic glacial drift support contrasting oak and birch woodland and contribute to the great species diversity of the site, with over 170 species of higher plants and a similar number of lower plants known to grow here.</p>	3.6 km north-east
Dyffrynoedd Nedd a Mellte a Moel Penderyn	SSSI	<p>Dyffrynnoedd Nedd a Mellte, a Moel Penderyn is of special interest for its extensive and diverse semi-natural woodland, important populations of several flowering plants and supporting outstanding assemblages of mosses, liverworts and lichens. The site includes a range of geological features, well-exposed in the cliffs and rocky river beds. These include exposures at Moel Penderyn, Craig y Ddinas and Bwa Maen and geomorphological features within parts of the valleys of the Hepste and Mellte are also of special interest.</p> <p>This site includes the wooded valleys of the rivers Nedd and Mellte, and their tributaries above Pontneddfechan, as they pass through a Millstone Grit and limestone plateau, and Moel Penderyn, which lies to the east. The plateau lies at about 300 m, the rivers having eroded deep, narrow valleys with gorges, river cliffs, block scree and waterfalls.</p>	2.9 km south-east
Caeau Nant y Llechau	SSSI	<p>This is the largest area of traditional unimproved hay meadow known in Brecknock. The collection of gently sloping, south-east facing fields on the upper valley side of the Nedd support a wealth of plant species. Developed on boulder clay overlying millstone grit, flushed in part by springs and drained by a number of well wooded streams, the varying topography is reflected in the diverse flora, with over 110 species of higher plants recorded from the grassland areas.</p>	4.5 km east

Non-Statutory Designations

7.14.7 Non-statutory designated sites within 1 km of the Site were returned in the desk study records from BIS. Five sites were identified, which are adopted Sites of Importance for Nature Conservation (SINCs). They are listed in Table 7.8 below.

Table 7.8: Non-statutory designated sites within 1 km of the Site

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Gorsllwyn Meadows	SINC	This site is mostly marshy grassland with areas of upland fen/swamp and wet woodland. The site as a whole contains at least 50 indicator species of purple moorgrass and rush pastures. notable species include marsh helleborine (<i>Epipactis palustris</i>), brookweed (<i>Samolus valerandi</i>), marsh arrowgrass, marsh cinquefoil (<i>Potentilla palustris</i>), Marsh pennywort (<i>Hydrocotyle vulgaris</i>), bogbean and water horsetail (<i>Equisetum fluviatile</i>).	200 m east
Aberhenwaun Uchaf	SINC	No information currently available.	600 m south
Onllwyn Coal Washery	SINC	A site of open mosaic on previously developed land adjacent to the Onllwyn Washery, which is largely made up of a raised area of reclaimed coal tip. The site supports over 82 plant species. Notable species include sand sedge (<i>Carex arenaria</i>), a significant indicator species of Open Mosaic Coal Tip Habitats.	700 m east
Dyffryn Cellwen	SINC	A small area of unimproved marshy grassland near Dyffryn Cellwen, which is grazed by horses. Part of the site is very wet and supports a significant population of marsh cinquefoil. Other notable species include marsh arrowgrass, whorled caraway, lesser skullcap (<i>Scutellaria minor</i>), sneezewort (<i>Achillea ptarmica</i>) and devil's-bit scabious.	800 m east
Land behind Marigold Place	SINC	No information currently available.	800 m south

Habitats

Desk Study

Local Biodiversity Record Centre Search

- 7.14.8 Other notable habitats within 1 km were returned in the desk study records from BIS. The only notable habitats within the site, are areas of ancient woodland, shown in Figure 7.4.
- 7.14.9 There were 57 areas of ancient woodland within 1 km, one of which is within the Project / Site boundary (as shown in Figure 7.4). A site investigation (Appendix 7Q, Volume 2) confirms that the PAWS within the Site Boundary has been misrecorded; as the AWS has been surface mined and backfilled with overburden shales. There are a number of other areas of recorded ancient woodland which occur within the wider Study Area, but which would not be affected by the Project.
- 7.14.10 Numerous records of notable vascular plants were returned by BIS within the search area. These included: small-flowered sticky eyebright (*Euphrasia officinalis subsp. anglica*), bluebell (*Hyacinthoides non-scripta*), globeflower (*Trollius europaeus*) and eyebright (*Euphrasia officinalis subsp. pratensis*). None of these were within the site boundary however.
- 7.14.11 Numerous records of notable bryophytes and lichen plants were returned by BIS within the search area, but not recorded within the Site. These included: the Witches' Whiskers lichen (*Usnea florida*), and lichens (*Parmotrema perlatum*, *Usnea articulate*, *Pachyphiale carneola*, *Pannaria conoplea*, *Parmeliella triptophylla*, *Phyllopsora rosei*, *Sticta canariensis (dufourii)*, *S. fuliginosa* and *S. limbata*), scarce turf moss (*Rhytidiadelphus subpinnatus*) and the varnished hook-moss (*Hamatocaulis vernicosus*).
- Review of existing ecology reports (associated with the Celtic Energy 2011 ES)**
- 7.14.12 Habitats recorded on Site during previous Extended Phase 1 Habitat surveys (undertaken to inform Celtic Energy's 2011 ES) included plantation woodland, broadleaved woodland, hedgerows, scrub, acid marshy / grassland, mire, ephemeral/short perennial, watercourses and standing water.
- 7.14.13 An Extended Phase 1 Habitat survey of the Site in 2016¹³ did not record any significant changes to habitats present on Site, except for fluctuating water levels within water bodies and the extension of the surface mine.
- 7.14.14 Grassland vegetation and areas dominated by purple moor grass (*Molinia caerulea*) were subject to NVC surveys in 2010, to inform the

2011 ES⁷. Five NVC community types were present within the Site: M3 - *Eriophorum angustifolium* bog pool community, U4b - *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland; *Holcus lanatus* – *Trifolium repens* sub-community, U5d - *Nardus stricta* – *Galium saxatile* grassland; *Calluna vulgaris* – *Danthonia decumbens* sub-community, U5 - *Nardus stricta* – *Galium saxatile* grassland and M25 - *Molinia caerulea* – *Potentilla erecta* mire.

- 7.14.15 The bryophyte and lichen survey¹⁵ undertaken in 2012 did not identify any specially protected species, but the reasonably diverse flora present would qualify as being of ‘high conservation interest’ under the assessment criteria detailed in a report by Miller *et al.* (2007) for the then Countryside Council for Wales³⁷. Notable species identified included: *Sphagnum denticulatum*, *S. inundatum*, *Stereocaulon dactylophyllum*, *Arthrorhaphis grisea*, *Cladonia cervicornis* ssp. *verticillata*, *Cladonia macrophylla*, *Cladonia ramulosa*, *Hytrachnya afrorevoluta* and *Syzygospora physciacearum*.
- 7.14.16 Restored grassland areas on Site (area immediately east of the overburden mound) were subject to NVC surveys again in 2013¹⁴. NVC communities that best fit the vegetation communities present on site included: MG 6b - *Lolium perenne*-*Cynosurus cristatus* grassland, *Anthoxanthum odoratum* subcommunity and U1e *Festuca ovina*-*Agrostis capillaris*-*Rumex acetosella* grassland, *Galium saxatile*-*Potentilla erecta* sub-community.
- 7.14.17 The Addendum to Condition 45 (of the planning application 18/1070/REM)¹⁶ describes habitats within part of the Site (comprising the overburden mound and areas immediately to the west and east), and how their nature conservation value has increased since surveys undertaken in 2010, to inform the 2011 ES. It states that ‘the overburden mound has developed an area of higher conservation interest and one that has several Section 42 Priority habitat types³⁸. These now encompass the upper third tier and its top, and the western and eastern slopes of the overburden mound, as well as the lower two south facing tiers. Juxtaposed with the western slopes of the overburden mound there is 29 ha of undisturbed land within the Site and which has been placed under management during the Site operations. This land comprises both acid grassland and mire communities which is similar to those developed on the mound and which are too listed as Section 42 habitats of conservation importance. Furthermore, the 2012 survey of the 42 ha of restored land to the east of the mound identified it also to be of high importance, also listed as Section 42 habitats, and for its Nationally rare and scarce lichen flora.

³⁷ Miller, H. S., Clarkson, B. and Smith, P. L. (2007). A Strategic Conservation Assessment of Heathland and Associated Habitats on the Coal Spoils of South Wales. CCW Science Report No. 772, 95pp.

³⁸ Under the Natural Environment and Communities Act 2006 but which is now superseded by the Environment (Wales) Act 2016. Section 7 of the Environment Act, requires a list of species and habitats of principal importance for conservation in Wales to be published.

Hence together, the undisturbed land, the overburden mound and the restored land currently provide a 120ha continuum of mosaics of highly (Section 42) important nature conservation habitats.’

Field surveys

Extended Phase 1 Habitat Survey

- 7.14.18 Forty habitat types were identified within the Site. These are described below and shown on Figure 7.5 and detailed in the Extended Phase 1 Habitat Report in Appendix 7A (Volume 2).

Broadleaved woodland – semi-natural

- 7.14.19 There were areas of semi-natural broadleaved woodland on the edges of the Site. Species compositions were broadly similar throughout the site and comprised willow (*Salix* sp.), silver birch (*Betula pendula*), hawthorn (*Crataegus monogyna*), rowan (*Sorbus acuparia*), sessile oak (*Quercus petraea*) and hazel (*Corylus avellana*). Along the access road to the Nant Helen site, there was a small area of large mature oak trees with a bluebell (*Hyacinthoides non-scripta*) understorey (TN51, Figure 5). This area of woodland is on the Ancient Woodland Inventory.

Broadleaved woodland – plantation

- 7.14.20 Small areas of semi-mature planted woodland were present throughout the Site and formed some of the previously restored mining areas. Species compositions were similar to those of the semi-natural woodlands on Site.

Coniferous woodland – plantation

- 7.14.21 A large conifer plantation was present in the north-west of the Site and extends outside of the site boundary. Larch trees (*Larix* sp.) were the dominant species, with pine (*Pinus* sp.) and spruce (*Picea* sp.) also present. The ground flora was sparse and was dominated by mosses and common wintergreen (*Pyrola minor*), which occurred extensively through the plantation. Bee orchids were identified within the woodland, but they were outside of the site boundary (TN1, Figure 5). In parts of the woodland, the understorey supported establishing broadleaved species such as oak and birch.
- 7.14.22 It is noted that part of this area is recorded as PAWS (in the Ancient Woodland Inventory³⁹), although did not support any indicator species of ancient woodland. Furthermore, a separate technical note (Appendix 7P, Volume 2) confirms that the plantation is on backfilled material following mining and extending over the area recorded as a

³⁹ <https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en>

PAWS; rather than as implied, the plantation replacing semi-natural woodland on the in situ woodland soils.

Mixed woodland – plantation

- 7.14.23 This habitat type was present in restored mining areas on Site. Species present included: larch, spruce, hazel, hawthorn, field maple (*Acer campestre*) and willow species.

Scrub – dense / continuous

- 7.14.24 Dense scrub was present around settling lagoons in the south-east of the Site. Bramble, European gorse (*Ulex europeaus*), dogwood (*Cornus sanguinea*), willow and self-seeded birch trees were present.

Scrub – scattered

- 7.14.25 Scattered willow and gorse scrub was present throughout the Site. Other species present included bramble and birch seedlings.

Broadleaved parkland / scattered trees (A3.1)

- 7.14.26 Scattered broadleaved trees were present throughout the site. Species present included English oak (*Quercus robur*), willow, hawthorn and rowan.

Coniferous parkland / scattered trees

- 7.14.27 An area of scattered larch, pine and spruce trees was present in the north of the Site.

Coniferous woodland – recently felled

- 7.14.28 A recently felled conifer plantation was present in the south-west, just outside the site boundary. It has been colonised by scrub species including bramble and willow. Stacked logs were present throughout the area.

Neutral grassland – unimproved

- 7.14.29 Areas were present alongside tracks within the Washery and comprised a moderately diverse flora including grasses: Yorkshire fog (*Holcus lanatus*), sweet vernal grass (*Anthoxanthum odoratum*), false oat-grass (*Arrhenatherum elatius*), crested dogs tail (*Cynosurus cristatus*), creeping bent (*Agrostis stolonifera*), and sedges: glaucous sedge (*Carex flacca*) and black sedge (*C. nigra*). Herbs included common yellow rattle (*Rhinanthus minor*), cowslip (*Primula veris*), hairy tare (*Vicia hirsuta*), cuckoo flower (*Cardamine pratensis*) and marsh thistle (*Cirsium palustre*). In unmanaged areas, ruderal and scrub species were present including rose-bay willowherb (*Chamerion angustifolium*), docks (*Rumex* spp), rushes (*Juncus* spp) and tufted hair grass (*Deschampsia cespitosa*), in addition to willow and hawthorn scrub, and oak saplings.

Acid grassland – semi-improved

- 7.14.30 The centre of the Site comprised short acid grassland. Species present included red fescue (*Festuca rubra*), sheep's fescue (*F. ovina*), cat's ear (*Hypochaeris radicata*), heath grass (*Danthonia decumbens*), bent grass (*Agrostis* sp.), tormentil (*Potentilla erecta*), pearly everlasting (*Anaphalis margaritacea*) and wild strawberry (*Fragaria vesca*).

Improved grassland

- 7.14.31 Grazed fields were present to the east of the Site. They were dominated by perennial rye-grass (*Lolium perenne*). Other species present included Yorkshire fog, white clover (*Trifolium repens*) and rush species.

Marsh / marshy grassland

- 7.14.32 Large areas of the site comprised grasslands dominated by rushes. Species present included hard rush (*Juncus inflexus*), soft rush (*Juncus effusus*), yarrow (*Achillea millefolium*), meadowsweet (*Filipendula ulmaria*), cock's foot (*Dactyla glomeratus*), valerian (*Valeriana* sp.), common sorrel (*Rumex acetosa*), ribwort plantain (*Plantago lanceolata*), vetch species (*Vicia* spp.), Yorkshire fog and teasel (*Dipsacus fullonum*). Some areas of this habitat were dominated by purple moor grass. These grasslands were often heavily grazed by sheep, cattle and horses.

Poor semi-improved grassland

- 7.14.33 A species-poor semi-improved grassland was present south of the improved fields. Species here included: Yorkshire-fog, soft rush, creeping thistle (*Cirsium arvense*), creeping buttercup (*Ranunculus repens*) and stitchwort (*Stellaria* sp.)

Bracken – scattered

- 7.14.34 Stands of bracken (*Pteridium aquilinum*) were present within grasslands outside the site boundary to the west.

Dry dwarf shrub heath – acid

- 7.14.35 This habitat, which occurred in the north east corner of the site and in a smaller area which was restored from previous mining activities; was dominated by common heather (*Calluna vulgaris*). Other species present included purple moor grass (*Molinia caerulea*), bilberry (*Vaccinium myrtillus*), soft rush, marsh willowherb (*Epibolium palustre*), hawthorn, Yorkshire fog, willow, bracken, foxglove, red fescue, silver birch, rowan, and *Cladonia* lichens (*Cladonia* spp.).

Wet dwarf shrub heath

- 7.14.36 The area that was restored from previous mining activities in the centre of the site comprised an area of wet heath. Common heather

and cross-leaved heather (*Erica tetralix*) were present, along with purple moor grass and sphagnum mosses (*Sphagnum* spp.).

Dry heath / acid grassland

- 7.14.37 An area of heath / acid grassland mosaic was present south of the overburden mound. Species present included: common heather and European gorse, mouse-ear-hawkweed (*Pilosella officinarum*), cowslip (*Primula veris*) and great wood-rush (*Luzula sylvatica*), with locally abundant willowherb (*Epibolium* sp.).

Acid / neutral flush

- 7.14.38 A flush was present within the field in the restored mining area and was dominated by rush species. Water was present at the time of the survey.

Fen – basin mire

- 7.14.39 A fen was present within the restored mining area, likely to be fed by the flush within the same field. Common cotton-grass (*Eriophorum angustifolium*) and common club-rush were present (*Schoenoplectus lacustris*).
- 7.14.40 Deep peat also occurs at this location, which was translocated (from the Mynydd Du peat deposit) as part of a previous habitat restoration project undertaken by Celtic Energy⁴⁰.

Swamp

- 7.14.41 A reedbed was present on site close to settling lagoons. The vegetation here was dominated by common reed (*Phragmites australis*).

Standing water

- 7.14.42 Numerous lagoons and settling ponds were present across the site. The lagoons were generally bordered by scattered scrub or ruderal vegetation with reedmace (*Typha* spp.) often present. Four ponds were present in the centre of the site in a previously restored mining area. These were bordered by rushes, reedmace and sphagnum mosses.

Running water

- 7.14.43 Various drains and streams were present throughout the Site. These were typically up to 1 m wide with beds formed of rocks. The River Dulais flows east to west, from the Washery, in the south eastern corner of the site.

Acid / neutral natural inland cliff

- 7.14.44 A sharp rock face was present in the acid grassland towards the south of the site.

Quarry

- 7.14.45 The opencast mine site comprises a large quarry to the north-west of the Site. A pool of standing water is present at the bottom of the quarry.

Spoil

- 7.14.46 Multiple spoil heaps were present on Site, comprised of coal.

Amenity grassland

- 7.14.47 A small area of amenity grassland formed an island along Onllwyn Road in Onllwyn village.

Ephemeral / short perennial

- 7.14.48 Various areas of the mine site had been colonised by ephemeral / short perennial vegetation. Colt's foot (*Tussilago farfara*) was abundant. Foxglove (*Digitalis purpurea*), mouse-ear hawkweed, and mosses were also present.

Intact hedge – species-poor

- 7.14.49 Hawthorn-dominated hedges formed borders between fields in the east of the Site.

Species-poor intact hedge with fence

- 7.14.50 A network of species-poor hedgerows was present in the restored land to the east of the Site. Hawthorn was the dominant species present. A stock fence ran along the hedges and earth banks were present on both sides.

Defunct hedge – species-poor

- 7.14.51 Species poor hedges with large gaps were present in the restored area to the east of the Site. The dominant species present was hawthorn with occasional willow.

Fence

- 7.14.52 Stock fences formed borders around fields throughout the Site.

Fence with trees

- 7.14.53 Part of the access road to Site was bordered by a fence with broadleaved trees, including oak, hazel, hawthorn and willow.

Wall

- 7.14.54 A length of brick wall was present along an access road connecting the Nant Helen site to the coal Washery.

Dry ditch

7.14.55 Dry ditches formed borders between fields to the west of the site.

Earth bank

7.14.56 Earth banks were present on both sides of species-poor hedgerows in the east of the Site.

Buildings

7.14.57 Single-storey buildings and cabins were present at the Nant Helen opencast mine site.

Bare ground

7.14.58 Areas of bare ground were present on site in the operational mining areas.

Gravel / hard standing

7.14.59 Car parks and operational areas on site comprised areas of hard standing.

Tarmac surface

7.14.60 Tarmac access roads were present at the Nant Helen opencast mine site. The site is bordered to the north and east by the A4221 and to the south by the A4109.

NVC surveys**Field Study**

7.14.61 The NVC survey identified a number of vegetation communities within the broad habitats as described above in the Extended Phase 1 Habitat survey. Those within or adjacent to the Site boundary are detailed in Table 7.9 below and in Figure 7.6 (in addition to being detailed within the NVC report in Appendix 7B, Volume 2)..

Table 7.9: NVC survey results

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
Semi-natural broad-leaved woodland	Small examples of W11 upland oak woodland, and W9 upland mixed ash woodland present near site perimeter.	This is mostly attributable to the NVC category W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland (Q 70, 81 and 82, Figure 6, are typical of this habitat, Figure 6).	W11	-
Plantation and scrub woodland	Relatively young habitats with limited botanical diversity.	<p>Some of the broad-leaved woodland shown on the habitat map comprises plantation woodland, planted as part of coal spoil restoration projects. Canopy species including field maple and grey alder (<i>Alnus incana</i>) are frequent in the plantations but would not be expected to occur in these situations naturally. Other relatively new woodland appears to have established from scrub on damp ground. For the purposes of this study these younger woodlands have been grouped together. Quadrats 53, 68 and 83 appear to have been established as plantations (See Figure 6).</p> <p>Quadrats 20 and 86 are examples of scrub woodland (which may have been planted) and Quadrat 1 is an example of young Alder woodland (Figure 6). These woodlands are all characterised by a high proportion of bramble in their understorey, and there are often remnants of grassland flora persisting in the shade (e.g. red fescue, soft rush, common bent (<i>Agrostis capillaris</i>), common spotted orchid (<i>Dactylorhiza fuchsii</i>)). They mostly lack old-woodland indicator species, although a few, such as wood sedge (<i>Carex sylvatica</i>), enchanter's nightshade (<i>Circaea lutetiana</i>) and wood avens (<i>Geum urbanum</i>) occur locally. Broad-leaved helleborine orchids (<i>Epipactis helleborine</i>) are present in many of the young woodlands on coal spoil; often in large numbers.</p> <p>These young woodlands are difficult to place within the NVC because they are in a transitional state between scrub and woodland. The plantations have a man-made canopy composition and most of the young woodlands have grassland elements in the ground flora. W21 <i>Crataegus monogyna</i> – <i>Hedera helix</i> scrub is a reasonable</p>	W21/W6	Sherard's downy rose (<i>Rosa sherardii</i>) (or a possible hybrid of it), several non-native invasive <i>Cotoneaster</i> species, particularly hollyberry cotoneaster (<i>Cotoneaster bullatus</i>), and Bird cherry (<i>Prunus pardus</i>) (probably planted).

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		match for much of the plantation woodland, while some damper scrub woodland has elements of W6 <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland (e.g. Q11).		
Conifer plantation	Relatively young and even-aged, with only a sparse ground flora. The large population of Common Wintergreen is of importance in a county context.	Conifer plantations were not sampled using quadrats, because the dense tree canopy only supports a sparse ground flora and the plant community was not expected to have much value for nature conservation value. A walk-through of the plantation at the north-west of the Study Area found that although the vegetation beneath the canopy of lodgepole pine (<i>Pinus contorta</i>), larch and sitka spruce (<i>Picea sitchensis</i>) was sparse it was of at least local value due to a very large population of common wintergreen (with many thousands of plants present). The moderately diverse range of other species in the ground flora was dominated by mosses and liverworts. Frequent seedlings of sessile oak and downy birch (<i>Betula pubescens</i>) may give an indication of the type of woodland that might develop in this area naturally.	Unclassified	Common wintergreen.
Acid grassland – unimproved (in mosaic with dry heathland)	Patchily distributed through much of the Study Area and mainly represented by U1 and U4 grassland, sometimes forming mosaics with other vegetation. Most of the acid grassland is relatively species-poor and in a heavily-grazed state.	<p>At this site acid grassland typically exists as part of a mosaic with marshy grassland and heath vegetation. It tends to occur patchily, especially on well-drained sloping ground, where succession to heath is limited by grazing. Much of it also varies in the openness of the sward, depending on slope and grazing intensity. In some cases, where it is developing on relatively young coal spoil it may also be a transitional stage that might eventually become heath.</p> <p>Much of the acid grassland within the site would be best classified semi-improved acid grassland (which is discussed later) due to the heavy grazing of sheep and likely past influences of reprofiling and soil conditioning work carried out to restore coal spoil.</p> <p>In terms of the NVC the acid grassland forming relatively open swards on dry, stony slopes and spoil heaps is best assigned to U1 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Rumex acetosella</i> grassland. It supports a relatively high proportion of annuals, bryophytes and lichens. However, it differs from the typical published U1 community as sheep’s sorrel (<i>Rumex acetosella</i>) is relatively scarce.</p>	U1/U4	-

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
Semi-improved acid grassland	Many extensive examples, especially on well-drained slopes associated with former mining activity. Including some areas with high densities of ant-hills.	<p>A high proportion of the heavily grazed, short grassland on the site is best classified as semi-improved acid grassland. Most is grazed by sheep and cattle, but a few fields near the Washery (represented by Quadrats 119, 124, 126 and 127, Figure 6) are grazed by horses. One of the features of the older semi-improved grassland is the abundance of ant-hills. For the purposes of this study the ‘ant-hill grassland’ was sampled separately from the other semi-improved acid grassland, because of its very distinct appearance. This fits the NVC community U4 <i>Festuca ovina – Agrostis capillaris – Galium saxatile</i> grassland.</p> <p>Other semi-improved acid grassland is present that also has a closed sward but does not support the same frequency of ant-hills. Some of this is of relatively recent origin (the large spoil heap where Q30 and 37 were recorded is only about 30 years old). Some appears to be on natural clay soil rather than coal spoil, and with a high proportion of sweet vernal-grass (<i>Anthoxanthum odoratum</i>), red fescue and crested dog’s-tail (<i>Cynosurus cristatus</i>) is close to MG5 semi-improved neutral grassland (e.g. Q69, 79 and 80, Figure 6).</p> <p>Much of the semi-improved grassland has patchy rushes (especially Soft Rush), and some is transitional with damp grassland (e.g. Q35, which has a high frequency of Purple Moor-grass and has affinity with M25 mire). A few areas with more prominent Mat Grass resemble U5 <i>Nardus stricta – Galium saxatile</i> grassland. However, the majority of this close-sward acid grassland still broadly conforms to the NVC community U4 <i>Festuca ovina – Agrostis capillaris – Galium saxatile</i> grassland</p>	U4 / U5	-
Neutral grassland	Mostly limited to small patches and roadside strips, mainly MG5 and MG1 but very variable in species diversity.	Unimproved and semi-improved neutral grassland at this site is mostly limited to small patches and road-side strips, where there is more base-enrichment in soils than the more prevalent acid grassland communities. In this case it is likely that the base minerals have originated from shale in coal waste or limestone associated with road building, and this is especially likely with the developing grasslands at the Washery (Quadrats 98, 99 and 100). Most are probably best classified as ‘unimproved’ neutral grassland because it is unlikely that there has been any intentional grassland improvement in most of these areas, except occasional grass cutting. There is a wide	MG5	-

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		<p>range of species in these rather fragmented habitats, reflecting the mix of acid and base minerals in the soils derived from coal spoil. In terms of the NVC the neutral grassland communities are probably closest to MG5 <i>Centaurea nigra</i> - <i>Cynosurus cristatus</i> grassland, although some patches of rougher, unmanaged grassland are closer to MG1 <i>Arrhenatherum elatius</i> grassland (which was more species-poor and not sampled). In addition to the species recorded in the quadrats, the neutral grassland also included small amounts of Restharrow, Cowslip and Hairy Tare.</p>		
<p>Sparse grassland on coal spoil and Washery sidings</p>	<p>Many variations on U1 grassland. There is a full spectrum of cover and diversity from almost bare spoil to very high diversity vegetation which includes locally uncommon species.</p>	<p>Much of the Study Area supports sparse vegetation on recently disturbed coal spoil. Similarly, the railway sidings at the Washery support sparse vegetation on the limestone ballast forming the tracks, which is also mixed with fine material from the coal. The flora supports a high proportion of annual and low-growing ruderal species, as well as early colonists more typical of heath and grassland vegetation, and seedlings of trees and scrub. Bryophytes and lichens are also locally prominent. The flora supports many species indicative of acid soils, but there are many base-loving species too. This mix is typical of coal spoil and results in a very variable, flower-rich and often high diversity flora.</p> <p>In Phase 1 habitat classification this would usually be classified as ‘ephemeral / short perennial vegetation’, although it is often not freely draining as the shale in the coal spoil breaks down into clays. It is not easy to define in terms of the NVC, probably because of the wide variation in the range of species that co-exist on the coal spoil and the presence of so many base-loving plants. The closest matches are probably U1 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Rumex acetosella</i> grassland community (Quadrats 38 and 72, Figure 6, are good examples of a typical U1 flora on coal spoil), but much of the spoil flora bears little resemblance to U1 and is probably best left unclassified.</p> <p>While the Onllwyn sidings and Washery spoil support a diverse ephemeral / short perennial community on the drier ground, there are damper areas within this area that support a higher proportion of wetland plants. Two quadrats from this</p>	<p>Unclassified</p>	<p>Small cudweed (<i>Filago minima</i>), viviparous fescue (<i>Festuca vivipara</i>) within the main site. Brown sedge (<i>Carex brunnescens</i>), eye bright (<i>Euphrasia arctica</i> ssp <i>borealis</i>) and bee orchid (<i>Ophrys apifera</i>) within the Washery.</p>

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		<p>vegetation are presented separately from the others because they are clearly developing towards a damp grassland flora rather than acid grassland or heath. Southern Marsh-orchids, Ragged Robin and a variety of sedges are a prominent feature of most of the damp areas of developing grassland at the Washery. The locally rare plant Brookweed is associated with several damp areas by the sidings. This damp, base-enriched grassland has similarities to some sand dune slack vegetation (e.g. SD15 or SD17), or forms of the M22 mire community. However, it is not a close match for any of the published NVC communities.</p>		
<p>Dry heath / Dry heath and acid mosaic</p>	<p>The Study Area supports very few examples of heath with >25% cover by dwarf shrub species that would qualify as the S7 habitat ‘upland heathland’. The largest area is in the restoration area in the centre of the site, which supports H1 heath. Heath is mostly only present as mosaic component amongst acid grassland on former colliery slopes.</p>	<p>Heath is a feature of several areas on older coal spoil, especially where it has not been limited by grazing or shaded by scrub. The largest stands of heath are in the centre of the site which supports a mix of dry heath, wet heath and marshy grassland. Dry heath is also found on steeper slopes of coal spoil, often forming a mosaic with acid grassland (e.g. in Quadrats 40, 60 and 73, Figure 6). Most stands of dry heath are dominated by common heather and readily conform to the published NVC community H1 <i>Calluna vulgaris</i> – <i>Festuca ovina</i> heath.</p>	<p>H1</p>	<p>-</p>
<p>Wet heath / marshy grassland mosaic</p>	<p>Only a few small examples present, and mostly M25 mire, grading into other habitat mosaics. All that were seen support a good range of species.</p>	<p>Wet heath is not a common feature within the site, and where it occurs it is generally a fragmentary form within a mosaic of marshy grassland and mire vegetation. The examples sampled are all dominated by purple moor-grass, and the shrubs are a relatively minor element. In terms of the NVC this type of vegetation is best classified as M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire (possibly close to the M25a <i>Erica tetralix</i> sub-community).</p>	<p>M25</p>	<p>-</p>
<p>Sphagnum-rich bog vegetation</p>	<p>Only a few small areas are present, but they all support uncommon plants and all occur in association with other diverse marshy grassland and heath.</p>	<p>Several wet areas with Cotton-grasses and <i>Sphagnum</i> mosses are present around the margins of the restored coal workings, typically only in small quantity and/ or filling ditches. The peaty substratum supports a number of species typical of upland peat bogs, including common cotton-grass, Hare’s-tail cotton-grass (<i>Eriophorum vaginatum</i>), star sedge (<i>Carex echinata</i>), white sedge (<i>Carex albida</i>), round-leaved Sundew and a good number of Sphagnum species, locally with standing water and</p>	<p>M6</p>	<p>Royal fern (centre of the site in restored peatland)</p>

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		<p>Bog Pondweed in wetter parts. A young plant of royal Fern (<i>Osmunda regalis</i>) was also found in this habitat. Only two quadrats were collected from this vegetation. Quadrat 48 is from a bog pool and Quadrat 42 is from a ditch. Both are probably forms of the published NVC community M6 <i>Carex echinata</i> - <i>Sphagnum fallax</i>/<i>S.denticulatum</i> mire.</p> <p>Only two quadrats were collected from this vegetation. Quadrat 48 is from a bog pool and Quadrat 42 (Figure 6) is from a ditch. Both are probably forms of the published NVC community M6 <i>Carex echinata</i> - <i>Sphagnum fallax</i>/<i>S.denticulatum</i> mire.</p>		
Marshy grassland	<p>Several relatively large areas are present that are dominated by Purple Moor-grass (M25 mire) and rush pasture (M23 mire). The most diverse would qualify as the S7 habitat ‘Purple Moor-grass and rush pastures’.</p> <p>An extensive area of diverse, minerotrophic M23 / M24 marshy grassland is present in wet fields with coal spoil north of the Washery.</p> <p>A high proportion of marshy grassland on recently restored farmland is species poor MG10 rush pasture with negligible value.</p>	<p>Large areas of the site comprised grasslands dominated by rushes. Species present included hard rush (<i>Juncus inflexus</i>), soft rush (<i>Juncus effusus</i>), yarrow (<i>Achillea millefolium</i>), meadowsweet (<i>Filipendula ulmaria</i>), cock’s foot (<i>Dactyla glomeratus</i>), valerian (<i>Valeriana</i> sp.), common sorrel (<i>Rumex acetosa</i>), ribwort plantain (<i>Plantago lanceolata</i>), vetch species (<i>Vicia</i> spp.), Yorkshire fog (<i>Holcus lanatus</i>) and teasel (<i>Dipsacus fullonum</i>). Some areas of this habitat were dominated by purple moor grass. These grasslands were often heavily grazed by sheep, cattle and horses.</p> <p>Some of the marshy grassland within the site is species-poor and dominated by rank Purple Moor-grass, and this is particularly found in areas where sheep have been excluded. The following examples were all ungrazed at the time of the survey, and supported tall, tussocky purple moor-grass. In terms of the NVC they are probably best described as a very species-poor M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire, although the amount of Tormentil and other associated species is much lower than the typical form of this community due to the dominance of the Purple Moor-grass.</p> <p>NB The presence of the sweet chestnut (<i>Castanea sativa</i>), pedunculate oak (<i>Quercus robur</i>) and Rowan in association with Quadrat 90 is due to the area being used for tree planting, which is presumably why sheep have been excluded.</p>	M25 (species poor – where ungrazed), M23. M22, U4, MG10	In species rich areas (in the Washery) - the flower-rich sward includes a number of locally uncommon species, such as marsh lousewort and brookweed.

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		<p>A high proportion of the extensively sheep-grazed marshy grassland in the south west of the site, and beside many of the damp ditch margins, is dominated by tall rushes, particularly sharp-flowered rush (<i>Juncus acutiflorus</i>) and Soft. Purple Moor-grass is present but not dominant. These damp grassland habitats sometimes support a moderate number of flowering herbs such as greater bird's-foot trefoil (<i>Lotus pedunculatus</i>), lesser skullcap (<i>Scutellaria minor</i>), bog stitchwort (<i>Stellaria alsine</i>) and marsh thistle (<i>Cirsium palustre</i>), and occasional ferns. Within the NVC this grassland is best categorised with M23 <i>Juncus effusus/ acutiflorus – Galium palustre</i> rush pasture.</p> <p>Rush-dominated marshy grassland on the recently restored parts of the site tend to be heavily sheep-grazed and form a mosaic with species-poor semi-improved grassland. The vegetation has a very low proportion of flowering herbs and is generally not of nature conservation significance. However, it covers a relatively large area, so several quadrats were recorded from it to describe it and help to illustrate the variation within the range of marshy grassland types on the site. It is best classified as the NVC community MG10 <i>Holcus lanatus – Juncus effusus</i> rush pasture. It differs slightly from the published community as it has a lower proportion of creeping bent and creeping buttercup, but both species are present and the difference may just be due to the young age of the grassland, the intensity of the sheep grazing or some other local factor.</p> <p>The marshy grassland flora in and around the Washery has a very different character to the other marshy grassland within the study area. This is partly because it is grazed by horses rather than sheep, and also probably because the substratum is base-rich but acidic coal waste rather than natural soil. This marshy grassland has a very diverse sward, characterised by a high proportion of sedges and wetland herbs. Rushes are prominent, but they are represented by several different dominant species. The flower-rich sward includes a number of locally uncommon species, such as marsh lousewort (<i>Pedicularis palustris</i>) and brookweed (<i>Samolus valerandi</i>). In terms of the NVC this is probably best classified as M23 <i>Juncus effusus/ acutiflorus – Galium palustre</i> mire. The base enrichment of the Washery soils also</p>		

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		adds elements of M22 <i>Juncus subnodulosus</i> – <i>Cirsium palustre</i> fen-meadow, although there was no sign of any blunt-flowered rush (<i>Juncus subnodulosus</i>) during the survey. Much of the vegetation appears to form transitions between the two communities, and also with swamp vegetation in wetter areas.		
Flush vegetation	Several small M23 flushes are present; mostly at the margins of the grazed upland areas. They support a diverse sward with locally uncommon plant species.	There are several areas of flush vegetation on gently sloping ground at the lower edges of the site, particularly at the south and west margins. In most cases the flushes are very small and the vegetation is not very different from other rush-dominated marshy grassland. The plant community probably conforms most closely to the NVC category M23 <i>Juncus effusus</i> s/ <i>acutiflorus</i> – <i>Galium palustre</i> mire. However, the flushes tend to be relatively diverse examples of this. An area of seepage from coal spoil at the Washery (Q114) appears to fit more closely with sand dune slack vegetation but this is probably just an anomaly of the unusual man-made nature of the habitat. Several locally uncommon species were found in association with flushes, including ivy-leaved bellflower (<i>Wahlenbergia hederacea</i>), whorled caraway and bog pimpernel (although no quadrats included the ivy-leaved bellflower).	M23	Several locally uncommon species were found in association with flushes, including ivy-leaved bellflower, whorled caraway and bog pimpernel (although no quadrats included the ivy-leaved bellflower).
Swamp	Several areas of swamp vegetation are present, but they are mostly too small to qualify as priority habitat. Only one small area of S4 reedbed is present, but this is relatively small and species-poor.	Dense stands of tall emergent plants forming swamp vegetation tend to be very localised within the site, and they are mostly low diversity plant communities. greater tussock-sedge (<i>Carex paniculate</i>) forms one rather uniform stand beside a small stream, and this has been sampled in Quadrat 15, Figure 6. Tall sedge (<i>Carex appressa</i>), common reed and reed canary-grass (<i>Phalaris arundinacea</i>) are patchily dominant in parts of the wet grassland north of the Washery, and a stand of lesser pond-sedge (<i>Carex acutiformis</i>) has been sampled to represent this (Q105). Bulrush was also present as small stands in several ponds (this was not sampled because it generally exists in deeper water as single-species stands). There is also a small common reed reedbed near the centre of the site. NVC classification for these very low-diversity swamp communities in this case is straightforward; the greater tussock-sedge swamp is S3 <i>Carex paniculata</i> swamp, the lesser pond-sedge stand is S7 <i>Carex acutiformis</i> swamp, the bulrush stands are S12 <i>Typha latifolia</i> swamp, and the reedbed is S4 <i>Phragmites australis</i> swamp.	S3, S7, S12 and S4	-

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		Common Reed was generally present as a single-species stand in the reedbed, but a list of associated species was obtained from the whole reed bed as a target Note (TN7), Figure 6.		
Ponds	There is an extensive network of ponds within the site. They are of man-made origin but support a variety of vegetation types, including several locally rare plant species such as floating bur-reed (<i>Sparganium angustifolium</i>).	<p>The Study Area supports a high density of ponds; many of these are relatively recent in origin, created for silt control, attenuating high flows and providing water for the mine operations. Some ponds are still very functional, with steep sides and little vegetation, but others are less intensively maintained and support a fringe of wetland plants. These typically include common spike-rush, soft rush, sharp-flowered rush, bulbous rush (<i>Juncus bulbosus</i>), lesser spearwort (<i>Ranunculus flammula</i>) and <i>Sphagnum</i> mosses. Some of the older ponds have a well-developed submerged plant community. The acidic, silty water from the coal spoil that feeds the ponds allows species typically associated with upland pools to grow, such as bog pondweed, cotton-grasses, star-sedge and the locally rare floating bur-reed.</p> <p>It is difficult to place the pond communities in terms of the NVC as any more than a rough approximation, particularly as each pond had a slightly different character, and elements of several different communities might be present in any pond. The fringing vegetation often has strong elements of M23 <i>Juncus effusus</i> / <i>acutiflorus</i> – <i>Galium palustre</i> mire, which is similar to much of the nearby marshy grassland. Ponds fringed by common spike rush could be considered to support a narrow band of S19 <i>Eleocharis palustris</i> swamp. The boggy margins of some ponds have some similarities with M29 <i>Hypericum elodes</i> – <i>Potamogeton polygonifolius</i> soakway vegetation (although there was no sign of marsh St. John’s-wort (<i>Hypericum elodes</i>)), M6 <i>Carex echinata</i> – <i>Sphagnum denticulatum</i> mire, and the OV35 <i>Lythrum portula</i> – <i>Ranunculus flammula</i> community. The aquatic plants could feasibly be described as a species-poor version of the A24 <i>Juncus bulbosus</i> community.</p>	Affinities with M23, S19, M29, M6 and OV35 and A24.	Floating bur-reed, lesser bulrush, and spiked water-milfoil (<i>Eleocharis palustris</i>).
Ditches	There are a range of ditch types within the site. Most are small with a limited wetland flora. Several larger ones support a more diverse flora.	There are numerous shallow ditches within the Study Area, but many of them appear to be almost dry most of the time and only support a species-poor rush-dominated flora. A few of the deeper, wetter ditches have a greater proportion of wetland plants, such as bulrush, water mint (<i>Mentha aquatica</i>) and common spike rush, and the flora resembles that of the pond margins. In most cases the ditches support variations of the NVC community M23 <i>Juncus effusus</i> / <i>acutiflorus</i> – <i>Galium</i>	Variation of M23, S12, S19, and Ov28	-

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		<p><i>palustre</i> mire. Some ditches support a high proportion of bulrush or common spike-rush and are closer to S12 <i>Typha latifolia</i> swamp and S19 <i>Eleocharis palustris</i> swamp respectively. Some ditches which are subject to disturbance or regular management, such as around the Washery, support open vegetation communities resembling the OV28 <i>Agrostis stolonifera</i> – <i>Ranunculus repens</i> community.</p> <p>The ditches with greatest botanical conservation significance tend to be those that are permanently wet. Some these support a high proportion of mosses (e.g. Q42, described under <i>Sphagnum</i>-rich bog vegetation, Figure 6). Some have a very high proportion of sedges and flowering herbs (e.g. TN20, which has a diverse flora including common sedge, star sedge, remote sedge (<i>Carex remota</i>), common yellow sedge (<i>C. demissa</i>) and white sedge (Figure 6).</p>		
Stream	The Afon Dulais is the only significant stream within the study area. It has a natural channel profile with a naturally meandering course and is bordered by diverse wetland vegetation and therefore meets the wildlife sites qualifying criteria.	The largest stream within the study area is the Afon Dulais which flows past the southern boundary. It flows just outside the Celtic Energy land ownership boundary so could only be examined from beside the adjacent fence (TN11). The stream is approximately 2-3m wide and flows in a meandering channel. The stream bed is stony and has localised ochre deposits. The channel is bordered by marshy grassland and flush vegetation, which is lightly grazed by sheep. Much of it appears to conform to the NVC category M23 <i>Juncus effusus</i> / <i>acutiflorus</i> – <i>Galium palustre</i> mire, but it locally grades into tall, dense stands of Meadowsweet which are classified as M27 <i>Filipendula ulmaria</i> – <i>Angelica sylvestris</i> mire.	M23 / M27	

- 7.14.62 The NVC survey did not compile a list of all NVC communities, and or map all locations of NVC communities within the Site, but rather provides further information of those habitats considered to be of nature conservation importance during the Extended Phase 1. As such the above list excludes a number of habitats present on site including improved grassland, continuous bracken and bare / recently disturbed or other man-made habitats.

Fungi

Desk study

- 7.14.63 There are two fungi records within the Site including Parrot wax-cap (*Gliophorus psittacinus*) and Persistent waxcap (*Hygrocybe acutoconica* var. *acutoconica*).

Field Study

- 7.14.64 Various wax cap mushrooms were identified on Site during the Extended Phase 1 habitat survey (TN45, TN46, TN47 & TN48, Figure 5). They were not identified to species level.
- 7.14.65 The fungi survey undertaken in 2019, identified 80 fungi species within the Study Area (and therefore not all these records were within the Site boundary). Areas 3 and 10, as shown in Figure 7.7 (and detailed within the fungi survey report, Appendix 7C, Volume 2), support the highest number and diversity of fungi, which occur on coal spoil. In addition areas 2, 6, 7, 8 and 12 have high numbers / diversity of fungi species. None of the fungi recorded during the survey are Section 7 species. However, several species, infrequently recorded in Wales including *H. substrangulata* (areas 1, 3 and 6), *H. phaeooccinea* (areas 3, 7 and 8) and *H. lacmus* (areas 2, 7 and 9). It is acknowledged in the report that fungi are generally under recorded and therefore it is difficult to determine whether these less frequently recorded species are rare or just under recorded. Furthermore, unsampled areas of the site were subject to a high level assessment, to identify their likely suitability to support fungi; and assessed as either having low or medium potential (shown in Figure 7.7).

Invertebrates

Desk study

- 7.14.66 Numerous records of notable invertebrates were returned by BIS within the search area. These included: broom moth (*Ceramica pisi*), dark barred twin-spot carpet moth (*Xanthorhoe ferrugata*), small phoenix (*Ecliptopera silaceata*), small heath (*Coenonympha pamphilus*), knot grass (*Acrionicta rumicis*), dot moth (*Melanchra persicariae*), rosy minor moth (*Litoligia literosa*), rosy rustic moth (*Hydraecia micacea*), sallow moth (*Cirrhia icteritia*), ear moth

(*Amphipoea oculea*), oak hook-tip moth (*Drepana binaria*), oblique carpet moth (*Orthonama vittata*), autumnal rustic moth (*Eugnorisma glareosa*), hedge rustic moth (*Tholera cespitis*), grayling butterfly (*Hipparchia semele*), double dart moth (*Graphiphora augur*), blood-vein moth (*Timandra comae*), buff ermine moth (*Spilosoma lutea*), garden tiger moth (*Arctia caja*), shoulder striped wainscot moth (*Leucania comma*), small square moth (*Diarsia rubi*), white ermine moth (*Spilosoma lubricipeda*), centre barred sallow (*Atethmia centrigo*), dusky brocade moth (*Mniotype adusta*), ghost moth (*Hepialus humuli*), small pearl-bordered fritillary butterfly (*Boloria selene*), small blue butterfly (*Cupido minimus*), wall, brindled beauty moth (*Lasiommata megera*), cinnabar moth (*Tyria jacobaeae*), narrow bordered bee hawk-moth (*Hemaris fuciformis*) and dingy skipper butterfly (*Erynnis tages*).

- 7.14.67 Previous invertebrate surveys undertaken for Celtic Energy's 2011 ES recorded 86 invertebrate species including one Red Data Book and one Nationally Scarce species; additionally, 92 moth species and 19 other invertebrates were recorded during the moth trap surveys, including one nationally scarce moth and 11 UK UKBAP and Section 7 species (previously Section 42 species published under the NERC Act 2006); 13 butterfly species were recorded, two of which are Section 7 species, under the Environment (Wales) Act 2016 (previously Section 42 species published under the NERC Act 2006). No adult or larval marsh fritillary were identified on Site.

Field Study

- 7.14.68 The invertebrate survey undertaken in 2019 (and detailed in Appendix 7D, Volume 2) identified 562 species within the Study Area (and therefore not all these records were within the Site boundary). Key species recorded include the scarce blue-tailed damselfly (*Ischnura pumilio*) (Near threatened), a water beetle (*Helochares punctatus*) (Near threatened), a number of rove beetles: *Hadrognathus longipalpis*, *Zyras collaris*, *Euaesthetus laeviusculus*, *Quedius planicus*, (Nationally scarce, Category A), a cryptophagid beetle (*Cryptophagus ruficornis*) (Nationally scarce), a pollen beetle (*Epuraea distincta*) (Na), a Ciid beetle (*Cis festivus*) (Nationally scarce, Category B), melandryid beetles: *Orchesia minor* and *O. micans* (Nationally scarce), a reed beetle (*Plateumaris rustica*) (Nationally Scarce, Category B), a flea beetle (*Mantura rustica*) (Nationally scarce), weevils: *Protapion filirostre* *Anthonomus brunnipennis*, *Gymnetron beccabungae*, *G. veronicae* and *Microplontus campestris*, *Pelenomus waltoni* and *Magdalis carbonaria* (Nationally scarce, Category B), six-belted clearwing moth (*Bembecia ichneumoniformis*), dingy skipper butterfly, grayling butterfly, small pearl-bordered fritillary (Section 7), small blue butterfly (Nationally scarce, Category B), double line moth (*Mythimna turca*) (Nationally scarce), banded general soldier-fly (*Stratiomys potamida*) (Nationally scarce), a hoverfly (*Microdon myrmicae*) (Nationally scarce), a theridiosomatid spider (*Theridiosoma*

gemmosum) (Nationally scarce), money spiders: *Walckenaeria kochi*, *Hypselistes jacksoni*, *Erigonella ignobilis* and *Agyneta olivacea* (Nationally scarce), triangle hammock spider (*Saaristoa firma*) (Nationally scarce).

Fish

- 7.14.69 BIS returned two records of notable fish species within the search area: Atlantic salmon (*Salmo salar*) at 600 m and European bullhead (*Cottus gobio*) at 2 km from the Site boundary.
- 7.14.70 Waterbodies such as man-made lagoon and bog pools, may support common fish species such as stickleback (*Gasterosteus aculeatus*). There are numerous streams and ditches within, and adjacent to, the Site.
- 7.14.71 These majority of these are narrow and shallow, and not well connected through the Site and as such are not considered to provide suitable habitat for any notable fish species including Atlantic salmon and bullhead. The Afon Dulais flows along the southern boundary of the Site, and partially within the boundary in the south eastern corner of the Site. It is likely that this the river supports migratory species such as Atlantic salmon and trout (*Salmo trutta*).

Amphibians

Desk study

- 7.14.72 BIS did not return any records of great crested newt from within the search area. Records of other notable amphibians including palmate newt (*Lissotriton helveticus*) at 1.7 km, common frog (*Rana temporaria*) at 700 m and common toad (*Bufo bufo*) at 200 m, from the Site boundary, were returned.
- 7.14.73 Previous invertebrate surveys undertaken for Celtic Energy's 2011 ES recorded no great crested newts. Good populations of palmate newt, common frog and common toad were recorded however.

Field Study

- 7.14.74 No records of great crested newts (GCN) were identified.
- 7.14.75 Numerous waterbodies are present within the Site, which may support GCN and other amphibians. The woodland and scrub on site may provide suitable terrestrial habitat for these species. Additionally, seven smooth / palmate newts (*Lissotriton* sp.) were recorded in a puddle during the amphibian survey (TN32, Figure 5).
- 7.14.76 No GCN were recorded during HSI and eDNA surveys undertaken in 2019 (detailed in Appendix 7E, Volume 2) and as such, they are not considered further in this ES. Common toad, common frog and

palmate and or smooth newt were recorded under refugia during reptile surveys.

Reptiles

Desk study

- 7.14.77 BIS returned records of reptiles within the search area including common lizard (*Zootoca vivipara*) at 700 m, grass snake (*Natrix helvetica*) at 1 km and slow worm (*Anguis fragilis*) at 2 km from the Site boundary.
- 7.14.78 Previous reptile surveys undertaken for Celtic Energy's 2011 ES recorded low numbers of common lizard and slow worm.

Field Study

- 7.14.79 The majority of the site provides suitable foraging habitat for common reptiles (adder (*Vipera berus*) common lizard, grass snake and slow worm) in the form of scrub, tussocky grasslands. Linear features, including pathways, roads, railways and hedgerows may provide suitable habitat for basking reptiles.
- 7.14.80 Reptile surveys undertaken in 2019 (and detailed within the reptile survey report in Appendix 7F, Volume 2), recorded a good population of common lizard and a low population of slow worm. No other reptile species were recorded within the Site, though desk study records indicate the presence of grass snake in the wider area and suitable habitat for this species occurs within the Site..

Birds (Breeding and Wintering)

Desk study

- 7.14.81 Bird records within the area provided by BIS within the Site boundary included cuckoo (*Cuculus canorus*), house sparrow (*Passer domesticus*), kestrel (*Falco tinnunculus*), lesser black-backed gull (*Larus fuscus*), red kite (*Milvus milvus*) and starling (*Sturnus vulgaris*). Records outside of the Site boundary but within the 2 km search area included hawfinch (*Coccothraustes coccothraustes*), dunnock (*Prunella modularis*), merlin (*Falco columbarius*), mistle thrush (*Turdus viscivorus*), bullfinch (*Pyrrhula pyrrhula*), common crossbill (*Loxia curvirostra*), skylark (*Alauda arvensis*), woodcock (*Scolopax rusticola*), grasshopper warbler (*Locustella naevia*), barn owl (*Tyto alba*), curlew (*Numenius arquata*), linnet (*Linaria cannabina*), mallard (*Anas platyrhynchos*), snipe (*Gallinago gallinago*), song thrush (*Turdus philomelos*), brambling (*Fringilla montifringilla*), fieldfare (*Turdus pilaris*), lapwing (*Vanellus vanellus*), redwing (*Turdus iliacus*), reed bunting (*Emberiza schoeniclus*), peregrine (*Falco peregrinus*), lesser redpoll (*Acanthis cabaret*), hen harrier (*Circus cyaneus*), jack snipe (*Lymnocyptes*

minimus), water rail (*Rallus aquaticus*), hobby (*Falco subbuteo*), honey buzzard (*Pernis apivorus*), goshawk, tree pipit (*Anthus trivialis*), nightjar (*Caprimulgus europaeus*), osprey (*Pandion haliaetus*) and short-eared owl (*Asio flammeus*).

- 7.14.82 A wider search was undertaken for Barn owl, of up to 3 km from the Site boundary. Two records exist: one from within the Site itself, which comprised incidental sightings of a barn owl in the Washery, and a pellet within one of the buildings (at NGR SN84771067); and, another sighting of a barn owl foraging within fields to the south of Main Road (approximately 150 m south of the Washery) and reports of a artificial nest box being located on a nearby house.
- 7.14.83 Previous breeding bird surveys undertaken for Celtic Energy's 2011 ES recorded no nesting honey buzzards were recorded on or adjacent to the Site. Neither goshawk nor peregrine were recorded but three old buzzard (*Buteo buteo*) nests were found. Tawny owl (*Strix aluco*) were heard during bat surveys. Twenty-one species were recorded as breeding / possibly breeding within, and adjacent to, the Site. Six of these species were Section 7 species under the Environment (Wales) Act 2016 (at the time Section 42 species, published under the Natural Environment Act (NERC) 2006) and five species were red listed on the Birds of Conservation Concern 3 (BoCC). No crepuscular species were recorded.
- 7.14.84 Previous wintering bird surveys undertaken for Celtic Energy's 2011 ES recorded common crossbill, which are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Five species listed as Section 7 species under the Environment (Wales) Act 2016 (at the time Section 42 species, published under the NERC 2006 were recorded, four of which were also red listed on BoCC 3.

Field Study

- 7.14.85 During the Extended Phase 1 survey, suitable habitat for nesting birds was identified: woodlands, hedgerows and scrub, in addition to the area of the open case mine. Marshy grassland was also assessed as being suitable for overwintering bird species. A peregrine was seen flying just south of the mine (TN28, Figure 5) during the Phase 1 survey. Skylark and cuckoo were also heard on Site (TN29, Figure 5), and a snipe (*Gallinago gallinago*) and lapwing were recorded on top of the spoil from the mine (TN30, Figure 5). During bat transect surveys, nightjars were heard and seen in recently felled woodland just outside the southern boundary of the Site (TN31, Figure 5).

Breeding Birds

- 7.14.86 Breeding bird surveys undertaken in 2019 (and detailed in Appendix 7G, Volume 2), recorded the following likely breeding species: greater Canada goose (*Branta canadensis*), mallard, common buzzard, lapwing, curlew, woodpigeon (*Columba palumbus*), Eurasian collared

dove (*Streptopelia decaocto*), cuckoo, nightjar, great spotted woodpecker (*Dendrocopos major*), jay (*Garrulus glandarius*), magpie (*Pica pica*), jackdaw (*Corvus monedula*), carrion crow (*Corvus corone*), goldcrest (*Regulus regulus*), blue tit (*Cyanistes caeruleus*), great tit (*Parus major*), coal tit (*Periparus ater*), skylark, long-tailed tit (*Aegithalos caudatus*), chiffchaff (*Phylloscopus collybita*), willow warbler (*Phylloscopus trochilus*), blackcap, garden warbler (*Sylvia borin*), whitethroat (*Sylvia communis*), grasshopper warbler, sedge warbler (*Scrocephalus schoenobaenus*), wren (*Troglodytes troglodytes*), starling, blackbird, song thrush, mistle thrush (*Turdus viscivorus*), robin (*Erithacus rubecula*), redstart (*Phoenicurus phoenicurus*), stonechat, northern wheatear (*Oenanthe oenanthe*), dunnock, house sparrow, pied wagtail (*Motacilla alba*), grey wagtail, tree pipit, meadow pipit (*Anthus pratensis*), chaffinch, bullfinch, linnet, lesser redpoll (*Carduelis cabaret*), goldfinch (*Carduelis carduelis*), siskin (*Spinus spinus*), yellowhammer (*Emberiza citrinella*) and reed bunting.

- 7.14.87 No territories of goshawk or honey-buzzard were present within the Study Area or relevant buffers. A number of observations of red kite occurred during the survey period, although no evidence of breeding within the Study Area was noted.

Wintering Birds

- 7.14.88 Wintering bird surveys undertaken in 2019 (and detailed within Appendix 7H, Volume 2) recorded the following species: greater Canada goose, mallard, grey heron (*Ardea cinerea*), red kite, buzzard, snipe, woodpigeon, kestrel, magpie, jackdaw, rook (*Corvus frugilegus*), carrion crow, raven, blue tit, great tit, skylark, wren, starling, blackbird, fieldfare, song thrush, redwing, mistle thrush, robin, stonechat, dunnock, house sparrow, pied wagtail, meadow pipit, chaffinch, linnet, goldfinch and reed bunting.

Otter

Desk study

- 7.14.89 BIS did not return any records of otter from within the search area.
- 7.14.90 Previous otter surveys undertaken for Celtic Energy's 2011 ES recorded no signs of otter.

Field Study

- 7.14.91 There are numerous watercourses on site, which may provide suitable commuting and foraging opportunities for otter. The woodlands and scrub on site may also provide suitable terrestrial habitat for this species.

- 7.14.92 During the field survey, an otter spraint and a mammal pathway were identified in a stream bed outside of the Site boundary, to the north-west of the site (TN27, Figure 5).
- 7.14.93 Riparian mammal surveys undertaken in 2019 (and detailed in Appendix 7I, Volume 2) identified a number of otter spraints along the Afon Dulais, partially within the Site boundary. No natal dens or couches were identified within the Site, although a potential couch was identified south-west of the Site, along the Afon Dulais. It is possible, due to the large territories of otter, that they may occur within the site whilst foraging or commuting, although due to the exposed nature of the site, current levels of disturbance, lack of well stocked fish ponds, this is considered likely to be infrequent.

Water Vole

Desk study

- 7.14.94 BIS did not return any records of water vole from within the search area.
- 7.14.95 Previous water vole surveys undertaken for Celtic Energy's 2011 ES recorded no signs of water vole.

Field Study

- 7.14.96 During the 2019 water vole survey (detailed in Appendix 7I, Volume 2), the majority of watercourses within the site were assessed as being unsuitable for water vole; due to their rocky beds / banks and fast flow rate, and ponds due to lack of emergent vegetation and disturbance. A few streams provided suitable habitat, although no signs of water vole were found during the surveys. As such water vole are not considered further in this ES chapter.

Bats (Roosting and Commuting/Foraging)

Desk study

- 7.14.97 Bats records within the area provided by BIS within the search area included roost and foraging records between 300 m and 2 km for the following species: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), unidentified species, Daubenton's bat (*Myotis daubentonii*), noctule bat (*Nyctalus noctula*), brown long-eared bat (*Plecotus auratus*), Myotis bat, Nathusius' pipistrelle (*P. nathusii*), Natterer's bat (*Myotis nattereri*) and lesser horseshoe bat (*Rhinolophus hipposideros*).
- 7.14.98 Previous surveys undertaken for Celtic Energy's 2011 ES recorded a single pipistrelle roost in a tree (which was removed as part of the Site's mining activities). In addition, bat boxes installed in woodland (at NGR SN80427 10771, SN 8403 10775 and SN80288 10812) as

part of mitigation in association with the 2011 EIA, supported single pipistrelle bats in two boxes in 2015, and three boxes in 2016.

- 7.14.99 Previous transect and static surveys undertaken for Celtic Energy's 2011 ES recorded seven bat species foraging and or commuting including: common pipistrelle, soprano pipistrelle, Nathusius pipistrelle, brown long-eared, noctule, serotine (*Eptesicus serotinus*) and Leisler's (*N. leislerii*). The most frequently recorded species were pipistrelles.

Field Study

Bat roosts (Tree, buildings and structures)

- 7.14.100 Various trees were identified during the field survey as having potential roosting features (TN16, TN17, TN18, TN19, TN20 & TN21, Figure 5). Additionally, three trees with bat boxes were recorded in woodland in the west of the Site (TN22, TN23 & TN24, Figure 5). A road bridge (TN25, Figure 5) and railway bridge (TN26, Figure 5) are present just outside of the Site boundary to the south-east of that Site that may also provide roosting opportunities for bats.
- 7.14.101 Bat roost surveys undertaken in 2019 (and detailed in Appendix 7J, Volume 2) recorded no roosts within any trees / buildings within the Study Area; however, 12 trees retained low-moderate roost potential following the tree climbing assessment (as shown in Figure 7.8). A potential *Pipistrellus sp.* and Natterers bat roost was identified within an old tunnel during the bat roost surveys, as well as during the 2019 transect surveys at NGR SN80138 09411.

Bat Foraging and Commuting

- 7.14.102 The Extended Phase 1 habitat survey identified suitable habitat for foraging / commuting bats: woodlands, hedgerows, and waterbodies.
- 7.14.103 During transect surveys soprano and common pipistrelle were by far the most abundantly logged species, with records from each transect, in addition noctule and *Myotis* species were recorded (bat activity report, Appendix 7N, Volume 2).
- 7.14.104 A minimum of eight bat species were recorded during static monitoring recorded (bat activity report, Appendix 7N, Volume 2), of these, common and soprano pipistrelle were by far the most commonly recorded, comprising 96.78% of all bat calls recorded (common pipistrelle - 49.36%, soprano pipistrelle - 45.97% and pipistrelle species (common or soprano) - 1.37%). *Myotis sp.* (3,824 calls representing 2.73% of all bat calls recorded) and Noctule (522 calls representing 0.37% of all bat calls recorded) were the next most commonly recorded species / species group. Of those species identified to species-level, serotine (two passes, static monitoring locations 1 and 8) and greater horseshoe bat (an Annex II species),

(five passes, static monitoring locations 3, 7, 9 and 16) provided the fewest records (bat activity report, Appendix 7N, Volume 2)).

- 7.14.105 During static monitoring, bat activity levels increased through spring to peak in May and July (no data for June) before tailing off in the autumn, quite considerably in October. Such a pattern is typical, but the large drop in bat activity in October, when bats are still active, would suggest that the Site is a 'summer' (maternity period) feeding area predominantly.
- 7.14.106 Bat activity levels (and activity by rarer species: greater horseshoe and serotine) were highest at lower elevations and / or when near to optimal foraging habitat (e.g. woodland / water), and lowest at higher elevations and / or near to busier roads (as opposed to access tracks around the site).
- 7.14.107 During transect surveys, a likely bat roost was noted at the Orange transect (Grid Reference SN80138 09411) (as detailed above under 'Bat roosts') where common and soprano pipistrelle bats are considered likely to have emerged during the June and September surveys. This likely roost consists of an old stone tunnel approximately 20 m long, and open at both ends. A Natterer's bat roost was also recorded here during inspections of buildings and structures, and is also detailed within the bat roost survey report (Appendix 7J, Volume 2).

Badger

Desk study

- 7.14.108 BIS provided a record of badger at 800 m from the Site boundary.
- 7.14.109 Previous badger surveys undertaken for Celtic Energy's 2011 ES recorded no signs of badger.

Field Study

- 7.14.110 The Site contains large areas of woodland and grasslands that offer suitable habitat for badger sett building, commuting and foraging.
- 7.14.111 During the Extended Phase 1 Habitat survey, two badger outlier setts were recorded in the east of the Site (TN3 and TN4, Figure 7.5). Badger latrines were identified in the grassland to the west of the site (TN5, Figure 5) and in the conifer plantation north of the site (TN6 & TN7, Figure 5). A badger footprint was found in the mud to the north of the site (TN8, Figure 7.5) and pathways and snuffle holes were also recorded (TN9, TN10 & TN11, Figure 7.5). Additionally, during a bat transect survey, a badger was seen crossing the site (TN12, Figure 7.5).

- 7.14.112 During the fungi survey, badger activity was recorded across the Site in the form of an outlier sett (TN13, Figure 7.5), badger hair (TN14, Figure 7.5) and foraging activity and footprints (TN15, Figure 7.5).
- 7.14.113 Badger surveys undertaken in 2019 within the Study Area (detailed in the badger survey report in Appendix 7K, Volume 2), recorded setts within the Site boundary. This included a three hole and five-hole subsidiary sett (TN3, Figure 7.5 - recorded during the Extended Phase 1 habitat survey). None of the sett entrances had any signs of currently being used by badger, but a latrine was recorded in close proximity. An outlier sett, badger latrine and signs of digging by badger were also recorded in woodland outside of the Site boundary, over 2 km to the south-west.

Hazel Dormouse

Desk study

- 7.14.114 BIS did not return any records of hazel dormouse from within the search area.
- 7.14.115 Previous hazel dormouse surveys undertaken for Celtic Energy's 2011 ES recorded no dormice or signs of dormice.

Field Study

- 7.14.116 No records of hazel dormouse were returned from the desk study and no dormice were found during previous surveys.
- 7.14.117 However, there is suitable habitat for hazel dormice on Site in the form of broadleaved woodland, scrub and hedgerows. These habitats are relatively well connected to other suitable woodland and scrub habitats in the wider area.
- 7.14.118 Despite survey effort throughout the field season, no hazel dormice or nests were recorded during nest tube / box surveys undertaken in 2019 (detailed in Appendix 7L, Volume 2). As such hazel dormouse are not considered further in this ES.

Other Notable Mammal Species

Desk study

- 7.14.119 Other notable mammal records provided by BIS within the search area included brown hare (*Lepus europaeus*), west European hedgehog (*Erinaceus europaeus*) at 800 m, polecat (*Mustela putorius*) at 1.5 km and harvest mouse (*Micromys minutus*) at 2 km, from the Site boundary.

Field Study

- 7.14.120 Mustelid pathways, footprints and scats were recorded on site during the field survey (TN33, TN34, TN35 & TN36, Figure 7.5). A brown hare was seen during the field survey outside of the site boundary to the west of the site (TN52, Figure 7.5).
- 7.14.121 Arboreal mammal surveys undertaken during 2019 (and detailed in Appendix 7M, Volume 2) recorded polecat at one of the feeding stations (captured on video from trail camera deployed for this survey). Red squirrel and pine marten were found likely to be absent from the survey area. Numerous other native UK species were recorded during this suite of surveys, including red fox, rabbit, jays, mice, and numerous bird species.

Invasive Non-native Species

Desk Study

- 7.14.122 BIS did not return any records of non-native invasive species from within the search area.

Field Study

- 7.14.123 During the Extended Phase 1 habitat survey Japanese knotweed (*Fallopia japonica*), montbretia (*Crocsmia x crocosmiiflora*), wall cotoneaster (*Cotoneaster horizontalis*) and rhododendron (*Rhododendron ponticum*) were all identified on or near the Site (TN37, TN38, TN39, TN40, TN41, TN42 & TN43, Figure 7.5). A potential American mink (*Neovision vision*) scat was recorded in a ravine on Site (TN44). These species are all listed on Schedule 9 of the WCA.
- 7.14.124 During the NVC survey (Figure 7.6), the above species were recorded in addition to Entire-leaved cotoneaster (*Cotoneaster integrifolius*) and Hollyberry cotoneaster (*Cotoneaster bullatus*).

7.15 Future Baseline

- 7.15.1 At the time of the proposed GCRE Project commencing, the Nant Helen Complementary Restoration Earthworks Project (which benefits from planning permission) is anticipated to have commenced. As such the 'Future Baseline' also needs to be considered in this Chapter. The Future Baseline will comprise the earthworks (including cutting and embankments) and associated infrastructure such as drainage and habitat restoration. The latter comprises the approved habitat restoration plan, required as part of the planning application by Celtic Energy (now approved) to mitigate for mining activities on the Nant Helen site, and the habitat creation and enhancement plan which was submitted with the Nant Helen Complementary Earthworks application, as mitigation for habitats affected by the earthworks.

- 7.15.2** The Future Baseline will therefore exclude habitats which will be lost as a result of the Nant Helen Complementary Restoration Earthworks Project, and which has been assessed within the Ecology ES Chapter prepared for that project⁴⁰. However, it will include the enhanced retained habitats and newly created habitats as set out in the Nant Helen Complementary Restoration Earthworks habitat creation and enhancement plan⁴⁰.
- 7.15.3** In summary the habitat creation and enhancement plan includes the creation of a habitat mosaic with the newly created landform, and retained adjacent habitats. Habitats will include acid grassland, enclosed pasture and broadleaved woodland, heathland, peatland-mire complex, wetland and lichen / fungi rich habitats. The diversity of habitats created will encourage the growth and establishment of increased species numbers and diversity including notable flora which occurs in the adjacent, retained habitats. Further enhancements will be facilitated through the long-term management of habitats such as conifer and broadleaved woodland, acid and marshy grassland in addition to wetland habitats.
- 7.15.4** The Future Baseline will also include additional land unaffected by the Nant Helen Complementary Restoration Earthworks (and which is also detailed in the existing baseline). In particular, land in the Washery which occurs within the GCRE Project boundary, but was excluded from the Nant Helen Complementary Restoration Earthworks Project boundary. In addition, all the ecological receptors which are retained as part of the Nant Helen Complementary Restoration Earthworks Project, and which remain in the Zone of Impact (ZOI) of the GCRE Project will be included within the Future baseline i.e. protected sites, habitats and species; which with the incorporation of mitigation as part of the Nant Helen Complementary Restoration Earthworks, will continue to occur in the site, and adjacent areas.
- 7.15.5** The Future baseline also incorporates likely changes as a result of climate change. Current and future climate baselines are outlined in Chapter 15 for key climate parameters, including winter and summer temperature and precipitation, using UK Climate Projections 2018 (UKCP18).

7.16 Evaluation of Receptors

- 7.16.1** This section evaluates the nature conservation importance of the habitats and species present in the vicinity of the GCRE Project in terms of their importance in an international, national, regional, county and local context. It includes ecological receptors within the Washery.

⁴⁰ Arup (2020) Nant Helen Complementary Earthworks Environmental Statement: Ecology Chapter

Designated Sites

- 7.16.2 Coedydd Nedd a Mellte SAC and Blaen cynon SAC are considered to be of **International value** due to their designated status.
- 7.16.3 The 12 SSSIs (Nant llech, Gors Llwyn Onwllwyn, Caeau Ton-y-Fildre, Waun Ton-y-Spyddaden Rhos Hen-Glyn-Isaf, Mynydd Du, Ogof Ffynnon Ddu, Ogof Ffynnon Ddu - Pant Mawr, Nant y Rhos, Craig y Rhiwarth, Dyffrynoedd Nedd a Mellte a Moel Penderyn and Caeau Nant y Llechau), are considered to be of **National value** due to their designated status.
- 7.16.4 The five SINCs (Gorsllwyn Meadows, Aberhenwaun Uchaf, Onllwyn Coal Washery, Dyffryn Cellwen and Land behind Marigold Place) are considered to be of **County value** due to recognition in the relevant Local Planning Authority LDP.
- 7.16.5 There are two areas of recorded ancient woodland⁴¹ within the Project boundary. The area within the project boundary, in the north-wet corner of the site, which is recorded as PAWS, is known to be plantation on backfilled material following mining and extending over an area of previously ancient woodland; rather than as implied, the plantation replacing semi-natural woodland on the in situ woodland soils (see supporting technical note in Appendix 7P, Volume 2). As such it is not PAWS. A smaller area of ancient woodland occurs within the Site boundary (adjacent to the proposed new road, in the eastern part of the site) and which was also recorded as mature broadleaved woodland during the Extended Phase 1 survey. This area of woodland is considered to be of **County value**.

Habitats

- 7.16.6 A large range of habitats occur within, and adjacent to, the Site including: Semi-improved acid grassland, neutral grassland, bracken, marshy grassland, dry heathland and acid grassland mosaic (including areas of unimproved acid grassland), improved grassland, short / ephemeral vegetation, dry heathland, poor semi-improved grassland, fen-mire, flushes, wet heathland, scrub, semi-natural broad-leaved woodland (including ancient woodland), mixed, conifer and broadleaved plantation, hedgerows (species poor), river and streams, standing water, swamp, dry and wet ditches. In addition, there are areas of quarry, bare ground, coal spoil, buildings, fences and areas of gravel and tarmac.
- 7.16.7 A summary of the habitat evaluation in terms of nature conservation significance is provided in Table 7.13 in Appendix 7O. Many of these habitats including semi-natural broadleaved woodland, heathland (dry

⁴¹ in accordance with the Ancient Woodland Inventory: <https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en>

and wet), neutral grassland, species rich marshy grassland, fen / mire, swamp, river and streams and many of the ponds are considered to qualify as Priority habitats within the 'UK Post-2010 Biodiversity Framework' Biodiversity Action Plan (UKBAP), in addition to being Section 7 habitats.

- 7.16.8 A number of these habitats are also considered to qualify the site as a SINC, in accordance with published guidelines⁴². These include those habitats above (i.e. UK BAP and Section 7 habitats) in addition to heath, acid grassland mosaic (where unimproved grassland) and flushes (which are not listed above as UKBAP / Section 7 habitats).
- 7.16.9 Qualifying SINC habitats include habitats restored further to previous mining activities i.e. the overburden mound and area to the east which support acid grassland, marshy grassland, fen-mire and heathland. These are also rich in fungi, lichen and bryophytes.
- 7.16.10 Previous surveys undertaken as part of the Celtic Energy 2011 ES, also support this conclusion, and note particularly the high value of the overburden mound (for nature conservation), and habitats immediately west and east, which comprise acid grassland, marshy grassland, heathland and mire. The addendum to Condition 45¹⁶ report also states this area supports Section 7 habitats, and meets the criteria for SINC designation.
- 7.16.11 In addition, conifer plantation habitat are considered to qualify as a SINC, due to the presence of notable vascular plant species (Common wintergreen). This is also a LBAP habitat within the Powys LBAP.
- 7.16.12 Other habitats listed within Powys LBAP and which occur in proximity to the Site include: Broadleaved woodland ('Oak woodland'), scrub ('Scrub and fridd'), marshy grassland ('Rhos pasture'), neutral grassland ('lowland meadow'), heathland ('Upland and lowland heathland'), rivers and streams ('Rivers and streams'). Mire / fen habitat could be classified as the Powys LBAP habitat 'mesotrophic waters'.
- 7.16.13 A presence of other notable plants, also contributes, to those habitats, which alone, are considered to qualify as UK BAP / Section 7 habitats, at last where these plants occur (although it is noted that the NVC survey only sampled key areas within the site, and these notable species may occur elsewhere). These include ponds (across the Site) which supported spiked water milfoil, floating bur-reed and lesser bulrush; mire, which supported royal fern, conifer plantation (in the Nant Helen part of the Site) which supported common wintergreen, species rich marshy grassland (in the Washery) which supported brookweed, and sparse grasslands (particularly within the Washery)

⁴² South Wales Wildlife Sites Partnership (2004) *Guidelines for the Selection of Wildlife Sites in South Wales*. Gwent Wildlife Trust.

which supported small cudweed, viviparous fescue, brown sedge, bee orchid and eyebright.

- 7.16.14 Examples of UK BAP / Section 7, SINC and LBAP habitats are however relatively small in extent or species poor examples. Of these habitats for example marshy grassland occurs across the site but is species poor due to agricultural improvement and unsympathetic grazing regimes; the only species-rich examples of this habitat occur to the east of the Site in the Washery.
- 7.16.15 There are still good quality examples of habitats of conservation significance importance, and which is reflected by the presence of notable plant species (and fungi, and invertebrates which is discussed later under ‘Species’), and the high number of different habitats which occur together, albeit some of lower habitat quality, indicates that the Site (excluding areas subject to disturbances from current mining activities) would qualify as SINC under the ‘Mosaic habitat’ criteria. As such, it is considered that the Site is of **County value** for its habitats. Although, it is noted that some habitats particularly areas of quarry, bare ground, coal spoil, buildings, fences and areas of gravel and tarmac would be of less than local value if considered separately.

Species

Fungi

- 7.16.16 There are several areas within and adjacent to the site, which support a high diversity of fungi species. This includes five areas (three in the Nant Helen site, and two in the Washery) which are considered to qualify as SINC habitat, based on the number of different species, and occurrence of rare species (in accordance with published guidance⁴²). The best examples of fungi habitat, which were surveyed, occur in grassland on coal spoil.
- 7.16.17 It is considered that similar habitats elsewhere on site such as the restored grassland on a large area of coal spoil in the south west corner of the Site, are likely to support similar diversity and rare species. Similarly, to those recorded, it is likely the distribution of fungi may be localised to key areas, and not spread throughout the Site.
- 7.16.18 Due to the known presence of SINC habitats, and the presence of habitats likely to be of conservation importance for fungi, being present within the Site boundary, the Site is considered to be of **County value** for fungi.

Invertebrates

- 7.16.19 The Site supports notable invertebrates including species listed in the Red data book (identified as Nationally scarce including NT, Nb, N,

NT⁴³ categories), and as species of principal importance for conservation in Wales (i.e. Section 7 species) (S7). In accordance with published guidance

- 7.16.20 These include scarce blue-tailed damselfly (NT), a water beetle (*Helochares punctatus*) (NS), a rove beetle (*Hadrognathus longipalpis*) (pNs), weevils: *Anthonomus brunnipennis* (Nb), *Pelenomus waltoni* (Nb) and *Magdalis carbonaria* (Nb), dingy skipper (S7), double line moth (Nb), a money spider (*Walckenaeria kochi*), money spiders: *Erigonella ignobilis* (NS) and *Agyneta olivacea* (NS), triangle hammock-spider (S7 / NS).
- 7.16.21 The majority of these species were recorded in small numbers in one or a few of the sampling areas within the Nant Helen site. Dingy skipper was recorded in higher numbers, and across the Nant Helen site in open, ruderal vegetation and is considered to be an important population of this butterfly.
- 7.16.22 The Washery site supported a number of other notable invertebrates including the small blue, grayling and small pearl bordered butterfly. All are S7 species.
- 7.16.23 Key habitats within the site of importance for these notable invertebrates are areas of mesotrophic mire and fen, species rich short ruderal vegetation, acidic grassland and or heathland, acidic bog and pools, streams, wood edges and dead wood, all of which occur within and adjacent to the Site.
- 7.16.24 Due to the presence of a diverse range of invertebrate species of high conservation value, including UK red data book and S7 species, the Site is considered to qualify as a SINC, at least where the above habitats occur.
- 7.16.25 The Site is assessed as being of **County value**, due to the presence of a high proportion of habitats which support a diverse invertebrate fauna including species of high conservation status.

Amphibians

- 7.16.26 There are areas suitable for common amphibians to breed within the site, in addition to a number of permanent and temporary water

⁴³ **NT** - IUCN UK Red List, Near Threatened. A taxon is Near Threatened when it has been evaluated against the IUCN criteria and does not currently qualify for Critically Endangered, Endangered or Vulnerable status, but is close to qualifying, or is likely to do so soon; **Nb** – Nationally Scarce Category B. Taxa thought to occur in between 30 and 100 10 km squares of the National Grid; **NS** – Nationally Scarce. In more recent second status reviews, the Na and Nb sub-divisions have been subsumed into a single category covering species occurring in 16 to 100 10km squares of the National Grid. Unlike the previous ‘N’ category, which covered the same range, the amalgamation does not necessarily result from inadequate information on the British distribution; **pNS** – Provisional Nationally Scarce. The rove beetles *Hadrognathus longipalpis* and *Zyras collaris* will almost certainly be accorded Nationally Scarce status in the forthcoming Review of this group, but they have no formal conservation status currently.

bodies. The site is known to support common toad, common frog, common and or smooth newt, which have been found in terrestrial habitat during reptile surveys. Common toad are a Section 7 species.

- 7.16.27 The Site is assessed as being of **Local value** to amphibian populations.

Reptiles

- 7.16.28 The mosaic of habitats within the site are suitable for common reptile species. A good population of common lizard and low population of slow-worms was recorded.
- 7.16.29 These species are Section 7 species. All native reptiles are protected under Schedule 5 of the Wildlife and Countryside Act 1981 with respect to killing, injury and sale only.
- 7.16.30 As such, the Site is considered to be of **Local value** to reptiles.

Birds

Breeding Birds

- 7.16.31 Surveys recorded an assemblage of breeding birds typically associated with the habitat surveyed. Of these species ten are included on the BoCCW 3 Red list, 12 on the BoCCW 3 Amber list with 14 being Section 7 species. One species (Common Crossbill) that is included on Schedule 1 of the Wildlife and Country 1981 (as amended) bred within the Study Area.
- 7.16.32 In addition, three of these species are listed as ‘Primary’ species, and ten as ‘Contributory’ species in published guidance⁴², and therefore the site would qualify as SINC based on the presence of these species.
- 7.16.33 One species, the nightjar (a BoCCW 3 Amber list, S7 and SINC ‘Contributory’ species) was recorded in cleared plantation woodland, south-west of the Site.
- 7.16.34 No territories of Goshawk or Honey-buzzard were present within the Study Area or relevant buffers. A number of observations of red kite occurred during the survey period, although no evidence of breeding within the Study Area was noted.
- 7.16.35 On the current survey information to date, the site is assessed as being of **County value** for breeding birds.
- 7.16.36 All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs. Some rarer species (those listed under Schedule 1 of the Act) are afforded

additional protection from disturbance when breeding. Barn owl is included on Schedule 1.

Wintering birds

- 7.16.37 The habitats present within the site have the potential to support breeding birds, which are listed as Section 7 species.
- 7.16.38 Overall, the assemblage of birds recorded is typical of habitats in upland areas of this part of Wales. No particularly rare species or large aggregations of species of conservation concern were recorded. Of the total of 34 species was recorded, three are included on the Birds BoCCW3 Red list, 12 are included on the BoCCW3 Amber list with seven being included on S7 of the Environment (Wales) Act 2016.
- 7.16.39 In addition, seven of these species are listed as ‘contributory’ species in published guidance⁴², and therefore the site would qualify as SINC based on the presence of these species.
- 7.16.40 On the current survey information to date, the site is assessed as being of **Local value** for wintering birds.

Badger

- 7.16.41 A number of badger setts have been recorded within / adjacent to the Site boundary in addition to a number of setts within the wider area. Although these badger setts appeared unused by badger at the time of the survey, evidence of badger was recorded around the site in the form of latrines and digging, as well as a badger being observed on site.
- 7.16.42 The Site is considered to be of **Less than Local value** to badgers.
- 7.16.43 Although not rare, badgers are protected under the Protection of Badgers Act 1992 for welfare reasons and therefore are a potential ecological constraint within the site.

Otter

- 7.16.44 Signs of otter have only been recorded along the Afon Dulais (outside of the Site), which flows to the south-west, from the Washery. No natal dens, and or couches were found. It is possible that they may occur within the Site, whilst commuting / foraging through the wider area but it is not considered that Otter frequently use the Site.
- 7.16.45 Otter are a Section 7 species, and they are also listed in Powy’s LBAP. Otters are fully protected by UK law under the Wildlife and Countryside Act 1981 (as amended) through inclusion in Schedule 5. Otter is also included in Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended).
- 7.16.46 The site is assessed as being of **Local value** for otter.

Bats (Roosts and Commuting / Foraging)

Bat Roosts

- 7.16.47 No confirmed bat roosts have been identified within the Site, or adjacent. One roost was identified at over 1.5 km from the Site boundary. There is potential roosting habitat within 12 trees, which occur within, and adjacent to, the Site boundary (in the Nant Helen part of the Site). The majority of buildings in the Nant Helen part of the site have negligible potential for roosting bats, and one building has low potential. In the Washery, four buildings have moderate potential for roosting bats, five have low, and 21 have negligible potential for roosting bats.
- 7.16.48 All bat species are protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended). Eight of the UK's bat species are Section 7 species. Four species including greater horseshoe are also listed as Annex II species in the Habitats Directive (also known as Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora); which requires the designation of important areas which support these species as SACs.
- 7.16.49 The Site is considered to be of **Local value** for roosting bats, due to the potential for small numbers of common roosting bat species to occur within trees and buildings. It is acknowledged however that further surveys would be required for any trees affected, and if any rare or notable bat species and or significant numbers of any roosting bats are recorded within the site during these surveys, the Site's value for bats may increase.

Bat Activity (Commuting and Foraging)

- 7.16.50 The site is used by foraging and commuting bats, with the most common species being pipistrelle bats (common and soprano species), followed by noctule and myotis species. In addition serotine (two passes), and greater horseshoe bats (five passes) were recorded.
- 7.16.51 The most commonly occurring species are common and widespread within Wales and the UK. Serotine and greater horseshoe, are rarer species in Wales however and greater horseshoe bats are also critically endangered in Europe.
- 7.16.52 On the current survey information to date, the site is assessed as being of **County value** for foraging / commuting bats, largely due to the presence of serotine and greater horseshoe bats, although it is acknowledged that this species are present infrequently and in lower numbers.
- 7.16.53 All bat species are protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of

the Conservation of Habitats and Species Regulations 2017 (as amended). Eight of the UK's bat species are listed as Section 7 species.

Other Notable Mammal Species

- 7.16.54 The presence of polecat was confirmed during surveys at a feeding station outside of the Site boundary but is considered likely to occur throughout the site, in suitable habitats such as woodland including plantations. Polecat is a UKBAP / S7 and Powys LBAP species.
- 7.16.55 Brown hare has also been recorded within the Site, which is also UKBAP / S7 and Powys LBAP species.
- 7.16.56 Species such as the West European hedgehog which are considered likely to occur within the Site, are also a S7 species.
- 7.16.57 The above species, which are of conservation significance, occur within the Site, however are likely to be present in small numbers due to the limited habitat available. It is therefore considered that the site is of **Local value** for notable mammal species.

Invasive Species

- 7.16.58 Japanese knotweed, montbretia, Cotoneaster species and rhododendron are present within and adjacent to the Site. Signs of potential use of the Site by American mink was also recorded in habitats outside of the Site boundary.
- 7.16.59 These species are listed as Schedule 9 species under the Wildlife and Countryside Act 1981 (as amended). Therefore, although not a valued receptor, the presence of invasive species is an ecological constraint within the Site and needs to be considered.

7.17 Future Baseline Evaluation

- 7.17.1 As discussed in Section 7.15, the Future Baseline will be used for the impact assessment of the GCRE Project, and which will comprise the Site as described in the Nant Helen Complementary Earthworks ES⁴⁰.
- 7.17.2 Ecological receptors of the Future Baseline, which have been affected by the Nant Helen Complementary Earthworks, will be subject to mitigation / compensatory measures including the creation and enhancement of habitats to ensure there is no overall significant impact on ecological receptors within the Site, or in connecting habitat.
- 7.17.3 As such the evaluation of these ecological receptors for the Future Baseline does not change from that of the existing baseline as described in Section 7.16.

- 7.17.4 Ecological receptors in the Washery (an additional area included in the footprint of the GCRE Project, but unaffected by the Nant Helen Complementary Earthworks Project) are included within the evaluation of the existing baseline, since this was based on the wider Study Area.
- 7.17.5 However, it is considered useful here to summarise the evaluation of ecological receptors in the Washery, and confirm whether this is different from that of the existing baseline evaluation. Although ecological receptors of the Washery are detailed in the existing baseline, they are combined with those of the Nant Helen site; and since the Washery comprises a smaller area and is located to the south-east of the Nant Helen site, it is possible that when assessed independently, they will be valued differently. This will also support a more accurate impact assessment on these ecological receptors from the GCRE development.
- 7.17.6 Additional habitats within the Washery comprise unimproved (MG5) neutral grassland, (M23) marshy grassland and the Afon Dulais (part of which occurs within the Washery). All of these habitats qualify as Section 7 / UK BAP habitats and Powys LBAP habitats, in addition to SINC habitat. As such these habitats are considered to be of **County value**.
- 7.17.7 A number of Fungi-rich grassland habitats also occur within the Washery, and as such the area would also be considered as being of **County value** for Fungi.
- 7.17.8 In terms of protected / notable species, the main interest within the Washery is the invertebrate fauna which includes the small blue and dingy skipper butterfly, the scarce blue damselfly, banded general soldier fly, rare crane fly (*T. marginella*), rare flea beetle (*M. rustica*), rare reed beetle (*P. rustica*) and rare weevil (*G. veronicae* and *B. lutulentus*). It is noted that the invertebrate fauna is of comparable quality to the Gors Llwyn SSSI, to which this part of the site is hydrologically connected. These invertebrate species are largely associated with fen / marshy grassland and short ruderal grassland / heathland communities within the Washery. The invertebrate fauna in the Washery is considered to be of **County value**.
- 7.17.9 Other notable / protected species found to occur within the Washery include foraging bats, amphibians, reptiles, breeding and wintering birds; all species recorded were common species although a small number of Section 7 breeding bird species were recorded. The habitats within the Washery are assessed as being suitable for Section 7 mammal species. The Washery is therefore considered to be of **Local value** for these protected and notable species.
- 7.17.10 It is noted that breeding birds and foraging bats were assessed as being of County value (in the existing baseline evaluation, relevant to the Nant Helen Complementary Earthworks application), when considering the presence of species of conservation significance and

abundance of these species within the overall Study Area. Due to the presence of small numbers of common and widespread species within the Washery, both breeding birds and foraging bats are assessed as being of **Local value** only in the Future Baseline.

- 7.17.11 A stand of Japanese knotweed (an INNS) is also present in the Washery, which is not a valued ecological receptor but ecological constraint that needs to be considered.

7.18 Assessment of Effects

- 7.18.1 Potential impacts of the Project on the biodiversity present (as detailed in the Ecological Baseline Section) are likely to occur in a number of ways both during construction and operation.
- 7.18.2 These impacts to biodiversity may be both temporary and permanent, and direct and indirect. The direct effects are habitat loss and severance, habitat damage / degradation from disturbance, disturbance to species and species mortality. Indirect effects are of displaced individuals on the occupancy of alternative habitat, including reduced foraging success, increased competition and predation, genetic isolation and inbreeding, which can lead to local extinctions.
- 7.18.3 A scheme wide summary of the main potential impacts is provided below.

Habitat Loss

Habitat Loss

- 7.18.4 Construction for the Project will result in some habitat loss, within the Washery site, an area of the Site which has been unaffected by the Nant Helen Complementary Restoration Earthworks Project; although this will be limited to areas of development including temporary works which require clearance within the Washery area only.
- 7.18.5 The areas within the Washery area which would require clearance to facilitate development, largely comprise buildings or other man made habitats associated with the current operations of the Washery. It is acknowledged that some of the affected habitats are notable, and support protected and notable species, which may be directly and or indirectly affected by habitat loss. Habitat loss will not affect any protected sites in the wider area.
- 7.18.6 Areas within the Nant Helen site will have been previously cleared as part of the Nant Helen Complementary Earthworks Project, and left to re-establish as grassland. As such these will be lost where new railway infrastructure is installed. The proposed road in the eastern extent of the Nant Helen site will also require further habitat loss.

- 7.18.7 The operation of the Site as a rail testing, maintenance, research, development and storage facility will result in no further habitat loss.
- 7.18.8 Opportunities exist within the Washery for small-scale habitat creation, to mitigate for habitat loss (some of which would also complement services such as drainage), in addition to the enhancement of the retained marshy grassland and acid grassland - heathland within the Washery.
- 7.18.9 There are also opportunities to create species rich habitats suitable for a variety of fauna on embankments of the tracks, which will be left as short grassland following the Nant Helen Complementary Restoration Earthworks Project.
- 7.18.10 Management and monitoring of any created / enhanced habitats will be crucial to ensure that the intended mitigation for this Project is implemented and successful.

Habitat Severance / Fragmentation

- 7.18.11 The majority of habitats within the Nant Helen site which are affected by the GCRE Project comprise newly established short grassland post construction of the Nant Helen Complementary Restoration Earthworks, particularly in the area of the proposed test tracks. No effects from habitat fragmentation are anticipated to these areas. The proposed road in the eastern part of the Nant Helen site will however be located through an area of connecting waterbodies which are proposed as part of the Nant Helen Complementary Restoration Earthworks application, and will therefore be fragmented.
- 7.18.12 Habitat loss within the Washery will be within an area largely comprised of man made habitats and small areas of semi-natural habitats (which are not considered to provide significant value as habitat corridors such as neutral grassland alongside buildings and access tracks), and therefore it is not anticipated that this will result in any habitat severance / fragmentation.
- 7.18.13 Consideration will need to be given to actions during construction which may act as a barrier to species movement (as well as during operation), which are discussed below under 'Species disturbances'. In addition, the construction of infrastructure such as fencing will need to be considered, and its long-term impacts on habitat re-establishment and species movement (i.e. during operation).
- 7.18.14 Barrier effects can lead to isolation both within and between populations of species and from specific resources vital for survival. This may also lead to indirect effects such as reduced foraging success, increased competition, genetic isolation and inbreeding, which could lead to local extinctions.
- 7.18.15 Mitigation will need to ensure that species present within the area of the Site, are able to continue to forage / commute / disperse within the

local area. In addition, it will need to ensure that no animals are trapped as a result of project infrastructure, and also that any migration routes such as those of amphibians travelling between ponds, are disrupted. Where larger species can travel across the track, it will be essential to consider collision impacts and mitigate for these appropriately. Collision risk is discussed further under ‘Species Harm and Mortality’ below.

Habitat Damage / Disturbance

- 7.18.16 Habitats adjacent to the Site, or hydrologically connected i.e. aquatic habitats, are sensitive to changes in air and water quality during both construction and operation such as pollution events from fuel and chemical spills, dust, vehicle emissions, and from sediment run-off with high sediments loads. In addition, there is the potential for habitats to be physically disturbed as a result of construction machinery.
- 7.18.17 Any wetland habitat, and those in hydrological connectivity are likely to be sensitive to changes in water quality, which may occur as a result of pollution events. Species supported by these habitats may also be affected as result.
- 7.18.18 Changes in air quality can affect habitats and vegetation, particularly those sensitive to increases in nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃), which can be absorbed directly (the relevant assessment benchmark for pollutant concentrations ‘in the air’ is referred to as a critical level) or indirectly i.e. through deposition, which affects the soil pH or causes nutrient enrichment of the soil. In addition, construction works may generate dust from the earthworks and or the use of access roads for vehicular movements.
- 7.18.19 Habitats within / adjacent to areas of construction works may be damaged through the spread of invasive, non-native species (INNS) from locations within the Site, and which would reduce the quality of any habitats where INNS newly establish. Furthermore, legal offences would result from any INNS being spread from the Site.
- 7.18.20 Any habitat damage may indirectly affect species, if this habitat becomes unavailable for foraging / commuting etc, and or directly if any species are harmed by pollution events.
- 7.18.21 The risk of pollution events and surface run-off can be reduced significantly through the implementation of best practice pollution prevention and control measures during construction and operation, together with measures such as the use of fencing to demarcate retained habitats or areas of INNS which are not to be disturbed. Where disturbance to INNS is likely, additional control measures will need to be implemented such as appropriate disposal of disturbed INNS and cleaning of machinery, equipment and footwear.

Management and monitoring post construction will also be required to ensure INNS are controlled within the Site.

Species Disturbance

- 7.18.22 Construction activities (including associated activities such as site clearance), and operation may result in effects such as noise, vibration and lighting, and which may significantly impact sensitive species such as bats, otter, badger, breeding / wintering birds etc. Disturbance from lighting, noise and vibrations are particularly significant to bats or badgers, which may abandon roosts / setts, alter foraging / commuting flight paths, and alter foraging based on a change in foraging resource. Such effects could result in reduced foraging / breeding success, and the use of critical energy reserves.
- 7.18.23 Vibration effects are anticipated during construction as a result of piling which will be required for the maintenance shed and associated buildings, ancillary and carriage wash buildings, and Overhead Line equipment (OLE) foundations. In addition the proposed acoustic barriers are likely to require piling. These could have impacts on ecological receptors, particularly sensitive species such as roosting bats and badger, and will need to be considered. Task lighting during construction is anticipated to be required during winter months only. Any lighting in winter months is considered to be less significant for some sensitive species (for example bat foraging / commuting will be significantly less at this time).
- 7.18.24 During operation permanent lighting is proposed around buildings, between sidings, platforms and access roads. There will be no lighting around either of the test tracks however. Noise levels may be significantly higher during train operation, and therefore affect sensitive species in the vicinity of the tracks; although there will be no significant vibrations during operation (see Chapter 10, Noise).

Species Mortality / Harm

- 7.18.25 Harm / mortality can occur to species as a result of construction activities including any site clearance. There is an increased risk to less mobile species, and or species that have young or which are in hibernation. Entrapment to species, for example in any open excavations created during construction (particularly if left overnight and during periods of the year when certain species are more active) may also result in harm / mortality to mobile species.
- 7.18.26 Harm / mortality could also occur during operation particularly as a result of collision with trains and traffic, although the levels of traffic are not anticipated to be significantly different to those currently associated with mining activities on the site. Collision risk is likely to be much greater at the location of the test track, due to the regular use of the tracks by trains and speed of the trains. Furthermore, where

regularly used dispersal / migration routes for species such as amphibians travelling between ponds are present, there could be increased impacts from collisions.

- 7.18.27 Collisions between animals and operating trains will be minimised to an extent through the installation of fencing around the operational site. However, it is acknowledged that standard fencing will not be a barrier to movement by smaller species such as amphibians, and others such as badgers have the ability to dig underneath such structures. Species such as bats and birds, will be at risk of collision during flight, particularly if any habitats suitable for foraging / nesting etc. establish along the railway.

7.19 Assessment of Impacts and Significance

- 7.19.1 The following sections characterise and evaluate the significance of potential impacts of the scheme on ecological receptors during the construction and operational phases.
- 7.19.2 In accordance with the CIEEM guidelines, impacts have only been assessed in relation to those features of local or greater ecological value and / or are subject to legal protection, which are also potentially vulnerable to impacts from the proposed scheme.
- 7.19.3 On this basis, the following receptors have been taken forward for detailed assessment:
- Statutory Designated Sites – Three SACs: Coedydd Nedd a Mellte, Cwm Cadlan, and Blaen Cynon, 12 SSSIs: Nant llech, Gors Llwyn Onllwyn, Caeau Ton-y-Fildre, Waun Ton-y-Spyddaden Rhos Hen-Glyn-Isaf, Mynydd Du, Ogof Ffynnon Ddu, Ogof Ffynnon Ddu - Pant Mawr, Nant y Rhos, Craig y Rhiwarth, Dyffrynoedd Nedd a Mellte a Moel Penderyn and Caeau Nant y Llechau.
 - Non-statutory Designated Sites - five SINC: Gorsllwyn Meadows, Aberhenwaun Uchaf, Onllwyn Coal Washery, Dyffryn Cellwen and Land behind Marigold Place.
 - Mosaic of habitats (qualifying the site as a SINC) –namely semi-improved acid grassland, quarry, bracken, marshy grassland. Dry heathland and acid grassland mosaic (including areas of unimproved acid grassland), unimproved neutral grassland, improved grassland, short / ephemeral vegetation, dry heathland, species-poor semi-improved grassland, fen-mire, flushes, wet heathland, scrub, semi-natural broad-leaved woodland (including ancient woodland), mixed, conifer and broadleaved plantation, hedgerows (species-poor), streams, standing water, swamp, dry and wet ditches.
 - Protected and Notable species including:
 - Fungi;

- Invertebrates;
- Amphibians;
- Reptiles;
- Breeding birds;
- Wintering birds;
- Badger;
- Otter;
- Roosting bats;
- Commuting / foraging bats;
- Notable mammals; and
- Invasive species.

7.19.4 In generic terms, the potential ecological impacts of the construction and operation of the scheme may be categorised as follows:

- Habitat loss during construction and operation;
- Habitat severance during construction and operation (and impacts to species);
- Habitat disturbance / degradation (including impacts on water quantity or quality) during construction and operation;
- Disturbance / displacement to fauna (e.g. visual impact, noise and lighting) during construction and operation; and
- Mortality / injury to fauna during construction (e.g. direct impacts during vegetation clearance, trapping within excavations, collisions with site vehicles / plant).

7.20 Assessment of Construction Impacts

Designated Sites

7.20.1 A draft Habitat Regulations Assessment (HRA) has been prepared and is detailed in Appendix 7Q. Likely effects on European sites (together with nationally and locally designated sites) are discussed below.

Habitat Loss and Disturbance

7.20.2 Potential effects could occur to nearby SACs during construction. Coedydd Nedd a Mellte SAC's closest compartment is 2.9 km from the proposed works. Cwm Cadlan is also 9.5 km from the proposed works. Impacts to European Sites are also detailed within the separate HRA included in Appendix 7Q, Volume 2.

- 7.20.3 Coedydd Nedd a Mellte SAC is designated for its important woodland and Cwm Cadlan SAC is designated for its *Molinia* meadows and alkaline fen habitat. Potential effects on these SACs are limited to [1] water quality effects: pollutants (fuel, chemical spills, dust and vehicle emissions) from construction or during operation of GCRE or high sediment load in surface water runoff from construction areas; and [2] air quality effects both during construction and operation: increases in levels of nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃), which can be absorbed directly or indirectly. The SACs are not hydrologically connected to the Project area, and therefore there is no pathway for effects from changes in water quality. Due to the distance / spatial separation of the SACs from the proposed works it is considered that any changes in air quality would not result in any effects.
- 7.20.4 The closest compartment of Blaen Cynon is located 9.2 km from the Site. It is designated for its population of marsh fritillary; a species which exists in metapopulations and are known to range up to 15 km from its primary habitat³³. Marsh fritillary are also known to be present in the Wildlife Trust Nature Reserve west of the Site (approximately 1.5 km).
- 7.20.5 Potential effects could occur to this species, if they were to occur within any habitats of the Site or adjacent habitats. Although purple moor grass and rush pasture that supports the larval foodplant devil's-bit scabious, the habitat often used by this species, is present within and adjacent to the Site, invertebrate surveys⁴⁴ found no evidence of marsh fritillary using habitats within the Site. In addition, surveys assessed the habitat present as being largely unsuitable for this species (due to being in poor condition as a result of agricultural improvement and overgrazing and having little or no growth of the larval food plant).
- 7.20.6 Therefore, it is considered unlikely that any metapopulations of marsh fritillary, associated with either the Wildlife Trust Reserve or Blaen Cynon SAC, would occur within the Site. Furthermore, although there would be a loss of habitat within the Site, this would be a very small proportion of what is available within the wider area.
- 7.20.7 Potential impacts on the Wildlife Trust Reserve, were scoped out in the Ecology Chapter of the Environmental Impact Assessment for the Nant Helen Complementary Earthworks project⁴⁰, due to the distance of the Reserve from the works. Furthermore, the future baseline of the GCRE Project has already considered the loss of habitat and habitat creation and enhancement proposed through the Nant Helen Complementary Earthworks project. As such, the potential construction impact is greatly reduced and considered to have no

⁴⁴ Further ecological details provided in the: Nant Helen Invertebrate Report; Arup (2019) prepared for Celtic Energy

likely effect on the habitats associated with the marsh fritillary within the suitable habitat in the wider area in relation to the GCRE Project.

- 7.20.8 Operational effects on the Blaen Cynon SAC are also considered to be unlikely, due to the distance at which marsh fritillary presence has been recorded (namely within the Wildlife Trust Nature Reserve) and their assumed absence from the Site.
- 7.20.9 Butterflies are known to one of the most common group of insects that are adversely affected by vehicle collision⁴⁵. As such, the habitat creation and enhancement proposed for both the Nant Helen Complementary Earthworks project and the GCRE Project have ensured that habitats within the test tracks will not be designed specifically to encourage marsh fritillary, through avoiding the planting of the larval foodplant devil's-bit scabious within or around the test tracks. This should reduce the risk of adult butterflies flying within the site and thus reducing the potential risk of fatality through collision with the trains. This considered, alongside the current assumed absence of this species within the Site, operational effects on the Blaen Cynon SAC marsh fritillary butterfly population are unlikely.
- 7.20.10 The Nant Llech SSSI (designated for its stream and associated cliff communities and woodland) and Gors Llwyn SSSI (designated for its mire and acid pasture) are hydrologically connected to the Site. As such there is the potential for these SSSIs to be adversely affected by changes in water quality during construction or operation for example as a result of pollution events and or surface run-off with a high sediment load. These SSSIs could also be affected by changes in air quality as a result of increases in dust, or pollutants such as nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃). Any adverse effect on these SSSIs would be of significance at a National level, due to their designated status. Effects would however be temporary and reversible. Pollution control measures as detailed in Section 7.23, 7.24 and 7.25, will avoid such adverse effects, and comply with UK legislation.
- 7.20.11 No direct or indirect effects on any of the others SSSIs within 5 km are anticipated due to spatial separation and absence of hydrological connections.
- 7.20.12 There are also five SINCs within 2 km of the Site, with the closest being approximately 200 m east. Any effects would be of significance at a County level, should they occur. There is significant spatial and physical separation of the Site from these SINCs, and as such no effects (either direct or indirect) are considered likely.

⁴⁵ Skórka, Piotr & Lenda, Magdalena & Moroń, Dawid & Kalarus, Konrad & Tryjanowski, Piotr. (2013). Factors affecting road mortality and the suitability of road verges for butterflies. *Biological Conservation*. 159. 148–157. 10.1016/j.biocon.2012.12.028.

- 7.20.13 There are a number of areas of ancient woodland, within 1 km of the Site. There is one area of recorded ancient woodland within the Project boundary⁴⁶. As previously discussed in Section 7.15.5 and the separate technical note (Appendix 7P, Volume 2), the area of conifer plantation to be lost as a result of the project, is not PAW due to previous mining activities in this area. Another area of confirmed ancient woodland is within the Site boundary and occurs adjacent to the existing track which is proposed for upgrades to facilitate vehicle movement during the construction and operation of GCRE. There is a risk that this habitat would be affected by air quality changes. It should not be disturbed / lost as a result of the GCRE development however.
- 7.20.14 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of good practice air and water pollution control measures and biosecurity during construction and operation.

Habitats

Habitat loss

- 7.20.15 Habitats within Nant Helen will have been cleared as part of the Nant Helen Complementary Earthworks, and likely to support newly establishing grassland on the newly created embankments and cuttings. As such these will be lost where new railway infrastructure is installed. The proposed road in the eastern extent of the Nant Helen site will also require further habitat loss however.
- 7.20.16 GCRE works will also affect habitats within the Washery. The majority of habitat loss in this part of the site will comprise buildings, hardstanding, tarmac surfaces and spoil (man-made habitats created for the Washery operations). Other habitats likely to be lost, due to being in the footprint of the development will include unimproved neutral grassland, semi-improved acid grassland, marshy grassland, scrub, ponds, ditches and mixed conifer woodland. Habitat loss will be limited to very small areas of these habitats however.
- 7.20.17 Some of the habitats affected are of conservation significance and support notable vascular plant species including:
- Marshy grassland (Marsh lousewort and brookweed);
 - Unimproved neutral grassland;
 - Semi-improved acid grassland;
 - Semi-improved acid grassland – dry heath mosaic;

⁴⁶ in accordance with the Ancient Woodland Inventory: <https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en>

- Standing water (ponds, ditches and swamp, with ponds likely to support lesser bur-reed); and
- Short perennial vegetation (with small cudweed, viviparous fescue, brown sedge, and eyebright sp.).

7.20.18 In addition, habitats within the Nant Helen site will be affected by the construction of a new road in the eastern part of the Site. Habitats affected will include newly created acid grassland, post construction of the Nant Helen Complementary Restoration Earthworks, and new waterbodies (as shown in Figure 7.9 of the Nant Helen Complementary Restoration Earthworks ES Chapter⁴⁰). Habitats which form part of the Site's Future Baseline.

7.20.19 Due to the collective value of habitats within the Site, effects of habitat loss and fragmentation would be significant at a **County level**, in the absence of mitigation.

7.20.20 The operation of the Site as a rail testing, maintenance, research, development and storage facility will result in no further habitat loss.

7.20.21 Mitigation measures to address the habitat loss are detailed in Section 7.23, 7.24, and 7.25. Opportunities exist within the Washery for small-scale habitat creation within the Washery, to mitigate for habitat loss (some of which would also complement services such as drainage), in addition to enhancements of the retained marshy grassland and acid grassland - heathland within the Washery. New habitats proposed as part of the Nant Helen Complementary Restoration Earthworks Project, such as waterbodies, and which form part of the Future Baseline, will be mitigated for through the re-siting of this habitat to avoid impacts from the new road. In addition, embankments created around the tracks, will provide additional areas for the establishment of acid grassland, and lichen and heathland communities which will mitigate for the loss of these habitats within the Nant Helen Site (as a result of the new track), and the Washery Site. Management and monitoring of any created / enhanced habitats will be crucial to ensure that the intended mitigation for this Project is implemented.

7.20.22 This mitigation / habitat creation will complement the habitat creation and enhancement plan, provided as part of the Nant Helen Complementary Earthworks⁴⁰.

Habitat Severance / Fragmentation

7.20.23 The majority of habitats within the Nant Helen site which are affected by the GCRE Project comprise newly established short grassland post construction of the Nant Helen Complementary Restoration Earthworks, particularly in the area of the proposed test tracks. No effects from habitat fragmentation are anticipated to these areas. The proposed road in the eastern part of the Nant Helen site will however be located through an area of connecting waterbodies which are

proposed as part of the Nant Helen Complementary Restoration Earthworks application, and will therefore be fragmented.

- 7.20.24 In addition, the development within the Nant Helen site will include infrastructure which will act as an additional barrier, to the establishment of habitats and movement of species including high palisade fencing (during construction and operation).
- 7.20.25 Species such as otter, badger, reptiles and Section 7 mammals, have been recorded within and adjacent to the Site, and are known to use habitat corridors present, for foraging / commuting, migrating and or dispersing to finding new territories, and may therefore be affected by the severance / fragmentation of habitats. Disturbances during construction and operation such as noise, lighting and vibration may also act as barriers to species movement within and across the Site. Specific impacts to species as a result of habitat severance / fragmentation are considered in the relevant species sections below.
- 7.20.26 Habitat loss within the Washery is within an area largely comprised of man made habitats and small areas of semi-natural habitats (which are not considered to provide significant value as habitat corridors such as neutral grassland alongside buildings and access tracks), and therefore it is not anticipated that this will result in any habitat severance / fragmentation.
- 7.20.27 As detailed above under ‘habitat loss’ new habitats proposed as part of the Nant Helen Complementary Restoration Earthworks Project, such as waterbodies, and which form part of the Future Baseline, will be mitigated for through the re-siting of this habitat to avoid impacts from the new road.
- 7.20.28 Effects of habitat severance and fragmentation are not considered to be significant. Impacts to species from barrier effects are discussed in the relevant sections below.

Habitat Disturbance / Degradation

- 7.20.29 Construction and associated site clearance could result in disturbance to habitats adjacent to the Site boundary. Habitats may be physically disturbed for example by construction machinery / vehicles or affected by changes in air and or water quality for example from pollution events, surface run-off, vehicle emissions and dust. Changes in air and water quality may also occur during operation, particularly as a result of train operation within the Site (see Chapter 14; Air Quality).
- 7.20.30 Connecting wetland habitats would be particularly sensitive to changes in water quality, which may occur as a result of pollution events or surface run-off. This includes protected sites such as the Nant Llech SSSI and Gors Llywn SSSI, in addition to watercourses, including the Afon Dulais, Afon Llech and Afon Tawe and their tributaries, and notable wetland habitats within the Site such as ponds, wet heathland, marshy grassland and mire. This would also have an

adverse effect on any notable species that these habitats support. Terrestrial habitats in proximity to construction / operational activities such as ancient woodland, marshy grassland, acid grassland, heathland and peatland – bog habitats could also be affected by changes in air quality, depending on the extent of air pollution, and proximity of these habitats from the source.

- 7.20.31 As such standard good practice air and water pollution control measures will be required to ensure adjacent habitats and associated species are not adversely affected by any pollution.
- 7.20.32 Disturbances and degradation of habitats also has the potential to impact on species present within the Site, and adjacent areas. Specific impacts to species are considered in the relevant species sections below.
- 7.20.33 Japanese knotweed is present at one location within the Washery, and therefore there is the potential risk that this will be disturbed and spread within / from the Site.
- 7.20.34 In the absence of mitigation, effects of disturbance on habitats of conservation significance would be significant at a **County level**, however they are likely to be of low magnitude and reversible.
- 7.20.35 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of good practice air and water pollution control measures and biosecurity during construction and operation.

Fungi

Habitat Loss and Disturbance

- 7.20.36 As previously discussed under ‘Habitats’ in section 7.20.13, the GCRE Project area within Nant Helen site will support newly establishing grassland, and therefore no fungi habitat will be affected. Construction and associated site clearance within the Washery (which will not be affected by the Nant Helen Complementary Earthworks) will result in the loss and or disturbance of small areas of valuable fungi habitats.
- 7.20.37 Two areas of confirmed ‘county’ importance for fungi and one area of ‘local’ importance, are within the Site boundary in the Washery area. Only one area of County importance and the area of local importance will be within the development footprint however.
- 7.20.38 The partial loss / disturbance of the fungi habitat is considered to be significant at a **County level**, and smaller area of local importance at a **Local level**.
- 7.20.39 Habitat loss will be permanent since the affected areas will support development which will remain in perpetuity. It is acknowledged

however that construction works will involve the re-use of materials including coal spoil within the Site, therefore providing a suitable substrate for the establishment of a diverse fungi assemblages at other locations within the Washery. Furthermore embankments of the test track, will provide a large area for the establishment of acid grassland, which will also be suitable habitat for fungi to establish. However, whilst fungi habitats will re-establish, it is likely to take a long period of time (approximately 20-30 years), and mitigation measures should therefore also be put in place to allow for this such as a long-term management and monitoring plan.

- 7.20.40 Mitigation measures to address the habitat loss / disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include habitat creation and long-term management and monitoring.

Invertebrates

Habitat Loss

Habitat Loss

- 7.20.41 Newly establishing grassland within the Nant Helen site, and which will be affected during GCRE construction, are not considered likely to support notable invertebrates. However, construction within the Washery site will result in the small-scale loss of habitats, which are of county importance to invertebrates due to supporting rare / notable species namely: the small blue and dingy skipper butterfly, the scarce blue damselfly, banded general soldier fly, rare crane fly (*T. marginella*), rare flea beetle (*M. rustica*), rare reed beetle (*P. rustica*) and rare weevil (*G. veronicae* and *B. lutulentus*).
- 7.20.42 Habitats of note for invertebrates, within the development footprint in the Washery site and which will be lost as a result of construction include marshy grassland, species-rich ruderal grassland and heathland. This habitat loss will be permanent due to the development remaining in perpetuity, but will be small-scale.
- 7.20.43 In the absence of mitigation, the loss / degradation of notable invertebrate habitat is considered to be significant at a **County level**.
- 7.20.44 As discussed under ‘Habitats’ in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery, as well as enhancements of existing habitats. Newly created habitats, providing they meet the specific species-requirements, may be rapidly utilised by notable invertebrates present within the Site, and adjoining habitats as they mature. Embankments of the test track will provide grassland habitat, which if subject to the appropriate management will provide a large extent of suitable habitat for some of the invertebrates using similar habitat in the Washery. Furthermore, habitat creation and enhancements to be undertaken as part of the Nant Helen Complementary Restoration Earthworks (i.e. creation of woodland

and wetland habitats), which aim to diversify habitats for the benefit of invertebrates within the Nant Helen part of the Site, will also benefit species present in the Washery.

- 7.20.45 Mitigation measures to address the habitat loss are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include habitat creation and enhancement in addition to long-term management and monitoring.

Habitat Fragmentation / Severance

- 7.20.46 No effects from habitat fragmentation / severance are anticipated on invertebrates as a result of the proposed construction works for GCRE.
- 7.20.47 Habitat loss within the Nant Helen site will not result in any fragmentation of key habitat corridors since the habitats within the site boundary will comprise newly established short grassland post construction of the Nant Helen Complementary Restoration Earthworks.
- 7.20.48 Habitat loss within the Washery is within an area largely comprised of man made habitats and small areas of semi-natural habitats (which are not considered to provide significant value as habitat corridors such as neutral grassland alongside buildings and access tracks), and therefore it is not anticipated that this will result in any habitat severance / fragmentation.

Habitat Disturbance / degradation

- 7.20.49 Habitats important for notable invertebrates may also be adversely affected if construction / operation activities were to damage / degrade habitats.
- 7.20.50 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that invertebrate habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.51 In the absence of mitigation, effects of disturbance on populations of notable invertebrates would be significant at a **County level**, however are likely to be of low magnitude and reversible.
- 7.20.52 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Harm / Mortality

- 7.20.53 As discussed under 'Protected Sites' in paragraph 7.20.8 there are potential effects of harm / mortality on some of the notable invertebrates occurring within the Site, in particular butterflies due to collision risk with trains during operation of the GCRE Project.

Mitigation planting for the Nant Helen Compensatory Restoration Earthworks project will ensure that habitats within the test tracks will not be designed specifically to encourage marsh fritillary, through avoiding the planting of the larval foodplant devil's-bit scabious within or around the test tracks. This should reduce the risk of adult butterflies flying into / from the Site and thus reducing the potential risk of fatality through collision with the trains.

- 7.20.54 Populations of no other butterfly species are considered to be at significant risk in the area of Nant Helen. In the Washery a number of notable butterflies are known to occur, however the collision risk is considered to be insignificant since in this part of the operational site, trains will not be travelling at high speeds.

Amphibians

Habitat Loss

- 7.20.55 Construction and associated site clearance within the Washery, which will be required for the GCRE Project, will result in the small-scale loss of amphibian habitat, including aquatic (breeding) and terrestrial (resting, foraging and hibernation) habitat. In particular these will comprise: a small number of ponds and ditches for breeding, and small areas of connecting terrestrial habitat including marshy grassland, acid grassland / heathland and scrub. In addition there will be the loss of newly established grassland in the area of the new test tracks in the Nant Helen site, where embankments and cuttings have been formed as result of the Nant Helen Complementary Earthworks Project, and new waterbodies will be lost as a result of the new road in the eastern part of the Nant Helen site. These areas are not considered likely to support notable amphibian species or populations. No further clearance within the Site will be required during operation.
- 7.20.56 It is acknowledged that the GCRE development in the Washery will be largely within areas of existing development and man-made habitats, and therefore loss of amphibian habitats is considered to be at a small-scale and of low magnitude. This is also considering that large areas of amphibian habitat occur in the wider area. As such any habitat loss is not considered to have a significant impact on local amphibian populations. Any habitat loss will be permanent however due to the development remaining in perpetuity.
- 7.20.57 As discussed under 'Habitats' in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery, as well as enhancement of existing habitats. Newly created habitats, providing they meet the specific species-requirements, are likely however to be rapidly utilised by amphibians present within the Site, and adjoining habitats. The loss of new habitats proposed as part of the Nant Helen Complementary Restoration Earthworks Project, such as waterbodies, and which form part of the Future Baseline, will be mitigated for

through the re-siting of this habitat to avoid impacts from the new road. Habitat creation and enhancements to be undertaken as part of the Nant Helen Complementary Restoratio Earthworks (i.e. creation of woodland and wetland habitats), which aim to diversify habitats for the benefit of amphibians within the Nant Helen part of the Site, will also benefit species present in the Washery

- 7.20.58 Mitigation measures to address habitat loss are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include habitat creation and enhancement in addition to long-term management and monitoring.

Habitat Fragmentation / Severance

- 7.20.59 No impacts to local amphibian populations, from habitat fragmentation / severance within the Washery, are considered likely as a result of the GCRE construction or operation, since the development footprint is similar to the existing operational Washery.
- 7.20.60 As detailed above under ‘habitat loss’ new habitats proposed as part of the Nant Helen Complementary Restoration Earthworks Project, such as waterbodies, and which form part of the Future Baseline, will be fragmented by the new road in the eastern part of the Nant Helen Site. This habitat loss will be mitigated for through the re-siting of this habitat to avoid impacts from the new road.
- 7.20.61 The test tracks within the Nant Helen site, during construction will create a more significant barrier to movement by amphibian species, this will be a temporary effect however habitats either side of the tracks will provide suitable breeding and terrestrial habitat, of a sufficient extent to support local amphibian populations. Post construction and during operation of GCRE, the tracks are not considered to be a barrier to amphibian movement, although as discussed below common toad, being less agile, may find it more difficult to cross and therefore be at a higher mortality risk from train collision⁴⁷.
- 7.20.62 As such adverse effects on amphibian populations from habitat fragmentation are not considered to be significant at population levels.

Habitat Disturbance / degradation

- 7.20.63 Habitats important for amphibians may also be adversely affected if construction / operation activities where to damage / degrade habitats.
- 7.20.64 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that amphibian habitats could be physically disturbed for example by machinery, during construction and potentially during operation.

⁴⁷ Budzic, K. A., & Budzic, K. M. (2014). A preliminary report of amphibian mortality patterns on railways. *Acta Herpetologica*, 9, 103–107

- 7.20.65 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local amphibian populations.
- 7.20.66 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Harm / Mortality

- 7.20.67 It is considered possible that construction activities would result in harm / mortality to common amphibians largely during any vegetation clearance, which will be required. This will be limited to small-scale clearance within the Washery only.
- 7.20.68 During operation, there is the risk of amphibian mortality as a result of collision with trains which will be in operation on the GCRE test tracks. There is also the potential risk fo collision with vehicles, to a lesser extent, during operation. Although effects on amphibians have not been well-studied, evidence has shown that mortality rates from train collision is high in amphibians, and the highest proportion of deaths are of common toad and common frog⁴⁸. Highest mortality rates are also associated with peaks of activity such as migration (particularly in spring). It is likely that high rates of amphibian mortality on roads associated with periods of high rainfall⁴⁹, would also occur on high-speed railway lines. Common toad are considered likely to be more susceptible to mortality from train due to their limited agility⁴⁷.
- 7.20.69 Evidence from previous surveys undertaken suggest a low amphibian population exists within the Site. As discussed above, the test tracks will not fragment likely corridors of dispersal / migration by amphibians such as between waterbodies, and the re-siting of new waterbodies within the Nant Helen site will mitigate for potential fragmentation by the new road. In addition, habitat creation to be undertaken as part of the Nant Helen Complementary Restoration Earthworks, will include the creation of waterbodies and surrounding terrestrial habitat either side of the test tracks, which will provide sufficient habitat for small populations of amphibians to exist and reduce the need to cross the tracks, and therefore risk collision with trains. It is also acknowledged, that the risk of collision with train traffic is likely to be lower than with road traffic, due to the lower number of trains travelling at one location on a track. Potential

⁴⁸ Santos S.M., Carvalho F., Mira A. (2017) Current Knowledge on Wildlife Mortality in Railways. In: Borda-de-Água L., Barrientos R., Beja P., Pereira H. (eds) *Railway Ecology*. Springer, Cham

⁴⁹ Heske, E. J. (2015). Blood on the tracks: Track mortality and scavenging rate in urban nature preserves. *Urban Naturalist*, 4, 1–13.

collision with vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently.

- 7.20.70 As such adverse effects on amphibian populations from harm / mortality are not considered to be significant at population levels.

Reptiles

Habitat Loss

- 7.20.71 Construction and associated site clearance, which will be required for the GCRE Project, will result in the small scale loss of suitable reptile habitat within the Washery including small areas of heathland, scrub, marshy grassland and short ruderal grassland. In addition there will be the loss of newly established grassland in the area of the Nant Helen site, where embankments and cuttings have been formed as result of the Nant Helen Complementary Restoration Earthworks Project. These areas are not considered likely to support significant numbers of reptiles. There will be no further habitat loss during operation.
- 7.20.72 It is acknowledged that the GCRE development in the Washery will be largely within areas of existing development and man-made habitats, and therefore loss of reptile habitats is considered to be at a small-scale and of low magnitude. This is also considering that large areas of reptile habitat occur in the wider area. Furthermore, habitat creation and enhancements to be undertaken as part of the Nant Helen Complementary Earthworks (i.e. creation of woodland and wetland habitats), which aim to diversify habitats for the benefit of reptiles within the Nant Helen part of the Site, will also benefit species present in the Washery. As such any habitat loss is not considered to have a significant impact on local reptile populations. Any habitat loss will be permanent however due to the development remaining in perpetuity.
- 7.20.73 As discussed under ‘Habitats’ in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery, as well as enhancement of existing habitats. Newly created habitats, providing they meet the specific species-requirements, are likely however to be rapidly utilised by reptiles present within the Site, and adjoining habitats. Furthermore track embankments created as part of Nant Helen Complementary earthworks, which do not support GCRE railway infrastructure are likely to provide additional habitat for reptiles.
- 7.20.74 Mitigation measures to address habitat loss are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include habitat creation and enhancement in addition to long-term management and monitoring.

Habitat Fragmentation / Severance

- 7.20.75 No impacts to local reptile populations, from habitat fragmentation / severance within the Washery, are considered likely as a result of the GCRE construction or operation, since the development footprint is similar to the existing operational Washery.
- 7.20.76 The test tracks within the Nant Helen site, during construction will create a more significant barrier to movement by reptile species, this will be a temporary effect and habitats either side of the tracks will support suitable breeding and terrestrial habitat for local reptile populations. Post construction and during operation of GCRE, the tracks within these test tracks are not considered to be a barrier to reptile movement, although as discussed below there is a mortality risk associated with animals crossing trainlines.
- 7.20.77 As such adverse effects on reptiles populations from habitat fragmentation are not considered to be significant at population levels.

Habitat Disturbance / degradation

- 7.20.78 Habitats important for reptiles may also be adversely affected if construction / operation activities where to damage / degrade habitats.
- 7.20.79 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that reptile habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.80 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local amphibian populations.
- 7.20.81 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Harm / Mortality

- 7.20.82 It is considered possible that construction activities would result in harm / mortality to common reptiles largely during any vegetation clearance, which will be required. This will be limited to small-scale clearance within the Washery only.
- 7.20.83 During operation, there is the small risk of reptile mortality as a result of collision with high speed trains which will be in operation at Nant Helen. There is also the potential risk of collision with vehicles within the Site during operation. Impacts on reptile mortality from collision

with trains, has not been well researched and available articles⁵⁰⁵¹ do not relate to comparable species present on the Site. Similar studies on impacts to amphibians⁴⁷ have however indicated that more agile species are at a lower risk of collision, and this is thought to be the case for species on site including common lizard and common slow worm, which could easily and quickly travel across the tracks.

7.20.84 Habitat creation to be undertaken as part of the Nant Helen Complementary Restoration Earthworks, will include the creation of sufficient habitat for populations of reptiles to exist and reduce the need to cross the tracks, and therefore risk collision with trains. It is also acknowledged, that the risk of collision with train traffic is likely to be lower than with road traffic, due to the lower number of trains travelling at one location on a track. Potential collision with vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently.

7.20.85 Adverse effects on reptile populations as a result of harm / mortality are considered to to of low magnitude, and not significant.

Birds

Breeding and Wintering birds

Habitat Loss / Fragmentation

7.20.86 Site clearance, required for the GCRE Project, will include small-scale habitat loss in the Washery site. This will comprise small areas of habitats such as marshy grassland, scrub and trees which provide nesting and overwintering habitat for a range of bird species, some of which are notable species although are known to be common and widespread within the local area. In addition there will be the loss of newly established grassland and waterbodies in the area of the Nant Helen site, proposed as part of the Nant Helen Complementary Restoration Earthworks Project. These areas are not considered likely to support notable bird species or significant numbers / population size. There will be no further habitat loss during operation.

7.20.87 Retained habitats in the wider site, as well as newly created and enhanced habitats provided as part of the Nant Helen Complementary Restoration Earthworks Project will provide sufficient habitat for birds present within the area to continue to nest and overwinter within the Site, and local area. In addition, as described under 'Habitats' in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery part of the Site as part of the GCRE Project, and

⁵⁰ Kornilev, Y., Price, S., & Dorcas, M. (2006). Between a rock and a hard place: Responses of eastern box turtles (*Terrapene carolina*) when trapped between railroad tracks. *Herpetological Reviews*, 37, 145–148.

⁵¹ S. C. V. (1996). *Mortalidad de vertebrados en líneas de ferrocarril*. Documentos Técnicos de Conservación SCV 1, Sociedad Conservación Vertebrados, Madrid.

there will be large-scale habitat creation as part of the Nant Helen Complementary Restoration Earthworks Project. In addition, new waterbodies proposed as part of the Nant Helen Complementary Restoration Earthworks will be re-sited to avoid being affected by the new road.

- 7.20.88 The GCRE development is not anticipated to create any barriers to movement by birds, as a result of habitat loss, additional infrastructure or train operation. However, as discussed below under ‘Harm and Mortality’ there is a mortality risk associated with train collision during the operation of GCRE.
- 7.20.89 Adverse effects on local bird populations from habitat loss or fragmentation are not considered to be significant.
- 7.20.90 Recommended mitigation for birds to address habitat loss is detailed in Section 7.23, 7.24 and 7.25.

Habitat Disturbance / degradation

- 7.20.91 Habitats important for nesting / wintering may also be adversely affected if construction / operation activities were to damage / degrade habitats.
- 7.20.92 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that bird habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.93 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local bird populations.
- 7.20.94 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Disturbance

- 7.20.95 Disturbance during construction, for example as a result of lighting or vibrations (from piling activities) and noise have the potential to result in displacement of breeding / wintering birds within the Site, and in adjacent habitats.
- 7.20.96 Some of the breeding birds recorded within the Site, including lapwing and curlew, both species of conservation significance, are known to be particularly sensitive to disturbance. Displacement of breeding birds is likely to result in abandonment of nests / young, and therefore reduced breeding success.

- 7.20.97 During operation, there is also the potential for disturbances from the activities associated with the proposed GCRE Project, in particular noise associated with the operation of trains on the test track within Nant Helen as well as from the lighting of buildings (largely within the Washery), access tracks and OLE foundations.
- 7.20.98 Any birds within the Site that may be displaced as a result of disturbances, would be able to continue to use suitable habitats in the wider area however.
- 7.20.99 Common crossbill, has been recorded breeding within the Site, and barn owl, potentially breeding nearby the Site, are Schedule 1 species and afforded additional protection against disturbance whilst breeding.
- 7.20.100 Recommended mitigation for breeding / wintering birds is detailed in Section 7.23, 7.24 and 7.25 to ensure compliance with UK and European legislation.

Harm / Mortality

- 7.20.101 Construction activities particularly vegetation clearance may result in harm or mortality to breeding birds. Breeding birds will be particularly susceptible during vegetation clearance due to being less mobile, and either sitting on eggs or with young.
- 7.20.102 During operation, there is a risk of bird mortality as a result of collision with trains which will be in operation at Nant Helen. There is also the risk of collision with vehicles on Site, to a lesser extent, during operation. Effects on birds as a result of train collisions have not been well studied⁴⁸, but available evidence indicates that low-flying species, particularly those that are less agile in flight such as barn owl, would be more susceptible to collision (as reported in studies of effects on barn owls by roads⁵²) as well as species which are likely to perch on railway infrastructure such as raptors⁴⁸. It is acknowledged, however, that the risk of collision with train traffic is likely to be lower than with road / highway traffic, due to the lower number of trains travelling at one location on a track. Potential collision with vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently. The risk of collision with OLE, and associated electrocution is considered unlikely to be significant, since the Site doesn't support any bird species prone to collision with such static structures.
- 7.20.103 Barn owl are known to be present in habitats adjacent to the Site, and have previously been recorded within the Washery. Other species, considered to be of greater risk to collision i.e. raptors such as buzzard, are common and widespread species within the local area.

⁵²Shawyer, C. and Dixon, N. (1999) Impacts of Roads on Barn owl *Tyto alba* populations. Highways Agency.

- 7.20.104 Collision impacts to species of conservation significance such as barn owl, will be of greater significance compared to more common and widespread species.
- 7.20.105 Effects of harm / mortality on barn owl would be significant at a **County level**. Due to the low risk from collision to other bird species within the Site, and being largely common and widespread, any effects of harm / mortality on these bird populations is not considered to be significant.
- 7.20.106 It is an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs.
- 7.20.107 Mitigation measures are recommended in Section 7.23, 7.24 and 7.25, which will also ensure compliance within UK legislation.

Badger

Habitat Loss / fragmentation

- 7.20.108 Two badger (outlier) setts occur within the north eastern part of the Site, between the larger and smaller test tracks, which are outside of the Development footprint, and should therefore not be affected by habitat loss. Construction and associated site clearance required for GCRE will be within the Washery site where no badger setts have been recorded, although suitable foraging habitats are present. In addition, there will be site clearance in newly established areas of grassland on embankments / cuttings formed by the Nant Helen Complementary Restoration Earthworks. These are unlikely to support setts, but may potentially provide foraging habitat to badgers in the area. No further clearance will be required during operation.
- 7.20.109 The GCRE development will be largely within areas of existing development and man-made habitats within the Washery, and therefore loss of badger foraging habitat is considered to be at a small-scale and of low magnitude. This is also considering that large areas of badger habitat occur in the wider area. In addition, as described under 'Habitats' in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery part of the Site as part of the GCRE Project, and there will be large-scale habitat creation as part of the Nant Helen Complementary Restoration Earthworks Project. As such any habitat loss is not considered to have a significant impact on local badger populations. Any habitat loss will be permanent however due to the development remaining in perpetuity.
- 7.20.110 During construction of the test tracks within Nant Helen, there is likely to be a temporary barrier to movement by badger (at least in parts of the Site). Post construction and during operation of GCRE, the test tracks could be a barrier to badger movement, although it is possible badgers may dig beneath fencing. Where this occurs, there is

a mortality risk associated with animals crossing trainlines, and which is discussed below under 'Harm and Mortality'.

- 7.20.111 Adverse effects on local badger populations as a result habitat fragmentation / loss are considered to of low magnitude, and not significant .
- 7.20.112 It is also acknowledged, that badger are a mobile species, and suitable habitat occurs within the Site for sett excavation. Therefore, badger setts, additional setts could be present in the vicinity of the Site, at the time of construction. Mitigation measures will be required to ensure compliance with UK legislation.
- 7.20.113 Mitigation measures to address habitat loss / severance, and ensure compliance with UK legislation are detailed in Section 7.23, 7.24 and 7.25.

Disturbance

- 7.20.114 Disturbances for example as a result of increased noise, lighting or vibrations during construction have the potential to result in displacement of badger within the Site, and in adjacent habitats.
- 7.20.115 During operation, there is also the potential for disturbances from the activities associated with the proposed GCRE Project, in particular from noise associated with the operation of trains on the test track within Nant Helen as well as from the lighting of buildings (largely within the Washery), access tracks and OLE foundations.
- 7.20.116 Based on the approximate distance of the two known setts from the Site, and proposed earthworks, it is considered likely that there would be disturbance to any badgers using these setts, particularly as a result of any piling operations, which are anticipated as part of GCRE. It is acknowledged however that the setts are likely to be used infrequently by badgers, and furthermore any badgers displaced from these setts, would have sufficient habitat within the Site and wider area to create new setts.
- 7.20.117 Adverse effects on local badger populations as a result disturbance are considered to to of low magnitude, and not significant. Mitigation measures will be required to ensure compliance with UK legislation.
- 7.20.118 Mitigation measures to address the disturbance are detailed in Section 7.23, 7.24 and 7.25, which will also ensure compliance within UK legislation.

Harm / mortality

- 7.20.119 Any excavations created during construction could result in animals becoming trapped or injured, when moving through the Site at night. There is also the potential for animals to collide with construction traffic within the Site.

- 7.20.120 During operation, there is the small risk of badger mortality as a result of collision with moving trains which will be in operation, particularly those travelling at high speeds around the test tracks in the Nant Helen part of the site. There is also the risk of collision with vehicles on Site during operation. There is also the risk of collision with vehicles on Site during operation. However, badger presence within the Site, is likely to be infrequent.
- 7.20.121 Adverse effects on local badger populations as a result of harm / mortality are considered to be of low magnitude, and not significant. However, badgers are protected from harm, by UK legislation and mitigation would be required to ensure legal compliance.
- 7.20.122 Recommended mitigation for badger is detailed in 7.23, 7.24 and 7.25 to ensure compliance with UK legislation.

Otter

Habitat Loss / Fragmentation

- 7.20.123 No evidence of otter using the Site has been found. Otter have been recorded west of the Site, along the Afon Dulais. It is considered that this species would use the Site for foraging / commuting purposes infrequently due to the nature of the Site.
- 7.20.124 The presence of otter, although likely to be infrequent within the Site cannot be ruled out due to the presence of suitable waterbodies, and connecting terrestrial habitat, some of which could also be used as breeding / resting places by otter.
- 7.20.125 Site clearance, which will be required for the GCRE Project, with small-scale habitat loss within the Washery, including the removal of some waterbodies, and adjacent grassland habitats. In addition there will be the loss of newly established grassland, and waterbodies in the area of the Nant Helen site, which will have been formed as part of the Nant Helen Complementary Restoration Earthworks Project. These areas are not considered likely to provide key habitats for otter, although they may travel across these areas when searching for suitable feeding / resting places. There will be no further habitat loss during operation.
- 7.20.126 Retained habitats in the wider Site, as well as newly created and enhanced habitats provided as part of the Nant Helen Complementary Restoration Earthworks Project will provide sufficient habitat for otter to continue to forage / commute within and through the Site. In addition, as described under 'Habitats' in paragraph 7.20.18 opportunities exist for small-scale habitat creation within the Washery part of the Site as part of the GCRE Project. New waterbodies proposed as part of the Nant Helen Complementary Restoration Earthworks will be re-sited to avoid being affected by the new road.

- 7.20.127 During construction of the test tracks within Nant Helen, there is likely to be a temporary barrier to movement by otter. Post construction and during operation of GCRE, the tracks are not considered to be a barrier to otter movement, although as discussed below under ‘Harm and Mortality’ there is a mortality risk associated with animals crossing the tracks.
- 7.20.128 Adverse effects on local otter populations from habitat loss or fragmentation are not considered to be significant.
- 7.20.129 Otters and their resting / breeding places are protected by UK and European legislation.
- 7.20.130 Mitigation measures to address habitat loss / severance, and ensure compliance with UK and European legislation are detailed in Section 7.23, 7.24 and 7.25.

Habitat Disturbance / degradation

- 7.20.131 Habitats important for otter may also be adversely affected if construction / operation activities where to damage / degrade habitats.
- 7.20.132 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that otter habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.133 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local otter populations.
- 7.20.134 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Disturbance

- 7.20.135 Construction activities may result in disturbance to otters for example through artificial lighting if works during winter require task lighting and noise. Piling may be required at some locations, during construction, which could also adversely affect any otter present in the Site.
- 7.20.136 During operation, there is also the potential for disturbances from the activities associated with the proposed GCRE Project, in particular noise from the operation of trains on the test track within Nant Helen as well as from the lighting of buildings (largely within the Washery), access tracks and OLE foundations.
- 7.20.137 As discussed above, although there is suitable habitat for resting / breeding places to be established otters have not been recorded within

the Site, and any occurrence is likely to be limited to infrequent foraging / commuting. Furthermore, any otters within the Site that may be displaced as a result of disturbances, would be able to continue to use suitable habitats in the wider area.

- 7.20.138 Adverse effects on local otter populations from disturbance are not considered to be significant.
- 7.20.139 Otters and their resting / breeding places are protected from disturbance by UK and European legislation.
- 7.20.140 Recommended mitigation for otter is detailed in Section 7.23, 7.24 and 7.25 to ensure compliance with UK and European legislation.

Harm / Mortality

- 7.20.141 Any excavations created during construction could result in animals becoming trapped or injured, when moving through the site at night. There is also the potential for animals to collide with construction traffic within the Site.
- 7.20.142 During operation, there is the small risk of otter mortality as a result of collision with high speed trains which will be in operation at Nant Helen. There is also the risk of collision with vehicles on Site during operation. However, otter presence within the Site, is likely to be infrequent.
- 7.20.143 Adverse effects on local otter populations from harm / mortality are not considered to be significant.
- 7.20.144 Otters are protected from harm, by UK and European legislation.
- 7.20.145 Recommended mitigation for otter is detailed in Section 7.23, 7.24 and 7.25 to ensure compliance with UK and European legislation.

Bats

Habitat Loss / Fragmentation

- 7.20.146 Site clearance, which will be required for the GCRE Project, will include small-scale habitats loss within the washery. This will comprise habitats suitable for foraging bats such as marshy grassland, acid grassland, heathland, scrub and trees. Bat species recorded in this part of the Site include common and soprano pipistrelle as well as noctule and myotis bats, which are common and widespread species in the local area. No potential or confirmed bat roosts have been recorded within the Washery, although it is acknowledged that bats are a mobile species, and suitable foraging roosting habitat occurs within the Washery. As such, bat roosts, although not recorded during recent surveys, could be present at the time of construction or during operation.

- 7.20.147 In addition there will be the loss of newly established grassland and waterbodies in the area of the Nant Helen site, which will have been created as part of the Nant Helen Complementary Restoration Earthworks Project. These areas are not considered likely to provide key habitats for bats, although small numbers may forage in these areas. There will be no further habitat loss during operation.
- 7.20.148 Retained habitats in the wider site, as well as newly created and enhanced habitats provided as part of the Nant Helen Complementary Restoration Earthworks Project will provide sufficient habitat for bats present within the area, to continue to forage. In addition, opportunities exist for small-scale habitat creation within the Washery as part of the GCRE Project. New waterbodies proposed as part of the Nant Helen Complementary Earthworks will be re-sited to avoid being affected by the new road.
- 7.20.149 The GCRE development is not anticipated to create any barriers to movement by bats, as a result of habitat loss, additional infrastructure or train operation. However, during the as discussed below there is a mortality risk associated with train collision and potential disturbance during the operation of GCRE.
- 7.20.150 Adverse effects on local bat populations from habitat fragmentation / loss are not considered to be significant.
- 7.20.151 Bats and their resting / breeding places are protected by UK and European legislation.
- 7.20.152 Recommended mitigation for roosting is detailed in Section 7.23, 7.24 and 7.25, which will also ensure compliance with UK and European legislation.

Habitat Disturbance / degradation

- 7.20.153 Habitats important for bats may also be adversely affected if construction / operation activities where to damage / degrade habitats.
- 7.20.154 Terrestrial / aquatic habitats used by foraging bats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that bat habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.155 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local bat populations.
- 7.20.156 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Disturbance

- 7.20.157 Disturbances during construction for example as a result of lighting, noise or vibrations (from piling activities) have the potential to result in displacement of foraging / commuting bats within the Site, and in adjacent habitats (and roosting bats if these were present at the time of construction).
- 7.20.158 During operation, there is also the potential for disturbances (including lighting and noise) from the activities associated with the proposed GCRE Project, in particular from noise associated with the operation of trains on the test track within Nant Helen as well as from the lighting of buildings (largely within the Washery), access tracks and OLE foundations.
- 7.20.159 A range of bat species are known to forage / commute within the Site, and adjacent habitats, including rare species, and which may be disturbed by construction / operation activities if they were to occur between dusk and dawn when bats are active. Woodland bat species such as *Rhinolophus*, *Myotis* and *Plecotus*, are known to be particularly disturbed by lighting, even high-pressure sodium and white LED lighting at low densities⁵³. Some bat species such as *Nyctalus* and *pipistrellus* species are attracted to short wave light however, due to the increased abundance of insect prey. Any lighting from isolated sources are not likely to be far reaching, although depending on the extent of high intensity lighting effects on foraging bats may be significant.
- 7.20.160 As discussed above bat roosts have not been recorded within or adjacent to the Site, but it is possible they may be present at the time of construction and or operation. Any disturbances from piling activities are only likely to affect bat roosts (that are present in the vicinity of the works,) since they will take place during day-time hours.
- 7.20.161 Any bats within the Site that may be displaced as a result of disturbances, would be able to continue to use suitable habitats in the wider area, and as such effects are considered to be of low magnitude.
- 7.20.162 Adverse effects on the majority of local bat populations, which are common and widespread, from disturbances are not considered to be significant. Adverse effects on rarer species such as the greater horseshoe bat could be significant at a **county level**.
- 7.20.163 Bats and their resting / breeding places are protected by UK and European legislation, and as such mitigation is required to ensure legal compliance.

⁵³ Altringham J., Kerth G. (2016) Bats and Roads. In: Voigt C., Kingston T. (eds) Bats in the Anthropocene: Conservation of Bats in a Changing World. Springer, Cham

- 7.20.164 Recommended mitigation for bats is detailed in Section 7.23, 7.24 and 7.25 to ensure compliance with UK and European legislation.

Harm / Mortality

- 7.20.165 Roosting bats would be subject to an increased risk of mortality during construction activities namely building demolition and vegetation clearance which is likely to be required prior to / during construction. No roosts have been recorded within the Washery, where however further vegetation clearance is proposed.
- 7.20.166 During operation, there is a risk of bat mortality as a result of collision with trains which will be in operation at Nant Helen, as well as with operational traffic. Very little information is available on collision risk to bats from trains, however, the effects of collision with road traffic has been relatively well-studied. Due to bat flight patterns and behavioural traits, they are highly vulnerable to moving vehicles when either foraging along roads or when attempting to cross roads on commuting flights⁵³. It is therefore considered likely that bats would be similarly affected by trains, particularly where they are travelling at high speeds. It is acknowledged, however, that the risk of collision with train traffic is likely to be lower than with road/highway traffic, due to the lower number of trains travelling at one location on a track. Potential collision with vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently.
- 7.20.167 There is considered to be no risk of collision with OLE, and associated electrocution, since bats will be able to avoid static structures.
- 7.20.168 Effects of harm / mortality on rarer species such as greater horseshoe bats would be significant at a **County level**. Any effects of harm / mortality on more common and widespread species would not be significant.
- 7.20.169 Bats are protected from harm, by UK and European legislation.
- 7.20.170 Recommended mitigation for bat roosts is detailed in Section 7.23, 7.24 and 7.25 to ensure compliance with UK and European legislation.

Notable Mammal Species

Habitat Loss

- 7.20.171 Suitable habitat for notable mammals, such as polecat, brown hare and European hedgehog, within the Nant Helen part of the Site will have been cleared as part of the Nant Helen Complementary Earthworks Project. Further
- 7.20.172 Construction and associated site clearance within the Washery, which will be required for the GCRE Project, will result in the loss of suitable mammal habitat including heathland, scrub and marshy grassland. In addition there will be the loss of newly established

grassland in the area of the Nant Helen site, which will have been created as part of the the Nant Helen Complementary Restoration Earthworks Project. These areas are not considered likely to provide key habitats for notable mammal species, although they may cross these areas when travelling between more suitable habitats. There will be no further habitat loss during operation.

- 7.20.173 It is acknowledged that the GCRE development will be largely within areas of existing development and man-made habitats within the Washery, and therefore loss of habitats suitable for notable mammals is considered to be at a small-scale and of low magnitude. This is also considering that large areas of habitat suitable for the notable mammal species occurs in the wider area. As such any habitat loss is not considered to have a significant impact on notable mammals. Any habitat loss will be permanent however due to the development remaining in perpetuity.
- 7.20.174 As discussed under ‘Habitats’ in paragraph 7.20.20 opportunities exist for small-scale habitat creation within the Washery, as well as enhancement of existing habitats. Newly created habitats, providing they meet the specific species-requirements, are likely however to be rapidly utilised by notable mammals present within the Site, and adjoining habitats.
- 7.20.175 Mitigation measures to address habitat loss are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include habitat creation and enhancement in addition to long-term management and monitoring.

Habitat Fragmentation / Severance

- 7.20.176 No impacts to notable mammal species (polecat, brown hare and European hedgehog), from habitat fragmentation / severance within the Washery, are considered likely as a result of the GCRE construction or operation, since the development footprint is similar to the existing operational Washery.
- 7.20.177 The test tracks within the Nant Helen site, during construction will create a more significant barrier to movement by notable mammal species, however this will be a temporary effect and habitats either side of the railway lines will continue to support suitable habitat for notable mammal species. Post construction and during operation of GCRE, the test tracks are not considered to be a barrier to the movement of notable mammals, although as discussed below under ‘Harm and Mortality’ there is a risk of mortality from collision with high speed trains during operation.
- 7.20.178 As such adverse effects on populations of notable mammal species from habitat fragmentation are not considered to be significant.

Habitat Disturbance / degradation

- 7.20.179 Habitats important for notable mammals may also be adversely affected if construction / operation activities were to damage / degrade habitats.
- 7.20.180 Terrestrial / aquatic habitats will be particularly sensitive to changes in water and or air quality, which could occur during construction or operation. In addition it is possible that notable mammal habitats could be physically disturbed for example by machinery, during construction and potentially during operation.
- 7.20.181 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude and reversible, and therefore not significant to local notable populations.
- 7.20.182 Mitigation measures to address the habitat disturbance are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include the implementation of best practice air and water pollution control measures during construction and operation.

Harm / Mortality

- 7.20.183 It is considered possible that construction activities would result in harm / mortality to notable mammal species as a result of vehicle collision or entrapment. This would only be within the Washery, and related to species such as European hedgehog which could occur at this location. However, the occurrence of notable mammal species is largely associated with Nant Helen where no effects are considered likely during the construction phase.
- 7.20.184 During operation, there is the risk of mortality of notable mammal species as a result of collision with trains which will be in operation at Nant Helen, as well as collision with vehicles on Site during operation. Although effects on mammals have not been well-studied⁴⁸ evidence has shown that mortality rates from train collision are higher for small sized mammals in comparison with larger mammals, and the most affected are lagomorphs (including brown hare) and carnivores **Error! Bookmark not defined.**, and to a lesser extent ungulates and insectivorous mammals (including West European hedgehog)⁵⁴. Notable mammal species have been recorded in low numbers within the Site and as discussed above, a large extent of suitable habitats will be available either side of the tracks. It is acknowledged, also, that the risk of collision with train traffic is likely to be lower than with road traffic, due to the lower number of trains travelling at one location on a track. Potential collision with vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently

⁵⁴ Van der Grift, E. A. (1999). Mammals and railroads: Impacts and management implications. *Lutra*, 42, 77–98.

- 7.20.185 Adverse effects on notable mammal populations as a result of harm / mortality are considered to be of low magnitude, and not significant
- 7.20.186 Mitigation measures to address the harm / mortality of notable mammal species, and ensure compliance with UK legislation are detailed in Section 7.23, 7.24 and 7.25.

Invasive species

- 7.20.187 The site is known to support Japanese knotweed, montbretia, rhododendron and cotoneaster species. Mitigation measures are required to ensure compliance with UK legislation. These are detailed in Section 7.23 and 7.24. The plants listed under Schedule 9 plants of the Wildlife and Countryside Act 1981 (as amended) and The Invasive Alien Species (Enforcement and Permitting) Order 2019, it is an offence to spread them from the site.

7.21 Potential effects due to Climate Change

- 7.21.1 This section, in addition to Chapter 15; Climate change, considers effects related to climate change as per the requirements of EU Directive 2014/52 and the 2017 EIA Regulations. The combined effects relating to ecological receptors of the proposed development and potential climate change include the following:

- Drier / drought conditions;
- Increased temperatures;
- Increased wind speed;
- Increase in frequency and intensity of heavy rainfall events and flooding;
- Variation in temperature and rainfall patterns; and
- Increase in frequency of extreme weather events.

- 7.21.2 Impacts are considered on the future baseline, which as set out in paragraph 7.15.5. During construction and operation, the above climate changes have the potential to influence effects of the proposed development on ecological receptors within the Site, namely: habitat loss, fragmentation and degradation (through the inability of plants to survive changes in temperature and weather patterns i.e droughts / flooding and high wind). These changes to habitats would also increase the likelihood of soil erosion, surface run-off and flooding within catchments. Rare or endangered species at the edge of their distribution are likely to be susceptible to changes in climate particularly increases in temperature, and changes in habitat / prey availability.

- 7.21.3 Therefore mitigation to address impacts from the GCRE Project during construction and operation, also needs to consider the

additional impacts of climate change. The promotion of resilient ecosystems, a requirement of the Environment (Wales) Act 2016, will also support the provision of ecosystems including habitats and species populations, which are more resilient to the likely impacts of climate changes.

- 7.21.4 Mitigation measures to address the climate change impacts are detailed in Section 7.23, 7.24 and 7.25. Mitigation will include management and monitoring to control INNS within the Site.

7.22 Construction Mitigation

- 7.22.1 The following mitigation principles and measures will be implemented prior to or during the Construction Phase, through adherence to a Construction Environmental Management Plan (CEMP), Ecological Protection Plan (EPP) and Ecological Management and Monitoring Plan (EMMP), as detailed below:

Site Clearance / Construction

Habitats and Protected Sites

- Consultation will be undertaken with the relevant teams within NRW regarding impacts on the Gors Llwyn and Nant Llech SSSI, and SSSI assents obtained where these are deemed a requirement.
- An EPP will be prepared prior to any site clearance / construction works commencing on Site, and be submitted to the LPA and NRW for approval. The EPP will include details of mitigation measures, which are required during site clearance / construction to ensure the protection of adjacent protected sites and notable habitats (including the immediately adjacent marshy grassland, species rich grassland, waterbodies, river corridor and heathland in the Washery and retained and newly created habitats within Nant Helen) for example measures such as fencing, buffer zones and pollution control measures.

Protected and Notable Species

- Pre-construction surveys including breeding birds (if works are planned between March and August inclusive), bats (in trees), otter and badger will be undertaken to determine the presence of these species within an appropriate distance from the construction works. Larger buffers will be required for more sensitive species (including some breeding birds such as lapwing and curlew) or where more significant impacts are likely to occur such as vibrations (for example a 60 m buffer would be required for bats, if roosts are found). Details of buffer distances will be agreed with LPAs in advance.

- Pre-construction checks will also be undertaken of vegetation clearance areas where it is likely to support nesting birds, reptiles, or any Section 7 mammals such as West European hedgehog.
- A reptile trapping and relocation programme will be implemented, in accordance with a reptile method statement will be undertaken by a Suitably Qualified Ecologist (SQE). A suitable receptor site for reptile translocations will need to be identified prior to any reptile mitigation taking place, and be agreed by the LPA ecologists and the sites landowner. It is anticipated that adjacent / connecting habitats within Nant Helen site will be suitable, and which would also be subject to further enhancements for reptiles.
- Badger setts located within the test tracks will be closed temporarily during the site clearance and construction, until construction is complete and suitable underpasses for badger have been constructed along with suitable connecting landscaping. This will need to be undertaken under a protected species licence from NRW, which will be obtained prior to construction commencing.
- Licences will be sought from NRW as required for any other European and Nationally protected species, where these are found during pre-construction checks or where the final design confirms likely impacts on these species. Mitigation will be implemented accordingly as detailed in accompanying Method Statements.
- Details of species translocations will be included within the EPP, to ensure their protection during site clearance. For species this will include reptiles and potentially some vascular plants (marsh lousewort, brookweed, bee orchid, viviparous fescue, eyebright and brown sedge) which occur in the Washery.
- Where there is a delay to site clearance / construction, and more than 2 years has lapsed, the LPA will need to confirm whether any of the ecological surveys undertaken will need to be repeated prior to site clearance / construction commencing. It is anticipated that there would be the requirement to update bat surveys of buildings and trees, within 60 m of the development.

Invasive (legally controlled) species

- An INNS Management Plan will be drawn up prior to site clearance, to ensure that legally controlled plant species are not spread outside of the site during, and post construction. This will be submitted for prior approval by the LPA and NRW.

Construction

- An Ecological Clerk of Works (ECoW) will provide a tool box talk to all contractors prior to any works commencing, and be available to provide reports on the implementation of ecological mitigation

on site during construction in line with the method statements and or licences provided.

- The INNS Management Plan will be implemented during construction.
- Any retained habitats will be clearly marked, and where necessary securely fenced off with appropriate temporary fencing at the start of construction work to prevent access and incidental damage by site vehicles, equipment and personnel.
- All retained trees will be treated in accordance with British Standard BS5837 (2005) Guidance for the Treatment of Trees in Relation to Construction. Damage to mature trees, as well as tree and scrub understorey and ground flora within mature woodland, should be avoided.
- Where possible vegetation clearance will take place outside of the bird breeding season (generally March to August inclusive); if this is not possible, pre-construction checks for nesting birds will be undertaken by an ecologist to ensure active nests are not disturbed.
- Where protected / notable species are found during pre-construction checks (including example nesting birds, resting / breeding otter, bat roosts and or badger setts), an appropriate buffer (based on best practice guidance for relevant species where available) will be demarcated and no construction works will take place within this area, until the SQE has confirmed otherwise. If it is not possible to avoid disturbing any protected species found within / adjacent to the site, a licence will be sought from NRW which includes the necessary mitigation.
- Pollution control measures will be implemented in accordance with industry standards and the Pollution Prevention Guidelines published by the Environment Agency⁵⁵ and dust pollution prevention guidelines published by the Institute of Air Quality Management (IAQM)⁵⁶.
- In particular, measures to control and contain sediment and material arising from demolition, earthworks and construction including dust, particularly in proximity to sensitive ecological receptors including the SSSIs Gors Llyn and Nant Llech, will be included within relevant CEMPs.
- Any task lighting or security lighting, which may be required on site during the winter months, is to be designed in consultation with an ecologist to ensure that there is no disturbance to habitats within the site, which are likely to support crepuscular or nocturnal species such as otter or bat. Where practicable, daytime working

⁵⁵ It is noted that these Guidelines have been withdrawn by the Environment Agency, however they are considered to still be relevant and applicable until such time as new guidance is available.

⁵⁶ <http://www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf>

hours will be adopted for any construction works to commence no sooner than one hour after sunrise and finish no later than one hour before dusk.

- All tools, food, litter and construction materials and packaging that may constitute a hazard to otters and other Section 7 mammals, as well as roosting birds and reptiles, will be removed daily from the site.
- Any traffic plans produced will ensure that vehicle traffic is restricted to agreed low limits.
- Excavations are to be covered at night-time or a means of escape provided (such as a plank of wood) for otter, badger or other animals.

7.23 Post Construction / Operation

7.23.1 Mitigation measures will be implemented post construction to avoid / reduce likely impacts on ecological receptors in the Site during the operation of the Project, in addition to further reducing and or offsetting likely impacts from the Project during site clearance and or construction (such as habitat loss). The creation of more diverse species-rich habitats post construction, and their appropriate long-term management supports the requirements of the Environment Act (Wales) 2016, by supporting the resilience of ecosystems, and in turn also the requirements of climate change legislation.

7.23.2 The following mitigation principles and measures will be incorporated in to the scheme design to reduce the scale of effects during the operational phase:

Habitats

- An indicative habitat creation and restoration plan has been prepared to mitigate / compensate for the habitat loss, and disturbance likely to occur to the future baseline, as shown in Figure 7.9. It has been updated to the proposed habitat retention in the Washery, in addition to opportunities for small-scale habitat creation. It will be updated at the detailed design stage, once the design has been finalised.
- The plan includes habitats which will be created / enhanced as part of the Nant Helen Complementary Restoration Earthworks Project, and which are relevant to the GCRE Project, since this mitigation, reduces the impact on habitats and species affected during GCRE construction and operation. In addition, within the Nant Helen part of the site there are additional opportunities for habitat creation particularly on railway embankments for species rich grassland and fungi habitat (as well as species such as reptiles). The Nant Helen part of the site will also need to support landscaping which delivers

species specific mitigation (see ‘Protected and Notable Species’ recommendations below which detail landscaping requirements for badger, bat and otter culverts).

- Within the Washery, enhancement will form the largest proportion of habitat mitigation for the GCRE Project, since the majority of land outside of the development footprint within the Washery supports notable habitats, and further habitat creation may compromise their value. There will however be opportunities for small-scale habitat creation within the Washery, which complements new infrastructure associated with the GCRE development such as drainage.
- Habitat enhancement will largely focus on areas of marshy grassland and acid grassland within the Washery, including areas of anthills; which have largely been left undisturbed and support a diverse assemblage of plants and invertebrates, as well as other species. Enhancement of these habitats will be delivered through long-term management such as light grazing (subject to grazing agreements) and or manual control, to remove encroaching scrub and maintain short grassland swards, as well as to an extent, disturb the ground, to provide a variety of microclimates suitable for a diversity of plants / invertebrates.
- Habitat creation within the Washery will focus on creating species rich wetland features which also provide drainage functions within the Site (where possible, on disturbed areas and not within existing notable habitats), including swales and lagoons, surrounded by species rich grassland and short perennial vegetation. Wetland features will provide habitat for species such as the scarce blue tailed damselfly.
- Where possible, coal spoil / substrate available in the Washery area will be re-used for newly created grassland habitats, so that a similar assemblage of species establishes. At these locations of the land will be profiled to provide a varied topography, with sheltered areas and more exposed areas for basking by invertebrates and reptiles etc. They will be left to be colonised by plants in the local area, such as bird’s-foot trefoil and black medick which are favoured foodplants for invertebrates such as dingy skipper and six-belted clearwing. The establishment / enhancement of short grassland will also provide a pioneering habitat for heathland, lichen and fungi.
- The above habitat creation will in places re-use calcareous substrates available within the Site, or where these are not available, additional calcareous substrate will be brought into the Site. This will facilitate the establishment of base-rich grassland habitats and in particular vascular plants such as kidney vetch, the favoured food plant of the small blue butterfly, a notable invertebrate within the Washery. To aid the establishment of kidney vetch, additional seeds will be sown in these areas.

- New landscaping will be small-scale within the Washery, and will only be established where this is the only available option to provide screening to residential areas; since additional planting increases the likelihood of scrub / trees encroachment on sensitive habitats such as marshy grassland and short ruderal grassland. Where required, landscaping will comprise the planting of native broadleaved tree and shrub species, which provide benefit to a range of species known to occur within the Site. The species mix will consider climate modelling, and likely changes in climate such as higher temperatures, and ensure that selected species are resilient to such changes.
- Re-profiled land at the locations of embankments and cuttings in the Nant Helen site, will provide a large surface area for the establishment of grassland and fungi, lichen and heath habitats. Where these areas do not need to support infrastructure associated with the GCRE Project, they will be left for grassland to establish. Long-term management will be required to ensure that trees / scrub from adjacent habitats do not establish, within the new short ruderal grassland.
- The existing habitat creation and landscaping plan (Figure 7.9) will be also be updated at the detailed design stage, to incorporate additional landscaping within the Site, which encourages the movement of badger, otter and bats through culverts beneath the railway track (see recommendations for ‘Protected and Notable Species’ below).
- Newly established and existing, retained habitats will be subject to long-term management to enhance their ecological value and which will be detailed in an EMMP.
- The EMMP will include:
 - Details of the ecological baseline, including ecological survey results. It will also detail information of existing landownership, management and use, as well as geology / ground conditions, hydrology and topography, which will be essential to inform habitat establishment proposals.
 - Details of the newly established habitats and the enhancement of existing habitats including existing habitat translocations, where possible. It will include details of how these habitats, will provide suitable habitat for notable species.
 - Suitable prescriptions, for the management of newly created habitats and existing habitats (to be enhanced), which maintains and enhances their value for biodiversity post development. This will include specific management measures for notable habitats and species within the site including notable plants / fungi, invertebrates, amphibians, reptiles, breeding birds, wintering birds, foraging /

commuting bats, otter and notable mammals. This will include information on methods / equipment / timing etc.

- To protect and enhance important ecological features within and adjacent to the site, the management plan will also detail how INNS will be eradicated from the site, and long-term management that is required to ensure INNS do not re-establish.
- A programme detailing the duration of each survey / habitat creation / management activity, what time of year it will need to be undertaken, and how frequently.
- The duration of the EMMP is to be agreed with the LPAs / NRW and anticipated to be for five years. A programme detailing all management prescriptions for the first 5 years post-construction, which will be subject to review and extension.
- Full details for the monitoring of the site post development, to provide information on changes in habitat condition / species populations and additional mitigation / management measures that may be required. In addition, mechanisms to feedback and agree / implement such remedial measures will be detailed for example the establishment of an ecological management committee of relevant stakeholders and regular meetings.

Protected and Notable Species

- To reduce collision risk for bats, otter and badger, wildlife crossings for these species will need to be provided in the final design. New culverts which are required for drainage, and detailed in the final design, will provide passage to bats known to occur in the local area, at least in locations where they are likely to travel across the tracks, for example where there is existing or new habitat connectivity (i.e. as a result of the proposed Nant Helen Complementary habitat creation and enhancement plan). The exact size and location of the structures will be designed at detailed design stage. Height is considered to be the most important factor for bats using culverts, as well as being sited at locations where they are likely to cross barriers such as tracks and roads. The Site supports both woodland adapted species such as brown long-eared bats, *Myotis* species and greater horseshoe bat, which require culvert heights of approximately 3 m, and generalist edge adapted species such as pipistrelle species, which require culverts heights of approximately 6 m. Open air species, such as noctule and serotine, which also occur within the Site, are likely to fly high above the track (and are unlikely to use culverts). As such the height of culverts of at least some of the culverts will need to be at least 3 m to accommodate pipistrelles and other generalist bat

species. Other road schemes in Wales⁵⁷ have designed culverts / underpasses for woodland adapted species, in particular greater horseshoe bats with 2 m height x 3 m width, due to monitoring of other road schemes recording greater horseshoe continuing to cross roads where culverts have a height of 1.8m. Due to the presence of this species within the Site, a 2 m height should be the minimum for other culverts which are designed to accommodate bat passage within the Site. Lighting of culverts will be avoided. Landscaping will be designed to encourage species through culverts from the adjacent habitats. Figure 7.9 will be updated at the reserved matters stage of the application, with details of culvert locations and associated planting, based on likely bat foraging / commuting corridors.

- Culverts designed to accommodate bat passage, will also facilitate otter movement, using similar designs to other WG road schemes. The otter ledges will be located 150 mm above the 1 in 100 year flood level including 25% for climate change. Due to the low number of otter recorded within the Site, and largely dry nature of the watercourses / ditches (with the exception of future high rainfall events), it is not considered necessary to provide ledges in all culverts.
- Furthermore, culverts adapted for bats and otter, due to being largely dry, are likely to provide passage to badger, for the majority of the time. Culvert can be adapted to provide a dry run and in certain circumstances the provision of a Class H 1050 mm diameter concrete pipe may be appropriate.
- As shown in culvert design on other road schemes⁵⁷ in Wales and detailed in best practice guidance^{58,59}, culverts to a length of 20 m should comprise at least a 600 mm cylindrical pipe, to accommodate badgers and otter. In crossings over 20 m in length, the width of the pipe should increase to 900 mm.
- Fencing used in the final design will also prevent crossing by wildlife, in particular otter and badger, consistent with similar specifications used in other road schemes in Wales⁵⁷. The fencing which will be at least 1.6 m high, without any crank on the top, will prevent otters, badgers and other wildlife from accessing the track and to guide them to the culvert passages. A Figure will be provided at the reserved matters stage of the application, with details of fencing location, and tie in with the culvert locations, as detailed above.

⁵⁷ Arup (2020) A40 Redstone Cross Environmental Statement. Welsh Government.

⁵⁸ The Highways Agency (2001) Design Manual for Roads and Bridges (DMRB) Volume 10 Section 4 Part 4 HA 81/99 Nature Conservation Advice in Relation to Otters. Although this guidance has been superseded by updated DMRB guidance, it is still considered relevant.

⁵⁹ The Highways Agency (2001) Design Manual for Roads and Bridges (DMRB) Volume 10 Section 4 Part 2 HA 81/99 Nature Conservation Advice in Relation to Badger. Although this guidance has been superseded by updated DMRB guidance, it is still considered relevant.

- A lighting design and associated plan will be produced in accordance with Bat Conservation Trust's (BCT) 'Bats and Lighting' publication⁶⁰, and will avoid light disturbance to bats, and other nocturnal or crepuscular species such as otter and badger. The plan will aim to avoid lighting of key wildlife corridors such as tree lines, waterbodies, rivers and streams, used by these species. Any lighting will be directional with minimal upwards or backwards light spill and minimising light spill onto adjacent, retained habitat features. Lighting onto any associated landscaping which is designed to direct species through culverts, will also need to be considered within this lighting plan.
- To compensate for the potential loss of one breeding barn owl pair, as a result of train collision, at least one barn owl nest box will need to be installed in suitable habitat further than 3 km from the Site in accordance with guidance⁶¹.52.
- Long-term management will target retained and newly created habitats for notable species known to occur within or adjacent to the site including vascular plants, fungi, invertebrates (particularly dingy skipper, six belted clearwing, small blue and scarce blue tailed damselfly), breeding / wintering birds, foraging bats, reptiles, amphibians and notable mammal species. Specific details for management to enhance the nature conservation value of the site, will be provided within an EMMP.

7.24 Enhancements

7.24.1 The project offers significant opportunities to provide further ecological enhancements within the scheme design post construction, for operation, and in doing so meet the requirements of PPW and the Environment Act (Wales) 2016, for biodiversity enhancement and the promotion of ecosystem resilience. This will also support the resilience of ecosystems to likely future threats of climate change.

Habitats

7.24.2 Retained and newly created habitats within the Washery (As shown in Figure 7.9) will be enhanced through long-term management. In addition to mitigating / compensating for small-scale habitat loss within the Washery, such long-term management should provide the opportunity for the creation of more diverse, species rich habitats, and therefore enhancements; in particular, enhancements of marshy grassland and short ruderal grassland habitats, which provide greater benefits to biodiversity including notable species within the Site.

⁶⁰ [http://www.bats.org.uk/data/files/bats and lighting in the uk final version version 3 may 09.pdf](http://www.bats.org.uk/data/files/bats_and_lighting_in_the_uk_final_version_version_3_may_09.pdf)

⁶¹ <https://www.barnowltrust.org.uk/barn-owl-nestbox/>

- 7.24.3 The provision of land on track embankments within the Nant Helen part of the site, will allow acid grassland to establish which will also provide a pioneering habitat for fungi, lichen and heathland, at a much greater extent than the extent of similar habitats lost. This will compensate for the likely time delay of similar fungi habitats developing, and once established (i.e. between 20 and 30 years), the greater extent of this habitat will also provide an enhancement; providing long-term management is in place to control scrub encroachment.
- 7.24.4 Opportunities will be sought to integrate biodiversity into Sustainable Drainage Systems (SuDS) across the Site. Whilst the main function of SuDs will be to manage rainfall using landscape and vegetation to control the flow, volume and quality of the surface water runoff, it should also be possible to create diverse habitats for example through the use of a range of native wetland plants in swales and rain gardens.
- 7.24.5 Opportunities will be sought to create green / brown roofs on buildings within the Washery, where this does not compromise other requirements of these buildings; it is anticipated that roof spaces of the decommissioning building and carriagewash will support essential services, and roofs of the larger depots will provide a rainwater harvesting function. The creation of green / brown roofs would not be suitable if this compromises the main objective of sustainable drainage. Smaller roofspaces such as those of the staff accommodation and control block, are not anticipated to house any additional infrastructure and or services and as such are likely to provide opportunities for the creation of green / brown roofs. Planting will include food plants for notable invertebrates such as six-belted clearwing, small blue and dingy skipper.

Species

- 7.24.6 An artificial otter holt will be provided along the Afon Dulais, at least 100 m west of the development, or an alternative site to be identified by the ECoW in consultation with NRW, to provide a suitable breeding site for otters due to the presence of foraging / commuting otter in this area.
- 7.24.7 A range of bat boxes and / or bat bricks in buildings and bridges (no less than 20) will be provided on mature trees, and where possible buildings and bridge structures, within the Site, and or adjacent habitats (subject to landowner agreement). The number and location will be selected by the ECoW and would be informed by the number of appropriate trees, buildings and bridge structures within / adjacent to the Site. These should be of woodcrete construction, such as Schwegler models, which are more durable and require minimal maintenance.
- 7.24.8 A range of bird boxes (no less than 30) will be provided on mature trees, and where possible buildings and bridge structures, within the

Site, and or adjacent habitats (subject to landowner agreement). The number and location will be selected by the ECoW and will be informed by the number of appropriate trees and buildings within / adjacent to the Site. Swift (*Apus apus*) boxes and house sparrow boxes should be prioritised for buildings, and grey wagtail / dipper (*Cinclus cinclus*) boxes for bridges. Similar to bat boxes, these should be of woodcrete construction, such as Schwegler models, which are more durable and require minimal maintenance.

7.24.9 At least 15 artificial reptile refugia, which provide shelter to hibernating and active reptiles, will be created using materials available post site clearance / construction such as timber logs, brash, grubbed up tree roots, inert hardcore, bricks or building rubble. The number and location will be selected by the ECoW and would be informed by available suitable habitat.

7.25 Monitoring Proposals

7.25.1 Monitoring (in addition to the supervision of the works outlined above and the auditing of mitigation measures) will be undertaken during the construction period and post-construction (period to be defined by the LPA / NRW), in accordance with the EMMP. The monitoring will include:

- Condition monitoring of newly established/enhanced habitats on an annual basis for a period of 5 years. The specific attributes of each habitat, for monitoring, will be detailed in the EMMP to include: extent, vegetation composition, vegetation structure and physical structure. Targets for each attribute will also be detailed. Where habitats aim to support notable species, attributes and targets will also account for this. Methods of monitoring will be determined once the attributes / targets have been set, but will follow published methods^{62,63,64}.
- Monitoring of notable species, of county value, including: vascular plants, fungi, invertebrates, breeding birds and bat activity (with surveys following relevant best practice, and based on previous surveys undertaken to establish the baseline). It is proposed that these monitoring surveys will be in year 1, 3 and 5 post construction. Species, attributes, targets and monitoring methods will be agreed, in consultation with the LPA and NRW.

⁶² JNCC, 2010. Handbook for Phase 1 habitat survey – a technique for environmental audit (2010) 2016.

⁶³ Jerram, R. & Drewitt, A. (1998). Assessing vegetation condition in the English uplands. Peterborough: English Nature Research Reports, No. 264.

⁶⁴ JNCC (2009). Common Standards Monitoring Guidance for Upland habitats, Version July 2009.

- Monitoring results will be reported through a Steering Group, led by the site owner in partnership with NPTCBC and PCBC, NRW, and invited interested parties such as users / managers, advisory consultants / independent experts and local interested parties (e.g. Commoners representative) as appropriate. The site owner and the local authorities shall agree where additional remedial measures are required to ensure the objectives of the EMMP are implemented. .

7.26 Residual Effects

- 7.26.1 Table 7.15 (detailed in Appendix 7O) provides a summary of the evaluation of impacts, with and without mitigation.
- 7.26.2 Providing the measures as detailed in Section 7.23, 7.24 and 7.25 are implemented prior to, during and post construction, it is considered likely that the scale of all impacts from the Project, on protected sites, and the majority of habitats and species, would be reduced sufficiently and there would be no significant residual impacts on the identified ecological receptors.
- 7.26.3 It is acknowledged that for some habitats i.e. fungi communities, there will initially be an adverse effect as a result of the habitat loss / disturbance. However it is likely that the newly proposed habitats to be created on / off site will establish over 20-30 years and therefore there will be no residual effects after this time. The extent of potential fungi habitat, associated with grassland habitats predominantly, will be greater to compensate for this.
- 7.26.4 The above habitat establishment will be dependent on the appropriate long term management and monitoring, which will be detailed within the EMMP.
- 7.26.5 It is also acknowledged that despite the provision of wildlife crossing to provide safe passage to species within the Site, namely bats, birds, otter and badger, it is unlikely to remove the collision risk completely. However, the residual effects are not considered to be significant to any populations of these species.
- 7.26.6 The proposed long-term monitoring will confirm any residual effects to habitats and or species, and where necessary identify further mitigation measures that may be required.

With the inclusion of enhancement measures (as detailed in section 7.24) which will also be detailed within the EMMP, it is considered likely that there would be an overall positive residual effect from the project for some habitats and species; namely marshy grasslands and wetlands, short grassland and invertebrates.

8 Cultural Heritage

8.1 Introduction

8.1.1 This chapter provides details of the cultural heritage baseline and considers the potential impacts from the construction and operation of the proposed project on known and potential heritage assets, including archaeological remains, built heritage and historic landscapes.

8.1.2 The purpose of this assessment is to:

- Describe the cultural heritage baseline, including the presence of known and potential archaeological remains, built heritage and historic landscapes, both designated and undesignated;
- Assess the significance of heritage assets potentially affected by the proposed scheme;
- Identify the potential impacts of the proposed scheme on the cultural heritage baseline, including both physical impacts and those resulting from changes to the setting of heritage assets;
- Identify any appropriate mitigation measures;
- Assess the magnitude of the mitigated impacts of the proposed project with the mitigation measures in place; and
- Assess the significance of the effects of the proposed scheme.

8.1.3 This chapter is supported by a historic environment desk-based baseline assessment, which forms Appendix 8A.

8.1.4 A Scheduled Monument Consent application has been submitted separately in support of the Nant Helen Complementary Restoration Earthworks application.

8.2 Review of proposed development

8.2.1 The proposed development comprises the construction of two rail testing tracks, one high speed of 6.9km and one low speed at 4.5km, alongside buildings for storage and maintenance of rolling stock, sidings, a carriage wash facility and a multi-storey control building and research and development centre. This accompanied by a network of internal access roads, utilities, land reformation, car parking, drainage and landscaping.

8.2.2 The proposed development would use the earthworks which form part of the Nant Helen Complementary Restoration Earthworks scheme which, alongside the wider restoration of the open cast mine means that construction across a large part of the site will have no impacts on archaeological remains. As a result, the elements of the proposed

development which may have an effect on cultural heritage assets would be limited to:

- Site preparation and construction within the area of the former Onllwyn Washery and its immediate surroundings; and
- The alteration of the setting of heritage assets.

8.2.3 As this is an outline application, a ‘worst-case’ assessment has been made of potential impacts arising from them. For this it is assumed that any archaeological remains present would be removed within the footprint of the works and associated landscaping. An archaeological assessment should be made at the reserved matters stage, with consultation with the LPA’s archaeological advisors, to agree any additional investigation or mitigation required.

8.2.4 No specific design mitigation has been incorporated for cultural heritage as the significant impact on the scheduled monument will have occurred as a result of the Nant Helen Complementary Restoration Earthworks project which is mitigated through that scheme.

8.3 Legislation, policy context and guidance

Legislation

8.3.1 *The Historic Environment (Wales) Act (2016)* received Royal Assent and became law on 21st March 2016. It is the first legislation enacted specifically for the Welsh historic environment. The Act makes important changes to the two main UK laws that provide the legislative framework for the protection and management of the historic environment: the *Ancient Monuments and Archaeological Areas Act (1979)* and the *Planning (Listed Buildings and Conservation Areas) Act (1990)*. It also incorporates stand-alone provisions establishing: statutory historic environment records, a list of historic place names and an advisory panel for the historic environment.

8.3.2 *The Historic Environment (Wales) Act (2016)*:

- gives more effective protection to listed buildings and scheduled ancient monuments;
- improves the sustainable management of the historic environment; and
- introduces greater transparency and accountability into decisions taken on the historic environment.

Policy context

- 8.3.3 *The Historic Environment (Wales) Act* (2016) stands at the centre of an integrated suite of legislation, policy, advice and guidance for the historic environment. National policy is included within:
- *Planning Policy Wales* (Edition 10, 2018), Chapter 6: Distinctive and Natural Places (section 6.1);
 - *Technical Advice Note 24: The Historic Environment* (May 2017 — replacing the previous Welsh Office circulars on the historic environment).
- 8.3.4 The site straddles the administrative boundary between Powys County Council and Neath Port Talbot County Borough Council and local planning policy from both areas is relevant to this assessment.
- 8.3.5 The Powys *Local Development Plan* (2011-2026, adopted April 2018) includes the objective “to protect, preserve and/or enhance the distinctive historic environment, heritage and cultural assets of Powys, in particular local assets that are not statutorily protected or designated under national legislation, and to ensure that development respects local distinctiveness” (Objective 13.2 Landscape and the Historic Environment).
- 8.3.6 Further relevant policies are DM2: The Natural Environment, part 5: Trees, Woodlands and Hedgerows of Significant Public Amenity, Natural or Cultural Heritage and DM4 – Landscape, which includes consideration of the historic qualities of landscapes.
- 8.3.7 Two new Supplementary Planning Guidance documents are currently being prepared for Powys County Council, relating to Archaeology and the Historic Environment. These are currently in draft form but are likely to be adopted in 2020.
- 8.3.8 The Neath Port Talbot *Local Development Plan* (2011-2026, adopted January 2016) has several policies grouped around the topic of ‘Culture and Heritage’. Relevant to this assessment are:
- Policy SP21 Built Environment and Historic Heritage;
 - Policy BE 1: Design; and
 - Policy BE 2: Buildings of Local Importance.
- 8.3.9 Additionally, heritage issues are covered by Neath Port Talbot’s *The Historic Environment Supplementary Planning Guidance* (adopted April 2019).

Relevant guidance

- 8.3.10 Historic environment desk-based assessment (DBA) is covered by several pieces of best-practice guidance produced by the Chartered Institute for Archaeologists (CIfA) and Cadw, the Welsh

Government’s historic environment service. CIfA’s¹ overall standard to which all DBAs should comply with states that “desk-based assessment will determine, as far as is reasonably possible from existing records, the nature, extent and significance of the historic environment within a specified area. In a development context desk-based assessment will establish the impact of the proposed scheme on the significance of the historic environment (or will identify the need for further evaluation to do so) and will enable reasoned proposals and decisions to be made whether to mitigate, offset or accept without further intervention of that impact.”

8.3.11 In addition to compliance with this overarching standard, and the guidance that accompanies it there are several other codes and guidance documents that will inform the production of the DBA:

- CIfA² *Code of Conduct*.
- Cadw³ *Conservation Principles for the Sustainable Management of the Historic Environment in Wales*. This sets out six principles for conservation, including that historic assets will be managed to sustain their values and that understanding the significance of assets is vital. Heritage values are identified as comprising evidential value, historical value, aesthetic value and communal value.
- Cadw⁴ *Heritage Impact Assessment in Wales*, which outlines the principles for creating a Heritage Impact Statement, in particular that ‘sufficient information to enable both the significance of the asset and the impact of change to be understood. It should be proportionate both to the significance of the historic asset and to the degree of change proposed’.
- Cadw⁵ *Setting of Historic Assets in Wales*. This explains what setting is, how it contributes to the significance of a historic asset and why it is important.

¹ CIfA (2017) *Standard and Guidance for Historic Environment Desk-Based Assessment*. Reading: CIfA, p4.

² CIfA (2019) *Code of Conduct*. Reading: CIfA.

³ Cadw (2011) *Conservation Principles for the Sustainable Management of the Historic Environment in Wales*. Cardiff: Cadw.

⁴ Cadw (2017a) *Heritage Impact Assessment in Wales*. Cardiff: Cadw, p5

⁵ Cadw (2017b) *Setting of Historic Assets in Wales*. Cardiff: Cadw.

8.3.12 For clarity the baseline elements of the DBA are included in Appendix 8A, with the heritage impact assessment elements presented in this chapter.

8.4 Scoping and consultation

Scoping

8.4.1 To inform initial consultation and scoping, an appraisal was made of the cultural heritage baseline of the site which identified that although much of the site’s archaeological potential was limited by the large-scale open cast mining which has taken place, there were areas of the site which had not been affected by extraction. In those areas archaeological potential remained, raising the possibility of adverse effects arising from construction. Further, the Scheduled Monument of the Tramroad at Ystradgynalis, the earthwork remains of a 19th century tramway, runs across the southern part of the site. Were there to be physical effects to the tramroad there would likely be significant adverse effects. Beyond the site itself there are also a large number of Scheduled Monuments and other designated heritage assets, some of which have settings sensitive to change. The closest of these, the Bryn Llechwen ring cairn, is located c130m west of the site and there is also the potential for an adverse effect arising from the change to the cairn’s setting.

8.4.2 The proposed scheme uses the Nant Helen Complementary Earthworks Restoration earthworks scheme as the base case for the assessment of environmental effects. As a result, no physical impacts to the scheduled tramroad are considered in this assessment (as these were considered for the Nant Helen application). However, impacts on the setting of heritage assets and physical impacts on non-designated assets in the south of the site will be included.

8.4.3 Details of the consultation are included in Table 8-1.

Table 8.1: Response to scoping opinion

Scoping opinion clause	Response
<p>Glamorgan Gwent Archaeological Trust (NPT) - The supporting information includes a scoping report from Arup dated September 2019 which notes that there are archaeological issues which need to be addressed in order to determine the impact of the proposals on the historic environment. An archaeological desk-based assessment will be undertaken to inform the cultural heritage chapter. Section 12 refers to cultural heritage, and outlines the methodology for assessing the impact of the proposal on the historic environment. It includes stating that the work will be in line with the current best practice for the Chartered Institute for Archaeologists, as well as national, regional and local policies. These include that a methodology for the assessment will need to be agreed with us as your advisors prior to the production of the assessment. The</p>	<p>A WSI was submitted to GGAT for approval. See further discussion in Table 8-2.</p>

<p>approach is appropriate, and we look forward to agreeing the methodology. See Appendix 4.</p>	
<p>We have already responded to the Welsh Government consultation exercise on this scheme and confirmed that a cultural heritage assessment of the development area would be necessary as part of an EIA.</p> <p>There are a number of recorded archaeological sites within the red boundary and a high potential for impacts to both recorded and unrecorded archaeology outside the main former extraction and soil bund stripping areas of the opencast in particular. Impacts are most likely to occur where the new testing tracks are constructed and where other infrastructure is placed outside areas of disturbance caused by prior extraction, soil stripping and quarry buildings.</p> <p>There is one scheduled monument within the red boundary area and the applicants will have to consult Cadw via cadwplanning@gov.wales regarding setting issues and other potential impacts.</p> <p>We have advised Welsh Government that initially a detailed desktop study will be required along with a walkover survey to collate information on known and unrecorded sites, assess the potential impacts and suggest appropriate mitigation. Further pre-determination assessment may then be required in the form of geophysics, measured surveys and investigative trenching. This work should be carried out in accordance with the appropriate CIFA standards and guidance and a specification (written scheme of investigation) should be forwarded to us by the nominated archaeological contractor for approval in advance of the commencement of the assessment. All finished reports and any resulting digital archives must be submitted to the Historic Environment Record and National Monuments Record (RCAHMW) on completion of the assessments. See Appendix 5.</p>	<p>A WSI was submitted to GGAT for approval. See further discussion in Table 8.2. Detailed walkover survey was carried out, although the land proved too boggy to be suitable for geophysics.</p> <p>Noted.</p>
<p>CADW (PCC & NPT) – Having carefully considered the information provided with this request, consider that further information is required.</p> <p>An environmental scoping report has been prepared by Arup outlining the proposed contents of the environmental impact assessment and the methodologies that will be used to assess any likely damage to the environment. Chapter 12 of that document deals with Cultural Heritage and in general we concur with its’ contents: However, in regard to grade II listed buildings we would recommend that given that these are Nationally designated heritage assets, a search area of 3km would be more appropriate than 1km and that impact of the proposed development on the setting of all designated heritage assets inside 3km (listed above) should be carried out in accordance with the Welsh Government guidance given in the document “The Setting of Historic Assets in Wales”. We would expect a stage 1 assessment to be carried out for all of the above designated heritage assets, which will determine the need, if necessary, for stages 2 to 4 to be carried out for specific heritage assets.</p>	<p>The study area has been extended to 3km for all designated heritage assets (with an additional extent to 5km for GII* and above designations, and scheduled monuments). The Cadw guidance on the assessment of setting has been used to inform the methodology. The first stages of the assessment have been carried for all designated assets located within the theoretically visible area of the ZTV, with further assessment made where the setting is deemed to be sensitive to change. The initial stages can be found in Appendix 8A, with the latter stages in this chapter.</p>

<p>Finally, it is noted that paragraph 343 of the scoping document that there is a reference to Planning Policy Wales Chapter 6: The Historic Environment (Edition 9, 2016). This document has been replaced by Planning Policy Wales Chapter 6: The Historic Environment (Edition 10, 2018). See Appendix 7.</p>	<p>Noted and updated.</p>
<p>Built Heritage Conservation Officer - Advises that the methodology for assessing the setting of historic assets is sound. Further detailed comments provided note that 5KM outer study area buffered from the site boundary will be used in the assessment of Grade I and II* listed buildings and Registered Historic Park and Gardens and Scheduled Ancient Monuments, and a smaller buffer of 1Km for Grade II listed buildings and Grade II Registered Historic Parks and Gardens.</p> <p>Given the location of the listed buildings in the landscape compared with the location of the Scheduled Ancient Monuments, it is considered that this approach is acceptable in respect of the setting of listed buildings.</p> <p>There is, however, one scheduled monument that either does not appear to be in the Environmental Scoping Report, or is not readily evident, namely BR201 Lefel Fawr Coal Audit, which is immediately to the south of Listed Buildings 7468 Pont-y-Yard and 17922 Yard House.</p> <p>Reference is also made to the setting of Scheduled Ancient Monuments noting that there is one Scheduled Ancient Monument within the site boundary GM399. It is suggested that early dialogue is entered into with Cadw in respect of any potential physical works to this Scheduled Ancient Monument, in order that should a Scheduled Ancient Monument Consent application be necessary, this can be undertaken concurrently with the planning application to avoid potential delays in the delivery of the scheme.</p> <p>Whilst not a built heritage asset in itself, the proximity of Henrhyd Lech Falls (National Trust) and the Trail along Graig Lech has also been referred to, and as such it is recommended that specific consideration should be given to the assessment of the impact of the proposal on this tourism feature either within the cultural heritage assessment or the landscape assessment.</p> <p>It is advised that the Archaeological Trusts be contacted in respect of the Historic Environment Records on the site.</p>	<p>Noted</p> <p>The Lefel Fawr coal adit is included in this assessment (CH076), although it has been considered as part of a physical and interpretative group with the associated listed buildings Pont-y-Yard and Yard House. Any impacts on these assets would be considered individually but, due to the steep topography of the land to the north of the site, this group of Scheduled Monument and two listed buildings is outside of the area from which the site is visible.</p> <p>Consultation (and scheduled monument consent) have been discussed separately with Cadw.</p> <p>This is addressed in the LVIA chapter (Chapter 9)</p> <p>HER data was obtained from both CPAT and GGAT HERs to inform the baseline.</p>

<p>Cadw guidance on Managing Change “the setting of historic assets” addresses the steps to be considered in assessing the setting of historic assets and should be followed: - https://cadw.gov.wales/advice/support/placemaking/heritage-impact-assessment/setting-historic-assets.</p> <p>Mindful of recent case law in terms of smell affecting the setting of a listed building, it is also recommended that reference is made to reports commissioned in terms of noise/dust for Environmental Health in the setting of historic assets in order that it can be seen in terms of setting of listed buildings it has been addressed.</p> <p>It is also noted that it is not only the visual impact that can be considered in respect of listed buildings, but noise dust etc. can also be considered as affecting the setting in some circumstances. As such it may be worthwhile in the report on the setting of historic assets to briefly reference or direct the reader to any relevant pollutant impact studies or reports that are being undertaken which will be assessed by the relevant body in that regard.</p> <p>All considerations should use and refer to the relevant and current legislation, policy and guidelines and use a suitable assessment methodology, based on these documents. The assessment should be independent and objective and seek to fully define and understand the heritage assets, their setting and the short, medium and long term effects of the proposed development based on desk based and field research and using appropriate illustrations / photos where necessary. It should also seek to assess the effect and success of any mitigation measures.</p> <p>The cultural heritage assessment should also include an assessment upon the settings of a number of scheduled monuments within the Brecon Beacons National Park boundary.</p>	<p>The Cadw guidance on setting has informed the methodology used in this assessment.</p> <p>A review of the assessments made for Noise and Vibration (Chapter 10) and Air Quality (Chapter 14) has been carried out. No significant effects on cultural heritage assets have been identified.</p> <p>Noted</p> <p>An assessment has been made regarding impacts resulting from changes to the settings of all scheduled monuments within 5km buffered from the site boundary.</p>
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Consultation

- 8.4.4** Due to the potential for the proposed development to have adverse impacts on cultural heritage assets, consultation has been carried out with the Cadw Senior Inspector of Ancient Monuments for the area and the archaeological advisors from Clwyd-Powys Archaeological Trust (CPAT) and Glamorgan-Gwent Archaeological Trust (GGAT). CPAT and GGAT are the Archaeological Trusts that provide development control advice to Powys County Council and Neath Port Talbot County Borough Council respectively.
- 8.4.5** A Written Scheme of Investigation, detailing the DBA methodology was submitted to CPAT and GGAT for approval. Consultation with the CPAT and GGAT advisors has informed the development of the mitigation recommendations (see section 8.9).

Table 9-2: Response to representations from stakeholders on scope of cultural heritage assessment

Stakeholder	Comment	Response
GGAT	<p>The archaeological advisor commented (email dated 7.11.2019) on an incorrect planning policy reference within the draft WSI but otherwise made no comments on methodology.</p> <p>An email was sent to GGAT on 10.06.2020 to update their advisor on the progress of the application and detail the approach to mitigation and the outline nature of the application.</p> <p>GGAT stated in an email (dated 28.07.2020) that the updated WSI was fit for purpose and accepted the approach to mitigation proposed – which is that the detailed strategy will be agreed at the reserved matters stage.</p>	<p>Planning Policy Wales reference corrected.</p> <p>It is anticipated that the mitigation proposed in this chapter would be enforced by condition. WSI(s) will be produced by the archaeological contractor(s) engaged to carry out the work and submitted to GGAT prior to the commencement of the mitigation work.</p>
CPAT	<p>The archaeological advisor provided comments on the draft WSI, including correcting the planning policy reference, highlighting new SPGs in preparation for Powys, and commenting on potential sources to include. They discussed the areas of archaeological potential submitted and requested that detailed walkover survey be included for areas not affected by open cast mining. The WSI was approved by email on 7.11.2019.</p> <p>An email was sent to CPAT on 10.06.2020 to update their advisor on the progress of the application and detail the approach to the outline element of the application.</p> <p>An updated WSI was requested and submitted to cover the desk-based elements of the research. As the majority of the area affected comes under the jurisdiction of GGAT, the CPAT Development Control Archaeologist deferred to GGAT.</p>	<p>Changes to the WSI and the subsequent approach to methodology have been followed by this ES. The results of the walkover survey are included in Appendix A.</p> <p>This has been supplied.</p>
Cadw	<p>Cadw have been consulted in relation to the potential adverse effects on the Tramroad at Ystradgynlais Scheduled Monument from the Nant Helen earthworks application. No physical works to the Scheduled Monument are included within this (GCRE) application. A Scheduled Monument Consent application will be submitted separately.</p>	

	<p>During this process, there was a discussion of implications for the setting of the tramroad and the nearby Bryn Llechwen cairn (also a Scheduled Monument).</p>	<p>This has informed the assessment of setting contained in this chapter.</p>
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8.5 Methodology

Overview

8.5.1 The methodology followed for this assessment has followed the CifA and Cadw best practice standards and guidance set out above (see section 8.3). Although there is no formal methodology for the assessment of effects on cultural heritage in Environmental Impact Assessment, the Design Manual for Roads and Bridges (DMRB)⁶ is generally accepted as best practice and has been used as the basis for this assessment.

Methodology for establishing baseline conditions

8.5.2 The CifA guidance on DBAs states that “where the project is carried out within the planning process, the report should contain sufficient objective data to enable ‘an informed and reasonable decision to be made’ including a decision to require further evaluation of the site” To achieve this, data has been collected from a range of sources, including Cadw datasets of designated heritage assets, the Historic Environment Records, historic mapping and walkover survey. Data has been collected for the area of the site and the study area. For the purposes of this assessment, the site is the area within the redline boundary. The study area is defined as:

- 500m buffered from the site for non-designated heritage assets;
- 3km buffered from the site for Grade II Listed Buildings and Registered Parks and Gardens, Conservation Areas and designated Historic Landscapes;
- 5km buffered from the site for all other designated heritage assets which include Scheduled Monuments, Grade I and II* Listed Buildings and Registered Parks and Gardens.

8.5.3 The base case for this assessment is the restored earthworks of the Nant Helen Complementary Restoration Earthworks scheme which received planning consent in July 2020. A Scheduled Monument Consent application relating to the impacts arising from the

⁶ Highways England, Transport Scotland, Welsh Government and the Department for Infrastructure (2019) *Design Manual for Roads and Bridges*, Volume 11, LA 104 Environmental assessment and monitoring.

construction of the Nant Helen Complementary Restoration Earthworks has been submitted separately.

- 8.5.4 The full methodology for establishing the baseline conditions is included in Appendix 8A.

Design mitigation

- 8.5.5 There is no cultural heritage specific design mitigation incorporated into the project design.

Assumed construction practices

- 8.5.6 Details regarding the approach to cultural heritage are included in the outline CEMP submitted alongside this application (Appendix 3A). An archaeological contractor will be appointed and will undertake surveys and recording as required by this ES and in line with Written Schemes of Investigation agreed in consultation with GGAT/CPAT and Cadw, as appropriate.

Assessment methodology

- 8.5.7 Assessment of the significance and impact of the proposed scheme on known and potential heritage assets within the study area has been conducted in line with the three-stage approach outlined in DMRB. Firstly, the value of heritage assets is determined, then the magnitude of effect posed by the proposed scheme and then the significance of the effect.
- 8.5.8 Additionally, complementary guidance has been applied from CIfA and Cadw’s best practice guidance. This includes informing the discussion of the value of heritage assets and the contribution made by their setting on the basis of their heritage values, which as described in *Conservation Principles in Wales*, can be evidential, historical, aesthetic or communal in nature.
- 8.5.9 A further element considered is the impact of change or development within the setting of a heritage asset. In order to understand the nature of an effect to the setting, the setting itself and the contribution it makes to the value⁷ of the heritage asset must first be understood. Cadw has outlined a four-stage methodology for doing this, which has been followed in this assessment:
- “Stage 1: Identify the historic assets that might be affected by a proposed change or development;
 - Stage 2: Define and analyse the settings to understand how they contribute to the significance of the historic assets and, in

⁷ The term ‘significance’ is used in relation to heritage value in the Cadw methodology. To avoid confusion with ‘significance of effect’, the term ‘value’ is used throughout this report.

particular, the ways in which the assets are understood, appreciated and experienced;

- Stage 3: Evaluate the potential impact of a proposed change or development on that significance;
- Stage 4: If necessary, consider options to mitigate or improve the potential impact of a proposed change or development on that significance.”

8.5.10 In order to identify heritage assets where there are potential effects arising from the change to their setting (Stage 1) the Zone of Theoretical Visibility (ZTV) developed for the LVIA has been used (see Chapter 9). This is a model which identifies areas which could potentially have views of the development. The analysis of the settings of assets identified as being potentially affected is contained within Section X4 of Appendix 8A (Stage 2). Additionally, further review was carried out to identify if additional heritage assets should be evaluated for potential effects arising from a non-visual change to their setting, acknowledging that the setting of heritage assets encompasses more than just what can be seen or not seen. Stage 3 and 4, the assessment of potential effects and discussion of mitigation, form part of this chapter (section 8.8).

8.5.11 Heritage assets can be designated or non-designated and, while designated assets are statutorily protected, non-designated heritage assets may exhibit equivalent values to those which have been granted statutory protection.

8.5.12 Taking these criteria into account, each identified baseline heritage asset has been assigned a level of significance in accordance with a five-point scale as shown in Table 9-3.

Table 9-3: Value of heritage assets

Value	Typical description
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives
High	Nationally important assets (scheduled monuments, listed buildings, registered parks and gardens)
Medium	Designated (conservation areas) or non-designated assets that are of regional importance
Low	Assets of local importance. Assets compromised by poor preservation and/ or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving value.

8.5.13 The approach to assessing the magnitude of impact on heritage assets shown in **Error! Reference source not found.** Table 9-4 considers the change upon the asset. This has taken into account the severity of the impact of the proposed development, together with the vulnerability of the asset to change.

Table 9-4: Magnitude of Impact

Magnitude of Impact	Description of impact
Major	Complete destruction/demolition of site or feature. Change to the site or feature resulting in a fundamental change in our ability to understand and appreciate the resource and its historical context and setting.
Moderate	Change to the site or feature resulting in an appreciable change in our ability to understand and appreciate the resource and its historical context and setting.
Minor	Change to the site or feature resulting in a small change in our ability to understand and appreciate the resource and its historical context and setting.
Negligible	Negligible change or no material change to the site or feature. No real change in our ability to understand and appreciate the resource and its historical context and setting.
No Change	No change

Significance Criteria

8.5.14 According to the DMRB methodology, significance of effect upon heritage is assessed according to a matrix approach using the criteria in the tables above. Effects may be either adverse or beneficial, permanent or temporary.

8.5.15 It should be noted that the initial assessment is made for the proposed scheme without mitigation; the residual effect as a result of mitigation is determined separately. In all cases, professional judgement has been used in conjunction with the descriptors in Table 9-5 **Error! Reference source not found.**, to arrive at a final judgement of the significance of effect.

8.5.16 Moderate or Major effects are considered to be significant.

Table 9-5: Significance of effect

		MAGNITUDE OF IMPACT				
		No Change	Negligible	Minor	Moderate	Major
VALUE	Very High	Neutral	Minor	Moderate or Major	Major	Major
	High	Neutral	Minor	Minor or Moderate	Moderate or Major	Major
	Medium	Neutral	Negligible or Minor	Minor	Moderate	Moderate or Major
	Low	Neutral	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
	Negligible	Neutral	Negligible	Negligible or Minor	Negligible or Minor	Minor

8.6 Limitations and assumptions

Limitations

8.6.1 No limitations have been identified in relation to this assessment

Assumptions

8.6.2 Baseline data has been obtained from a range of sources, including the Historic Environment Records (HER) held by CPAT and GGAT and the National Monuments of Wales record held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW). The assumption is made that this data is accurate but there are inherent limitations in these kinds of data. The HERs and NMRW are records of known archaeological and historic assets. They are not exhaustive records of all surviving historic assets and do not preclude the existence of further assets, which are unknown at present. This means that this assessment represents a professional judgement of what is most likely, rather than a definitive statement of the presence or absence of archaeological remains within the site.

8.6.3 The extent of past open cast mining within the site has informed the assessment of archaeological potential. This data was obtained from Celtic Energy (the owner of the mine) and confirmed, where possible,

with historic aerial photography. It is assumed that no archaeological remains survive in areas subjected to open cast mining.

- 8.6.4 The Nant Helen Complementary Restoration Earthworks scheme, which forms the base case for this assessment, involves the construction of cuttings and embankments. It is assumed that there is no archaeological survival within the footprint of these earthworks.

8.7 Baseline Environment

- 8.7.1 The details of the cultural heritage baseline assessment, including sources used and a full archaeological and historic background can be found in Appendix 8A. All heritage assets identified have been given the prefix 'CH' and full details are included in the gazetteer (see section X8 Appendix). They are shown on Figures 8.1 and 8.2. Historic landscape areas are shown on Figure 8.3 and archaeological potential is shown on Figure 8.4.
- 8.7.2 In summary, 124 heritage assets were identified and assessed within the site and study area (see Section 8.5 for details of the study area). This included one Scheduled Monument located within the site; 35 non-designated heritage assets within the site; 40 designated heritage assets and 48 non-designated heritage assets located within the study area beyond the site. Additionally, 11 historic landscape areas were identified within or in proximity to the site.
- 8.7.3 Out of these heritage assets, only 12 of those within the site were potentially affected by the proposed scheme. This is because many of the recorded sites of archaeological remains or features identified from historic maps have been removed by open cast mining or as part of the base case.
- 8.7.4 In addition to the known heritage assets within the site there is the potential for previously unrecorded archaeological remains to be removed during construction. While the archaeological potential for much of the site is negligible, due to past open cast mining and the construction of the base case, there remains some areas of higher archaeological potential. Figure 8.4 shows four areas of archaeological potential. The first, Area A, is the known extent of restored opencast mining and archaeological potential is negligible in this area. Area B is the land affected by the construction of the base case. In this area, where topsoil stripping or other ground works have occurred, there is assumed to be negligible archaeological potential. However, there remains a high potential for 19th century and modern features relating to historic mining and extraction, including the scheduled Tramroad at Ystradgynlais (CH001). Area C, in the north of the site, is a small area outside of the opencast mine and the earthworks which form the base case. The baseline research (Appendix X) indicates that this is an area of high potential for 19th and 20th century features relating to mining and land management. Additionally, Area C is notably marshy and, although peat deposits have not been identified here, it is possible that

these are present. This means that there is a moderate potential for paleoenvironmental remains within Area C. Area D, which in the south of the site, is mostly covered by the Onllwyn Washery (CH061), a modern operation which is likely to have removed any evidence of earlier industry or other activity. Within the footprint of the washery there is negligible archaeological potential. Beyond it, there is a moderate potential for surviving below ground features associated with the railway and Onllwyn Colliery.

- 8.7.5 Additionally, 6 heritage assets were identified which are within the ZTV and have the potential to be affected by changes to their setting arising from the Project (see section X4 of Appendix 8A).

8.8 Assessment of effects

- 8.8.1 Effects have been identified arising from the construction of the proposed development. Outside of the areas of the earthworks which form the base case, construction activities may result in physical effects to archaeological features, in addition to effects arising from changes to the setting of heritage assets located beyond the site.
- 8.8.2 All physical effects on heritage assets are permanent, adverse and will occur during construction. Effects arising from changes to the setting of heritage assets are assessed as construction effects as, although they will continue throughout operation, they are a continuation of an effect which would begin during construction rather than a new effect.
- 8.8.3 Full details of the identified asset's value and the contribution made to their value by their setting is included in Appendix 8A.

Assessment of effects from construction

- 8.8.4 The proposed scheme would involve the construction of two rail testing tracks – one large rolling stock test track and one high tonnage infrastructure test track. These test tracks would be built along the earthworks constructed as part of the Nant Helen Complementary Restoration Earthworks project, which forms the base case for this assessment. As such, there would be no physical impacts on heritage assets within the area of the already constructed earthworks (archaeological potential Area B). While there are further heritage assets located within the site (Area C), these are not impacted by the proposed scheme. There would, however, be impacts arising from the setting of heritage assets, which are discussed further below.
- 8.8.5 As this is an outline application, with all matters reserved. At the reserved matters application stage, an assessment should be made to validate the conclusions and, if necessary, undertake additional heritage assessment and mitigation.
- 8.8.6 The proposed scheme would include the construction of new sidings alongside the existing branch railway in the southern part of the site

and the establishment of a number of facilities on the site on the Onllwyn Washery. This would include a storage facility, research and development building, maintenance facility, carriage wash facility and multi-storey staff and signal control buildings. The existing Onllwyn Washery buildings would be demolished, although the existing sidings would be retained for cold storage.

- 8.8.7 Onllwyn Washery (CH061) is a 20th century complex considered to be of negligible heritage value. Its removal would constitute a major magnitude of change, resulting in a **minor adverse** significance of effect. This is not significant.
- 8.8.8 The Dulais Valley Mineral Railway (CH055) runs through the southern part of the site and would have new sidings built immediately adjacent to it. This would not alter its heritage value, which is considered to be negligible. There would be **no impact**.
- 8.8.9 There are several former railway bridge bases or underbridge structures which have been reported in archaeological potential Area D (CH10, CH011 and CH059). While it is understood that there are no extant remains of some of these features, it is likely that the surviving pier bases beneath the road bridge over the railway immediately west of the Onllwyn Washery are still extant. They are assets of low value. The current proposals, in their outline form, would not necessitate their removal, but this should be assessed further at the reserved matters stage. It is assumed for the purposes of this assessment that there would be **no impact**. However, as a worst possible case, their complete removal would be a major magnitude of impact, resulting in a minor adverse significance of effect, which is not significant.
- 8.8.10 The proposed scheme would be visible and, in the case of the Tramroad at Ystradgynlais and the Bryn Llechwen cairn, audible from a number of assets which have settings which are sensitive to change. The most immediate of these changes would be to the setting of the Tramroad at Ystradgynlais (CH001). A 450m section of the asset will have been buried by the construction of the base case embankments, which while leaving the physical fabric of the monument largely intact would sever the final eastern stretch of the tramway with its western extent. This was considered to be a major adverse effect for the base case. The addition of the large railroad testing track on top of the monument would not further impact on the value of the monument. Indeed, the evolution of railway technology could be said to be a part of the story of this monument, which derives its value as an important moment in the evolution of railway technology. As a change from the base case, there would be **no impact** on the value of the scheduled tramroad (CH001).
- 8.8.11 There would be effects arising from changes to the setting of six scheduled monuments located within the study area. Bryn Llechwen ring cairn (CH002) is located c130m west of the site boundary and would have clear views across the entire site. It is a Scheduled

Monument and has high value. While the setting of the cairn is an important aspect of how the cairn is understood, views to the east towards the site do not contribute to this due to the extent of 20th century open cast mining. In addition to dramatically altering the natural hillside, the mine also removed three cairns which formerly were part of a chain which included Bryn Llechwen. The construction of the base case was considered to have a temporary minor adverse effect, resulting from the increased noise, lighting and appearance of construction activities happening only a short distance from the cairn. Views to the east, while not specifically contributing to the cairn's value would not have, prior to the construction of the base case, have overly detracted from its value. The impact of the earthwork construction would only have been temporary, extending through the construction period and into the first year post-construction as grass seeding took hold and reduced the visibility of the earthworks. However, the construction of the large railroad testing track close to the cairn would introduce a permanent change to its setting, with increased noise, light and industrial activity. This would result in a permanent depreciation of the way in which the cairn is understood within its upland environment. This would be a minor magnitude of impact, resulting in a **minor adverse** significance of effect. This is not significant.

8.8.12 Craig-y-Rhiwarth Hillfort (CH088), is an Iron Age hillfort located 3.9km north-east of the site. It is a Scheduled Monument and is of high value. It is located on a high limestone cliff and has panoramic views across the Tawe valley to the north and south. The site is located within this landscape and, although the landscape of Mynydd y Drum makes a negligible contribution to the hillfort's value, the hillfort would have been deliberately sited to command views over this area. During the construction, and first year post-construction, of the base case, there would have been a temporary minor adverse effect resulting from the increased activity on the hillside, especially in the restored areas east of the former opencast workings. The construction of the two rail testing tracks, with their associated lighting and the movement of trains along them, would make this temporary adverse effect a permanent one. Due to the distance and the breadth of the views from the hillfort this would be a minor magnitude of impact resulting in a permanent **minor adverse** significance of effect. This is not significant.

8.8.13 There are four Bronze Age ritual or burial monuments located on the surrounding hillsides: Dorwen Standing Stone (CH090) and Lorfa Stone Circle (CH091), which are located on the southern slopes of the Black Mountain, and Coed Ddu (CH096) and Carn Cornel (CH097) cairns, on the Hirfynydd ridgeline. All of these monuments are understood to derive value from their settings, which include panoramic views across the whole of the Tawe and Dulais valleys. They are Scheduled Monuments and are high value. The site is visible from all four monuments and the base case would be visible during

construction and the first-year post-construction, resulting in a temporary minor adverse effect. As with the assets above, the construction of the proposed scheme would mean that the intrusion into the landscape of the new rail testing loops and associated infrastructure would alter the temporary effect of the earthwork construction to a permanent effect. The distance from these monuments to the site and the breadth of their views minimises the impact on them by the proposed scheme. As a result, it is considered that there would be a negligible magnitude of impact, as there would be no real change to the legibility of the monuments or a change to how they are appreciated. This would be a permanent **minor adverse** significance of effect, which is not significant.

8.8.14 There are 11 historic landscape areas within the site or its immediate vicinity (Appendix 8A, Figure 8.3). Of these, Coelbren, Dyffryn Tawe, Dulais Valley NW, Dulais Valley NE, Banwaen Tor-y-Betal and Ystradgynlais/Abercraf are either unaffected by the proposed development or such a small part is affected as to have no effect on a landscape level. Of the remaining five historic landscape areas, the following effects have been identified during construction:

8.8.15 The site occupies a large area within the Onllwyn historic landscape area, which is an area of modern coal mining of negligible value. The construction of the base case would have altered the form and appearance of this landscape area, but its characteristics would still be broadly legible. construction of the earthworks would alter the physical appearance and form of the historic landscape area, but its characteristics would still be broadly legible. The addition of the rail testing tracks would be a more substantive change, as the base case earthworks would be much more visible as a new installation in the landscape with a track. This would be an appreciable change to its legibility, which equates to a moderate magnitude of impact. The Onllwyn landscape is of negligible value, meaning that the result of this impact would be a **negligible adverse** significance of effect. This is not significant.

8.8.16 Nant Pen-rhos is an area of 20th century conifer woodland which extends into the north-western part of the site. This part is an area of restored mining land. It is of negligible value. The proposed scheme would involve the construction of the outer rail testing track through the eastern portion of the landscape area. This would have a minor adverse magnitude of impact, resulting in a permanent **negligible adverse** significance of effect. This is not significant.

8.8.17 The north and south areas of Twyn Eithinog are an expanse of marginal upland stretching across Mynydd y Drum to the west of the site. They are of low value. The proposed scheme would extend into the easternmost parts of the two areas with the construction of the outer rail testing loop along the eastern boundary of the areas but not otherwise affecting their legibility. This is a minor magnitude of

impact and would result in a permanent **minor adverse** significance of effect. This is not significant.

8.8.18 The Crynant & Seven Sisters Urban Corridor is a historic landscape area comprising the built-up strip of land to the south of the site. The site extends into a portion of it along the Dulais Valley railway line and the Onllwyn Washery site. It is a historic landscape of low value, containing a reasonably well preserved industrial communications and settlement corridor. The proposed scheme would redevelop the area of the Onllwyn Washery and add new sidings alongside the extant branch railway. This would not alter the historic industrial nature of the landscape or alter its form. There would be a negligible magnitude of impact resulting in a **negligible adverse** significance of effect. This is not significant.

8.8.19 An assessment has been made of potential in combination effects with climate change but no effects have been identified and are, therefore, it is not discussed further in this chapter. This is discussed in Chapter 15.

Assessment of effects from operation

8.8.20 No effects have been identified from the operation of the proposed scheme, although it is anticipated that the change to the setting of heritage assets identified as construction effects would continue throughout the lifetime of the GCRE. These effects were identified on the Bryn Llechwen ring cairn (CH002), Craig-y-Rhiwarth Hillfort (CH088), Dorwen Standing Stone (CH090), Lorfa Stone Circle (CH091), Coed Ddu Ring Cairn(CH096) and Carn Cornel Round Cairn (CH097).

8.8.21 Although noise and dust can have an effect on heritage assets through the change to their setting, no significant effects have been identified on any of the heritage assets identified in this chapter (see chapters 14 and 10, respectively).

8.9 Mitigation and enhancement

Mitigation of effects from construction

8.9.1 No significant adverse effects have been identified resulting from effects to non-designated archaeological remains. However, national and local planning policy (see section 8.3) require that any adverse effects should be mitigated.

8.9.2 The Onllwyn Washery, while identified within the NMRW datasets, is a modern complex of negligible heritage value. While a minor adverse effect has been assessed, resulting from its removal, archaeological mitigation, such as building recording, is not proportionate as it is already recorded within the NMRW. No mitigation is proposed.

- 8.9.3** No further physical impacts on heritage assets have been identified at this outline application stage. Further assessment and consultation may be required should the reserved matters application vary from the proposed scheme as it is currently understood. Mitigation may be required should construction works extend into areas beyond that of the base case, the site of the Onllwyn Washery and existing railway line, where archaeological potential is negligible. Strip, map and sample is likely to be required should construction be required outside of these areas and would need to be confirmed with the LPA Archaeological Advisors (CPAT and GGAT). Archaeological recording would be required if any of the historic bridge bases (CH010, CH011 and CH059) were to be removed.
- 8.9.4** The full details of any archaeological mitigation should be agreed with the archaeological advisors of GGAT and CPAT and be undertaken under an agreed Written Scheme of Investigation approved by CPAT and GGAT and carried out by an appropriately qualified archaeological contractor.
- 8.9.5** No significant adverse effects have been identified arising from changes to the setting of heritage assets or from physical alterations to historic landscapes. No mitigation is proposed.

Mitigation of effects from operation

- 8.9.6** As no operational effects have been identified, no mitigation is proposed.

8.10 Residual effects

Residual effects from construction

- 8.10.1** No mitigation is currently proposed for the minor and negligible adverse effects identified on the Onllwyn Washery and to the scheduled monuments with views of the site. As such there is no reduction in the residual effects from construction. These are not significant.

Residual effects from operation

- 8.10.2** As no operational effects have been identified, there are no residual effects arising at this stage.

8.11 Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Removal of the Onllwyn Washery	Onllwyn Washery (CH061)	Negligible	Major	Minor adverse (permanent)	None proposed	Major	Minor adverse (permanent)
Change to the setting of Bronze Age cairn	Bryn Llechwen Ring Cairn (CH002)	High	Minor	Minor adverse (permanent)	NA	Minor	Minor adverse (permanent)
Change to setting of Scheduled Monument	Craif-y-Rhiwarth, Hillfort (CH088)	High	Minor	Minor adverse (permanent)	NA	Minor	Minor adverse (permanent)
Change to setting of Scheduled Monument	Dorwen Standing Stone (CH090)	High	Negligible	Minor adverse (permanent)	NA	Negligible	Minor adverse (permanent)
Change to setting of Scheduled Monument	Lorfa Stone Circle (CH091)	High	Negligible	Minor adverse (permanent)	NA	Negligible	Minor adverse (permanent)
Change to setting of Scheduled Monument	Coed Ddu ring cairn (CH096)	High	Negligible	Minor adverse (permanent)	NA	Negligible	Minor adverse (permanent)
Change to setting of Scheduled Monument	Carn Cornel Round Cairn (CH097)	High	Negligible	Minor adverse (permanent)	NA	Negligible	Minor adverse (permanent)
Change to historic landscape	Twyn Eithinog (N and S)	Low	Minor	Minor adverse (permanent)	NA	Minor	Minor adverse (permanent)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Change to historic landscape	Nant Pen-rhos	Negligible	Minor	Negligible adverse (permanent)	NA	Minor	Negligible adverse (permanent)
Change to historic landscape	Onllwyn	Negligible	Moderate	Negligible adverse (permanent)	NA	Moderate	Negligible adverse (permanent)
Change to historic landscape	Crynant & Seven Sisters Urban Corridor	Low	Negligible	Negligible adverse (permanent)	NA	Negligible	Negligible adverse (permanent)

9 Landscape and Visual

9.1 Introduction

- 9.1.1 This chapter provides an assessment of the likely landscape and visual effects arising from proposed development including changes to the landscape character within the zone of influence, and changes to features or composition of views.
- 9.1.2 Effects on landscape and visual receptors are closely related but separately assessed. Landscape receptors are its characteristics, key features and special qualities, and visual receptors are people and changes to their visual amenity.
- 9.1.3 This assessment sets out the national and local legislation, policy and guidance related to the proposed development and its site before setting out the baseline conditions and how these will be affected by proposed development.

9.2 Review of proposed development

- 9.2.1 A full proposed development description is set out in Chapter 3. However, elements of the proposed development particularly relevant to the LVIA include;
- the erection of overhead line equipment and laying of rail track along two test tracks of track configuration;
 - the operation of trains across two test tracks of track configuration;
 - the construction and operation of a multi-storey control building;
 - the construction and operation of a research and development centre;
 - the construction and operation of buildings for up to 400 rolling stock vehicles;
 - the construction and operation of a carriage wash facility; and
 - construction and operation of access roads, car parking, drainage and landscaping.
- 9.2.2 Mitigation proposed as part of the closely related Nant Helen Complementary Restoration Earthworks application (references 20/0738/FUL (Powys) and P/2020/0362 (Neath Port Talbot), that will also contribute to the mitigation of the effects of proposed development is described and accounted for in this assessment.
- 9.2.3 An iterative process was followed to include proposals to mitigate the effects of proposed development. These proposals and any reductions

to the significance of effect are outlined in the assessment where it is assumed that any mitigation planting will have established by year 15.

9.3 Legislation, policy context and guidance

European Landscape Convention

- 9.3.1 The following paragraphs are quoted from Institute of Environmental Management and Assessment (IEMA) and the Landscape Institute's *Guidance on Landscape and Visual Impact Assessment (GLVIA), 3rd Edition* (2013).
- 9.3.2 “The UK has signed and ratified the European Landscape Convention (ELC) since 2002, when the last edition of this guidance was published. The recognition that government has thus given to landscape matters raises the profile of this important area and emphasises the role that landscape can play as an integrating framework for many areas of policy. The ELC is designed to achieve improved approaches to the planning, management and protection of landscapes throughout Europe and to put people at the heart of this process.”
- 9.3.3 The ELC defines landscape as:
- “Landscape” means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.”

Well-being of Future generations (Wales) Act 2015

- 9.3.4 Part 2 of the Act sets out what is meant by sustainable development, defining it as:
- 9.3.5 “the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the wellbeing goals.”
- 9.3.6 Under the “well-being goals”, of relevance is “A resilient Wales” described as “A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).”
- 9.3.7 Section 5 of the Act provides a meaning for sustainable development principles, stating that “the body must act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs.”

- 9.3.8** Based on the Act Neath Port Talbot published *Well-being Plan 2018-2023* that sets out Local Well-being objectives. Of particular reference is ‘Objective 5: Value our green infrastructure and the contribution it makes to our well-being’. The objective sets out the contribution that it will make to each of the seven national well-being goals.
- 9.3.9** Powys County Council’s *Towards 2040 – the Powys Well-being Plan* sets out its own objectives and contributions to the seven national well-being goals. Of particular relevance is ‘Well-being Objective 2’ which relates to the natural environment, access to it, and a sustainable and resilient environment.

Planning Policy Wales (PPW) – Edition 10

- 9.3.10** The following paragraphs have been highlighted as they are of particular relevance to proposed development.
- 6.0.2** outlines the necessity for protecting landscape character and visual amenity.
- 6.3.5** outlines the statutory duty planning authorities have to National Parks and AONBs
- 6.3.6** outlines the purpose and importance of national parks.
- 6.3.8** outlines landscape and scenic importance of national parks.
- 6.3.9** outlines the importance of assessing national parks to ensure that effects are acceptable.
- 6.3.10** whilst the proposed development does not fall within the Brecon Beacons National Park, this paragraph outlines the overall importance and weighting given to national parks in the decision-making process.
- 6.3.19** and **6.3.20** outline the importance of LANDMAP as a resource in the decision-making process.
- 6.3.11** outlines the importance of conserving and enhancing local landscapes.
- 6.3.13** outlines the recognition of important landscapes through non-statutory designations such as SLAs.
- 6.4.26** outlines the importance and irreplaceable nature of Ancient Woodland which can contribute to landscape character and value.

Technical Advice Notes

9.3.11 “Technical advice notes (TANs) provide detailed planning advice for Wales. Local planning authorities take them into account when they are preparing development plans.”¹

9.3.12 The following TANs are of particular relevance to the proposed development.

(TAN) 5: nature conservation and planning

Paragraph 4.3.2 – regarding the necessity to provide landscape proposals to avoid, mitigate or compensate for adverse effects on nature conservation.

(TAN) 12: design

Paragraph 4.8 – regarding design, scale, siting, use of materials in relation to landscape character and distinctiveness;

Paragraph 4.11 - regarding the use of LANDMAP to inform assessment and decision making;

Paragraph 4.14 – regarding legibility in relation to views and vistas, landscape features and connectivity of footpath networks.

Local Planning Policy

9.3.13 The proposed development falls within Powys County Council and Neath Port Talbot County Borough Council.

9.3.14 Key policies within Powys Local Development Plan (2011-2026, adopted April 2018) have been identified:

Policy DM4 – Landscape

Proposals for new development outside the towns, large villages, small villages and rural settlements defined in the Settlement Hierarchy must not, individually or cumulatively, have an unacceptable adverse effect, on the valued characteristics and qualities of the Powys landscape. All proposals will need to:

- 1) be appropriate and sensitive in terms of integration, siting, scale and design to the characteristics and qualities of the landscape including its: topography; development pattern and features; historical and ecological qualities; open views; and tranquillity; and
- 2) have regard to LANDMAP, Registered Historic Landscapes, adjacent protected landscapes (National Parks and Areas of Outstanding Natural Beauty) and the visual amenity enjoyed by users of both Powys landscapes and adjoining areas.

¹ GOV.WALES (2020) *Technical Advice Notes*

9.3.15 Key policies within the Neath Port Talbot LDP (2011-2026, adopted January 2016) are listed below:

Policy EN2 Special Landscape Areas

9.3.16 This policy identifies 6 Special Landscape Areas (SLA) within which, development “will only be permitted where it is demonstrated that there will be no significant adverse impacts on the features and characteristics for which the SLA has been designated.”

9.3.17 Whilst the site is not located within any SLA, Neath Port Talbot Special Landscape Area 2: Dulais Valley is considered relevant to the Proposed development as its boundary abuts the Powys County boundary. It is assumed that the defining features and characteristics of the SLA would continue beyond the county boundary. The defining features of the Dulais Valley SLA have been explored as part of the baseline studies and taken into consideration when defining and assessing individual character areas.

Policy SP 14

9.3.18 The countryside and undeveloped coast, including landscapes, seascapes and agricultural land, will be protected and where feasible enhanced through the following measures: 1. The protection of the open countryside through the control of inappropriate development outside settlement limits; 2. The protection of the undeveloped coast through the control of inappropriate development; 3. The designation and protection of Special Landscape Areas; 4. The designation and protection of Green Wedges. LDP Objective: OB 15

9.3.19 As well as policies, Key Issues and Overarching objectives are identified within the Neath Port Talbot LDP which need to be addressed.

KI 11: There is a need to balance the impact of development on the countryside, landscape and coast, in particular the exploitation of mineral and renewable energy resources.

OB 15: Conserve Neath Port Talbot’s important landscapes, countryside, undeveloped coast, important wildlife, habitats and geodiversity sites, ensuring that developments throughout the County Borough respect all landscapes and minimise adverse impacts. [KI 2, KI 11 and KI 12]

Management Plans

9.3.20 The Proposed development site is located in close proximity to the Brecon Beacons National Park and therefore information included within A Management Plan for the Brecon Beacons National Park

2015-2020² has been used to form judgments on the anticipated effects as a result of the Proposed development.

9.3.21 The management plan is integrated with other plans and policies and outlines the importance and purpose of the national park and sets out the management plan themes to meet the purposes and duties of the national park.

9.3.22 Most relevant to this assessment are the potential effects on park users and their enjoyment of and opportunities for outdoor access and recreation within the national park. The relationship that the national park has with its contextual landscape, beyond the national park boundary is a key consideration which has potential to impact upon the overall character of the national park through effects derived from changes in the sense of peace and tranquillity, its remoteness and ruralness.

9.3.23 Key extracts relevant to this assessment are listed below:

1.9 Special Qualities: A National Park offering peace and tranquillity with opportunities for quiet enjoyment, inspiration, relaxation and spiritual renewal.

1.10 Vision: Widely acclaimed for its natural beauty, geodiversity, biodiversity and cultural heritage while being a sought-after destination, providing an outstanding variety of sustainable opportunities for all to understand, enjoy and benefit from its tranquillity, rural character, Welsh way of life, sense of remoteness and other special qualities.

Objectives Theme 1: Conserve and enhance the sense of tranquillity, peace and remoteness experienced throughout the National Park.

Aims Theme 3: The sense of tranquillity, peace and remoteness experienced throughout the National Park will be conserved and enhanced.

Relevant guidance

9.3.24 This assessment has followed guidance set out in the following documents:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA), (Third Edition, 2013)³;
- Technical Guidance Note 06/19 Visual representation of development proposals, Landscape Institute (September 2019)⁴; and

² Brecon Beacons National Park Authority *A Management Plan for the Brecon Beacons National Park 2015-2020*

³ Landscape Institute and I. E. M. A (2013) *Guidelines for Landscape and Environmental Impact Assessment*

⁴ Landscape Institute (2019) *Technical Guidance Note 06/19 Visual representation of development proposals*

- LANDMAP Methodology Overview (2017)⁵.

9.4 Scoping and consultation

Scoping

9.4.1 The scope was defined following the advice provided in GLVIA3⁶

9.4.2 A desktop study was undertaken to scope the proposed development landscape and visual assessment. This desktop study sought to define key matters including:

- the extent of the study area to be used for assessment of landscape and visual effects;
- sources of relevant landscape and visual information;
- the nature of relevant possible landscape and visual effects;
- identification of main receptors;
- appropriate methodology to be used (including baseline to be used and cumulative effects).

9.4.3 Following further studies, site investigation and receipt of scoping opinions from Neat Port Talbot Council and Powys County Council, the scope of the assessment was refined further. The table below outlines the changes made as a result of the scoping opinions and initial consultation.

Table 9-1: Response to scoping opinion

Scoping opinion clause	Response
The proposed 2km buffer applied to the ZTV “would miss a number of viewpoints and receptors within the National Park, including from land north/east of Coelbren/Dyffryn Cellwen, on ridges of Llorfa and Cefn Mawr to the north west and from Cribarth to the north, and around Pen-y-cae to the north east”.	Following initial site surveys, the buffer was extended to 8km.
<p>“In light of NRW advice, you may wish to provide additional viewpoints as follows:</p> <ul style="list-style-type: none"> - Trig point on Cribarth (SAM & Registered Common Land) approx. 3.16km - Public Footpath north east of Henrhyd falls, south of Bryn Bugeiliaid (open access land) 2.5-3km 	The suggested viewpoints have been visited and where deemed appropriate are included within the report.

⁵ Natural Resources Wales (2017) *LANDMAP Methodology Overview*

⁶ Landscape Institute and I. E. M. A (2013) *Guidelines for Landscape and Environmental Impact Assessment*

Scoping opinion clause	Response
<ul style="list-style-type: none"> - Dismantled railway north west of Bryn Bugeiliaid forest, on edge of NNR (Ogof Ffynnon Ddu) & a permissive path (Open Country) approx. 4km. - Bridleway on Cefn Mawr ridge north west of Giedd Forest (Open Access 4.8-5km. The alternative to this could be Llorfa ridge, which was used in the open cast assessment, although this is further away. <p>Potential viewpoints from paths on/close to the site with views looking towards the national park e.g. on Mynydd Y Drum or to the south.’’.</p>	
<p>NRW have stated that the baseline for the LVIA should be based on the approved restoration plans for the site, and not the existing situation, i.e. the existing working surface coal mine which is a largely pre-restored site. BBNPA would concur with this advice. The site is subject to planning conditions to secure restoration of the site to beneficial after uses and this also means that the site is not a brown field site, but green field – this should be reflected in the LVIA.</p>	<p>The baseline has been updated and is defined within this chapter. The assessment is based on future baseline post-restoration and provides a worst-case assessment.</p>
<p>NRW also refer to the need to consider effects of light pollution, particularly Night-time effects and the Dark Sky Reserve status of the National Park.</p> <p>BBNPA would concur with this advice. Reference should be made to the SPG – Obtrusive Lighting and Light Pollution dated 27.03.2015.</p>	<p>The night-time assessment has not yet been completed due to site visit constraints. Considerations to mitigate the potential night-time effects have been incorporated into the design and are described within this chapter and chapter 3.</p>
<p>NRW state that the LVIA should refer to the National Park’s Management Plan, (i.e. the latest version 2015-2010), the Special Qualities of the National Park (particularly peace and tranquillity) and the Landscape Character Assessment (as set out in the Landscape and Development Supplementary Planning Guidance dated 24.10.2014). Impacts on Landscape Character Area 2 - Y Mynydd Du, 3 – Fforest Fawr and 4 - Waterfall Country and Southern Valleys should be assessed. BBNPA would concur with this advice.</p>	<p>Whilst there are no direct impacts upon the national park, indirect impacts and resulting effects* have been considered, notably those that will affect the enjoyment and recreation of the national park due to impacts on the national park’s special qualities. References to the Management Plan and Landscape Character Assessment have been made where appropriate.</p> <p>(*Effects that result indirectly from the proposed development as a consequence of a direct effect, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects)</p>

Scoping opinion clause	Response
Noted the absence of any viewpoint on the A4221 / Inter Valley Road and within Coelbren.	<p>The majority of views from Inter Valley Road towards the site are screened by roadside vegetation. Longer distance views are generally to the north towards the Brecon Beacons. This has been confirmed by site surveys.</p> <p>A representative viewpoint from Coelbren has been included in this report.</p>

Consultation

9.4.4 Stakeholder comments relating to landscape and visual effects are outlined in the table below.

Table 9-2: Response to representations from stakeholders on scope of landscape and visual assessment

Stakeholder	Comment	Response
Neath Port Talbot Council	Noted the absence of any viewpoint on the A4221 / Inter Valley Road and within Coelbren.	<p>The majority of views from Inter Valley Road towards the site are screened by roadside vegetation. Longer distance views are generally to the north towards the Brecon Beacons. This has been confirmed by site surveys.</p> <p>A representative viewpoint from Coelbren has been included in this report.</p>
Brecon Beacons National Park Authority, Neath Port Talbot Council and Powys County Council.	<p>Draft Landscape Character Area boundaries and visual receptor locations were sent to stakeholders for comment outside of the scoping process.</p> <p>Comments were provided by stakeholders within the scoping opinion.</p>	Additional viewpoints were visited and where deemed appropriate included within the report.

9.5 Methodology

Overview

9.5.1 Throughout this chapter, ‘Nant Helen Restoration’ refers to the restoration proposals as originally submitted in the 2011 Nant Helen

Remainder Application and later amended as part of the 2019 Addendum (section 73 application 19/1899/REM).

- 9.5.2 Throughout this chapter ‘Nant Helen Complementary Restoration Earthworks’ refers to the earthworks proposals submitted as part of the 2020 application (references 20/0738/FUL (Powys) and P/2020/0362 (Neath Port Talbot) which has been consented.
- 9.5.3 This assessment is based on worst-case winter conditions where filtering and screening provided by intervening vegetation or trees is at its least effective (see limitations).
- 9.5.4 The assessment firstly describes the current baseline conditions and then the future baseline. The assessment is carried out based on construction, on completion year 1, and at year 15 once planting has established.
- 9.5.5 The assessment is based on the future baseline once the Nant Helen Restoration and Nant Helen Complementary Restoration Earthworks have been completed.
- 9.5.6 A study area of 8km from the site boundary was used to identify potentially affected receptors. This was based on the Zone of Theoretical Visibility (ZTV), findings from site surveys and feedback from consultation.
- 9.5.7 The use of the term ‘impact’ throughout this chapter refers to absolute, objective changes such as ‘the removal of trees’. The use of the term ‘effects’ refers to the consequences of such ‘impacts’ such as ‘degradation of a view’ or ‘loss of landscape character’.

Methodology for establishing baseline conditions

- 9.5.8 The following studies were undertaken to understand baseline conditions and inform the assessment:
- desk study – study of existing site information and preparation of ZTV;
 - initial site surveys (summer) - Initial site surveys were undertaken in September 2019 to identify representative viewpoints and familiarise with the landscape and its character;
 - preparation of figures including those included in ES Volume 3:
 - Figure 9.1 - Landscape Context Plan
 - Figure 9.2 - Site Location and ZTV
 - Figure 9.3 - Site Location and Viewpoints
 - Figure 9.4 - Landscape Character Areas
 - Figure 9.5 to 9.13 - Viewpoint Photography Sheets

Receptors and approach to identification of receptors

9.5.9 This study identifies landscape and visual receptors that may be affected by the Proposed development. The types of receptors assessed and the methods for identification of these receptors are described below.

9.5.10 Landscape Receptors – (Landscape Character Areas)

This report assesses the impact of the proposed development on landscape character areas (LCAs). LCAs are defined within GLVIA3 as follows:

‘These are single unique areas which are the discrete geographical areas of a particular landscape type’. (GLVIA3)

Some of the key features that make up character areas are as follows:

- Geological influences;
- Land Cover;
- Human activity;
- Aesthetic aspects such as scale complexity or openness.

9.5.11 Identification of Landscape Character Areas

The following existing information sources were used to identify LCAs appropriate to the nature and scale of the Proposed development.

- Brecon Beacons National Park – Landscape Character Assessment⁷
- Neath Port Talbot LANDMAP Landscape Assessment⁸
- Landscape and Seascape – Supplementary Planning Guidance⁹
- LANDMAP¹⁰

Where appropriate, LCAs formed by the relevant authorities were used. Amendments to these areas were made where they terminated abruptly at authority boundaries. New LCAs were identified based on LANDMAP aspects where previous assessments did not exist.

There are no pre-defined LCAs within Powys County Council.

⁷ Fione Fyfe Associates (2012) *Brecon Beacons National Park – Landscape Character Assessment*

⁸ Neath Port Talbot County Borough Council and Countryside Council for Wales (2004) *Neath Port Talbot LANDMAP Landscape Assessment*

⁹ Neath Port Talbot County Borough Council (2018) *Landscape and Seascape Supplementary Planning Guidance*

¹⁰ Natural Resources Wales (2019). *Natural Resources Wales / LANDMAP - the Welsh landscape baseline.* [online]

9.5.12 Visual Receptors

Representative visual receptors identified across the site include public places, recreational routes/areas, transport routes, residential areas/communities and were selected based on:

- accessibility to the public;
- potential number and sensitivity of receptors who may be affected;
- the viewing direction, distance (i.e. short-, medium- and long-distance views) and elevation;
- the nature of the viewing experience (for example static views, views from settlements and views from sequential points along routes);
- the view type (for example panoramas, vistas and glimpses);
- the potential for cumulative views of the proposed development in conjunction with other developments.

Design mitigation

9.5.13 Mitigation planting proposals have been developed in parallel with the assessment process to minimise the significance of effects. Planting across the site has been incorporated to function as visual screening and to integrate the proposed development into the surrounding landscape. Proposals were developed in consultation with the proposed development ecologist.

9.5.14 To reduce potential landscape and visual effects a number of mitigation proposals have also been incorporated into the proposed development design and description including:

- Landscape and visual mitigation planting which is shown on Figure 9.14. (The design of areas shown to receive mitigation planting shall be developed at detailed design to ensure they meet the minimum functional requirements as set out in this chapter).
- Acoustic barriers are to have wooden cladding on external faces to minimise visual impacts.
- Train carriages are to be unlit outside of daylight operational hours.
- No maintenance operations are to be undertaken outside daylight operational hours.
- The vehicle maintenance track shall be on the outside of the rail track. This ensures that the tallest features (overhead line equipment and trains) are furthest back from the embankment edge and any screening planting is most effective.
- Overhead line equipment shall be cantilevered to minimise visual effects.

- 9.5.15 All of the above design mitigation has been accounted for in the landscape and visual assessment.

Assessment methodology

- 9.5.16 This report assesses the anticipated impacts that will arise as a result of the proposed development. The methodology for deriving the significance of effect for landscape and visual receptors is set out within Appendix 9A.

9.6 Limitations and assumptions

Limitations

- 9.6.1 Due to the proposed development timeframes, it has not been possible to assess the proposed development based on summer and winter conditions. Instead, the assessment has been based on worst-case winter conditions only.
- 9.6.2 Due to restrictions as a result of the Covid-19 pandemic it has not been possible to undertake surveys required for the night-time assessment of the Proposed development. Night-time impacts are therefore not included within this chapter at this stage.

Assumptions

Construction

- 9.6.3 It is assumed that the construction period for the Proposed development will be between 2021 and 2024. It is assumed that there is no requirement for overnight working during the construction period.
- 9.6.4 It is assumed that there will be no night-time working during the construction phase. Working hours would be 06:00-22:00 Monday to Friday and 7:00 – 13:00 on a Saturday with restricted hours on the Northern Embankment of 07:00-18:00 during weekdays.
- 9.6.5 It is assumed that construction of the Proposed development will commence within 3 years of the completion of the Nant Helen Restoration and Nant Helen Complementary Restoration Earthworks. This represents the worst-case scenario where the restored landscape may be affected by construction and operation of the proposed development.
- 9.6.6 It is unknown at this stage whether the rail infrastructure will be single track or dual track. For the purposes of this assessment and to capture the worst-case scenario it is assumed that a dual track will be constructed with cantilevered overhead line equipment.

Operation

- 9.6.7 It is assumed that the rail testing facility will be in 24hour use. (see night-time assessment limitation).
- 9.6.8 It is unknown at this stage whether the rail infrastructure will be single track or dual track. For the purposes of this assessment and to capture the worst-case scenario it is assumed that a dual track with cantilevered overhead line equipment will be operated.
- 9.6.9 It is assumed that due to the exposed nature of the site and ground conditions for any mitigation planting proposed, as part of the Nant Helen Complementary Restoration Earthworks or as part of the proposed development, the growth of trees may be limited. The exact timescales cannot be measured but a worst-case, cautious approach has been taken when considering the effectiveness of mitigation planting.

9.7 Baseline Environment

- 9.7.1 An overview of the Proposed development site and surrounding landscape is provided below. LCAs were derived from existing landscape character assessments and analysis of LANDMAP aspect areas. Appendix 9B provides summary tables of the aspect areas that form the constituent parts of larger character areas.
- 9.7.2 Special Landscape Areas (SLAs) relevant to the study area only include Neath Port Talbot Special Landscape Area 2: Dulais Valley. It was determined that effects upon the SLA would not be separately assessed. The features, characteristics and recognised special qualities of the SLA have instead been used when defining amendments to the LCA boundaries and assigning values. The baseline conditions for each LCA are also described. It is the changes to these character areas that this report assesses.
- 9.7.3 The site is located approximately 2km east of Ystradgynlais, and approximately 22km north-east of Swansea. To the north, the Brecon Beacons National Park lies approximately 96m from the Proposed development at its closest point. The surrounding landscape is formed by the Swansea Valley and Dulais Valley. The Brecon Beacons mountain range lies to the north and east, and elevated landform comprising the hills Mynydd Marchywel and Hirfynydd are located to the south and south-west. Built up areas within the surrounding landscape include Abercraf, Coelbren, Dyffryn Cellwen, Seven Sisters and Swansea.
- 9.7.4 A context plan showing the key landscape features identified within 8km of the site boundary is shown on Figure 9.1. Figure 9.4 shows the landscape character area boundaries that were generated.

9.7.5 Table 9-3 provides a summary of the descriptions of the landscape character areas being assessed. Value and susceptibility¹¹ of the landscape character areas has been assigned based on the criteria as set out in Appendix 9A. For detailed landscape character area descriptions refer to Appendix 9C.

Table 9-3: Landscape Future Baseline Summary

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
Banwen Uplands LCA	Inter Valley Road. Important habitats towards the northern boundary of the character area. Caeau Ton-Y-Fildre SSSI.	High
Black Mountain Southern Fringe LCA	Pattern formed by small-medium scale fields. Transition landform.	Medium
Bryn Henllys Reclaimed Open Cast LCA	Open character. Public access due to large number of PRowS. Long-distance panoramic views available from higher ground.	Low
Coelbren Settlement LCA	Prices Arms pub. Disused Neath and Brecon Railway and Swansea Vale Railway.	Low
Cwm Twrch LCA	Enclosed fields with overgrown hedges. Valley landform. Woodland belt along north-eastern edge including Ancient Semi-Natural Woodland.	Medium
Dulais Valley LCA	Valley landform. River Dulais. Enclosed pastoral land with treed field boundaries. A4109. Neath and Brecon Railway. Crynant.	High

¹¹ Susceptibility refers to the degree to which a particular landscape feature or character area is able to accommodate the changes proposed by a development without significant effects to its components or overall character.

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
Fforest Fawr LCA	Remoteness. Peace and tranquillity. Dark skies. The Beacons Way. High proportion of open access land.	High
Head of Dulais Valley LCA	A4109 along the Dulais river valley. Sparsely vegetated, restored coal mine valley slope to the south. Linear settlements typical of mining industry. Neath and Brecon Railway corridor and washery. Seven Sisters Miners Welfare and Onllwyn Welfare Hall.	Medium
Hirfynydd LCA	Roman Road that follows the ridgeline from north-east to south-west. Wind Turbines on north-eastern edge. Large proportion of coniferous woodland plantation. Elevated topography (Hirfynydd hill).	Medium
Mynydd Allt y grug LCA	Exposed rock and scree cover. Heathland. Views across Tawe Valley.	Medium
Mynydd Marchywel LCA	High proportion of coniferous plantation. Remoteness and tranquillity. Elevated landform and distinctive Varteg Hill. Pylons and wireless mast that are highly visible.	Medium

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	<p>Open character.</p> <p>Common Land.</p> <p>Panoramic views.</p> <p>Grazed landcover.</p> <p>Gwrhyd Welsh Independent Church.</p>	High
Nant Helen Reclaimed Uplands LCA	<p>Past mining activity.</p> <p>Open character.</p> <p>Established marsh and grassland landcover.</p> <p>Newly restored marsh, acid grassland and enclosed pasture.</p> <p>Tramroad at Ystradgynlais Scheduled Monument.</p>	Low
Slopes of Cefn Gwrhyd & Cwm Egel LCA	<p>Grazed pasture.</p> <p>Field boundaries formed by hedgerows and stone walls.</p> <p>Scattered farmsteads.</p> <p>Remoteness and tranquillity.</p> <p>SSSIs.</p> <p>Ancient Semi-Natural Woodland.</p>	Medium
Swansea Valley LCA	<p>Meandering River Tawe.</p> <p>Deciduous woodland.</p> <p>Mosaic of pasture fields.</p>	Medium
Swansea Valley Settlements LCA	<p>Linear settlements of Ystalyfera, Gurnos, Ystradgynlais, Penrhos, Cwm-twrch Isaf, Cwmgiedd and Glan-rhyd.</p> <p>Transport corridors of A4067, A4068 and B4599.</p> <p>Enclosed, relatively high density urban character.</p> <p>Historic relics of the industrial history of the area such as Swansea Canal that is now used for recreation.</p>	Medium

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
Upland Settlements	A4068. Exposed character and views of surrounding landscape. Linear settlements.	Medium
Waterfall Country and Southern Valleys LCA	Recreational opportunities. Complex geology. Complex pastoral field patterns. Rivers and multiple waterfalls. Peace and tranquillity.	High
Wooded Tawe Valley LCA	Ancient Woodlands. River Tawe. A4067 and A4221. Settlements of Caerbont, Abercraf and Caehopkin. Listed buildings at Gwaunclawdd.	Medium
Y Mynydd Du LCA	Openness. Peace and tranquillity. Spectacular long-distance views to the south. Recreational value and accessibility.	High

9.8 Assessment of effects

Assessment of effects from construction (Landscape)

9.8.1 Appendix 9D provides the assessment for all LCAs. This section provides the assessment of the one identified LCA which would be significantly affected during the construction phase. For the purpose of the EIA, these are effects which are identified as being of

moderate and above significance. Landscape Character Area boundaries are shown on Figure 9.4.

Nant Helen Reclaimed Uplands

9.8.2 The LCA has some capacity to accommodate the Proposed development without affecting its overall integrity due to the development taking place on engineered landforms within the restored landscape. The LCA also contains existing urban features such as electricity pylons and is surrounded by urban development (Ystradgynlais and Seven Sisters) and road infrastructure (A4109, A4221 and A4067). It is susceptible to the removal of restored features and urbanisation. The susceptibility to change is therefore Medium.

Value: **Low**
Susceptibility: **Medium**
Sensitivity: **Medium**

9.8.3 The construction of the outer and inner rail tracks would take place within the LCA. Two rail tracks would be constructed on the existing Nant Helen Complementary Earthworks development. This rail infrastructure would tie into the Neath and Brecon Railway to the south and further associated sidings and buildings located at the washery.

9.8.4 Construction includes the laying of the track bed and rail track and erection of overhead line equipment. To the south, where the rail tracks connect with the sidings at the washery, construction would include 2 platforms 230m in length and an associated station building.

9.8.5 Works within the adjacent Head of Dulais Valley LCA would include the construction of maintenance and storage sheds, research and development centre and a multi-storey control centre building as well as rail sidings for up to 400 vehicles. These works would be at the location of the washery and would not directly impact on the LCA but would contribute to the overall sense of scale of construction works taking place.

9.8.6 Whilst the removal of previously restored areas of the LCA is not anticipated, the construction works within and adjacent to the LCA would introduce large-scale construction activity to the restored landscape. Evidence of historic mining activity and urbanising features including pylons, overhead lines and engineered landforms are characteristic of the LCA. Due to the activity being introduced to approximately half of the LCA but concentrated to the engineered earthworks and not resulting in removal of mature vegetation/habitats the magnitude of change would be Medium (Adverse) for this Medium sensitivity receptor. The significance of effect on the Nant Helen Reclaimed Uplands LCA would therefore be **Moderate (Adverse)**.

Assessment of effects from construction (Visual)

9.8.7 Appendix 9D provides the assessment for all viewpoints. This section provides the assessment of the viewpoints identified which would be significantly affected during the construction phase. For the purpose of the EIA, these are effects which are identified as being of **moderate and above significance**. Viewpoint locations are shown on Figure 9.3.

Viewpoint 1 - View from Ystradgynlais Bridleway 61

9.8.8 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

9.8.9 Construction activity would be visible within 3.5km of the viewpoint. Receptors would have views of construction works on the northern embankment and the shallow cuttings at the western edge of the Proposed development. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of a vehicle maintenance access route alongside the track. Construction works would be confined to the engineered landforms implemented as part of the Nant Helen Complementary Restoration Earthworks.

9.8.10 Broadleaf woodland planting implemented as part of the Nant Helen Complementary Restoration earthworks would provide some filtering of works at grade on the northern embankment.

9.8.11 Due to the introduction of construction activity across an open upland landscape across which restored features from the Nant Helen restoration works, such as vegetation would not yet have established, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 2 - View from Ystradgynlais Footpath 64

9.8.12 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

9.8.13 Construction activity would be visible within 1.7km of the viewpoint. Receptors would have views of construction works on the northern

embankment of the Proposed development. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle access route alongside the track. Construction works would be confined to the engineered landforms implemented as part of the Nant Helen Complementary Restoration Earthworks.

9.8.14 Broadleaf woodland implemented as part of the Nant Helen Complementary Restoration earthworks would provide some filtering of works that are at grade with the embankment. However, due to the elevated position of the viewpoint, the majority of the works including construction vehicles and erection of infrastructure elements would remain visible.

9.8.15 Due to the construction works visible across a wide section of the view, and the perceived disturbance within restored areas of the view, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 3 - View from Trig point on Cribarth

9.8.16 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

9.8.17 Construction activity would be visible within 2km of the viewpoint. Receptors would have views of construction works on the northern embankment as well as some works visible on the cutting at the eastern edge of the Proposed development. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle access route alongside the track.

9.8.18 Works would also be visible, further into the distance at the location of the washery and would include demolition of existing sheds and construction of; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage shed for rolling stock.

9.8.19 Receptors' views would be dominated by the construction works associated with the outer rail track on the northern embankment. The establishing planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would not filter views of construction due to the receptors' elevated position above the Proposed development.

- 9.8.20 The works at the washery would take place within a less prominent area of the view and where activity is already a feature of the view. Although 2km from the viewpoint, construction works would be taking place within a prominent, open upland area within the view. Works would be incongruous with the restored landscape and a large proportion of the Proposed development would be visible, the magnitude of change would therefore be High (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Viewpoint 4 - View from Ogof Ffynnon Ddu NNR

- 9.8.21 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.
- Value: **High**
Susceptibility: **High**
Sensitivity: **High**
- 9.8.22 Construction activity would be visible within 4km of the viewpoint. Receptors would have views of construction works on the northern embankment as well as some works visible on the cutting at the eastern edge of the Proposed development. It is also anticipated that some works may be perceptible on the inner track in deep cutting. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle access route alongside the track.
- 9.8.23 The majority of works taking place at the location of the washery would be screened by the topography in the middle ground but demolition of existing sheds and construction of taller structures including the multi-storey control building or works at the eastern edge of the washery would be perceptible.
- 9.8.24 Mitigation broadleaf woodland planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would provide partial visual filtering of works at grade with the top of the embankment. Construction vehicles and taller features such as fencing, overhead line equipment and signals would remain visible throughout the construction period.
- 9.8.25 Due to the construction works taking place on a prominent landform in the direction of the longer distance views, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 5 - View from western edge Ynyswen

9.8.26 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Medium**
Susceptibility: **High**
Sensitivity: **High**

9.8.27 Construction activity would be visible within 1km of the viewpoint. Receptors would have views of construction works on the northern embankment. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of a vehicle access route alongside the track.

9.8.28 Mitigation broadleaf woodland planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would partially filter views of construction activity due to receptors viewing the Proposed development from lower ground. It is anticipated that construction vehicles and overhead line equipment would be clearly visible above intervening mitigation vegetation across the embankment.

9.8.29 Due to the works being visible across the view above existing mature and establishing vegetation and the introduction of activity into an otherwise rural backdrop the magnitude of change would be High (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Viewpoint 8 - View from Ystradgnlais Footpath 4

9.8.30 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**
Susceptibility: **High**
Sensitivity: **Medium**

9.8.31 Construction activity would be visible within 3.1km of the viewpoint. Receptors would have views of the construction works on the shallow cutting at the western edge of the Proposed development. It is anticipated that works on the northern embankment would also be perceptible. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle maintenance access route alongside the track.

9.8.32 Construction works would extend urban activity and features into the open, upland hillside above the woodland, adding to the existing development in the view. The magnitude of change would be Medium

(Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 9 - View from NCNR 43

- 9.8.33 Recreational receptors have a High susceptibility to change as their attention is concentrated on surrounding views.
- Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**
- 9.8.34 Receptors would have close range views of the construction work on the northern embankment. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of a vehicle maintenance access route alongside the track.
- 9.8.35 Mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would partially filter the construction works at ground level on the top of the embankment, however due to the close proximity of works it is anticipated that the majority of works would be clearly visible.
- 9.8.36 The introduction of construction activity at close range above the viewpoint into a view that comprises engineered landform, but no urban features or activity would result in a Medium (Adverse) magnitude of change for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 10 - View from Station Road, Coelbren

- 9.8.37 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.
- Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**
- 9.8.38 Construction would be visible within 600m of the viewpoint. To the south, works would be visible at the location of the washery, including demolition of existing buildings/equipment and the construction of; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock. It is anticipated that cranes used for construction and the taller buildings would be visible at this location above intervening vegetation within field boundaries and alongside the A4221 within the middle ground.
- 9.8.39 To the west, receptors would have views of construction on the shallow outer track cuttings at the eastern extent of the Project. It is also anticipated that construction works within the deeper cuttings of

the inner track would be perceptible. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle maintenance access route alongside the track. These works would be visible just above mature vegetation and below the horizon.

- 9.8.40 Due to the increased large-scale activity at the washery, in close proximity to receptors, and the introduction of activity and urban elements on the grassed cuttings to the west, the magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 12 - View from Ystradfelle Byway 74

- 9.8.41 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

- 9.8.42 Construction would be visible within 1.8km of the viewpoint. Receptors would have views of construction on the shallow outer track cuttings at the eastern extent of the Proposed development. It is also anticipated that construction works within the deeper cuttings of the inner track would be perceptible. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle maintenance access route alongside the track.

- 9.8.43 Further works at the location of the washery would be visible including the demolition of existing buildings/equipment and construction of; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock. Due to the lack of vegetation north-east of the washery site these works will be clearly visible, whilst works closer to Onllwyn will be screened by topography.

- 9.8.44 Due to the lack of intervening vegetation and therefore the clear visibility of construction works at the washery and on earthworks to the west, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 14 - View from Ystradgynlais Footpath 10

- 9.8.45 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**

Susceptibility: **High**
Sensitivity: **High**

- 9.8.46 Construction activity would be visible within 400m of the viewpoint. Receptors would have views of construction works on the shallow cuttings at the western edge of the Proposed development as well works on the slight embankment and cutting earthworks running parallel to the pylons to the east. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of a vehicle maintenance access route alongside the track.
- 9.8.47 Views of construction works at the location of the washery would also be available, beyond the existing pylons and power lines. These works would be difficult to distinguish, due to distance and construction works within the foreground and middle ground but would include demolition of existing sheds and construction of; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock.
- 9.8.48 The view includes existing urban features such as pylons, wind turbines, settlements and road infrastructure in the middle to long distance to the east. However, the construction works within a restored upland landscape would be incongruous. Expansive long-distance view to the north-west would be retained and therefore the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 16 - View from properties on A4109

- 9.8.49 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.
- Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**
- 9.8.50 Construction would be visible within 500m of the viewpoint. Receptors would have direct views of construction on the outer rail track embankment and shallow cutting at the southern edge of the Proposed development. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of a vehicle maintenance access route alongside the track.
- 9.8.51 There would be large-scale construction activity within the open, elevated landscape in the view, however there are existing urban features within the foreground and middle ground including; the Neath and Brecon Railway; street lighting; pylons; and engineered landforms (Nant Helen Complementary Restoration Earthworks). The magnitude of change would therefore be Medium (Adverse) for these

Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Viewpoint 18 - View from Sarn Helen Roman Road

9.8.52 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

9.8.53 Construction would be visible within 2.7km of the viewpoint. Due to the elevation of the viewpoint, receptors would have views of the construction works on the cutting and embankment that form the southern extent of the outer rail track. Works would also be perceptible within the deeper cuttings that form the inner rail track. These works would include; the laying of track bed and rail track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle maintenance access route alongside the track.

9.8.54 At the intersection of the rail tracks and the connecting branch line to the Neath and Brecon Railway, works would also include the construction of rail platforms and a station building.

9.8.55 Construction of rail infrastructure across a small section of the branch line which follows the existing vehicular access between the coal washery, and the central site compound would be visible.

9.8.56 To the north, construction works at the washery site would be perceptible, including the demolition of existing buildings/equipment and construction of; sidings for up to 400 vehicles; multi-storey control centre building; research and development centre; and maintenance/storage sheds for rolling stock. It is anticipated that cranes and construction of taller elements including the multi-storey control building would be more clearly visible in this area, above the topography.

9.8.57 Due to the elevated view down onto construction works across a wide section of the available view, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Assessment of effects from operation (Landscape)

9.8.58 Appendix 9D provides the assessment for all landscape character areas. This section provides the assessment of the identified landscape character area which would be significantly affected during operation. For the purpose of the EIA, these are effects which are identified as

being of **moderate and above significance**. Landscape Character Area boundaries are shown on Figure 9.4.

Nant Helen Reclaimed Uplands

9.8.59 The LCA has some capacity to accommodate the Proposed development without affecting its overall integrity due to the development taking place on engineered landforms within the restored landscape. The LCA also contains existing urban features such as pylons and is surrounded by urban development (Ystradgynlais and Seven Sisters) and road infrastructure (A4109, A4221 and A4067). It is susceptible to the removal of restored features and urbanisation. The susceptibility to change is therefore Medium.

Value: **Low**

Susceptibility: **Medium**

Sensitivity: **Medium**

Year 1

9.8.60 The Proposed development would introduce urban features including; overhead line equipment, signals and fencing; two platforms and a station building to the north-eastern extent of the LCA. The rail tracks would tie into the Neath and Brecon Railway and further associated sidings and buildings located at the washery.

9.8.61 The urbanising features would sit on the engineered earthworks within the newly reprofiled and restored landscape.

9.8.62 Changes within the contextual landscape are closely related to the existing Neath and Brecon Railway corridor and the washery site and would not impact the LCA.

9.8.63 The introduction of new urbanising features and large-scale activity and noise across a large proportion of the LCA, whilst not anticipated to result in loss or degradation of key features, would result in a substantial change to the newly restored landscape. The scale of the new features and prominent position on elevated topography would result in a Medium (Adverse) magnitude of change. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

9.8.64 Established mitigation planting will reduce the perceptibility of the Proposed development from within the rest of the LCA to the south-west. The planting on the north-eastern edge of the site combined with established planting implemented as part of the Nant Helen Complementary Restoration Earthworks will re-establish the wooded valley character just north of the LCA.

9.8.65 Although the perceptibility of the Proposed development will be decreased across the south-western extent of the proposed development the Proposed development will remain a substantial

change to the LCA and therefore the magnitude of change would remain Medium (Adverse). The significance of effect would be **Moderate (Adverse)**.

Wooded Tawe Valley

9.8.66 The LCA is susceptible to changes that would result in an increased sense of urbanisation and loss of its natural character. The susceptibility to change is therefore Medium.

Value: **Medium**
Susceptibility: **Medium**
Sensitivity: **Medium**

Year 1

9.8.67 The presence of rail infrastructure elements such as overhead line equipment, signals and fencing on the outer track of the Proposed development would introduce urban and rail infrastructure features to the newly restored adjacent landscape.

9.8.68 There are direct impacts on a small area of the LCA where the Proposed development is on the embankment that passes through the plantation woodland, introducing track bed, overhead line equipment and train movements to the highest areas on the valley slope. These changes would continue on the embankment in the adjacent LCA, where the grassland land cover would allow the proposed development, particularly train movements, to influence the surrounding landscape. The LCA's valley topography would limit the influence of the proposed development on the LCA, however the proposed development features contrast with the infrastructure within the LCA and would be a substantial change to the character of the adjacent landscape. Mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide a buffer between the LCA and the operational scheme but would not be sufficiently established within its first three years to screen the Proposed development.

9.8.69 Due to the introduction of rail infrastructure up the valley slope and the contrast with its otherwise wooded character and limited development beyond the valley floor, the magnitude of change would therefore be Medium (Adverse) for this Medium sensitivity receptor. The significance of effect would be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

9.8.70 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would reinstate the wooded valley character on the southern side of the Swansea valley. The planting would provide screening of rail infrastructure and passing trains reducing the perceptibility of the Proposed development from the rest of the LCA. The magnitude of change would therefore reduce

to Low (Adverse). The significance of effect would be Minor (Adverse).

Y Mynydd Du

9.8.71 The LCA is susceptible to indirect changes that would affect its sense of peace and tranquillity, which are; recognised special qualities of the national park; identified within the aims and objectives of A Management Plan for the Brecon Beacons National Park 2015-2020 ; and recognised within both the national park's landscape character assessment and within LANDMAP. The LCA is also susceptible to the introduction of incongruous features into the contextual landscape. The susceptibility to change is therefore Medium.

Value: **High**
Susceptibility: **Medium**
Sensitivity: **High**

Year 1

9.8.72 There are no direct impacts to the LCA. The operational scheme would introduce urban features into a recently restored landscape which forms part of the LCA's contextual landscape. These features include the fencing, signals and overhead line equipment on the outer rail track which would affect the southern extent of the LCA.

9.8.73 Passing trains halfway up the valley slope would impact upon the sense of peace and tranquillity at the southern extent of the LCA. It is anticipated that the Proposed development would be perceptible at a greater distance from within the LCA however this would form part of much wider vistas where settlements, road and rail infrastructure also form constituent parts of the surrounding landscape. The magnitude of change would be Medium (Adverse) for this High sensitivity receptor. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

9.8.74 Established mitigation planting would help the proposed development to integrate into the surrounding landscape and would reduce the perceptibility of movement/activity within the contextual landscape. Planting implemented as part of the Nant Helen Complementary Restoration Earthworks would re-establish the wooded valley side that forms part of the contextual landscape. Woodland planting at the western extent of the Proposed development would screen rail infrastructure and passing trains and would integrate the Proposed development through its connection with surrounding mature woodland. Due to the reduced perceptibility of the Proposed development and the reinstatement of character within the LCAs wider surrounding landscape, the magnitude of change would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

Assessment of effects from operation (Visual)

9.8.75 Appendix 9D provides the assessment for all viewpoints. This section provides the assessment of the viewpoints identified which would be significantly affected during operation. For the purpose of the EIA, these are effects which are identified as being of **moderate and above significance**. Viewpoint locations are shown on Figure 9.3.

Viewpoint 1 - View from Ystradgynlais Bridleway 61

9.8.76 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

9.8.77 The Proposed development would be visible within 2km of the viewpoint. Receptors would have views of rail infrastructure on the northern embankment and shallow cuttings at the western edge of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers. When in use, passing trains would highlight the location of the track and introduce fast movement into a rural upland landscape view. Infrequent maintenance vehicle operations will also be visible alongside the track.

9.8.78 Broadleaf woodland implemented as part of the Nant Helen Complementary Restoration earthworks would be perceptible but would only provide minimal filtering of rail infrastructure and train movements at grade with the embankment due to its size.

9.8.79 The Proposed development will be visible across a small section of the view. However, due to the introduction of urbanising features into a prominent, open upland landscape and the introduction of fast movement into an otherwise rural view, the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

9.8.80 **Year 15 – (with established mitigation planting)**

9.8.81 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide a greater level of filtering of train movements and overhead line equipment and visually integrate the Proposed development with existing surrounding woodland on the valley slopes.

9.8.82 It is anticipated that mitigation planting on the western extent of the Proposed development outside the outer rail track would provide screening of passing trains. Overhead line equipment may remain

visible above the tree canopies due to the location of planting away from the cutting edge down the hillside.

- 9.8.83 The additional screening provided by mitigation planting implemented as part of the Proposed development and the Nant Helen Complementary Restoration Earthworks would reduce the overall perceptibility of the Proposed development and restore the overall character of the view. Whilst some woodland will be visible further up the side of Mynydd y Drum contrasting with the open upland landscape, woodland will tie in with existing coniferous plantation and the change will only affect a small proportion of the overall view. The magnitude of change will therefore be Low (Adverse). The significance of effect would be Minor (Adverse).

Viewpoint 2 - View from Ystradgynlais Footpath 64

- 9.8.84 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.85 Receptors would have elevated views onto rail infrastructure on the northern embankment of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers. During operation, fast train movement would be introduced into the open landscape across the view. The scale and linearity of the infrastructure would contrast with the winding A4221.
- 9.8.86 Broadleaf woodland implemented as part of the Nant Helen Complementary Restoration earthworks would be perceptible but would only provide minimal filtering of infrastructure elements and trains at grade with the embankment. Due to the elevated position of the viewpoint, fast train movement would be visible above acoustic fencing and change the rural character of the view. Infrequent maintenance vehicle operations would also be visible alongside the track.
- 9.8.87 Due to the introduction of urbanising features into a rural open landscape view and visibility of features across a wide section of the view, the magnitude of change would be High (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.88 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide screening of

acoustic barriers and train movements on the northern embankment. It is anticipated that overhead line equipment would remain visible above tree canopies but would be difficult to distinguish as they do not break the horizon.

- 9.8.89 Mitigation planting at the western extent of the Proposed development would integrate with existing coniferous plantation, it is however anticipated that glimpsed views would be available of passing trains as they transition from embankment to cutting. Due to the reduced visibility of rail infrastructure and integration of mitigation planting with surrounding woodland cover the magnitude of change would reduce to Medium (Adverse). The significance of effect would be **Moderate (Adverse)**.

Viewpoint 3 - View from Trig point on Cribarth

- 9.8.90 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.91 Receptors would have elevated views of rail infrastructure on the northern embankment as well as some taller features visible on the cutting at the eastern edge of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.92 The view would be dominated by rail infrastructure on the outer rail track on the northern embankment. The planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would not provide any filtering of views of infrastructure features or passing trains due to the receptors elevated position above the Proposed development.
- 9.8.93 Facilities at the location of the washery would also be visible including; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage shed for rolling stock. The visibility of these features would not result in a substantial change to the character of the view as they would be located on the site of existing development however the scale of the facilities would contrast with nearby small-scale settlements.
- 9.8.94 Due to the prominence and close proximity of the Proposed development which would be visible across the restored upland landscape and would contrast with the rural character of the view, the magnitude of change would be High (Adverse) for these High

sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.95 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide partial screening of the rail infrastructure and passing trains on the northern embankment. It is anticipated that overhead line equipment would remain visible above canopies due to the elevated position of the receptor looking down onto the Proposed development.
- 9.8.96 Mitigation planting at the eastern extent of the Proposed development between the inner and outer rail track and would provide partial screening of trains as they transition between the northern embankment and the cuttings at the eastern extent of the Proposed development. It is anticipated that glimpsed views of trains would remain visible.
- 9.8.97 Mitigation planting would provide screening of trains across a large proportion of the view and would integrate the proposed development with the adjacent wooded valley. Due to the elevated position of the receptor and the close proximity of the Proposed development rail infrastructure would remain visible above tree canopies. The magnitude of change would therefore reduce to Medium (Adverse). The significance of effect would remain **Moderate (Adverse)**.

Viewpoint 4 - View from Ogof Ffynnon Ddu NNR

- 9.8.98 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.99 Receptors would have views of rail infrastructure on the northern embankment as well as some taller features on the cutting at the eastern edge of the Proposed development and the deeper cutting that forms the inner rail track. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.100 The majority of facilities at the location of the washery would be screened by the topography. It is anticipated that the increased scale of operations at this location would be perceptible and some taller structures such as the multi-storey control building or buildings/sheds at the eastern edge of the washery would be visible.
- 9.8.101 Mitigation planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would

provide partial filtering of infrastructure features at grade with the top of the embankment. Taller features such as overhead line equipment, signals, fencing and passing trains and maintenance vehicles would all remain visible across this section.

- 9.8.102 Due to the introduction of urbanising rail infrastructure to a rural landscape and prominent landform that dominates the middle ground of the view, the magnitude of change would be High (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.103 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide screening of passing trains on the northern embankment. It is anticipated that overhead line equipment would remain visible above the tree canopies but would be difficult to distinguish as they would not break the horizon and due to the distance of the receptor from the Proposed development. Tree planting would visually integrate with surrounding wooded landcover on the valley slopes.
- 9.8.104 Tree planting alongside the buildings at the coal washery would not screen any of the buildings but would provide a soft buffer and help integrate the structures within the surrounding landscape.
- 9.8.105 Due to the screening provided by mitigation planting and therefore the reduced perceptibility of the Proposed development within the view, the magnitude of change would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

Viewpoint 5 - View from western edge Ynyswen

- 9.8.106 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Medium**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.107 Receptors would have views of rail infrastructure on the northern embankment. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.108 Mitigation planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would partially filter views of infrastructure elements (at grade with the top of the embankment) due to the lower elevation of the viewpoint. It is anticipated that taller features such as overhead line equipment, signals and passing trains and maintenance vehicles would remain visible.

9.8.109 Due to the rail infrastructure being visible across the full width of the view across the hillside, and the introduction of movement and urbanising features to a rural view, the magnitude of change would be High (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Major (Adverse)**.

Year 15 – (with established mitigation planting)

9.8.110 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide screening of train movements across the northern embankment and would visually integrate with existing woodland on the lower hillside slopes. It is anticipated that the viewing position of receptors on lower ground would increase the effectiveness of planting as a visual screen. Overhead line equipment would remain visible above the tree canopies but would not break the horizon.

9.8.111 There would be reduced visibility of trains and associated infrastructure across the view and woodland would be sufficiently established to visually integrate with mature woodland on the hillside. It is anticipated that the Proposed development would remain perceptible due to overhead line equipment. The magnitude of change would therefore reduce to Low (Adverse) and the significance of effect would be Minor (adverse).

Viewpoint 6 - View from Tanygarth, Abercraf

9.8.112 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**

Susceptibility: **High**

Sensitivity: **Medium**

Year 1

9.8.113 Receptors would have views of rail infrastructure on the northern embankment and the cutting at the north-western edge of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers.

9.8.114 Mitigation planting on the northern embankment implemented as part of the Nant Helen Complementary Restoration Earthworks would be perceptible but would only filter rail infrastructure features at grade with the top of the embankment. Fast moving trains would be visible between property roof tops to the east.

9.8.115 To the south, existing mature coniferous plantation would provide screening of rail infrastructure and passing trains on embankment through the woodland. The Proposed development would emerge above the woodland in shallow cutting and rail infrastructure and fast-moving trains would be visible across a short section of the view.

9.8.116 The Proposed development will introduce urbanising features across the middle ground of the view, between the rooftops and the horizon. Existing mature coniferous woodland would screen the scheme across a large portion of the view, leaving rail infrastructure and trains visible across short sections of the view to the south and south-east. The magnitude of change will be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

9.8.117 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide screening of passing trains along the northern embankment.

9.8.118 It is anticipated that woodland at the western edge of the Proposed development would screen trains as they transition between the northern embankment and cuttings at the western extent of the Proposed development. Overhead line equipment would remain visible above the tree canopies across a short section of the view.

9.8.119 Due to the reduced visibility of the Proposed development, and the screening of fast movement from the backdrop of the view, the magnitude of change would reduce to Low (Adverse). The significance of effect would be **Minor (Adverse)**.

Viewpoint 7 - View from Pen-Rhiwfawr

9.8.120 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Medium**
Susceptibility: **High**
Sensitivity: **High**

Year 1

9.8.121 Rail infrastructure on the shallow cutting at the western edge of the Proposed development would be perceptible to receptors. This would include; overhead line equipment; signals, fencing and acoustic barriers.

9.8.122 Passing trains would introduce movement across an open, rural upland landscape and highlight other Proposed development features.

9.8.123 The proposed development would introduce incongruous urbanising features across the hillside of Mynydd y Drum but would constitute a small proportion of much wider views. Built proposed development features would be perceptible, however train movements would result in noticeable change to the rural character of the view. The magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.124 Mitigation planting to the west of the outer rail track would provide screening of passing trains on the shallow cuttings. It is anticipated that overhead line equipment would remain visible above tree canopies but would not be clearly distinguishable due to the distance of the receptor from the Proposed development.
- 9.8.125 Due to the screening of fast movement from the long-distance view, the magnitude of change would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

Viewpoint 8 - View from Ystradgnlais Footpath 4

- 9.8.126 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**
 Susceptibility: **High**
 Sensitivity: **Medium**

Year 1

- 9.8.127 Receptors would have views of rail infrastructure on the shallow cutting at the western edge of the Proposed development. It is anticipated that a small section of the rail infrastructure on the northern embankment would also be perceptible. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.128 The Proposed development would introduce fast-moving trains and visible urbanising features on the hillside, separated by mature woodland from settlements in the valley. This would affect the composition of the view by increasing the proportion of development within the valley.
- 9.8.129 Rail infrastructure would be clearly visible, contrasting with the landscape of ponds and marshy grassland to the west of the Proposed development. Despite existing settlement being a feature of the view, due to the elevation and perceived increase of developed areas within the valley, the magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.130 Mitigation planting on the hillside of Mynydd y Drum on the western side of the outer rail track, would provide screening of passing trains. It is anticipated that overhead line equipment would remain visible above tree canopies but would not break the horizon and would therefore be difficult to distinguish.
- 9.8.131 Due to the reduced perceptibility of the Proposed development and therefore development within the valley, the magnitude of change

would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

Viewpoint 9 - View from NCNR 43

- 9.8.132 Recreational receptors have a High susceptibility to change as their attention is concentrated on surrounding views.

Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**

Year 1

- 9.8.133 Mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would provide a filter between receptors travelling along the cycle route and the rail infrastructure. Receptors would have filtered views of the rail infrastructure on the northern embankment. This would include; overhead line equipment; signals, fencing and acoustic barriers and fast-moving trains.

- 9.8.134 The introduction of rail infrastructure, close to receptors would result in a less tranquil experience for receptors using the cycle route who would have transient views of the Proposed development. The magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.135 Established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks would screen rail infrastructure across the northern embankment and would alter the receptors experience from a corridor with woodland belts and glimpsed views out to a cycle route which would become a densely wooded enclosed corridor with limited views outwards.

- 9.8.136 Due to the close proximity of the railway, passing trains would remain perceptible and would intermittently affect the sense of tranquillity experienced by cycle route users. The magnitude of change would therefore remain Medium (Adverse). The significance of effect would be **Moderate (Adverse)**.

Viewpoint 10 - View from Station Road, Coelbren

- 9.8.137 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**

Year 1

- 9.8.138 Receptors would have views of rail infrastructure on the shallow outer track cutting at the north-eastern extent of the Proposed development. It is also anticipated that taller features within some areas of the deeper cuttings of the inner track would be perceptible. These features would include; overhead line equipment; signals, fencing and acoustic barriers; and moving trains. The majority of cuttings are deep enough to completely screen rail infrastructure and therefore these would be visible across short sections of the view.
- 9.8.139 To the south, facilities at the location of the washery, including; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would be visible and would result in an increased scale of development beyond the intervening vegetation along the A4221 and within middle-ground field boundaries.
- 9.8.140 Due to the increased amount and size of buildings at the washery, in close proximity to receptors, and the introduction of urbanising features to a restored area of the landscape to the west, the magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.141 Established mitigation planting on the eastern side of the outer rail track would provide screening of trains and rail infrastructure features within the shallowest parts of the cuttings to the west.
- 9.8.142 To the south, tree planting alongside the multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would not screen the buildings but would provide a soft buffer to lessen the visual intrusion of the structures.
- 9.8.143 Due to the screening of the Proposed development to the west and the reduced perceptibility of buildings at the washery site the magnitude of change would reduce to Low (Adverse). The significance of effect would be reduced to Minor (Adverse).

Viewpoint 11 - View from Tawe-Uchaf Footpath 5

- 9.8.144 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.145 Receptors would have views of taller rail infrastructure features within the shallowest areas of inner track cuttings. This would include; overhead line equipment; signals, fencing and acoustic barriers; and moving trains.
- 9.8.146 Trains travelling at high speeds would contribute to the receptors' awareness of the Proposed development within a restored area of the view.
- 9.8.147 Facilities associated with the Proposed development rail infrastructure including; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would be visible to the south at the location of the washery. The western half of the site would be screened by intervening vegetation and topography however, the introduction of buildings further east would result in increased scale of development within the view.
- 9.8.148 Rail infrastructure features and moving trains will only be visible across short sections of the view to the west however, due to the increased scale of development and visibility of sidings and buildings at the washery the magnitude of change would be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.149 Established mitigation planting would screen passing trains and rail infrastructure on the outer rail track and shallow areas of the inner rail track to the west.
- 9.8.150 Buildings at the site of the washery including the multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would remain visible however mitigation planting alongside the buildings would provide a soft buffer to the structures.
- 9.8.151 Due to the reduced perceptibility of rail infrastructure to the west and the reduced dominance of buildings at the washery site, the magnitude of change would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

Viewpoint 12 - View from Ystradfellte Byway 74

- 9.8.152 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.153 Receptors would have views of rail infrastructure within the shallowest areas of the inner track cuttings at the eastern extent of the Proposed development. It is anticipated that taller features including; overhead line equipment; signals, fencing and acoustic barriers; and fast-moving trains would be visible.
- 9.8.154 It is anticipated that topography would screen the majority of the branch line connecting the outer tracks to the washery. However, the platforms and station building would be visible and indicate the location of rail infrastructure.
- 9.8.155 Facilities associated with the Proposed development rail infrastructure including; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would be visible at the location of the washery and would result in an increased scale of development. The sidings and buildings would be clearly visible due to the location on a small exposed plateau and a lack of intervening vegetation.
- 9.8.156 The Proposed development would result in an increase in the scale of development at the washery site and would introduce new urbanising features to the view to the west. These changes would contribute to the urbanisation of a view that already comprises development associated with rail infrastructure and urbanising features such as urban settlement and pylons. The magnitude of change would therefore be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.
- Year 15 – (with established mitigation planting)**
- 9.8.157 Mitigation planting outside the outer rail track at the south-eastern extent of the Proposed development would screen rail infrastructure and passing trains on cuttings. Established planting around the platforms and station building would integrate the structures within the surrounding landscape, it is still anticipated that the station building would remain visible above the tree canopies.
- 9.8.158 Buildings at the washery site including multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock would remain visible however tree planting alongside the buildings would help the structures to integrate with their vegetated surroundings.
- 9.8.159 Due to the reduced visibility of the Proposed development and integration through mitigation planting the magnitude of change would reduce to Low (Adverse). The significance of effect would be reduced to Minor (Adverse).

Viewpoint 13 - View from School Road, Ystalyfera

- 9.8.160 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**
Susceptibility: **High**
Sensitivity: **Medium**

Year 1

- 9.8.161 Receptors would have views of rail infrastructure on the shallow cuttings at the north-western extent of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.162 Passing trains would be clearly visible across the shallow cuttings due to the positioning on a prominent landform (the slopes of Mynydd y Drum) with no intervening vegetation.
- 9.8.163 Due to the introduction of rail infrastructure features and fast train movement which would be incongruous with the restored landscape and rural hillside setting of the view, the magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.164 Mitigation planting on the side of Mynydd y Drum at the western extent of the Proposed development would provide screening of passing trains. It is anticipated that overhead line equipment would remain visible above tree canopies but would not break the horizon and would therefore be difficult to distinguish.
- 9.8.165 Due to the screening of train movement and the reduced perceptibility of the Proposed development the magnitude of change would therefore reduce to Low (Adverse). The significance of effect would be reduced to Minor (Adverse).

Viewpoint 14 - View from Ystradgynlais Footpath 10

- 9.8.166 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.167 Receptors would have views of rail infrastructure within the shallowest areas of the cuttings at the western edge of the Proposed development as well as elevated views across works on the slight embankment and cuttings running parallel to the pylons to the east. This would include; overhead line equipment; signals, fencing and acoustic barriers.

- 9.8.168 The close proximity of the rail infrastructure features, and fast-moving trains would introduce development and activity to the rural upland view, affecting the perception of the immediate view and views to the Brecon Beacon National Park to the north. The introduction of rail infrastructure would widen the existing corridor of urban features comprising pylons, urban settlement, and road and rail infrastructure.
- 9.8.169 Facilities associated with the rail testing tracks would be visible beyond the pylons and power lines at the location of the washery. This would include; sidings for up to 400 vehicles; multi-storey control building; research and development centre; and maintenance/storage sheds for rolling stock. The introduction of buildings and sidings would increase the scale of development at the location of the washery, however intervening features including rail infrastructure and existing pylons and the distance of the buildings would make the change difficult to distinguish. The magnitude of change would therefore be High (Adverse) for these High sensitivity receptors. The significance of effect would be **Major (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.170 Mitigation planting at the western extent of the Proposed development would partially screen rail infrastructure and passing trains across shallow cuttings. The scheme would remain visible across embankments and cutting running parallel to the pylons to the east.
- 9.8.171 Due to the close proximity of receptors to the Proposed development and the upland character that offers open views the magnitude of change would remain High (Adverse). The significance of effect would remain as **Major (Adverse)**.

Viewpoint 16 - View from properties on A4109

- 9.8.172 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**

Susceptibility: **High**

Sensitivity: **Medium**

Year 1

- 9.8.173 Receptors would have direct views of rail infrastructure on the outer rail track small embankment and shallow cutting at the southern edge of the Proposed development. This would include; overhead line equipment; signals, fencing and acoustic barriers. It is anticipated that taller features would also be visible within the shallowest areas of the cuttings that form the inner rail track.
- 9.8.174 The introduction of rail infrastructure and passing trains would alter the character of the views and widen the infrastructure corridor that

currently comprises the A4109, Neath and Brecon Railway and pylons that all span the view.

- 9.8.175 The changes as a result of the Proposed development would introduce urban features and fast movement into an open restored area of the landscape that forms the backdrop to foreground views of the A4109. The magnitude of change would be Medium (Adverse) for these Medium sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.176 Belts of woodland planting to the south of the outer rail track would screen the majority of the rail infrastructure. It is anticipated that overhead line equipment (approx. 9m tall) would remain visible above the tree canopies. Train movement would be screened across the view.
- 9.8.177 The reduced visibility of the proposed development would result in the restoration of the backdrop to the view as a restored landscape with some urban detractors. The mitigation planting would be slightly incongruous with the open upland landscape but would integrate with existing plantation woodland at a similar elevation. Due to the reduced visibility of the Proposed development the magnitude of change would reduce to Low (Adverse). The significance of effect would reduce to Minor (Adverse).

Viewpoint 18 - View from Sarn Helen Roman Road

- 9.8.178 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **High**
Susceptibility: **High**
Sensitivity: **High**

Year 1

- 9.8.179 Receptors would have views of rail platforms and associated station building at the intersection of the rail tracks and the connecting branch line to the Neath and Brecon Railway. The branch line connecting to the Neath and Brecon Railway would be visible across a small section before being screened by topography. Due to the elevation of the viewpoint, receptors would also have views of the rail infrastructure on the cutting and embankment that form the southern extent of the outer rail track. Taller rail features would also be perceptible within the shallowest areas of the inner rail track cuttings. This would include; overhead line equipment; signals, fencing and acoustic barriers.
- 9.8.180 To the north it is anticipated that facilities at the location of the washery would be perceptible. This would include; sidings for up to 400 vehicles; multi-storey control building; research and development

centre; and maintenance/storage sheds for rolling stock. It is anticipated that the taller structures would be visible and the increased number of units at this location would increase the scale of the development in the view.

- 9.8.181 Passing trains would be clearly visible across the earthworks implemented as part of the Nant Helen Complementary Restoration Earthworks and would add movement across a wide section of the view.
- 9.8.182 The proposed development would introduce transport infrastructure and urbanising features across an open restored landscape in an elevated view, the Proposed development would not break the horizon and long-distance open views would be retained, the magnitude of change would therefore be Medium (Adverse) for these High sensitivity receptors. The significance of effect would therefore be **Moderate (Adverse)**.

Year 15 – (with established mitigation planting)

- 9.8.183 Mitigation planting to the south of the outer rail track and planting alongside the branch line earthworks would provide screening of passing trains across a large proportion of the view. It is anticipated that overhead line equipment would remain visible above the tree canopies.
- 9.8.184 There would be no change to the visibility of facilities at the location of the washery.
- 9.8.185 Due to the reduced visibility of train movement across a large portion of the view and the integration of platforms and station building due to established woodland the magnitude of change would reduce to Low (Adverse). The significance of effect would be Minor (Adverse).

9.9 Mitigation and enhancement

- 9.9.1 Mitigation proposals envisaged to reduce significant adverse landscape and visual effects have been accounted for in the year 15 assessment when it is assumed that planting will have established, albeit within the limitations expressed in Paragraph 1.6.8.
- 9.9.2 Planting for the mitigation of operational effects was developed and areas for both visual screening and landscape integration are shown on Figure 9.14. This plan was developed in conjunction with the project ecologist to ensure that it is appropriate and meets the requirements of any secondary ecological functions.
- 9.9.3 Descriptions of the function of planting areas are outlined below. The planting areas on Figure 9.14 show the maximum extent of planting, these areas should be developed at detail design to ensure they reflect the local character as closely as possible. The functional requirements for areas shown on Figure 9.14 are set out below:

9.9.4 **Area L-01**

Visual screening planting to mitigate effects from viewpoints 1, 2, 6, 7, 8 and 14.

9.9.5 **Area L-02**

Visual screening planting to mitigate effects from viewpoints 16, 18 and 17.

9.9.6 **Area L-03**

Visual screening planting to mitigate effects from viewpoints 17 and 18. Planting to integrate the branch line, platforms and station building.

9.9.7 **Area L-04**

Planting to integrate the rail infrastructure, with the surrounding wooded valley character. Design should be developed to work with culverts.

9.9.8 **Area L-05**

Visual screening planting on bund to mitigate effects from viewpoint 10.

9.9.9 **Area L-06**

Visual screening planting on bund to mitigate effects from viewpoints 10 and 12.

9.9.10 **Area L-07**

Planting to integrate buildings at the washery site into the surrounding vegetated landscape. Creates a soft visual buffer for viewpoints 10, 11 and 12. Planting to be limited to immediate area surrounding buildings and not to encroach into existing habitats to the north.

Opportunities

9.9.11 Opportunities for green/brown roofs should be sought on the buildings at the old washery site. Inclusion would help integrate the buildings into the surrounding landscape and reduce visual effects. However, mitigation afforded by such measures has not been taken into account in the assessment at this stage as delivery of this mitigation is not yet confirmed.

9.10 Residual effects

9.10.1 The section below outlines the adverse landscape and visual effects that would remain beyond year 15. Photomontages showing the Proposed development at year 15 from viewpoint 3 and viewpoint 16 are shown on Figure 9.15 and 9.16.

Residual effects from operation (Landscape)

- 9.10.2 There would be residual effects to one LCA following the establishment of mitigation planting at year 15.

Nant Helen Reclaimed Uplands

- 9.10.3 Mitigation planting required to mitigate the landscape and visual effects would provide some benefits in reducing the effects on the LCA but would remain a significant change to the restored open upland landscape. The Proposed development is located within and covers a large proportion of the LCA. Moderate (Adverse) Effects to the LCA would therefore remain beyond year 15.

Residual effects from operation (Visual)

- 9.10.4 It is anticipated that there would be residual effects to 4 visual receptors following the establishment of mitigation planting at year 15.
- 9.10.5 Residual effects from viewpoint 2 and 3 are as a result of the elevated position of receptors and the assumed tree growth by year 15. It is assumed that tree growth will be limited due to ground conditions and the exposed nature of the site and these residual effects are therefore representative of the worst-case scenario. Should overhead line equipment be fully screened by planting, then significant effects will be removed.

Viewpoint 2 - View from Ystradgynlais Footpath 64

- 9.10.6 It is anticipated that **Moderate (Adverse)** effects would remain beyond year 15 due to the proposed development being visible across a dominant feature of the view.

Viewpoint 3 - View from Trig point on Cribarth

- 9.10.7 It is anticipated that **Moderate (Adverse)** effects would remain beyond year 15 due to the receptors elevated position and therefore the limited effectiveness of mitigation planting.

- 9.10.8 Residual effects from viewpoint 9 and 14 are as a result of the close proximity of receptors to the proposed development and resultant change to future baseline conditions.

Viewpoint 9 - View from NCNR 43

- 9.10.9 It is anticipated that **Moderate (Adverse)** effects would remain beyond year 15 due to the close proximity of the Proposed development and change in character of the cycleway from this viewpoint to an enclosed wooded corridor.

Viewpoint 14 - View from Ystradgynlais Footpath 10

- 9.10.10 It is anticipated that **Major (Adverse)** effects would remain beyond year 15 due to the close proximity of the Proposed development and therefore dominance of the proposed development in the view.

9.11 Assessment summary matrix

Construction

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at Construction	Significance at construction
Loss or degradation of character due to construction impacts.	Banwen Uplands LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Black Mountain Southern Fringe LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Bryn Henllys Reclaimed Open Cast LCA	Low	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Coelbren Settlement LCA	Low	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Cwm Twrch LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Dulais Valley LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Fforest Fawr LCA	High	Negligible (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Head of Dulais Valley LCA	Medium	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Hirfynydd LCA	Medium	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Mynydd Allt y grug LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Mynydd Marchywel LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	Medium	Negligible (Adverse)	Negligible (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at Construction	Significance at construction
Loss or degradation of character due to construction impacts.	Nant Helen Reclaimed Uplands LCA	Medium	Medium (Adverse)	Moderate (Adverse)
Loss or degradation of character due to construction impacts.	Slopes of Cefn Gwrhyd & Cwm Egel LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Swansea Valley LCA	Medium	No Change	Neutral
Loss or degradation of character due to construction impacts.	Swansea Valley Settlements LCA	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Upland Settlements	Medium	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Waterfall Country and Southern Valleys LCA	High	Negligible (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Wooded Tawe Valley LCA	Medium	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Y Mynydd Du LCA	High	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 1	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 2	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 3	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 4	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 5	High	High (Adverse)	Major (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at Construction	Significance at construction
Visual effects due to construction impacts of the Proposed development.	Viewpoint 6	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 7	High	Negligible (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 8	Medium	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 9	Medium	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 10	Medium	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 11	High	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 12	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 13	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 14	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 15	N/A	N/A	N/A
Visual effects due to construction impacts of the Proposed development.	Viewpoint 16	Medium	Medium (Adverse)	Moderate (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at Construction	Significance at construction
Visual effects due to construction impacts of the Proposed development.	Viewpoint 17	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts of the Proposed development.	Viewpoint 18	High	Medium (Adverse)	Moderate (Adverse)

Operation

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Banwen Uplands LCA	Medium	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Black Mountain Southern Fringe LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Bryn Henllys Reclaimed Open Cast LCA	Low	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Coelbren Settlement LCA	Low	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Cwm Twrch LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Dulais Valley LCA	Medium	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Fforest Fawr LCA	High	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Head of Dulais Valley LCA	Medium	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Hirfynydd LCA	Medium	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Mynydd Allt y grug LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Mynydd Marchywel LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Nant Helen Reclaimed Uplands LCA	Medium	Medium (Adverse)	Moderate (Adverse)	Mitigation Planting across Proposed development.	Medium (Adverse)	Moderate (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Slopes of Cefn Gwrhyd & Cwm Egel LCA	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Swansea Valley LCA	Medium	No Change	Neutral	Mitigation Planting across	No Change	Neutral

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
					Proposed development.		
Loss or degradation of character due to the on completion impacts of the Proposed development.	Swansea Valley Settlements LCA	Medium	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Upland Settlements	Medium	Negligible (Adverse)	Negligible (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Waterfall Country and Southern Valleys LCA	High	Low (Adverse)	Minor (Adverse)	Mitigation Planting across Proposed development.	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Wooded Tawe Valley LCA	Medium	Medium (Adverse)	Moderate (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Proposed development.	Y Mynydd Du LCA	High	Medium (Adverse)	Moderate (Adverse)	Mitigation Planting across Proposed development.	Low (Adverse)	Minor (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 1	High	Medium (Adverse)	Moderate (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks) and Area L-01.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 2	High	High (Adverse)	Major (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks) and Area L-01.	Medium (Adverse)	Moderate (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 3	High	High (Adverse)	Major (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen	Medium (Adverse)	Moderate (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
					Complementary Restoration Earthworks).		
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 4	High	High (Adverse)	Major (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks).	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 5	High	High (Adverse)	Major (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks).	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 6	Medium	Medium (Adverse)	Moderate (Adverse)	Planting on Northern Embankment (Implemented as part of Nant	Low (Adverse)	Minor (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
					Helen Complementary Restoration Earthworks) and Area L-01.		
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 7	High	Medium (Adverse)	Moderate (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks) and Area L-01.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 8	Medium	Medium (Adverse)	Moderate (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks) and Area L-01.	Low (Adverse)	Minor (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 9	Medium	Medium (Adverse)	Moderate (Adverse)	Planting on Northern Embankment (Implemented as part of Nant Helen Complementary Restoration Earthworks).	Medium (Adverse)	Moderate (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 10	Medium	Medium (Adverse)	Moderate (Adverse)	Area L-05, L-06 and L-07.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 11	High	Medium (Adverse)	Moderate (Adverse)	Area L-07.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 12	High	Medium (Adverse)	Moderate (Adverse)	Area L-06 and L-07.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 13	Medium	Medium (Adverse)	Moderate (Adverse)	Area L-01.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 14	High	High (Adverse)	Major (Adverse)	Area L-01.	High (Adverse)	Major (Adverse)

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude at year 1 (prior to established mitigation planting)	Significance at year 1 (prior to established mitigation)	Mitigation	Magnitude at year 15 (following establishment of mitigation planting)	Significance at year 15 (following establishment of mitigation planting)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 15	N/A	N/A	N/A	N/A	N/A	N/A
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 16	Medium	Medium (Adverse)	Moderate (Adverse)	Area L-02.	Low (Adverse)	Minor (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 17	Medium	Low (Adverse)	Minor (Adverse)	Area L-03.	Negligible (Adverse)	Negligible (Adverse)
Visual effects due to the operational impacts of the Proposed development.	Viewpoint 18	High	Medium (Adverse)	Moderate (Adverse)	Area L-03 and L-04.	Low (Adverse)	Minor (Adverse)

10 Noise and Vibration

10.1 Introduction

10.1.1 This chapter of the ES considers the effects of noise and vibration associated with the construction and operation of GCRE on the nearby communities.

10.1.2 The assessment sets out the noise mitigation measures which will be put in place to minimise noise to communities and confirms that no residual adverse significant effects are identified as a result of the operation of the scheme.

10.1.3 This main chapter of the assessment has been kept as concise as possible, with all detail included in the following accompanying appendices:

- Appendix A: Noise survey and baseline
- Appendix B: Policy, assessment criteria and consultation
- Appendix C: Operational and Construction assessment detail, assumptions and limitations
- Appendix D: Glossary

10.2 Overall approach to noise

10.2.1 The primary approach to controlling noise from the facility has been to minimise noise to all the surrounding communities regardless of existing noise levels through the proactive use of appropriate noise mitigation, without introducing other adverse impacts such as visual intrusion. This approach is in line with the Welsh Government's main noise policy document, the Noise and Soundscape Action Plan 2018-2023¹.

10.2.2 This approach of minimising noise levels from the facility to or below the criteria set out in section 10.3 has been adopted for *all* communities near to the scheme, regardless of the measured baseline noise levels at receptors, as it is acknowledged that the existing anthropogenic sources of noise in the area can be sporadic, especially at times when the main roads are not busy, such as night-times.

10.2.3 The noise mitigation provided for the scheme is shown on the following pages in Figures 10.1 to 10.3 along with the noise predictions for day, evening and night-time and is referred to further in the following sections.

¹ <https://gov.wales/sites/default/files/publications/2019-04/noise-and-soundscape-action-plan.pdf> para 10.3.12

10.2.4 The receptors at which noise assessments have been carried out are shown in Figure 10.1.

10.3 Criteria

10.3.1 The criteria used for the operational noise assessment are set out in Table 10.1. They are based on criteria in British Standard 8233, which sets out guidance on acceptable noise levels in residences – both for overall noise levels (quantified by a metric called the equivalent continuous sound level, denoted by $L_{Aeq,T}$) and for maximum noise levels (denoted by $L_{Amax,F}$).

10.3.2 The external (outdoor) noise levels predicted as part of the operational noise assessment (detailed in the next section) will be compared against the criteria in the last column of the table, to indicate whether any noise impacts are likely.

Table 10.1: Criteria for operational noise assessment

Time period	Noise metric	Internal noise criteria	Acoustic transmission loss of partially open window ²	External noise criteria*
Daytime, 0700-1900	Overall scheme noise level, $L_{Aeq,T}$	Living areas: 35dB**	15	50dB
Evening, 1900-2300	Overall scheme noise level, $L_{Aeq,T}$	Living areas: 35dB**		50dB
Night-time, 2300-0700	Overall scheme noise level, $L_{Aeq,T}$	Bedrooms: 30dB**		45dB
	Maximum train noise levels, $L_{Amax,F}$	Bedrooms: 45*** OR 45-55****		60dB OR 60-70dB

*free-field external noise levels

**from BS8233 2014 Table 4

***from BS8233 1999 Table 5

****from BS8233 2014 Table H.3

² Value of 15dB between free-field outdoor level and reverberant indoor level taken from the *Institute of Acoustics & Association of Noise Consultants' Acoustics, Ventilation & Overheating Residential Design Guide 2020*, Appendix C <https://www.association-of-noise-consultants.co.uk/wp-content/uploads/2020/07/ANC-AVO-Residential-Design-Guide-January-2020-v1.1.1.pdf>

10.3.3 The criteria for the construction noise assessment are included in Appendix 10B.

10.4 Noise assessment: scheme operation

10.4.1 For the purposes of assessing noise from the facility during its operation, three features of the scheme have been assessed:

- The rolling stock test track
- The infrastructure test track
- The sidings and facilities in and around the old washery site (the washery)

These features are described in detail in the project description in Chapter 3.

Rolling stock test track

10.4.2 The rolling stock test track will be used to test trains at speeds of up to 110mph.

10.4.3 The rolling stock test track will be open for business to clients all year '24/7': the flexibility for the facility to run into the evenings and night-time periods when required is important to enable to clients to meet tight testing deadlines. However, it is unlikely that the scheme facilities will be constantly in use 365 days a year with no downtime and it is also likely that testing will more commonly occur during the daytime than the evenings/night-times.

10.4.4 To reflect the above, reasonable worst-case assumptions have been developed for the purposes of the assessment. They are as follows:

- when in use, a train would typically complete approximately 20 circuits of the test track per hour, and a typical train is assumed to be 12 cars (carriages) in length;
- on average over a typical year, the rolling stock test track has been assumed to be in active use for five daytimes (defined as 0700-1900) out of every seven
- on average over a typical year, the rolling stock test track has been assumed to be in active use for five evenings (defined as 1900-2300) out of every seven
- on average over a typical year, the rolling stock test track has been assumed to be in active use for two night-times (defined as 2300-0700) out of every seven

10.4.5 In order to minimise train noise from the test track to nearby communities – especially considering that the test track will be in use during some evenings and night-times – the following noise

mitigation has been included in the design. This mitigation is shown on Figures 10.1-10.3:

- Noise mitigation would be provided on the northern and southern sides of the test track, either in the form of noise fence barriers or earth bunds. The mitigation locations are shown on Figure 10.1. Where provided as noise fence barriers, these will not exceed 2m (above top of rail) in height so as not to create adverse visual impacts.
- A landscape bund would be built on the eastern side of the test track and would provide noise as well as visual mitigation. This is also shown on Figure 10.1.

10.4.6 The above noise mitigation measures would also have the benefit of visually shielding some of the test track railway infrastructure from communities – this is described further in the landscape & visual assessment chapter.

Infrastructure test track

10.4.7 The high tonnage infrastructure test track would be used to test railway infrastructure such as rails, trackform and track foundations by running a heavy freight train around the test track at speeds of up to 40mph.

10.4.8 The high tonnage infrastructure test track will be open for business to clients all year ‘24/7’: the flexibility for the facility to run into the evenings and night-time periods when required is important to enable clients to meet tight testing deadlines. However, it is unlikely that the scheme facilities will be constantly in use 365 days a year with no downtime and it is also likely that testing will more commonly occur during the daytime than the evenings/night-times.

10.4.9 Unlike the rolling stock test track, the high tonnage infrastructure test track has been assumed to operate seven days a week (as opposed to five) in order to maximise the tonnage which can be run over any rail infrastructure which is ‘on-test’.

10.4.10 To reflect the above, the following reasonable worst-case assumptions have been used for the assessment:

- The typical train used to stress-test infrastructure would comprise of two locomotives pulling 40 freight wagons;
- When in use, the train would complete approximately 14 circuits of the test track per hour
- on average over a typical year, the high tonnage infrastructure test track has been assumed to be in active use for seven daytimes (defined as 0700-1900) out of every seven

- on average over a typical year, the high tonnage infrastructure test track has been assumed to be in active use for five evenings (defined as 1900-2300) out of every seven
- on average over a typical year, the high tonnage infrastructure test track has been assumed to be in active use for two night-times (defined as 2300-0700) out of every seven

10.4.11 Much of the infrastructure test track is in cutting and hence earthworks will provide some noise mitigation: this has been taken into account in the noise predictions.

10.4.12 On the southern side of the test track, the noise mitigation provided for the rolling stock test track will also provide noise shielding from the infrastructure test track to nearby communities.

Washery facility

10.4.13 The facility on the site of the old washery will include a maintenance shed, train wash and railway sidings.

10.4.14 The washery facility will see only a small fraction of the number of movements or activities which would be found at a train depot servicing an operational train fleet, which would stable and maintain a large number of trains every night. Rather, the facility will see sporadic train movements around the site - primarily during the day - between the sidings, maintenance shed, train wash and the test tracks.

10.4.15 Noise sources would consist of trains moving at very low speeds (around 5mph) around the facility and the train wash.

10.4.16 The maintenance shed would be an enclosed building and noise breakout from this will therefore be minimal. The decommissioning facility is screened by the maintenance shed building and would also not result in significant noise effects.

10.4.17 In order to minimise noise breakout from the washery facilities, western sidings and headshunt to nearby communities, a noise barrier of 3m above rail height has been assumed to be located alongside their southern perimeter. This noise barrier may double as a security/perimeter fence.

10.4.18 To assess possible noise effects during the day, some typical envisaged train movements have been defined in consultation with project railway engineers and noise from these predicted, in order to assess noise from the moving trains within the washery facility. These movements, all assumed to take place at a speed of 5mph, are as follows:

- A train from eastern sidings backing out to the western sidings then moving through the train wash to the headshunt and back;

- A train from the western sidings moving to the maintenance shed and back;
- A train moving from the eastern sidings to the test tracks and back; and
- Noise from the train wash has also been included in the predictions.

10.4.19 The only movements expected during the night will be very occasional and consist of:

- Trains arriving at the facility to be tested - or departing from the facility - from/to the branch line (as the branch line is not electrified, these trains would be pulled by a diesel locomotive), and
- trains either commencing or finishing testing on the test tracks moving from/to the washery sidings.

10.4.20 Due to their small and occasional number, these night-time movements will not give rise to adverse noise effects.

Combined noise predictions and assessment

The predicted noise level from all three groups of sources (rolling stock test track, high tonnage infrastructure test track, washery & sidings) have been summed together and the results are presented in Table 10.2 and shown in Figures 10.1 to 10.3.

Table 10.2: Predicted operational noise levels from the scheme

Receptor (See Fig 10.1)	Total overall predicted scheme noise level, $L_{Aeq,T}$			Maximum noise level from rolling stock test track trains, $L_{Amax,F}$	Existing noise levels based on noise survey				Adverse noise effects
	Daytime $L_{Aeq,T}$ 0700- 1900	Evening $L_{Aeq,T}$ 1900- 2300	Night- time $L_{Aeq,T}$ 2300- 0700		Daytime $L_{Aeq,T}$ 0700- 1900	Evening $L_{Aeq,T}$ 1900- 2300	Night- time $L_{Aeq,T}$ 2300- 0700	Maximum noise level, night- time 2300- 0700 $L_{Amax,F}$	
R1	29	29	25	56	46	41	38	55	No
R2	42	42	39	60	46	41	38	55	No
R3	41	41	38	59	46	41	38	55	No
R4	43	43	39	60	51	42	43	61	No
R5	43	43	39	59	51	42	43	61	No
R6	39	38	34	54	56	56	34	62	No
R7	41	37	32	49	49	51	44	67	No
R8	38	38	34	53	48	47	33	59	No
R9	40	37	33	50	49	51	44	67	No
R10	37	37	33	53	48	47	33	59	No
R11	43	43	40	60	46	41	38	55	No
R12	36	31	25	48	49	51	44	67	No
R13	34	30	25	47	49	51	44	67	No

- 10.4.21 For the daytime and evening periods, the envisaged noise mitigation in the form of noise barriers and/or bunds keeps the overall ($L_{Aeq,T}$) noise levels from the facilities below 50dB(A) at all communities.
- 10.4.22 During daytimes and evenings, noise levels inside dwellings - assuming a typical 15dB(A) reduction provided by an open window - will therefore be kept below the 35dB(A) criterion set out in Table 10.1.
- 10.4.23 Keeping external noise levels below this level of 50dB(A) also meets the guidance from the World Health Organization (WHO) on noise levels for outdoor spaces³.
- 10.4.24 For the night-time period, the noise mitigation keeps overall noise levels from the facilities below the level of 45dB $L_{Aeq,T}$ at all communities and hence noise levels inside bedrooms to below the 30dB(A) $L_{Aeq,T}$ criterion set out in Table 10.1.
- 10.4.25 The assessment has also considered maximum noise levels from the trains which would be tested on the rolling stock test track.
- 10.4.26 At the vast majority of residential receptors, the maximum noise levels ($L_{Amax,F}$) generated by the trains using the rolling stock test track will be below the criteria set out in Table 10.1.
- 10.4.27 At receptors R2 and R11, maximum noise levels are predicted to be 60dB $L_{Amax,F}$ – that is, at the lowest range of the criteria. They are not, however, predicted to exceed the criteria. The test track will be a new sound feature in their noise climate and will be audible: however, being just on the threshold of the noise criteria, it is not considered that these receptors would be subject to a likely significant effect. Noise mitigation in the form of noise barriers or bunds would be provided to minimise noise from the test track for these receptors.
- 10.4.28 No likely significant effects from noise are therefore predicted during the daytime, evening or night-times.

10.5 Construction noise assessment

- 10.5.1 An assessment of construction noise impacts has been carried out and is reported in Appendix 10C.
- 10.5.2 In summary, no likely significant effects due to construction noise are expected at any receptors during the construction period.
- 10.5.3 However, some temporary noise impacts may be experienced at houses in Onllwyn to the north of the A4109 Wembley Avenue, closest to the existing washery facility, represented by receptor R7

³ Guidelines for community noise, World Health Organization, Birgitta Berglund et al
<https://www.who.int/docstore/peh/noise/Comnoise-1.pdf>

(see Figure 10.1), when the existing buildings on the washery site are being demolished.

10.5.4 Construction noise is more difficult to predict accurately than operational noise: this is because construction methods and equipment can differ in reality from those assumed in the assessment, depending on site conditions.

10.5.5 For this reason, a good practice and the primary mechanism for minimising construction noise and vibration is the Construction Environmental Management Plan (CEMP), which contains measures known as Best Practicable Means which will be used during the construction phase to minimise noise. These include standard working hours and specific measures to reduce noise from construction plant. The outline CEMP is included as part of this application (Appendix 3A).

10.6 Vibration

10.6.1 Vibration decays away much more rapidly through the ground with increasing distance than does noise through the air: vibration impacts are therefore only likely within tens of metres of construction or operational activities. The closest dwelling to the facility is over 100 metres away.

10.6.2 No likely significant effects are predicted due to either construction or operation of the facility.

10.7 Traffic associated with the scheme

Road traffic

10.7.1 The potential additional traffic associated with the scheme has been quantified as part of this application. Traffic flow data were analysed to establish whether this additional traffic would result in any material increases in noise levels during either the construction period, or during the day-to-day operation of the facility.

10.7.2 Traffic flows are likely to increase by approximately 15% on the A4017 west of Ollwyn during both construction and operation of the facility: however, this translates to less than a 3dB increase in noise levels along the road and hence would not cause any likely significant effects for communities alongside the road.

10.7.3 The details of the analysis of road traffic is contained in Appendix 10C.

Rail traffic

- 10.7.4 The additional possible rail traffic along the branch line serving the facility - between Onllwyn and the main lines running along the coast - is limited by the fact that it is single track and can only accommodate one train on it at a time.
- 10.7.5 Trains are likely to be used during the construction period to deliver materials such as rail ballast and long lengths of rail for the construction of the facility.
- 10.7.6 During the operation of the facility, trains arriving at the facility for test may arrive along the branch line, hauled by a diesel locomotive.
- 10.7.7 Overall, the low frequency of expected rail movements along the branch line means no likely significant effects are expected during the construction or operational phases.

Noise from fixed plant

- 10.7.8 At this early stage of design it is not known exactly what fixed plant (such as cooling, ventilation or electrical equipment) may be installed across the facility. A detailed assessment has therefore not been carried out at this stage.
- 10.7.9 Assessments of noise from fixed plant and design of any required mitigation will be carried out at detailed design stage in line with British Standard 4142.

11 Water Environment

11.1 Introduction

11.1.1 This chapter provides an assessment of the likely significant effects on the water environment that may arise from the proposed development. For the purposes of this chapter, the water environment is considered to comprise the following elements within the study area:

- The water quality and hydromorphology of surface waters;
- Groundwater quality;
- Terrestrial ecosystems that are dependent on groundwater;
- Flood risk to, and resulting from, the project; and
- Climate change impacts.

11.1.2 Impacts associated with aquatic ecology will be assessed in Chapter 7 – Biodiversity.

11.1.3 The chapter provides sets out the baseline of the existing water environmental in the study area, provides an overview of the relevant legislation and describes changes to the water environmental as a result of the proposed development. The methodology used to assess potential impacts during construction and operation phases of the proposed development is detailed before presenting the results of the assessment. Where required, mitigation and/or monitoring has been suggested.

11.2 Review of proposed development

11.2.1 The proposed development would involve changes to the existing water environment that would have an impact on hydrology, hydrogeology and flooding. The elements of the proposed development that have been considered within this chapter include:

- Train testing track;
- Access roads and car parks within the site boundary;
- The washery site expected to comprise a four-road rolling stock maintenance shed, decommissioning facility, storage sidings, carriage wash and plant room (referred to hereafter as the ‘washery site’);
- Site drainage strategy including Sustainable Drainage System (SuDS) features expected to comprise filter drains, swales, attenuation basins and treatment forebays; and
- Construction practices.

11.2.2 The proposed development has been designed to incorporate mitigation such that issues related to the water environment are resolved. For further details please refer to Section 11.5.

11.2.3 For further details on the proposed development – please refer to Chapter 3 – Proposed Development.

11.3 Legislation, policy context and guidance

11.3.1 Legislation, policy and guidance relevant to the water environment and applicable with the proposed development is listed below.

Legislation

Water Framework Directive

11.3.2 The Water Framework Directive (WFD) 2000/60/EC provides a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. The Directive requires Member States to establish river basin districts and for each of these prepare a river basin management plan (RBMP), which is prepared, implemented and reviewed every six years. The current period from 2015-21 is Cycle 2 of these RBMPs.

Groundwater Directive

11.3.3 A daughter directive of the WFD, the Groundwater Directive 2006/118/EC establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. Amended by Directive 2014/80/EU to clarify groundwater information to be provided to the European Commission. Member States must provide information on groundwater bodies classified as being at risk and threshold values for the respective pollutants and indicators established.

Floods Directive

11.3.4 The Floods Directive 2007/60/EEC requires Member States to:

- assess if all watercourses and coastlines are at risk from flooding;
- to map the flood extent;
- to map assets and people at risk in these areas; and
- to take adequate and coordinated measures to reduce this flood risk.

11.3.5 The Directive requires that flood risk management plans be prepared, implemented and reviewed every six years for each river basin district, in coordination with RBMPs prepared under the WFD.

Priority Substances Directive

- 11.3.6 The Priority Substances Directive amends WFD 2000/60/EC and the Directive on Environmental Quality Standards (Directive 2008/105/EC) by updating the list of priority substances that would apply to WFD assessment.

Drinking Water Directive

- 11.3.7 The Drinking Water Directive 98/83/EC concerns the quality of water intended for human consumption. Its objective is to protect human health from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean.

Environmental Protection Act 1990

- 11.3.8 The Environmental Protection Act 1990 sets out legislative provisions aimed at controlling pollution arising from industrial and other processes for waste management.

Land Drainage Act 1991

- 11.3.9 The Land Drainage Act 1991 requires that a watercourse be maintained by its owner. The Act provides functions to internal drainage boards and local authorities to manage watercourses and provide consenting powers for proposed works to watercourses associated with development.

Water Act 2003

- 11.3.10 The Water Act 2003 amends the Water Resources Act 1991 and the Water Industry Act 1991 to make provision with respect to compensation under Section 61 of the Water Resources Act 1991.

Water Resources (Abstraction and Impounding) Regulations 2006

- 11.3.11 These Regulations (SI 2006/641) contain provisions relating to the licensing of abstraction and impounding of water in England and Wales in the light of amendments made by the Water Act 2003 to the Water Resources Act 1991.

Flood Risk Regulations 2009

- 11.3.12 The Flood Risk Regulations 2009 transposes the EC Floods Directive (Directive 2008/60/EC) on the assessment and management of flood risk into domestic law in England and Wales and implements its provisions. The regulations designate a Local Lead Flood Authority (LLFA) and imposes duties on NRW and Lead Local Flood Authorities to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood hazard and flood risk maps; and
- Flood Risk Management Plans.

Flood and Water Management Act 2010

- 11.3.13 Flood and Water Management Act 2010 makes provision for water, including provision about the management of risks in connection with flooding and coastal erosion.

Environmental Damage (Prevention and Remediation) (England) Regulations 2015

- 11.3.14 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 are based on the ‘polluter pays principle and imposes obligations on operators of economic activities requiring them to prevent, limit or remediate environmental damage. They apply to damage to protected species, natural habitats, Sites of Special Scientific Interest (SSSIs), water and land, and implement Directive 2004/35/EC, on environmental liability.

Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

- 11.3.15 The Water Framework Directive (WFD) 2000/60/EC has been transposed into the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. WFD is delivered in England and Wales through a framework of River Basin Management Plans (RBMPs). England and Wales are divided into 11 River Basin Districts (RBDs), each comprising smaller management units known as water bodies, including all river, lake, groundwater, coastal, and transitional waters located within that RBD.

Schedule 3 of the Flood and Water Management Act 2010, Sustainable Drainage (Wales) Order

- 11.3.16 Schedule 3 of the Flood and Water Management Act 2010 (the 2010 Act) relates to provisions for SuDS. These include the establishment of a SuDS Approving Body (SAB) to be set up within the local authority alongside their LLFA duty. SAB approval is required before construction of drainage systems can commence on new and redeveloped sites. Provided appropriate statutory National SuDS Standards are met, the SAB will be required to adopt and maintain the approved SuDS that serve more than one property.

Policy context

National Planning Policy Framework (NPPF) 2019

- 11.3.17 The National Planning Policy Framework (NPPF) 2019 provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans. Section 14, titled “Meeting the challenge of climate change, flooding and coastal change” relates to flooding. The document aims to direct development away from areas of the highest risk of flooding but where necessary, development must be safe without increasing flood risk elsewhere.

Neath Port Talbot County Borough Council Local Development Plan (2011-2026)

- 11.3.18 Within the Neath Port Talbot County Borough Council (NPTCBC) Local Development Plan the policies of relevance to this chapter include:
- Policy EN8 – Pollution and Land Stability.
The policy states that proposals that could have an unacceptable adverse effect on healthy, biodiversity and/or local amenity or would expose people to unacceptable risk due to water (including groundwater) pollution is not permitted unless mitigation measures are included to reduce the risk of harm to an acceptable level.
 - Policy EN 7 – Important Natural Features
The policy states that proposals that could adversely affect ecologically or visually important natural features such as watercourses or ponds will only be permitted when measures are in place to retain or protect features or the value and role of feature has been taken into account and removal is unavoidable and mitigation measures agreed.
 - Policy SP 16 – Environmental Protection
The policy states that water quality will be protected where feasible through preventing significant adverse effects from proposals, giving preference to brownfield sites and not increasing the number of people exposed to significant levels of pollution.
 - Policy BE 1 – Design
The policy states that drainage systems should be designed to limit surface water run-off and flood risk and prevent pollution.

Powys County Council Local Development Plan (2011-2026)

- 11.3.19 Within the Powys County Council (PCC) Local Development Plan the policies of relevance to this chapter include:

- Policy DM2 – The Natural Environment
The policy states that development should not adversely impact the achievement of the Water Framework Directive’s overarching objectives.
- Policy DM6 – Flood Prevention Measures and Land Drainage
The policy states development should avoid unnecessary flood risk, take opportunities for enhancements and provide undeveloped buffer strips adjacent to watercourses.

Relevant guidance

Design Manual for Roads and Bridges

- 11.3.20 The assessment has adapted from the Design Manual for Roads and Bridges (DMRB) Guidance LA 113 Road drainage and the water environment (formerly HD 45/09); hereby referred to as LA 113. This guidance provides the methodology and criteria for identifying likely impacts of a proposed road project on the water environment and predicting their magnitude and the significance of the resulting effects. There is no standard guidance for the methodology for water resources assessment therefore in the absence of any sector guidance, DMRB is recognised as the most tried, tested and robust approach.
- 11.3.21 There are some areas of LA 113 that are not applicable to the proposed development (e.g. Highways England Water Risk Assessment Tool (HEWRAT)) as LA 113 is designed to assess major road schemes and therefore these areas have not been incorporated into the assessment.
- 11.3.22 The following guidance has also been considered in the assessment:
- Network Rail Standard NR/L2/CIV/005 module 9 on drainage design;
 - Planning Inspectorate Advice Note 18 (‘Water Framework Directive’). This guidance is specifically for Nationally Significant Infrastructure Projects (NSIP); however, it benefits from being recognised by regulators and details the relationship between WFD assessment and EIAs. The WFD Screening Assessment provided in Appendix 11A has been produced following this guidance;
 - Planning Policy Statement 15 (Revised): Planning and Flood Risk.

- Due reference has been made to GOV.UK guidance for preventing pollution¹, working on or near water² and for managing water on land³;
- CIRIA⁴ guidance used for the assessment includes:
 - Control of Water Pollution from Construction Sites – Guide to Good Practice (SP156);
 - Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (C532);
 - Remedial processes for contaminated land - principles and practice (C549);
 - Environmental good practice on site (C692); and
 - Groundwater control: design and practice (second edition) (C750).
- Pollution Prevention Guidelines (PPG)⁵ are a series of documents developed by the Environment Agency for England and Wales. The PPGs are currently being reviewed and updated with a replacement guidance series, Guidance for Pollution Prevention (GPP). Some GPPs have been introduced but PPGs can still be used in the interim as good practice.

11.4 Scoping and consultation

Scoping

11.4.1 A scoping report was submitted to statutory consultees and key interest groups for comment in September 2019.

11.4.2 Comments were received from Natural Resources Wales (NRW) which focused on the site's location in proximity to the River Pyrddin and River Dulais and the presence of ordinary watercourses in the vicinity. NRW has requested consideration of appropriate pollution

¹ The Environment Agency, "Pollution prevention for businesses," 12 07 2016. [Online]. Available: <https://www.gov.uk/guidance/pollution-prevention-for-businesses>. [Accessed September 2019].

² The Environment Agency, "Check if you need permission to do work on a river, flood defence or sea defence," 2017. [Online]. Available: <https://www.gov.uk/permission-work-on-river-flood-sea-defence>. [Accessed September 2019].

³ The Environment Agency, "Manage water on land: guidance for land managers," 19 02 2015. [Online]. Available: <https://www.gov.uk/guidance/manage-water-on-land-guidance-for-land-managers>. [Accessed September 2019].

⁴ Construction Industry Research and Information Association (CIRIA), Free CIRIA Downloads Available: https://www.ciria.org/CIRIA/Resources/Free_CIRIA_publications/Resources/Free_CIRIA_publications.aspx?hkey=622b85b3-7d21-4e59-8093-459571496a0a [Accessed September 2019].

⁵ NetRegs, "Guidance for Pollution Prevention (GPPs) – Full list" [Online]. Available at: <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppps-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/> [Accessed July 2020].

control measures and the development of a Construction Environmental Management Plan (CEMP). The topics NRW requested to be included in the CEMP are summarised in **Table 11.1** below, along with a response to the comments.

11.4.3 The scoping report detailed that the water environment chapter would consider impacts on foul and storm drainage however this has now been considered within the Drainage Strategy in Appendix 11B.

Table 11.1: Response to scoping opinion

Scoping opinion clause	Response
Construction methods including details of materials, waste, contaminated land.	An outline CEMP will be submitted with the planning application. Once appointed, the contractor will develop the CEMP to provide more detailed construction methodology and information on materials, waste and contaminated land.
General Site Management: construction programme, site clearance requirements, construction drainage, site set-up plan detailing sensitive receptors and buffer zones, relevant protection measures e.g. fencing.	An outline CEMP will be submitted with the planning application. Once appointed, the contractor will develop the CEMP to provide more detailed information on general site management.
Biodiversity Management: tree and hedgerow protection, invasive species management.	Please refer to Chapter 7 – Biodiversity for information on Biodiversity Management.
Control of Nuisances: restrictions on timing/duration/frequency of works, dust control measures, control of light spill and conservation of dark skies.	An outline CEMP will be submitted with the planning application. Once appointed, the contractor will develop the CEMP to provide more detailed information on control of nuisances.
Resource Management: fuel and chemical storage, waste management, water consumption, energy consumption.	An outline CEMP will be submitted with the planning application. Once appointed, the contractor will develop the CEMP to provide more detailed information on resource management.
Traffic Management: deliveries, plant on site, wheel washing facilities.	An outline CEMP will be submitted with the planning application. Once appointed, the contractor will develop the CEMP to provide more detailed information on traffic management.
Pollution Prevention: demonstrate compliance with relevant Guidelines for Pollution Prevention, incident response plan, site drainage plan.	An outline CEMP will be submitted with the planning application. The outline CEMP will include the requirement to adhere to the relevant pollution prevention guidelines. An incident response plan and site drainage plan during construction will be developed by the appointed contractor.
Ecological clerk of works to ensure compliance with approved plans and environmental regulations.	Please refer to Chapter 7 – Biodiversity for information on ecological clerk of works.
Details of the persons/bodies responsible for activities associated with the CEMP and emergency contact details.	Contact details to be provided by contractor.

Consultation

- 11.4.4 Consultation with statutory consultees including SABS Approval Body, NRW, PCC and NPTCBC has been undertaken with regards to the Drainage Strategy and ecological mitigation proposals that are referenced in this chapter for the Nant Helen project. No further consultation has been undertaken.

11.5 Methodology

Overview

- 11.5.1 This section details the methodology for the water environment impact assessment. As stated in Section 11.3, the methodology is based on DMRB LA 113. The methodology includes a review of existing baseline conditions against which to assess impacts associated with construction and operation of the site. The impact assessment details construction practices and design mitigation that affect identified impacts.

Methodology for establishing baseline conditions

- 11.5.2 The water environment baseline data for the study area has been obtained from a combination of desktop study and walkover study.
- 11.5.3 The following information sources have been used to complete the baseline assessment:
- NRW ‘Water Watch Wales’⁶;
 - Ordnance Survey (OS) Open Data;
 - Nant Helen Remainder Environmental Statement (2011);
 - Nant Helen Environmental Statement Addendum (2016);
 - Nant Helen Earthworks Environmental Statement (2019);
 - Groundsure report (2019);
 - NRW Geocortex Viewer⁷
 - Lle Development Advice Map; and
 - BGS GeoIndex.
- 11.5.4 A site visit was undertaken by a fluvial geomorphologist on 28th November 2018 in advance of the restoration works associated with the closure of the mine. It is unlikely that a site visit following the

⁶ <http://waterwatchwales.naturalresourceswales.gov.uk/en/> (last accessed 17/07/2019)

⁷

https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtual_directory/Resources/Config/Default&layerTheme=1 (last accessed 30/07/2020)

restoration works is feasible for the project considering time constraints, but it is considered that there is sufficient knowledge of the site from the 2018 site visit in combination with existing desktop resources.

- 11.5.5** For direct effects on surface waters, the study area will include the geographical extent of the proposed development and all surface water features within 500m of the proposed development. Indirect effects on surface waters will be considered up to 1km away where features have hydrological connectivity to the proposed development.
- 11.5.6** For direct effects on groundwater features, the study area will include the extent of the proposed development and extending up to 250m away from the proposed development boundary. For further information on the groundwater feature study area, please refer to Chapter 6 – Ground Conditions.
- 11.5.7** The size of the study area has been selected based on professional judgement and is proportionate with the potential impacts posed by the scheme.

Design mitigation

- 11.5.8** Measures have been built into the proposed development which seek to minimise the impact on the water environment once the development is operational. The measures include good culvert design, a series of SuDS features (referred to as a ‘treatment train’) as well as measures to manage point source pollution from the washery site. Further details are provided below.
- 11.5.9** Culverts will be designed to CIRIA Guide C786 standard to allow the same volume and rate of flow as the existing watercourse. Further design measures include bottomless culverts that are oversized relative to the existing channel dimensions where the risk of scour can be managed safely. This would help to maintain natural processes and the ecological connectivity of the stream corridor. During detailed design, anticipated velocities within the culvert would be assessed to balance the risk of sedimentation whilst maintaining suitable conditions for fish passage.
- 11.5.10** The SuDS features would manage surface water run-off across the testing track, washery site, development roads and car parks. The appropriate SuDS features required to mitigate impacts has been calculated based on the simple index approach, as specified in the SuDS manual, and will be subject to SABS approval. The simple index approach is the recognised method of assessing water quality within the Welsh Government Statutory Standards for SuDS. The proposed elements of the treatment train and track drainage for the areas of the proposed development specified include:
- Testing track: Surface run off from the tracks would percolate through the ballast into filter drains lining the track which would

convey flow to attenuation ponds. The attenuation ponds would discharge flow to the River Tawe, River Nant Llech, River Pyrddin and River Dulais catchment.

- **Development access roads and car park:** Surface water runoff from the tracks would collect in the swales that line the development roads and car park. The swales would convey flows into attenuation ponds. At this outline stage, it is anticipated that the attenuation ponds would discharge flow to the River Nant Llech, River Pyrddin and River Dulais catchment.
- **Washery site:** The washery site contains facilities that are expected to present a greater risk of pollution including carriage washing and rolling stock maintenance shed. To manage point source pollution from the washery site, the facilities within the site would comprise specific drainage systems to manage effluent released from this area. Following discharge from these systems, effluent will be collected in the filter drains within washery site. Run off would be conveyed through filter drains into swales which will deposit the run off into treatment forebays. The treatment forebays are designed to capture and contain sediment/soil. Following the treatment forebays, run off then passes into attenuation basins before being discharged to River Pyrddin and River Dulais catchment.

11.5.11 The track drainage design would adhere to Network Rail Standard NR/L2/CIV/005 module 9 on drainage design. The standard states that environmental issues related to a new or existing drainage system will be identified and a potential form of mitigation proposed and supplied. The standard further states that where the quality of discharge is a risk and non-compliant to legislation, a relevant treatment shall be proposed.

Assumed construction practices

11.5.12 An Outline Construction Environmental Management Plan (CEMP) will be submitted with the planning application and will be developed by the appointed the contractor. The CEMP will ensure that industry standard working methods and mitigation measures set out in the Environment Agency's Pollution Prevention Guidelines (PPG) (withdrawn) and Guidance for Pollution Prevention (GPP) are implemented. The CEMP will include details of the management of water and sediment across the site and provisions to minimise the likelihood of run-off, provide containment of spillage and capture or treat wastewaters where necessary. These mitigation measures are

intended to prevent impacts upon surface water or groundwater quality.

Assessment methodology

11.5.13 As set out in Section 11.3, this assessment has been carried out in broad alignment with DMRB guidance LA 113 Road drainage and the water environment. It should be noted that LA 113 does not provide guidance on assessment of flood risk or climate change. For flood risk, therefore the assessment criteria have been developed based on professional judgement, the principles of LA 113 and the National Planning Policy Framework guidance. For the assessment of climate change impacts on the water environment, the assessment has been based on professional judgement in the absence of a defined, industry approved methodology.

11.5.14 LA 113 provides a standard methodology for the impact assessment and has four key steps:

- Step 1 - Identification of receptors (surface water, groundwater, flood risk) within the study area. Receptors are assessed against criteria defining quality and importance (sensitivity). **Table 11.2** sets out the attributes used to define the sensitivity of surface water, groundwater and flood risk receptors. An assessment of the sensitivity of each of these receptors is then undertaken using the criteria set out in **Table 11.3**;
- Step 2 – Identification of potential impacts to the receptors identified in Step 1, from construction and/or operation;
- Step 3 – Assessment of the potential magnitude of any construction and/or operation impacts on the receptor based on the criteria in LA 113, summarised and defined in **Table 11.4**; and
- Step 4 – Assessment of overall significance of effect using the significance matrix provided in **Table 11.5**. This identifies the magnitude of impact on the top and the receptor sensitivity on the side. The significance of impact is identified where the two meet within the matrix. The assessment considers ‘Very Large’, ‘Large’ and ‘Moderate’ significance of effect as significant. ‘Slight’ and ‘Neutral’ significance of effect are not considered significant.

Table 11.2: Surface water, groundwater and flood risk receptor attributes and indicators of quality (adapted from LA 113: Table 3.69)

Feature	Attribute/Service	Indicator of quality	Possible measure
Watercourse	Water Supply/quality	Amount used for water supply (potable); Amount used for water supply (industrial/agricultural); Chemical water quality.	Location and number of abstraction points Volume abstracted daily Physio-chemical quality elements of WFD ecological status

Feature	Attribute/Service	Indicator of quality	Possible measure
			Supporting hydrological regime element of WFD ecological status
	Dilution and removal of waste products	Presence of surface water discharges and effluent discharges.	Daily volume of discharge (treated/untreated)
	Recreation	Access to watercourse; Use of watercourse for recreation.	Length of watercourse used for recreation (fishing, water sports) and number of clubs
	Biodiversity	Biological water quality	WFD ecological status class; NRW routine fish and/or invertebrate monitoring data
		Fisheries quality	Fish Status Supporting hydromorphological element of WFD ecological status, includes geomorphology
	Value to economy	Value of use of watercourse	Length of watercourse used for recreation commercially Number of people employed Length of river bank developed Length of watercourse fished commercially
Conveyance of flow	Presence of watercourses	Number and size of watercourses Number of watercourses artificially managed to control flow/levels	
Groundwater	Water supply/quality	Amount used for water supply (potable); Amount used for water supply (industrial/agricultural).	WFD groundwater quantitative and chemical status Catchment abstraction management Strategy (CAMS) status Location and number of abstraction points Volume abstracted daily and use (potable most important) Location and grade of SPZ
	Soakaway	Presence of soakaways or other discharges to the ground.	Location and number of discharge points Daily volume discharged
	Vulnerability	Groundwater vulnerability.	Classification of aquifer vulnerability
	Economic value	Extent of use for abstractions.	Number of people employed, cost of alternatives
	Conveyance of flow	Presence of groundwater supported watercourses; Potential for groundwater flooding; Groundwater interception by road structures or drainage.	Changes to groundwater recharge, levels or flows Number and size of watercourses

Feature	Attribute/Service	Indicator of quality	Possible measure
	Biodiversity	Presence of groundwater supported wetlands.	Changes to groundwater recharge, levels or flows Status or classification of wetland including Groundwater Dependent Terrestrial Ecosystems (GWDTE) under WFD
Receptors vulnerable to flooding	Development	Presence of development	Essential infrastructure: transport and utility infrastructure, wind turbines. ⁸ Highly vulnerable: emergency services (operational during flooding), basement dwellings, mobile homes, installations requiring hazardous substance consent. ⁸ More vulnerable: hospitals, residential institutions, dwelling houses, health services and education establishments, landfill/waste management, campsites. ⁸ Less vulnerable: emergency services, shops and businesses, waste/water/sewage treatment, land for agriculture and forestry. ⁸ Water-compatible development: Amenity open space, outdoor sport and water based recreation, docks etc. ⁸

Table 11.3: Criteria for estimating the importance of surface water, groundwater and flood risk receptors (adapted from DMRB LA 113: Table 3.70)

Importance	Criteria	Examples
Very High	Attribute has a high quality and rarity on regional or national scale	Surface water: Watercourse having a WFD classification shown in a RBMP and Q95 ≥ 1.0 m3/s. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation Ecology and Nature Conservation. Groundwater: Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation Ecology and Nature Conservation. Groundwater locally supports GWDTE and/or Source Protection Zone 1 (SPZ1). Flood risk: Essential infrastructure or highly vulnerable development ⁸
High	Attribute has a high quality and rarity on local scale	Surface water: Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m3/s. Species protected under EC or UK legislation Ecology and Nature Conservation.

⁸ Communities and Local Government (2012), Technical Guidance to the National Policy Framework. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6000/2115548.pdf

Importance	Criteria	Examples
		Groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE SPZ2 Flood risk: More vulnerable development ⁸
Medium	Attribute has a medium quality and rarity on local scale	Surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001m3/s. Groundwater: Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3 Flood risk: Less vulnerable development ⁸
Low	Attribute has a low quality and rarity on local scale	Surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001m3/s. Groundwater: Unproductive strata Flood risk: Water compatible development ⁸

Table 11.4: Criteria for estimating the magnitude of an impact (adapted from LA 113: Table 3.71)

Magnitude	Criteria
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute
Minor Adverse	Results in some measurable change in attributes, quality or vulnerability
Negligible	Results in effect on attribute but of insufficient magnitude to affect the use or integrity
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality
No Change	No loss or alteration of characteristics, features and elements; no observable impact in either direction.

Table 11.5: Significance matrix (adapted from DMRB LA 104: Table 3.8.1) as referenced in LA 113

		Magnitude of impact (degree of change)				
Environmental value (sensitivity)		No change	Negligible	Minor	Moderate	Major
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large

Magnitude of impact (degree of change)						
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Note: The impacts highlighted in red are deemed significant.

11.6 Limitations and assumptions

Limitations

- 11.6.1 It has not been possible to undertake a site visit to the site following completion of the restoration and earthworks as these activities are still in progress. Therefore, our baseline conditions have been based on information gained from the site visit before these activities commenced and desktop research.
- 11.6.2 As the restoration plan has not yet been introduced, there is no desktop research available on the baseline.

Assumptions

- 11.6.3 It is assumed that the measures within the CEMP will be adhered to and implemented.
- 11.6.4 It is assumed that construction will be undertaken by competent contractors with experience of working in and/or near to watercourses.
- 11.6.5 It is assumed that the site drainage strategy for the Nant Helen project will be implemented.

11.7 Baseline Environment

- 11.7.1 This section sets out the baseline conditions and identifies potential receptors, describing sensitivity according to the methodology described in Section 11.5. The baseline conditions detailed has accounted for the restoration works associated with the closure of the Nant Helen mining operations and therefore can be considered a future baseline.

Surface Water

- 11.7.2 The following surface water receptors have been identified in the study area and are shown in Figure 11.1. The site overlaps with three

principal river catchments: the Tawe catchment, the Dulais catchment and the Pyrddin catchment.

River Dulais

- 11.7.3 The River Dulais (headwaters to confluence with River Neath - GB110058032430)⁹ is located to the south of the proposed development.
- 11.7.4 There are multiple unnamed tributaries of the River Dulais within the site boundary that flow southwards from the southern portion of the proposed development into the River Dulais.

River Nant Llech

- 11.7.5 The River Nant Llech (headwaters to confluence with Tawe - GB110059032240)⁹ is located to the north east of the study area and, at its closest point, 280m from the proposed development although it is separated from the scheme by the A4221. The River is located within the Nant Llech Site of Special Scientific Interest (SSSI).
- 11.7.6 There are several unnamed tributaries of the River Nant Llech that flow north eastwards from the eastern portion of the proposed development.

River Tawe

- 11.7.7 The River Tawe (conf with Giedd to confluence with Twrch - GB110059032180)⁹ is located to the north of the proposed development and, at its closest point, is approximately 580m from the proposed development.
- 11.7.8 There are multiple unnamed tributaries of the River Tawe that flow northwards from the northern portion of the proposed development and one named tributary, Nant Helen located within the northern portion of the proposed development.

River Pyrddin

- 11.7.9 The River Pyrddin (headwaters to conf with Nedd Fechan – GB110058032400)⁹ is located to the south east of the proposed development and, at its closest point, is approximately 880m from the proposed development.
- 11.7.10 The Camnant is a named tributary of the River Pyrddin that is located within the south eastern portion of the proposed development.

⁹ NRW, Cycle 2 Rivers and waterbodies [online]. Available at: <https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=4ef6ea25c5984c939636714dbf3ce25f3>

- 11.7.11 NRW have monitoring stations located on the River Nant Llech, River Dulais and River Tawe. However, monitoring activities ceased in 2015 and the data is therefore not considered representative due to the length of time that has passed since monitoring ceased. Flow data for these watercourses, and their tributaries, is not available.
- 11.7.12 Site run off is collected in attenuation ponds across the site, the run off settles within these attenuation ponds and then is released at greenfield run off rates or below greenfield run off rates into tributaries of the River Dulais, Nant Llech, Tawe and Pyrddin.

Ponds and Wetlands

- 11.7.13 The site contains a collection of small ponds to the south of the site. These ponds were historically water treatment areas associated with the mine workings. As part of the restoration works associated with the closure of the mine, these water treatment areas will be converted to ponds. These ponds are connected to the River Dulais.
- 11.7.14 The site contains two wetlands to the west and in the centre of the site. These wetlands have been created through the restoration works associated with the closure of the mine.

Ephemeral Drainage Ditches

- 11.7.15 There are a series of drainage ditches located within the study area which are expected to have resulted from the mining activities or introduced as part of the restoration plan. These ditches are ephemeral and only wet following heavy rain.
- 11.7.16 In line with DMRB guidance, the surface water receptors have been valued according to their sensitivity in **Error! Reference source not found.** using the criteria for valuation in **Table 11.3.**

WFD Status

- 11.7.17 The study area includes four WFD surface water bodies and one WFD groundwater body. These are:
- River Nant Llech (headwaters to confluence with Tawe - GB110059032240);
 - River Dulais (headwaters to confluence with River Neath - GB110058032430)
 - River Tawe (conf with Giedd to confluence with Twrch - GB110059032180);
 - River Pyrddin (headwaters to conf with Nedd Fechan - GB110058032400);
 - Swansea Carboniferous Coal Measures (GB41002G201000).

11.7.18 The current status of each of these WFD water bodies (surface water and groundwater) is summarised in **Table 11.6**. The sensitivity of WFD water bodies is captured in surface water receptors and groundwater receptors.

Table 11.6: Summary of WFD water bodies in the study area

WFD Waterbody	River Nant Llech (headwaters to confluence with Tawe)	River Dulais (headwaters to confluence with River Neath)	River Tawe (conf with Giedd to confluence with Twrch)	River Pyrddin (headwaters to conf with Nedd Fechan)	Swansea Carboniferous Coal Measures
ID	GB110059032250	GB110058032360	GB110059032240	GB110058032400	GB41002G201000
Type of Waterbody	River	River	River	River	Groundwater
Area (km/km ²)	3.97	16.06	5.94	7.09	758
HMWB/AWB	Not heavily modified or artificial	Not heavily modified or artificial	Not heavily modified or artificial	Not heavily modified or artificial	N/A
Overall Status	Good	Good	Good	Good	Poor
Objective	N/A	N/A	N/A	N/A	Objective not assigned as no known technical solution available
Chemical Status	Good	Good	Good	Good	Poor
Ecological Status (River) / Quantitative Status (Groundwater)	Good	Good	Good	Good	Good
Driver of failure to achieve 'Good' status	N/A	N/A	N/A	N/A	Poor Chemical status is driven by the results of a surface water dependent test for groundwater chemical status. The test showed there had been a significant diminution of surface water chemistry and ecology.

WFD Waterbody	River Nant Llech (headwaters to confluence with Tawe)	River Dulais (headwaters to confluence with River Neath)	River Tawe (conf with Giedd to confluence with Twrch)	River Pyrddin (headwaters to conf with Nedd Fechan)	Swansea Carboniferous Coal Measures
Reasons for not achieving 'Good' status	N/A	N/A	N/A	N/A	Point source pollution is defined as causing the poor Chemical status. Point source pollution is thought to have resulted from mining activities.
Other (including Mitigation Measures)	N/A	N/A	N/A	N/A	No known technical solution available.

Table 11.7: Summary of surface water receptors within the study area

Surface water receptor	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
River Dulais	Located 850m to the south west of the site boundary	None	High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s
Unnamed tributaries of River Dulais	Southern area of site boundary	Attenuation pond outfall to tributaries Diversion Culvert	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s
River Nant Llech	Located to the north east of the proposed development, located 300m at its closest point	None	Very High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s Section of the river located within SSSI
Unnamed tributaries of the River Nant Llech	Located to the north east of the proposed development	Attenuation pond outfall to tributaries	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s
River Tawe	Located to the north of the proposed development, approximately 350m from the proposed development at its closest point	None	High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s
Unnamed tributaries of the River Tawe (and named tributary Nant Helen)	Located to the north of the development, several tributaries abut the proposed development	Attenuation pond outfall to tributaries	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s
River Pyrddin	South eastern area of study area	None	Very High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s Section of river within SSSI
Camnant (tributary of the River Pyrddin)	South eastern area of site boundary	Attenuation pond outfall to tributaries	High	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s

				Section of the tributary located within SSSI
Ponds	Approximately 9 ponds located across the site boundary	Some ponds are expected to be removed, modified or relocated	Low	Ponds are artificial created through restoration plan and historic mine workings
Wetlands	Two wetlands, one to the east of the site boundary and one in the centre of the site	None	Low	Wetlands are artificial and recently introduced as part of the restoration plan
Ephemeral drainage ditches	There are drainage ditches throughout the study area and within the site boundary	Some drainage ditches will be cut off or diverted	Low	Majority of drainage ditches are a result of the restoration plan following the decommission of the mine

Groundwater

Groundwater Quality

- 11.7.19** The groundwater regime in the site boundary and its vicinity is likely to be fundamentally controlled by remnants of historical mining activities such as shafts or adits. The historical mine workings may act as preferential flow paths for groundwater flows and constitute a major drainage network, which would discharge into the surface water network.
- 11.7.20** Active dewatering was necessary to accommodate the open cast mining activities. Whilst there are no data to confirm this, it is likely to have had an impact on local hydrogeology including groundwater levels and flow direction. When the dewatering stops, the groundwater regime is likely to restore to pre-dewatering state. This is likely to result in an increase in groundwater levels from those currently present and potentially flooding of the void present in the western site area. This increase is however unlikely to be major due to the presence of the deep mine’s drainage. Refer to Chapter 6 on ground conditions for more details on local hydrogeology.
- 11.7.21** The aquifer designations have been determined through review of the Groundsure EnviroInsight¹⁰ report purchased for the site.
- 11.7.22** The glacial till deposits shown to be present in the southern and western portion of the site are designated as Secondary Undifferentiated. The designation is attributed to a stratum where it has not been possible to differentiate between a ‘Secondary (A)’ or ‘Secondary (B)’ designation.

¹⁰ Groundsure, EnviroInsight report, Report ref.: GS-6396069, 14/10/2019

- 11.7.23 The deposits of peat shown to be present within the site are designated as ‘unproductive strata’.
- 11.7.24 The South Wales Coal Measures Formations (both Middle and Lower) shown to be present beneath the entirety of the site are both designated as ‘Secondary (A) Aquifers’. Secondary (A) Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale.
- 11.7.25 There are no private water supplies or Source Protection Zones within 1km of the proposed development.
- 11.7.26 The groundwater levels and flows and groundwater quality from existing contamination is detailed in Chapter 6 – Ground Conditions.
- 11.7.27 In line with DMRB guidance, the groundwater receptors have been valued according to their sensitivity in Table 11.8 using the criteria for valuation in Table 11.3.

Table 11.8: Summary of groundwater receptors in the study area

Groundwater receptor	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
Glacial till deposits	Southern and western portion of the site (above South Wales Coal Measures Formations)	Permanent drainage of cuttings	Low	Secondary undifferentiated Not in a Source Protection Zone
Peat deposits	Southern portion of the site (above South Wales Coal Measures Formations)	None	Low	Unproductive strata Not in a Source Protection Zone
South Wales Coal Measures Formations (both Middle and Lower) (part of Swansea Carboniferous Coal Measures WFD groundwater body)	Entire site is encompassed within the groundwater body	Permanent drainage of cuttings	Medium	Secondary A Aquifer Not in a Source Protection Zone

Groundwater Dependent Terrestrial Ecosystems

- 11.7.28 There are three Sites of Special Scientific Interest (SSSI) partially located within the study area: Nant Llech, Gorsllwyn and Caeau Ton-y-Fildre. The SSSIs are shown in Figure 11.1. Each of the SSSI contains species of vegetation that are considered a Groundwater

Dependent Terrestrial Ecosystem (GWDTE)¹¹. Potential ecological impacts to the protected sites are addressed in Chapter 7 – Biodiversity.

- 11.7.29** The Nant Llech is located approximately 100m, to the north east of the proposed development. The SSSI has been designated for: Broadleaved Semi-natural Woodland; Bryophytes (mosses and liverworts); Westphalian Sedimentary Rocks; and Westphalian Fossil Plants¹². In the wet flushed areas of the site alder *Alnus glutinosa* are present, which has moderate dependency on groundwater.
- 11.7.30** The Gorsllwyn is located approximately 40m to the south east of the proposed development and is designated due to its raised mire. Much of the mire drains north into an area dominated by common reed *Phragmites australis* which has low dependency on groundwater. Greater tussock-sedge *Carex paniculata* is also present. Wetland species to be found include meadow thistle *Cirsium dissectum*.¹³ Both species have moderate dependency on groundwater.
- 11.7.31** The Caeau Ton-y-Fildre is located approximately 260m to the east of the proposed development and is designated for its two unimproved herb-rich pastures that supports a range of species characteristic of damp, flushed peaty pasture including alder *Alnus glutinosa* which has moderate dependency on groundwater.¹⁴
- 11.7.32** Potential GWDTE receptors that will be considered in the assessment are summarised in **Table 11.9**.

Table 11.9: Summary of GWDTE in the study area

GWDTE	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
Nant Llech	100m north east of study area	Cutting in proposed development	Very High	GWDTE within SSSI
Gorsllywn	40m south east of study area	Cutting in proposed development	Very High	GWDTE within SSSI

¹¹ UK Technical Advisory Group on the Water Framework Directive, 2004. Guidance on the identification and risk assessment of groundwater dependent terrestrial ecosystems. Accessed: 17/07/2020. Available at: <

https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Risk%20assessment%20of%20terrestrial%20ecosystems%20groundwater_Draft_210104.pdf>

¹² NRW, 1990. *Site of Special Scientific Interest Citation: Nant Llech*. Accessed: 14/11/2019. Available at: <https://naturalresources.wales/media/676915/sssi_0366_citation_en001.pdf>

¹³ NRW, 1982. *Site of Special Scientific Interest Citation: Gorsllywn, Onllwyn*. Accessed: 17/07/2020 https://naturalresources.wales/media/648654/SSSI_0657_Citation_EN0010893.pdf

¹⁴ NRW, 1996. *Site of Special Scientific Interest Citation: Caeau Ton-y-Fildre*. Accessed: 17/07/2020 <https://naturalresources.wales/media/645611/SSSI_0544_Citation_EN001dd16.pdf>

GWDTE	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
Caeau Ton-y-Fildre	260m east of study area	Cutting in proposed development	Very High	GWDTE within SSSI

Flood Risk

11.7.33 Under TAN15, as shown in Lle Development Advice Map¹⁵, all of the site is within Zone A which is defined as ‘Considered to be at little or no risk of fluvial or tidal/coastal flooding’. There is a very small area of Flood Zone C2 in the south-east corner of the Washery site associated with a stream. Areas within Zone C2 and Zone B are outside of the site boundary but within the study area and predominantly localised to the immediate areas surrounding the major watercourses although Zone B extends into the southern part of the village of Ystradgynlais. However, the data has been based upon the mine workings as the restoration plan has not yet been introduced.

11.7.34 Potential flood risk receptors are shown in **Table 11.10** and include the surrounding existing receptors as well as proposed receptors.

Table 11.10: Summary of flood risk receptors in the study area

Flood risk receptor	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
Existing communities within the River Tawe	Northern and western area of the site boundary and study area	Use of existing outfall to tributary of River Tawe	High	More vulnerable development
Existing communities within the River Pyrddin catchment	Eastern area of the site boundary and study area	Use of existing outfall to tributary of River Pyrddin	High	More vulnerable development
Existing communities within the River Dulais catchment	Southern area of the site boundary and study area	Use of existing outfall and addition of new outfall to tributary of River Dulais	High	More vulnerable development
Proposed central control building and research and development centre	Eastern area of the site boundary	N/A	Medium	Less vulnerable development
Proposed testing track	Extends across entire site	N/A	Medium	Less vulnerable development
Proposed carriage washing facility	South east area of the site boundary	N/A	Medium	Less vulnerable development

¹⁵ Lle, 2016. Map Browser. Accessed: 14/11/2019. Available at: <http://lle.gov.wales/map#b=europa&l=328;329;330;&m=-3.72297,51.77936,14>

Flood risk receptor	Location relative to scheme	Scheme elements	Sensitivity	Value Rationale
Proposed car park and access roads	South east area of the site boundary extending to north east area of the site	N/A	Medium	Less vulnerable development

Climate Change

11.7.35 Current and future climate baselines are outlined in Chapter 15 Climate Change for key climate parameters, including winter and summer temperature and precipitation, using UK Climate Projections 2018 (UKCP18).

11.8 Assessment of effects

11.8.1 Potential effects can occur as a result of construction or operation or a combination of construction and operation. Typically, these effects are grouped into temporary, short-term construction effects and permanent, long-term operational effects, although short and long-term effects can occur as a result of both construction and operation activities.

11.8.2 The assessment has taken a precautionary approach, where the significance matrix in Table 11.5 specifies a range of two effects, the worst case effect has been chosen to provide a robust assessment. Any exceptions to this approach are detailed within the assessment.

11.8.3 The assessment of effects from construction will focus on effects relating to the construction activities and methods and will not include assessment of effects of the proposed development scheme elements e.g. realignment of the tributary of the River Dulais.

11.8.4 The assessment of effects from operation will focus on effects relating to the proposed development scheme elements.

Assessment of effects from construction

11.8.5 This section presents the assessment of potential effects to the water environment resulting from the construction of the proposed development. The significance of effects is based on a combination of the potential magnitude of effect and the sensitivity of the receptor.

11.8.6 The potential effects of contamination associated with the made ground on surface water quality and groundwater quality has been assessed in Chapter 6 – Ground Conditions. Groundwater levels and flows have also been assessed in Chapter 6 – Ground Conditions.

11.8.7 The potential effects associated with ecology have been assessed within Chapter 7 – Biodiversity.

11.8.8 The potential impacts experienced by receptors that will be considered in this section include:

- Surface water: surface water quality and quantity impacts and hydromorphology impacts;
- Groundwater: groundwater quality impacts and impacts on GWDTE; and
- Flood risk: impacts of flood risk on surrounding and on site receptors.

Surface Water

Surface Water Quality

11.8.9 The most likely sources of surface water impacts are:

- Disturbance of silt/soil generating surface runoff with high sediment concentrations (mobilised suspended solids). This includes the proposed earthworks for the Washery site and introduction of the track and ancillary infrastructure;
- Accidental spillage of fuels, oils and chemicals (e.g. concrete, plant fuels/oils, lubricants, hydraulic fluids and floating solids such as litter) resulting in pollution of watercourses and potential impact on fish; and
- Dewatering discharges from excavations causing high levels of suspended solids.

11.8.10 The risk of pollution is heightened during periods when vegetation has been removed and exposed and soil is present, such as during initial site preparation. Risks of surface water pollution impacts are also greater during works in close proximity to surface watercourses. Without control measures, the risk of runoff from exposed soil would remain until vegetation is established, which would take generally one growing season.

11.8.11 The magnitude of these impacts would be Major Adverse and short term. However, as outlined in Section 11.5, if the surface water management measures set out in the outline CEMP are implemented, then the magnitude of impact would reduce to Negligible. All surface waterbodies within the site boundary and immediate area surrounding the site have potential to receive run-off from the site. The tributaries of the River Nant Llech, River Dulais and River Tawe are considered to be of Medium sensitivity and the Camnant is considered to be of High sensitivity, the significance of effect on these features is considered to be *Slight Adverse* and not significant. The ponds, wetlands and ditches are considered to be of Low sensitivity, and the significance of effect on these features is considered to be *Slight Adverse* and not significant. As the effects on features is not significant, additional mitigation is not required.

Surface Water Quantity

- 11.8.12 Potential impacts to surface water quantity during construction include an increase in the volume of surface water run off through removal of grassed areas and discharges associated the construction activities including wheel washing.
- 11.8.13 Surface water management measures are included within the outline CEMP (to be developed further at reserved matters stage) which would reduce the magnitude of impact on surface water quantity to Negligible. All surface waterbodies within the site boundary and immediate area surrounding the site have potential to receive run-off from the site. The tributaries of the River Nant Llech, River Dulais, River Tawe are considered to be of Medium sensitivity and the Camnant is considered to be of High sensitivity, the significance of effect on these features is considered to be *Slight Adverse* and not significant. The ponds, wetlands and ditches are considered to be of Low sensitivity, with the significance of effect on these features considered to be *Slight Adverse* and not significant. No additional mitigation is required.

Hydromorphology

- 11.8.14 The most likely sources of hydromorphological impacts relate to direct physical modifications to surface water features including:
- Introduction and construction of culverts over the River Dulais tributary;
 - Diversion of River Dulais tributary; and
 - Removal of on-site ditches for development proposals.
- 11.8.15 All proposed modifications would require in-channel working that have the potential to modify flow processes and sediment movement through bank failure, erosion, scouring and modification of geomorphological features. Changes to flow processes and sediment movement have potential for the washing of sediment into the surface water features. Clogging of the surface water features by silt would reduce in-stream habitat quality.
- 11.8.16 The effects of siltation could be long term, as the flow velocities in the tributary may be insufficient to remobilise the silt and flush it downstream.
- 11.8.17 When considering measures set out in the outline CEMP as inherent mitigation, the magnitude of hydromorphological impacts during construction is reduced from Major Adverse to Minor Adverse on the River Dulais tributary and on site ditches. Construction activities are expected to cause a measurable change in attributes and quality but would not affect the integrity of the attribute. As the River Dulais tributaries are considered to be of Medium importance and the on-site ditches are of low importance, the significance of effect is *Slight*

Adverse and not significant. As the effects on the features are not significant, no additional mitigation is required.

Groundwater

Groundwater Quality

- 11.8.18 Sources of potential pollutants to groundwater quality include accidental spills (e.g. fuel from vehicle/plant), silt laden waters from excavation activities or from water contaminated during specific activities such as concrete pouring/washing. Potential pathways for these pollutants include the excavations and piling required for the washery area where pollutants can directly infiltrate at source. In the case of spillages, pollutants can infiltrate from the surface water features during periods of low flow. The receptor for these activities is the South Wales Coal Measures Formations (both Middle and Lower) underlying the scheme area.
- 11.8.19 Mitigation measures included within the outline CEMP will significantly reduce potential impacts. When incorporating the measures, the potential magnitude of the risk of contamination is Negligible. When combined with South Wales Coal Measures Formations (both Middle and Lower) of Medium sensitivity, the significance of effect is *Slight Adverse*. As the effect is not considered to be significant, no additional mitigation is required.

Groundwater Dependent Terrestrial Ecosystems

- 11.8.20 There are three SSSI within the study area that contain GWDTE: Nant Llech, Gorsllwyn and Caeau Ton-y-Fildre.
- 11.8.21 As stated above, groundwater quality is not expected to be significantly impacted during construction hence should not impact GWDTE. The assessment will focus on the impact of potential change in groundwater flows and levels on GWDTE.
- 11.8.22 Construction activities such as excavations and dewatering have the potential to temporarily influence the groundwater regime. No deep excavations are however required as part of the proposed development. These are likely to comprise only shallow excavations for the construction of buildings foundations or tracks, in a range of 1-2m depth. These works are not anticipated to be deep enough to impact the groundwater levels and influence the groundwater levels of the three GWDTE sites.
- 11.8.23 These are unlikely to influence groundwater regime and therefore have a negligible impact on GWDTE.
- 11.8.24 With the sensitivity of all three GWDTE as Very High, the significance of effect is *Slight Adverse*. As the effect is not considered to be significant, no additional mitigation is required.

Flood Risk

- 11.8.25 Activities such as removal of topsoil and construction of areas of hardstanding during construction have the potential to cause an increase volume and rate of surface run off across the site into the surrounding catchments. The site is not at risk of flooding and incorporating the working practices within the outline CEMP into the assessment, the potential magnitude of effect is Negligible. Therefore, for the existing surrounding communities in the River Tawe, River Pyrddin and River Dulais catchment of High sensitivity, the significance of effect is *Slight Adverse* and not significant. No additional mitigation is considered to be required.

Climate Change

- 11.8.26 The ES considers effects related to climate change as required by the 2017 EIA Regulations. Construction is expected to commence within the next 5 years, therefore, it is not anticipated that there will be significant changes to precipitation or extreme weather events within this period that would cause difficulties for construction activities. The magnitude of impact is No Change, the sensitivity of receptors varies from Very High to Low but the significance of effect is *Neutral*. The effect is not considered to be significant and additional mitigation is not required.

Assessment of effects from operation

- 11.8.27 This section considers the potential effects on the water environment during the operation of the proposed development. Similar to the assessment for the construction phase, the significance of effect would depend on the magnitude of impact as well as the sensitivity of the receptor.
- 11.8.28 The potential impacts experienced by receptors that will be considered in this section include:
- Surface water: surface water quality impacts, surface water quantity impacts and hydromorphology;
 - Groundwater: groundwater quality impacts and impacts on GWDTE; and
 - Flood risk: impact of flood risk.

Surface Water

Surface Water Quality

- 11.8.29 Surface water quality impacts could arise from elements of the proposed development including the railroad testing track, development roads and car parks and the washery site including a

carriage washing facility and refuelling area as detailed in Section 11.2.

- 11.8.30 Potential operational impacts upon surface waters include the release of pollutants to the wider water environment from accidental and major spills from trains and accidental spills from vehicles on access roads and car park. Surface water run-off from the washery site can become contaminated with pollutants including hydrocarbons, oils, metals and sediment and there is the potential for accidental and major spills.
- 11.8.31 Trains are a potential source of accidental spills and present a source of potential pollutants to surface water quality. The track drainage along the test tracks is unlikely to have means of separating pollutants and will likely consist of a basic collector drain (or multiple) in the cess with a typical outlet into the wider system. The likelihood of spills is low because trains would not be stationed and would always be moving.
- 11.8.32 However, the track drainage system would be designed in accordance with Network Rail standards NR/L2/CIV/005/02 and Environmental Management Plans. Any accidental spills would be collected in the track ballasts and directed into the track drainage system that flows into swales and then into attenuation ponds. The attenuation ponds would reduce pollutant concentrations entering surface waters to an acceptable level and would be agreed through a SAB application. The magnitude of impact on surface water from accidental spills and contaminants from trains is considered to be Negligible.
- 11.8.33 The Camnant and tributaries of the River Nant Llech, Dulais and Tawe have the potential to receive discharges from the attenuation basins on site. The Camnant is considered to be of High sensitivity and the tributaries of the River Nant Llech, River Dulais, River Tawe are considered to be of Medium sensitivity, the significance of effect on these features is considered to be *Slight Adverse* and not significant. As the effects on features is not significant, additional mitigation is not required.
- 11.8.34 Vehicles may be a source of accidental spills as a result of fuel leaks in car parks and development access roads and present a source of potential pollution to surface water quality. Spills could run off into surface water features presenting a pollution pathway. However, spills are expected to be minimal and it is considered that the introduction of the swales and attenuation basins would reduce pollutant concentrations entering surface waters to an acceptable level. Major spills are not anticipated due to the nature of the development. In addition, the quality of water entering surface watercourses would be controlled through a SAB application therefore there is expected to be no change to the surface water quality of the surface watercourses. The magnitude of impact on surface water quality from accidental spills from vehicles is considered to be Negligible. The exact layout of

the car parks and development access roads is not confirmed at this outline stage but it is expected that run-off would enter attenuation basins that discharge to tributaries of the Dulais, Tawe and the Camnant. For the tributaries of the River Dulais and River Nant Llech of Medium sensitivity and the Camnant of High sensitivity, the significance of effect is ***Slight Adverse***. The effect is not considered significant and additional mitigation is not required.

11.8.35 The individual facilities within the washery site present a potential source of pollution to surface water quality through the hydrocarbons, oils, sediment, detergents and other pollutants washed off the trains or spilt during activities such as refuelling. It is acknowledged that some facilities within the washery site present a greater risk of pollution which would therefore be equipped with a specific drainage system including measures for intercepting contaminants if the effluent was accidentally released. However, there is still a risk of effluent being of unacceptable standards feeding into the wider drainage system and discharging into surface water features, therefore further measures would be required at detailed design.

11.8.36 Without these measures the magnitude of impact is Moderate Adverse. Effluent from the washery site would discharge into the wider site drainage system that discharges into a tributary of the River Dulais and the Camnant. For the tributary of the River Dulais of Medium sensitivity, the significance of effect is ***Moderate Adverse***. For the Camnant of High sensitivity, the significance of effect is ***Large Adverse***. The effects are significant and further mitigation is required as the project is at outline stage, the measures required have not yet been defined but will be secured at the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC.

Surface Water Quantity

11.8.37 Operational activities that could impact surface water quantity include changes to the volume of surface run-off through the introduction or removal of development hardstanding. Additional discharges or removal of existing discharges to surface water features could also impact surface water quantity.

11.8.38 The proposed development will introduce additional hardstanding through the testing track and washery site. The proposed development does not include any additional discharges to surface water features to those existing.

11.8.39 The drainage design will ensure that any surface water run-off from hardstandings is collected in swales and attenuation ponds. The attenuation ponds will discharge into the Camnant and the tributaries of the River Tawe, River Nant Llech and River Dulais at Greenfield Runoff Rates (GRR). Discharging into surface water features at GRR will ensure that the existing hydrological regime is maintained and there will be no change to surface water quantity. The magnitude of impact on surface water quantity is therefore No Change. For the

Camnant of High sensitivity and the tributaries of the River Tawe, River Nant Llech and River Dulais of Medium sensitivity, the significance of effect is *Neutral*. The effect is not considered significant and additional mitigation is not required.

Hydromorphology

- 11.8.40 The activities that would involve direct physical modifications to surface water features and impact their hydromorphology include:
- Introduction and construction of culverts over the tributary of the River Dulais;
 - Diversion of the tributary of the River Dulais; and
 - Removal of on site ditches and ponds.
- 11.8.41 New culverts would remove natural channel bed and banks. If designed inappropriately, culverts can cause local scour, prohibit fish passage and impair downstream transport of sediment. However, the proposed culverts would be designed to CIRIA Guide C786 standard to allow the same volume and rate of flow as the existing tributary. Culverts have already been introduced over the tributary so the introduction of an additional culvert is not considered to impact the natural habitat of the tributary. Following introduction of good culvert design, the magnitude of impact is considered to be Minor Adverse. For the tributary of the River Dulais with a Medium sensitivity, the significance of effect is *Slight Adverse*. The effect is not considered significant and additional mitigation is not required.
- 11.8.42 The diversion of the River Dulais tributary in close proximity of the Dulais headwaters causes modification of a natural system and could impact surrounding habitats that are dependent on the existing hydrological regime. The stretch of the River Dulais tributary that is to be diverted shows evidence of previous realignment for the existing railway track to the north. However, the magnitude of impact is considered to be Moderate Adverse as the works will cause permanent loss of part of the feature. For the tributary of the River Dulais with Medium sensitivity, the significance of effect *Moderate Adverse*. Additional mitigation is required.
- 11.8.43 Removal of on site ditches and ponds is required for the introduction of development proposals. The ponds and on site ditches are artificial and expected to have resulted from the mine workings. Based on the guidance, the magnitude of impact is considered to be Major Adverse due to the loss of the attribute. As the sensitivity of ponds and ditches is low, the significance of effect is *Slight Adverse* and not considered significant. No additional mitigation is required. The guidance specifies that the impact could be Slight Adverse or Moderate Adverse. As the ditches and ponds on site are artificial and a result of the mine workings or recently introduced through the restoration plan, Slight Adverse has been chosen.

Groundwater

Groundwater Quality

- 11.8.44 Operational activities that could impact groundwater quality include poor surface water quality, accidental spills from trains on the testing track, accidental spills from vehicles on development roads and car parks and run-off from the washery site.
- 11.8.45 Surface water drainage discharges have the potential to impact groundwater quality if discharged into dry surface watercourses or surface watercourses of low flow as discharges will seep into groundwater. The treatment train of SuDS features is considered sufficient to treat the quality of discharges and therefore even if discharged to dry surface watercourses or watercourses of low flow, groundwater quality would not be impacted. The resulting magnitude of impact on groundwater quality through drainage discharges is Negligible. The South Wales Coal Measures Formations (both Middle and Lower) underlying the tributaries on site has Medium sensitivity, the significance of effect on this receptor is therefore ***Slight Adverse***. The effect is not considered to be significant and additional mitigation is not required.
- 11.8.46 Trains are a potential source of accidental spillages that present a source of potential pollutants to groundwater. Potential pathways from train accidental spills or leakages include direct infiltration at source or infiltration from surface water drainage features e.g. swales during periods of low flow. The design currently allows for attenuation ponds being lined with an impermeable layer to allow permanent wet conditions.
- 11.8.47 Accidental spills that could directly infiltrate are considered to be minimal and would be intercepted by the track drainage. The likelihood of spills is low because trains would not be stationed and would always be moving. The track drainage system would be designed in accordance with Network Rail standards NR/L2/CIV/005/02 and Environmental Management Plans. Any accidental spills would be collected in the track ballasts and directed into the track drainage system that flows into swales and then into attenuation ponds. The track drainage along the test tracks is unlikely to have means of separating pollutants and will likely consist of a basic collector drain (or multiple) in the cess with a typical outlet into the wider drainage system leading to attenuation/treatment. Therefore, there is potential for seepage into groundwater at the swales. Considering all of these factors, the potential magnitude of impact is Moderate Adverse. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of effect is ***Moderate adverse***. The effects are considered significant and additional mitigation is required as the project is at outline stage and additional measures to manage impacts have not yet been defined. These measures will be

defined at detailed design, secured through the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC.

- 11.8.48 Vehicles may be a source of accidental spillage as a result of fuel leaks from car parks and roads within the site boundary presenting a source of potential pollutants to groundwater quality. Major spills are not anticipated due to the nature of the development. Potential pathways from vehicle accidental spills include direct infiltration at source or infiltration from surface water drainage features during periods of low flow. Accidental spills that could directly infiltrate are anticipated to be minimal due to the impermeable development roads and hardstanding. However, there is a potential for infiltration from surface water features when spills are deposited into the swales. Therefore, the potential magnitude of impact is Moderate Adverse. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of effect is *Moderate adverse*. The effect is significant and additional mitigation is required as the project is at outline stage and additional measures to manage impacts have not yet been defined. These measures will be defined at detailed design, secured through the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC.
- 11.8.49 The individual facilities within the washery site present a potential source of pollution to groundwater quality through hydrocarbons, oils, sediment, detergents and other pollutants washed off the trains or spilt during activities such as refuelling. Potential pathways for pollutants include direct infiltration at source or infiltration from surface water drainage features during periods of low flow. It is acknowledged that some facilities within the washery site present a greater risk of pollution compared to the testing tracks and therefore individual facilities are equipped with a slab track to direct effluent into the facilities' specific drainage system to intercept pollutants. These measures would prevent effluent seepage into groundwater.
- 11.8.50 However, there is still a risk of effluent seeping into groundwater in the areas where track ballasts are present and slab tracks have not been incorporated. Without these slab tracks, the magnitude of impact is Moderate Adverse. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of effect is *Moderate Adverse*. The effect is significant and additional mitigation is required as the project is at outline stage and additional measures to manage impacts have not yet been defined. These measures will be defined at detailed design, secured through the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC.

Groundwater Dependent Terrestrial Ecosystems

- 11.8.51 As previously mentioned there are three SSSIs within the study area that contain GWDTE: Nant Llech, Gorsllwyn and Caeau Ton-y-Fildre.

- 11.8.52 Operational activities such as cuttings drainage required for deep cuttings have the potential to influence the groundwater regime of GWDTE.
- 11.8.53 Although the main groundwater body is located at considerable depth groundwater e.g. associated with sandstone bands or fractured/weathered mudstone, it may be intercepted by the proposed drainage. The proposed testing tracks are located at approximately 250-260mOD and in some locations these are accommodated by cuttings in the ground. The groundwater levels may therefore be locally reduced to these levels. This is higher than the ground elevation of the identified GWDTE, which are located at approximately 200-250mOD (Nant Llech) and at approximately 230-240mOD (Gorsllwyn and Caeau Ton-y-Fildre). Therefore, it is unlikely that the reduced groundwater levels would have an impact on groundwater levels beneath GWDTE areas, which are likely to be at the ground level.
- 11.8.54 Furthermore, the Nant Llech is located on the northern side of the Nant Llech valley. The watercourse creates a natural hydraulic barrier and therefore preventing changes to the groundwater regime. The Caeau Ton-y-Fildre GWDTE is underlaid by alluvium superficial deposits on top of glacial till superficial deposits which are expected to provide the groundwater flows sustaining this GWDTE. The proposed development will not impact these deposits or involve any activities that could draw water away from this area and hence will not influence the groundwater level of this GWDTE. The Gorsllwyn GWDTE is located on peat superficial deposits which are expected to provide the groundwater levels sustaining the GWDTE. The proposed development will not impact these peat deposits or undertake any activity that could draw water away from this area and hence will not influence the groundwater level of Gorsllwyn GWDTE.
- 11.8.55 The impact of the permanent drainage on the GWDTE is anticipated to be Negligible. With the sensitivity of all three GWDTE as Very High, the significance of effect is *Slight Adverse*. As the effect is not significant, no additional mitigation is required.

Flood Risk

- 11.8.56 The potential operational impacts upon surface water could result from an increase in hardstanding formed as part of the proposed development which would cause an increased volume and rate of surface water run-off across the site into the receiving surface watercourses when compared to the existing situation.
- 11.8.57 As previously mentioned, the proposed surface water drainage system will comprise SuDS features to attenuate surface water run-off. The attenuation features will discharge surface water run off at Greenfield Runoff Rate (GRR) or below Greenfield Runoff Rate, in line with the

existing arrangement on site. Further details can be found in the Drainage Strategy in Appendix 11B.

- 11.8.58** The proposed realignment of a tributary of the River Dulais would require a culvert. The culvert would be designed to allow the same volume and rate of flow as the existing tributary in accordance with CIRIA Guide C786.
- 11.8.59** Based on the information included in the drainage strategy for the site including the introduction of the measures listed, the magnitude of impact upon all existing and proposed receptors is considered to be Negligible. Existing receptors include the existing communities of the River Tawe, River Pyrddin and River Dulais catchment with a High sensitivity. Proposed receptors include the central control building, research and development centre, testing track, carriage washing facility and proposed car park and access roads with a Medium sensitivity. The significance of effect on all existing receptors is *Slight Adverse*. The effect on existing and proposed receptors is not considered to be significant and additional mitigation is not required.

Climate Change

- 11.8.60** Climate change impacts including increased precipitation and an increased frequency of extreme weather events have the potential to exacerbate impacts already identified in preceding sections of this assessment.
- 11.8.61** Increased precipitation has the potential to exacerbate flood risk on existing and proposed receptors through an increase in surface water runoff. The site is at low risk of flooding and the drainage strategy has been designed to accommodate for potential climate change. Therefore, the magnitude of impact is considered to be No Change.
- 11.8.62** Existing receptors include the existing communities surrounding the River Tawe, River Pyrddin and River Dulais catchment which have a High sensitivity. Future receptors include the central control building, research and development centre, testing track, carriage washing facility and proposed car park and access roads which would have a Medium sensitivity. The significance of effect on all existing and future receptors is *Neutral*. The effect is not significant and additional mitigation is not required.
- 11.8.63** An increase in extreme weather events can cause long periods of dry weather resulting in watercourses with lower flow. Less rainfall can cause pollutants to accumulate and during extreme events (e.g. summer thunderstorms) pollutants can runoff into watercourses where there is little dilution, increasing the effect of pollution. The introduction of SuDS is sufficient to mitigate the risk of drier/drought conditions on surface water quality that could impact underlying strata. The magnitude of impact is No Change. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of

effect is *Negligible*. The effects are considered not significant and additional mitigation is not required.

11.9 Mitigation

11.9.1 This section describes the mitigation and enhancement required following the assessment of effects.

Mitigation of effects from construction

11.9.2 The assessment of effects resulting from construction activities identified that no additional mitigation is required.

Mitigation of effects from operation

11.9.3 The assessment of effects resulting from operation activities identified that additional mitigation is required for effects on surface water quality, hydromorphology and groundwater quality.

Surface Water Quality

11.9.4 The assessment has identified impacts on surface water quality as a result of the polluted effluent anticipated to discharge from the washery site into surface water features. A Moderate Adverse impact was identified for the tributary of the River Dulais and a Large Adverse impact identified for the Camnant.

11.9.5 Separate drainage systems, pollutant interceptors and further measures if required would be incorporated into the washery site to intercept pollutants and detergents at detailed design. These measures would be secured at the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC. These systems would ensure the effluent leaving the site is of an acceptable quality to be released into the wider site drainage system.

Hydromorphology

11.9.6 The assessment has identified a Moderate Adverse impact on hydrology as a result of the diversion of the tributary of the River Dulais. The requirement to realign a section of the River Dulais will be reconsidered during detailed design of the track.

11.9.7 The realignment of the watercourse would impact upon channel morphology and may also impact upon hydrology by limiting the ability of the realigned watercourse to receive water from existing springs.

11.9.8 The following design principles would be implemented during the detailed design of the scheme to mitigate the effects of the realignment upon hydromorphology:

- The detailed design of the realigned watercourse would provide naturalistic features of an equivalent or greater value to that of the existing watercourse;
- The channel design would incorporate bioengineering techniques over traditional hard engineering where feasible;
- The flow regime of the realigned watercourse would be as similar as the existing flow regime as practicable;
- The detailed design would be overseen by an experienced fluvial geomorphologist.

Groundwater Quality

11.9.9 The assessment identified a Moderate Adverse impact on groundwater quality from accidental spills from vehicles and trains. There is potential for seepage into groundwater through the surface water drainage feature swales and a more detailed risk assessment to confirm the appropriate treatment and swale design should be undertaken as part of detailed design when more information is available.

11.9.10 The assessment also identified a Moderate Adverse impact on groundwater quality as a result of polluted effluent anticipated to discharge from the washery site into groundwater receptors. A Moderate Adverse Impact was identified on the South Wales Coal Measures Formations. Slab tracks, separate drainage systems and further measures if required to intercept pollutants and detergents would be incorporated into the washery site at detailed design. These measures would be secured at the reserved matters stage and agreed in consultation with NRW, PCC and NPTCBC. These systems would ensure effluent leaving the site will be isolated and not seep into groundwater receptors before treatment.

11.10 Residual effects

Residual effects from construction

11.10.1 There has been no additional mitigation or enhancement described therefore the effects remain as specified in the assessment above.

Residual effects from operation

11.10.2 Following the introduction of mitigation measures specified in Section 11.9, the following residual impacts are anticipated.

Surface Water Quality

11.10.3 Following the introduction of separate drainage systems to intercept pollutants, the magnitude of impact is reduced from Moderate

Adverse to Negligible for both the Camnant and the tributary of the River Dulais. For the Camnant of High sensitivity, the significance of effect is reduced from Large Adverse to *Slight Adverse*. For the tributary of the River Dulais, the significance of effect is reduced from Moderate Adverse to *Slight Adverse*. The effects are not considered significant.

Hydromorphology

- 11.10.4 The tributary of the River Dulais shows evidence of previous realignment and is not considered to be in its natural form. Should the tributary of the River Dulais require further realignment, mitigation specified will reduce the magnitude of impact from Moderate Adverse to Minor Adverse. For the tributary of the River Dulais with Medium sensitivity, the significance of effect is *Slight Adverse* and not significant.

Groundwater Quality

- 11.10.5 Following a detailed risk assessment and appropriate treatment and design of swales, the magnitude of impact from vehicle spills is reduced from Moderate Adverse to Minor Adverse. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of effect is *Slight Adverse*.
- 11.10.6 Following the introduction of slab tracks and separate drainage systems to intercept pollutants and detergents, the magnitude of impact on the South Wales Coal Measure Formation reduces from Moderate Adverse to Negligible. For the South Wales Coal Measures Formations of Medium sensitivity, the significance of effect is *Slight Adverse*. For the glacial till deposits and peat deposits of Low sensitivity, the significance of effect is *Slight Adverse*. The effects are not considered significant.

Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Effects from construction							
Surface water quality impacts	Camnant	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Tributaries of River Dulais, Nant Llech and Tawe	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Ponds, Wetlands, Ditches	Low	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Surface water quantity	Camnant	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Tributaries of River Dulais, Nant Llech and Tawe	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Ponds, Wetlands, Ditches	Low	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Hydromorphology impacts	Tributary of River Dulais	Medium	Minor Adverse	Slight Adverse	N/A	Minor Adverse	Slight Adverse
	Ditches	Low	Minor Adverse	Slight Adverse	N/A	Minor Adverse	Slight Adverse
Groundwater quality impacts	South Wales Coal Measures Formations (both Middle and Lower)	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
GWDTE impacts	Nant Llech Gorsllwyn Caeau Ton-y-Fildre	Very High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Flood risk impacts	Existing communities in River Tawe, River Pyrddin and River Dulais catchment	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse

Climate Change	All receptors	Very High - Low	No Change	Negligible	N/A	No Change	Negligible
Effects from operation							
Surface water quality (train accidental spills)	Camnant	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Tributaries of River Dulais, Nant Lech and Tawe	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Surface water quality (vehicle spills)	Camnant	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Tributaries of River Dulais and River Nant Lech	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Surface water quality (individual facilities in the washery site)	Camnant	High	Moderate	Large Adverse	Measures to intercept pollutants	Negligible	Slight Adverse
	Tributary of River Dulais	Medium	Moderate	Moderate Adverse	Measures to intercept pollutants	Negligible	Slight Adverse
Surface water quantity	Camnant	High	No Change	Neutral	N/A	No Change	Neutral
	Tributaries of River Dulais and River Nant Lech	Medium	No Change	Neutral	N/A	No Change	Neutral
Hydromorphology	Tributary of River Dulais	Medium	Minor Adverse	Slight Adverse	N/A	Minor Adverse	Slight Adverse
	Diversion of River Dulais	Medium	Moderate Adverse	Moderate Adverse	Match or exceed the form and habitat value of the channel	Minor Adverse	Slight Adverse
	Ponds and ditches	Low	Major Adverse	Slight Adverse	N/A	Major Adverse	Slight Adverse

Groundwater (surface water drainage discharges)	South Wales Coal Measures Formations	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Groundwater quality (vehicle spills)	South Wales Coal Measures Formations	Medium	Moderate	Moderate Adverse	Detailed risk assessment to inform treatment and design	Minor Adverse	Slight Adverse
Groundwater quality (individual facilities in the washery site)	South Wales Coal Measures Formations	Medium	Moderate Adverse	Moderate Adverse	Slab tracks and any additional mitigation to intercept pollutants	Negligible	Slight Adverse
GWDTE	Nant Llech Gorsllwyn Caeau Ton-y-Fildre	Very High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
Flood Risk	Existing communities in River Tawe, River Pyrddin and River Dulais catchment	High	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse
	Central control building Research and development centre Testing track Carriage washing facility Proposed car park Access roads	Medium	Negligible	Slight Adverse	N/A	Negligible	Slight Adverse

Climate Change (flooding)	Existing communities in River Tawe, River Pyrddin and River Dulais catchment	High	No Change	Neutral	N/A	No Change	Negligible
	Central control building Research and development centre Testing track Carriage washing facility Proposed car park Access roads	Medium	No Change	Neutral	N/A	No Change	Negligible
Climate Change (pollution)	Camnant	High	No Change	Neutral	N/A	No Change	Negligible
	Tributaries of River Dulais and River Nant Lech	Medium	No Change	Neutral	N/A	No Change	Negligible

12 Socio-Economics

12.1 Introduction

12.1.1 This chapter considers the potential socio-economic effects of the proposed development during both construction and operation and focusses on the following broad receptor groups:

- Local Residents;
- Local Businesses;
- Community Facilities;
- Land use (existing and future);
- The local and regional economy (employment and supply chain); and
- Tourism and recreational facilities, including Public Rights of Way (PRoW).

12.1.2 The assessment considers both potential direct and indirect effects arising from the proposed development. Direct effects are generally focussed on the development boundary (e.g. the red line) as well as any working areas required for construction (e.g. temporary compounds / haul routes etc.). Potential indirect effects can occur over a larger area but generally focus on amenity effects which may occur in the communities or resources (e.g. PRoW) in the areas surrounding the proposed development.

12.1.3 The chapter considers the potential socio-economic impact of the project during both construction and operation. Where possible, consideration has also been paid to the proposed operational ‘phases’, acknowledging that some impacts (e.g. creation of operational jobs) will vary at each proposed development phase.

12.1.4 The phases referred to within the Chapter are as follows:

Table 12.1: GCRE Phasing

Phase	Description
Phase One	Construction of the Warm Storage, Cold Storage, Decommissioning/Maintenance Facility, and Winch-propelled test track.
Phase Two	Construction of Base Rolling stock and infrastructure testing facilities
Phase Three:	Construction of Railroad testing loop, improved rolling stock testing and research and development facilities.

12.2 Review of proposed development

12.2.1 In reviewing the proposed development as described in Chapter 3 of this ES, the following elements are considered to be of particular relevance to the assessment of socio-economic effects.

12.2.2 During construction, the proposed development has the potential to bring both positive and adverse socio-economic effects as follows:

- Potential employment and training opportunities which could benefit the local and regional economies;
- Wider multiplier effects associated with construction staff living and working in the local area and through the procurement of materials from local businesses;
- Temporary land-take associated with the construction which could impact on existing and future land uses;
- Potential effects on the local community (residents, businesses and community facilities); and
- Potential effects (temporary and permanent) on the PRoW and recreation network in the area of and surrounding the proposed development.

12.2.3 In designing the proposed development mitigation for socio-economic effects has been embedded as part of the scheme, for example, PRoW would be diverted prior to construction. The embedded mitigation measures proposed are set out in detail within the Construction Environmental Management Plan (CEMP) and Construction Traffic Management Plan (CTMP).

12.2.4 During operation, the proposed development has the potential to bring the following socio-economic effects:

- Potential permanent / longer-term impacts on the PRoW and recreational network in the area;
- Potential permanent land take which could impact on current and future land uses (including common land);
- Potential employment generation associated with the project;
- Potential wider benefits in terms of companies using the facility and multiplier effects this could bring for services / facilities in the local area; and
- Potential indirect effects of the operation on the local community, with reference to other ES chapters where necessary (e.g. Noise).

12.3 Legislation, policy context and guidance

12.3.1 Specific Legislation, Policy and Guidance of relevance to the assessment of socio-economic effects are set out below.

Legislation

12.3.2 Legislation which is relevant to this assessment is summarised below.

12.3.3 **The Commons Act 2006**¹ makes provision in relation to common land and town or village greens. The legislation includes for registration, deregistration and exchange of land and the statutory processes through which a scheme must progress.

12.3.4 A total of 115.7 hectares (ha) within the development boundary is designated Common Land known as Mynydd-y-Drum.

12.3.5 Both Powys County Council and Neath Port Talbot County Borough Council are required by law to publish a **Public Right of Way Definitive Map** which shows all the footpaths, bridleways, restricted byways and byways open to all traffic (BOAT). If any changes are proposed to the definitive map, either temporarily or permanently, permission must be sought from the relevant Local Authority.

12.3.6 There are several designated PRoW within the development boundary and will require diversion.

Policy context

National Policy

12.3.7 Planning Policy Wales (PPW) Edition 10 sets out the land use planning policies of the Welsh Government. The relevant sections of PPW10 to the socio-economic assessment include:

- Strategic and Spatial Choices;
- Active and Social Places;
- Productive and Enterprising Places;
- Distinctive and Natural Places.

12.3.8 In relation to Economic Development, paragraph 5.4.2 states that *'economic land uses include the traditional employment land uses (offices, research and development, industry and warehousing), as well as uses such as retail, tourism, and public services.'*

12.3.9 In relation to the rural economy, paragraph 5.6.2 sets out that: *'small-scale enterprises have a vital role to play in the rural economy and contribute to both local and national competitiveness and prosperity.'*

12.3.10 In relation to tourism, paragraph 5.5.1 states that: *'tourism involves a wide range of activities, facilities and types of development and is vital to economic prosperity and job creation in many parts of Wales'*. Paragraph 5.5.3 sets out that that: *'in rural areas, tourism-related development is an essential element in providing for a healthy and*

¹ <http://www.legislation.gov.uk/ukpga/2006/26/contents/2014-01-09>

diverse economy. Here development should be sympathetic in nature and scale to the local environment.'

12.3.11 In relation to recreation, paragraph 4.51 outlines that: *'recreational spaces are vital for our health, well-being, amenity and can contribute to an area's green infrastructure.'*

12.3.12 Technical Advice Note (TAN) 23: Economic Development builds on the broad definition of economic development set out within PPW10 and states that 'economic development is development where the resulting space will be occupied by economic activities'. It sets out high level planning objectives for economic development which includes recognition that economic benefits arising from development may spread beyond the area in which the development is located. As a consequence of this, the TAN states that 'it is essential that the planning system recognises and gives due weight to, the economic benefits associated with new development.'

12.3.13 TAN 13: Tourism states that tourism 'makes a major contribution to the Welsh economy, provides employment in a wide variety of occupations and can bring benefits to local economies and communities in urban and rural areas.' The TAN sets out the approach that the planning system should take with regards to tourism development, specifically; hotels, holiday and touring caravans and seasonal and holiday lettings.

Local Policy

12.3.14 The proposed site lies on the border of Neath Port Talbot County Borough Council (CBC) and Powys County Council and as such the following local policy documents are relevant to the scheme:

- Neath Port Talbot CBC Local Development Plan (2011-2026), Adopted January 2016; and
- Powys Local Development Plan (2011-2026), Adopted April 2018.

12.3.15 Relevant policies from these plans are summarised in Table 12.2 with commentary where the assessment considers these further.

Table 12.2: Relevant Local Planning Policy

Policy	Summary	Considerations
<i>Neath Port Talbot Local Development Plan</i>		
SP4	Relates to infrastructure. It states that developments will be expected to make efficient use of existing infrastructure and where required make adequate provision for new infrastructure, ensuring that there are no detrimental effects on the area and community.	Impact of new infrastructure on local residents, businesses and community facilities.

Policy	Summary	Considerations
SP11	New and expanding employment developments will be encouraged through land allocations, supporting existing employment uses, encouraging employment uses in settlement limits.	Impact of new development on job creation during construction and operation.
SP14	States that the countryside (including agricultural land) should be protected and where possible enhanced.	Impact of the proposed development on existing land uses.
EC5	Employment development outside settlement limits will be supported where it adjoins a settlement, the site is in a sustainable location, it is serviced or can be readily serviced, and/or the development would not have a detrimental impact on the amenities of neighbouring residential or commercial property, the environment, landscape or highway safety.	Assessment of impact on the development on the amenity of key receptors e.g. local residents.
TO4	Makes reference to specific walking and cycling routes and states that development which would adversely impact on them will be resisted. These include TO4/1 Wales Coast Path, TO4/2 Cognation Mountain Bike Trails, TO4/3 Great Dragon Ride route.	Assessment of the impact of development on recreational routes in the area.
TR2	Sets out that developments will only be supported where they do not compromise safe use of the highway, include appropriate levels of parking for vehicles and cycles and is accessible by multiple means.	Consideration of results of transport and access assessments and how access considerations could impact amenity of residents and businesses.
<i>Powys Local Development Plan</i>		
SP2	Sets out the amount of land needed to support employment growth. The policy sub-text states that 'it is important that the LDP supports economic development'.	Assessment of the economic benefits/disbenefits of the scheme and the impact it could have on the economic development of the area.

Policy	Summary	Considerations
E2	Relates to employment proposals on non-allocated employment sites. It states that this will be supported where it can be shown that the proposed use cannot reasonably be accommodated on existing site, or where the proposal is small in scale (less than 0.5ha) or for the extension/expansion of existing sites, or where it is supported by a business case justifying the proposed location.	Assessment of economic benefits of the scheme to the local area and consideration of other ES chapters e.g. LVIA and the impact on the surrounding environment.
T1	Development proposals should incorporate safe and efficient transport measures for all users, manage impacts on the transport network and minimise demand on public transport.	Impact of the proposed development on the existing transport network/access for surrounding uses including PRoW and cycle routes.

12.4 Scoping and consultation

Scoping

- 12.4.1 A formal Environmental Scoping Report (September 2019) was submitted to Neath Port Talbot CBC and Powys County Council in order to agree the scope of the ES.
- 12.4.2 Chapter 5 of this Scoping Report included the proposed approach and scope of this socio-economic assessment. This proposed a study area which considered potential effects within 2km of the proposed development with wider impacts (e.g. economic effects) being considered over a wider area (county council areas) or a regional area.
- 12.4.3 The report included a high-level summary of the baseline situation, a summary of key potential effects, a high-level approach in terms of assessment methodology and a summary of planned consultation.
- 12.4.4 A formal Scoping Opinion was received in November 2019 and the pertinent points in relation to the assessment of socio-economic effects are summarised in Table 12.3, with a response as to how the advice received has been taken onboard within this assessment.

Table 12.3: Response to scoping opinion

Scoping opinion clause	Response
The approach and methodology are largely agreed, albeit it is noted that it will be important to predict the potential wider socio-economic benefits.	This has been addressed within the assessment of effects. Further detail in relation to the wider socio-economic benefits of the proposed development has also been assessed within the Outline Business Case.

Scoping opinion clause	Response
<p>It is noted that there is no mention of any potential increase in use of the rail link both during construction and operation. This needs to be assessed in the ES, first through an assessment of the use of the rail link, followed by a consequential assessment of any socio-economic impacts. This could most likely include impacts on communities associated with any intensification in use in terms of connectivity, should rights of way or crossing points be adversely affected.</p>	<p>This is addressed throughout this chapter both within the baseline and the assessment of effects. The existing rail line is referred to as the wider study area for the purposes of the assessment.</p>
<p>The scoping report confirms that the proposed development is sited on Common Land known as Mynydd-Y-Drum.</p>	<p>The Common Land status of the site has been acknowledged within the baseline and is addressed under ‘land use’ within the assessment of effects.</p>

12.5 Methodology

Overview

12.5.1 There is no definitive guidance or methodology for the assessment of socio-economic effects; as such the assessment draws on existing industry accepted practice. The focus of the assessment is on determining whether effects would change patterns of activity; social or economic within the local area surrounding the proposed development. The assessment methodology should be read in conjunction with the scope of the socio-economic assessment which is outlined in the previous section.

Methodology for establishing baseline conditions

12.5.2 Data for this Chapter has been gathered from a number of sources to inform the socio-economic baseline and assessment; these are listed in this section.

Desk study

12.5.3 This ES Chapter has drawn from a variety of desk-based sources including:

- National policy and local development plan documents and guidance;
- Official labour market statistics (Office for National Statistics (ONS) and Nomis²);
- Visit Wales statistics;

² A service provided by the Office for National Statistics, to give you free access to the most detailed and up-to-date UK labour market statistics from official sources.

- Agricultural Land Classification (ALC) information³;
- PRoW and formal cycle networks from OS data and a variety of web resources including local authority mapping;
- Neath Port Talbot and Powys Council Definitive Public Rights of Way mapping;
- Residential, commercial, industrial and tourism receptors from OS data and site surveys;
- Area of common land identified through online mapping; and
- Online aerial photograph resources (Google Earth).

Survey work

12.5.4 An initial site walkover was undertaken in January 2020 in order to understand the proposed development, gather baseline data on the main socio-economic receptors and begin to understand the potential effects.

12.5.5 Site work has included a review of the PRoW network in the local study area and the wider study area.

Spatial Scale

12.5.6 The socio-economic baseline has been considered at two spatial levels as defined below.

Local Study Area

12.5.7 The local study area is a focussed study area and has been taken to be the area within 1km of the red line surrounding the site (herein referred to as the development boundary). After a visit to site and an assessment of topography and surrounding land uses, it is considered that that this is a suitable study area to be able to consider key receptors. The development boundary is shown in Volume III, Figure 1.1.

12.5.8 For the purposes of the baseline, the local study area utilises data related to the ward areas of Seven Sisters and Onllwyn (Neath Port Talbot) and Ystradgynlais, Tawe-uchaf and Aber-craf (Powys) given that the area within 1km of the development boundary crosses these ward boundaries. As a result of this, it is acknowledged that for the purposes of the baseline, the local study area covers a greater area than the development boundary. Notwithstanding this, it is considered to provide an adequate picture of the area for the purposes of this socio-economic assessment.

³ Available on the Lle Geo-Portal, an open source catalogue of environmental data developed by Welsh Government and Natural Resources Wales.

Wider Study Area

- 12.5.9** It is acknowledged that the proposed development has the potential to impact existing socio-economic receptors along the existing railway line, as identified in the Scoping Opinion. As such, in addition to the local study area, a baseline scenario is also presented for a wider study area. The wider study area comprises the existing railway line extending from Aberdulais in the south, to Onllwyn in the north and the area within 1km of this railway line as shown in Volume III, Figure 12.1. The socio-economic effects of the proposed development on the wider study area are assessed separately in the Assessment of Effects from section 12.10 onwards.
- 12.5.10** The baseline presented in relation to the wider study area has concentrated on amenity effects on local businesses and local residents, as well as potential impacts on access, as these are likely to be the only impacts arising from the proposed development at this spatial scale.

Assessment methodology

- 12.5.11** The significance of a socio-economic effect has been determined by assessing both the magnitude of the effect and the sensitivity of the receptor.
- 12.5.12** Effects are also considered in relation to their nature and classified into direct or indirect effects. Only those receptors within the development boundary (red line) or situated along construction routes are expected to experience direct effects.
- 12.5.13** The socio-economic assessment also explores potential indirect effects on receptors normally related to effects on amenity. This assessment focusses on receptors that are vulnerable to indirect effects such as severance, or amenity effects relating to construction / operational activities (e.g. noise). Where a receptor is not sensitive to its local amenity, potential effects are not considered.

Significance Criteria

- 12.5.14** Appropriate sensitivity and magnitude criteria have been developed, based on professional judgement and industry best practice. These criteria differ slightly from those set out in other ES Chapters and are considered appropriate for the socio-economic assessment.
- 12.5.15** The sensitivity of a receptor relates to the scope for the receptor to overcome an effect. For example, an effect on a distribution facility owned by a firm with multiple premises in the local area with spare capacity would be viewed as less sensitive than an equivalent firm for which the affected distribution facility is its only property.
- 12.5.16** Table 12.4 provides definitions of the sensitivity criteria used in the assessment.

Table 12.4: Sensitivity Criteria

	Definition of sensitivity
High	<p>Businesses, individuals, groups of individuals, or other receptors possessing very significant economic, social or community value, that are considered very likely to incur a material loss or gain as a result of potential changes in the environment.</p> <p>For example: a national trail; residential properties, business premises or tourism facilities where they are directly affected; irreversible effects on Grade I Best Most Versatile (BMV) agricultural land.</p>
Medium	<p>Businesses, individuals, groups of individuals, or other receptors possessing some significant economic, social or community value, that are considered likely to incur some material loss or gain as a result of potential changes in the environment.</p> <p>For example: a regional trail, long distance path, or national cycle network; irreversible effects on Grades 2 and 3a BMV agricultural land, residential properties, business premises of tourism facilities where they are situated in the development boundary.</p>
Low	<p>Businesses, individuals, groups of individuals, or other receptors possessing limited economic, social or community value, that are not considered likely to incur a material loss or gain as a result of potential changes in the environment.</p> <p>For example: a footpath, bridleway or permissive trail, effects on Grade 3b to Grade 5 agricultural land, residential properties, business premises or tourism facilities where they are in the study area but not likely to be affected.</p>

12.5.17 Sensitivity is a key dimension to the assessment of indirect amenity effects. This can be illustrated by considering an adverse visual effect on two different receptors⁴. For a tourism business the visual effect could have a negative effect on activity whereas for a distribution company the effect would not be expected to affect business activity. As such, the sensitivity for the amenity assessment is essentially a binary choice; either a resource is sensitive to amenity effects or it is not. Sensitive resources would be expected to largely comprise tourism resources, outdoor community resources and specialised manufacturing which is sensitive to noise/vibration effects

12.5.18 The magnitude of an effect represents its severity. Key factors to be considered when assessing magnitude include the extent (number of groups and/or individuals⁵, or businesses affected) and the value of the resource. For example, an effect on a heavily trafficked PRoW which is part of a National Trail would have a higher magnitude than an effect on a local footpath.

12.5.19 Table 12.5 provides definitions of the magnitude of impact criteria used in the assessment.

⁴ When considering indirect amenity, the assessment does not include individual residential properties unless they have a business function which is considered to have an amenity value (e.g. B&B accommodation).

⁵ For the purposes of the assessment individuals refers to users of a receptor/resource (e.g. a PRoW or community facility) and does not include individuals in the sense of residential properties.

Table 12.5: Magnitude of Impact

	Definition of magnitude	Amenity effects
Major	An adverse or beneficial effect that would be likely to result in total or permanent changes to baseline conditions for a large number of businesses, individuals, groups of individuals, or other receptors.	Two or more residual significant effects are identified where both are major in nature.
Moderate	An adverse or beneficial effect that would be very likely to result in partial changes to baseline conditions for a moderate number of businesses, individuals, groups of individuals, or other receptors.	Two residual significant effects are identified with one being major in nature.
Minor	An adverse or beneficial effect that would be likely to result in minor changes to baseline conditions for a small number of businesses, individuals, groups of individuals, or other receptors.	Two residual significant effects are identified with both being moderate or less in nature.
Negligible	An adverse or beneficial effect that would be likely to result in little or no change to baseline conditions for businesses, individuals, groups of individuals, or other receptors.	One residual or no significant effects identified.

12.5.20 The significance of a socio-economic effect is determined by combining both the magnitude of the effect and the sensitivity of the receptor.

12.5.21 Table 12.6 illustrates how the sensitivity and magnitude criteria are used to assess significance

Table 12.6: Significance of Effects

		Sensitivity		
		High	Medium	Low
Magnitude	Major	Severe	Major	Moderate
	Moderate	Major	Moderate	Minor
	Minor	Moderate	Minor	Minor
	Negligible	Minor	Minor	Negligible

12.6 Limitations and assumptions

12.6.1 The assessment has been completed on the basis of the following limitations and assumptions.

Limitations

- 12.6.2 This assessment has been progressed on the basis of information known at the time of writing and has considered site analysis, desk-based work and information gathered through the consultation process.
- 12.6.3 In the absence of published guidance and advice in relation to socio-economic assessment, the assessment utilises a methodology which has been established, tested and accepted through other major schemes (for example High Speed 2, the Hinkley Connection Project) and relies in part on the professional judgement of the author in drawing conclusions.

Assumptions

- 12.6.4 The following assumptions should be noted with respect to this socio-economic assessment.
- Construction employment data has been informed by the Outline Business Case (OBC) prepared for GCRE⁶ and is based on experience on similar projects / is considered to represent the most accurate way of assessing potential employment benefits of the proposed development.
 - Indirect amenity effects have been assessed based on both the findings of other related assessments including visual, traffic, noise and air quality effects, as well as professional judgement / experience in this field.
 - The timescales referred to within the assessment are based on the construction programme at the time of writing. This may change during detailed design once a main contractor has been appointed.

12.7 Baseline Environment

- 12.7.1 This section of the chapter provides the socio-economic baseline against which the assessment of potential effects is completed. This is structured under a number of key headings and provides data of relevance to the following receptor groups:
- Local Communities (including demographics and community facilities);
 - Economic Profile (including local businesses);
 - Land use (existing and future);
 - Tourism and recreational facilities, including PRoW.
- 12.7.2 Wherever possible in compiling this baseline, data is presented at the local level. However, in instances where data collation is only

⁶ Arup (2020) Welsh Government Global Centre of Rail Excellence Outline Business Case

undertaken at higher spatial scales, this data is used as reflective of the local situation.

- 12.7.3** It should also be noted that for the purposes of this assessment, as noted with the ES introductory chapter, the baseline situation has been taken as the ‘future baseline’ i.e. based on a remediated site after mining operations has ceased and the site has been restored as approved by the Celtic Energy application for Nant Helen Complementary Restoration Earthworks (Planning Application References: P2020/0362 (NPT) and 20/0738/FUL (Powys)).

Local Communities

- 12.7.4** The settlements nearest to the development boundary are shown in the table below:

Table 12.7: Nearest Settlements to the development boundary

Settlement	Approximate Distance from Centre of Main Site
Penrhos, Neath Port Talbot	2.0 kilometres west
Cae'r-bont, Powys	1.7 kilometres west
Caer-Lan, Powys	1.9 kilometres north
Caehopkin, Powys	1.4 kilometres north
Seven Sisters, Neath Port Talbot	2.2 kilometres south
Abercrave, Powys	1.9 kilometres north
Onllwyn, Neath Port Talbot	2.2 kilometres south

- 12.7.5** There are also a number of settlements located within the wider study area which are as follows: Onllwyn, Seven Sisters, Cilfrew, Aberdulais and Tonna.
- 12.7.6** The assessments made in relation to residential amenity from section 12.10 onwards relate to residences located in the abovementioned settlements. In addition, the assessment also considers farm owners, tenants and isolated residential dwellings located outside settlement boundaries located within 1km of the development boundary.
- 12.7.7** The existing railway line does sever some of the settlements presented in Table 12.7 and where this is the case there is an existing crossing point in place. These crossing points were surveyed during a visit to site in January 2020 in order to understand their location, primary function (e.g. serving an individual property) and current condition.
- 12.7.8** For the purposes of the baseline the statistical data presented in the baseline data comprises data for the wards of Tawe Uchaf, Seven Sisters, Aber-craf, Ystradgynlais and Onllwyn given that data is only readily available up to a ward level.

Population

12.7.9 At the time of the 2011 census, there was a total usual resident population within the local study area of 9,403 people with an average density of 1 person per hectare, evidencing the largely rural nature of the local study area. This compares to a total population in Powys of 132,976 persons and a total population in Neath Port Talbot of 139,812 persons⁷.

12.7.10 Population estimates are only available at a county level and data from 2018 suggest that the population of Powys has slightly decreased compared to 2011 census data, with an estimated population of 132,400. By contrast, it is estimated that the population of Neath Port Talbot has increased to 142,900⁸.

12.7.11 Population projections estimate that this trend is expected to continue over the next 10 years⁹ as shown in the graph below.

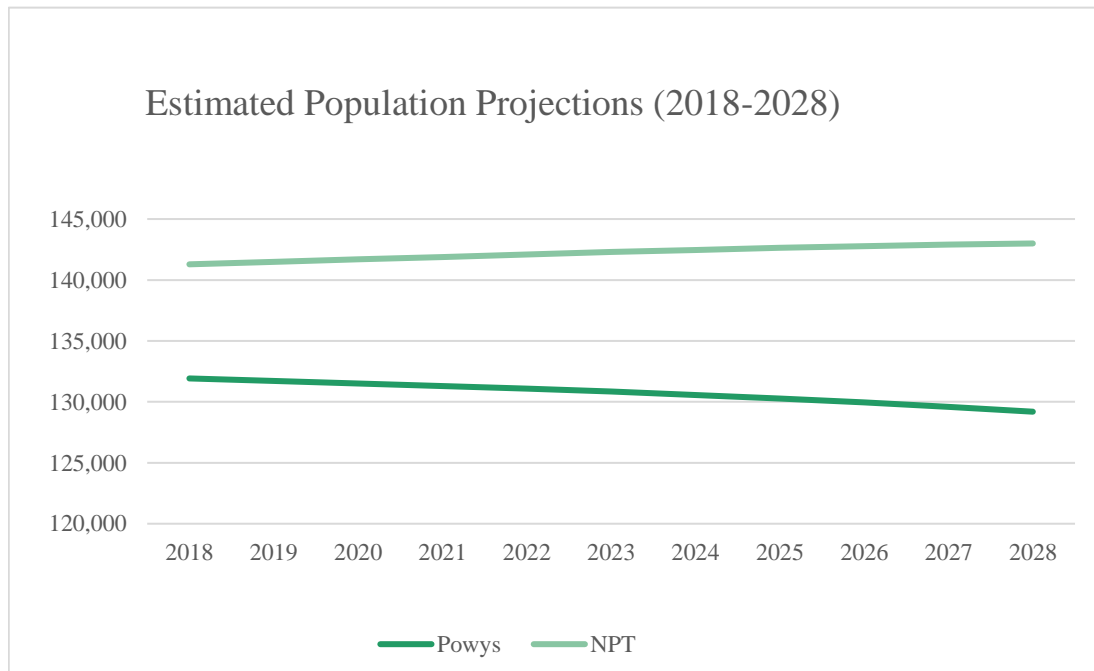


Figure 12.1 Estimated Population Projections by Local Authority and Year (2018-2028)

⁷ ONS Census (2011) KS101EW – Usual Resident Population

⁸ Annual Population Survey (2019)

⁹ StatsWales (2014) Population projections by local authority and year, available online at: <https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Projections/Local-Authority/2014-based/populationprojections-by-localauthority-year>. [Date accessed: 23.12.19]

Age Structure

- 12.7.12** In terms of age structure, 2011 census data shows that 8.6% of the local study area is aged between 18 and 24 whilst 21.3% of the local study area population is aged over 65.
- 12.7.13** At a local authority level, Powys has a larger proportion of the population aged over 65 (22.8%) compared with neighbouring Neath Port Talbot where the figure stands at 18.5% of the population. In terms of younger people, in Powys 7% of the population is aged 18-24 whereas in Neath Port Talbot, the percentage of 18-24-year olds is 8.1%.

Qualifications

- 12.7.14** The level of qualification across the study area is generally consistent with the average figures for Neath Port Talbot. Overall the level of qualification across the local study area falls below the average figures for Powys local authority area. In particular, the percentage of the population with no qualifications is high, 23.7% of the total population, this compares with a figure of 22% for Neath Port Talbot, 15.4% for Powys and an England and Wales figure of 15%¹⁰.
- 12.7.15** The level of qualification across the local study area in comparison with the wider local authority areas is presented in more detail in the figure below.

¹⁰ONS Census (2011) - KS501EW – Qualifications and Students



Figure 12.2 Level of Qualification in Local Study area and Local Authority Area (Source: Census 2011)

Deprivation

- 12.7.16 Statistics on deprivation have been found using the Welsh Index of Multiple Deprivation (WIMD) 2019¹¹.
- 12.7.17 Within the Neath Port Talbot local authority area, there are 91 LSOAs. A total of 14 LSOAs are within the 0-10% most deprived in Wales in terms of overall deprivation, however none of these are within close proximity to the development boundary.
- 12.7.18 By contrast, out of 79 LSOAs in Powys, only 1 is in the 0-10% most deprived in Wales in terms of overall deprivation. This LSOA is known as ‘Ystradgynlais 1’ and is located just east of the development boundary.
- 12.7.19 The development boundary crosses the boundary of two LSOAs: Tawe-Uchaf and Aber-craf. In terms of overall deprivation, both LSOAs fall within the 30-50% most deprived LSOAs in Wales. In terms of other indicators however there are differences. For example, in terms of ‘access to services’ Taw Uchaf falls within the the 10% most deprived in Wales whilst Aber-Craf remains in the 30-50% most deprived bracket.

¹¹ Welsh Government (2019) WIMD – available online at: <https://wimd.gov.wales/geography/la/W06000023?lang=en#&min=0&max=10&domain=overall> [date accessed: 02.01.20]

12.7.20 There are also variations in terms of LSOAs situated along within the wider study area. Onllwyn and Seven Sisters have higher overall deprivation compared with Tawe Uchaf and Aber-craf, falling within the 20-30% most deprived in Wales. This is also the case in terms of other key indicators e.g. employment.

Economic Profile

Employment & Economic Activity

12.7.21 Economic data for the local study area is only available using 2011 census data. According to this data, economic activity across the local study area is low compared with similar data at a county and national level. Total economic activity is 61.6% compared to 62.3% in Neath Port Talbot, 69.6% in Powys and 65.8% in Wales¹².

12.7.22 According to data obtained from the Annual Population Survey, which is available to a county level, the economic activity rate in both Neath Port Talbot and Powys is consistent with the Welsh average and has increased compared to 2011 figures across all areas.

12.7.23 In Neath Port Talbot 75.7% of those aged 16-64 are economically active with an employment rate of 72.7%. These figures fall just below the Welsh figures of 76.5% and 73.2% respectively. In Powys, the rate of economic activity and the employment rate measure just above the Wales average. Of those aged 16-64 in Powys, 78.1% are economically active, with the overall employment rate standing at 76%¹³.

Employment by Sector

12.7.24 In terms of key sectors across the local study area, the largest employment sector (by broad industrial group) is health which employs 24% of total employees within the local study area, other notable employment sectors include education, construction, business administration and accommodation and food services.

12.7.25 Employment within the local study area is shown in further detail in figure 12.4 below¹⁴.

12.7.26 Health is also the largest employment sector in Powys at a county level as well as in Wales as a whole. Percentage employment in the health sector is also significant in Neath Port Talbot (17.0% of total employment) however, manufacturing is the largest employment

¹² ONS Census (2011) QS601EW - Economic activity

¹³ ONS (2019) Annual Population Survey, Estimate 12 months to June. Available online at: <https://www.nomisweb.co.uk/query/construct/components/date.asp?menuopt=13&subcomp=> [date accessed: 06.01.20]

¹⁴ N.B. Figure is based on employment by Broad Industrial Group obtained from the Business Register and Employment Survey (BRES) data (2018). This data excludes farm agriculture (SIC subclass 01000). As such agriculture appears as 0 however, given the rural nature of the study area, it should be noted that there is likely to be employment in the agriculture sector.

sector, employing a total of 19.1% of the county’s population¹⁵. Manufacturing is the second largest employment sector in Powys, employing 12.0% of employees and at a Wales level where it employs 11.3% of the total Welsh population.

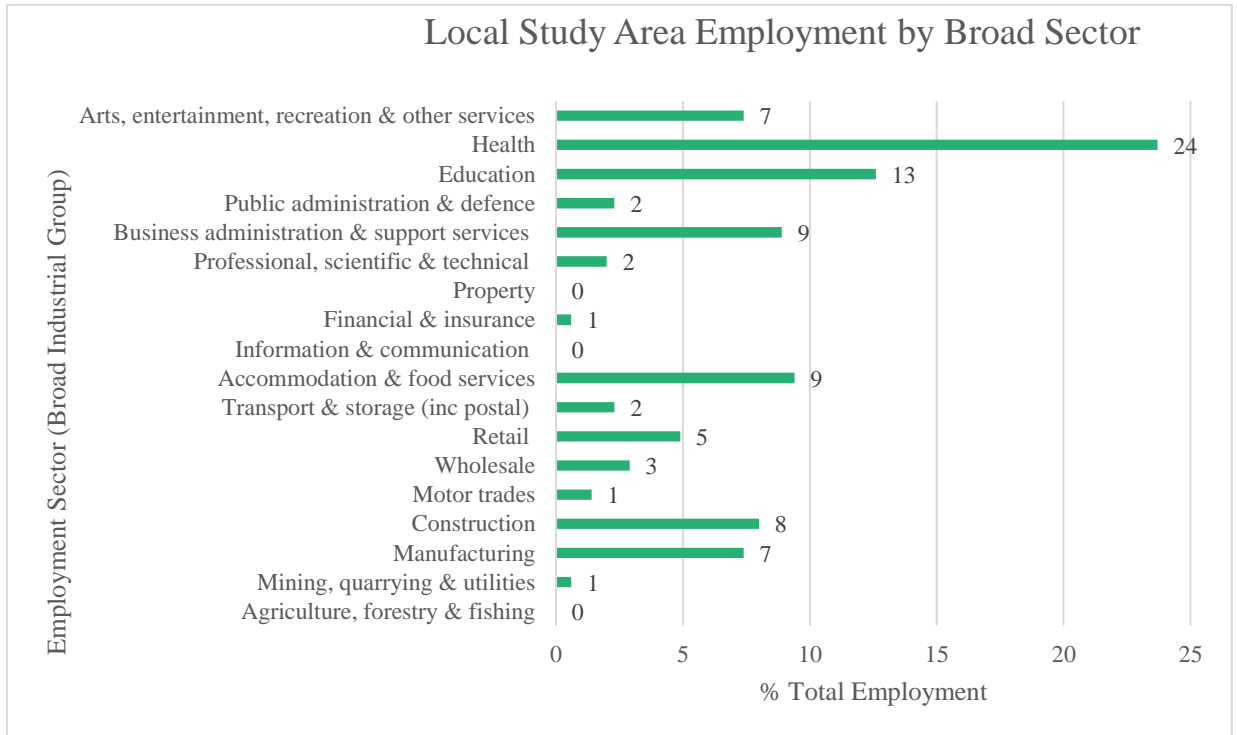


Figure 12.3 Local Study Area Employment by Broad Sector (Source: BRES 2018)

Local Businesses

Local Study Area

- 12.7.27 Local businesses have been identified through a desktop study using Google Earth supplemented by a site visit.
- 12.7.28 For clarity, the businesses identified have been arranged by settlement. They comprise businesses located with 1km of the development boundary. Businesses within the wider study area are presented in Table 12.8 and are shown on Figure 12.6.
- 12.7.29 The businesses set out below do not include businesses specifically related to tourism and recreation e.g. accommodation services, as these are presented separately later in this baseline section.

¹⁵ ONS (2018) Business Register and Employment Survey : open access, <https://www.nomisweb.co.uk/query/construct/summary.asp?menuopt=200&subcomp=> [date accessed: 07.09.2020]

Table 12.8: Businesses Receptors in Local Study Area

Settlement	Business Name
Onllwyn	<ul style="list-style-type: none"> Banwen News Dyffryn Pharmacy Café Sarn Helen
Abercrave	<ul style="list-style-type: none"> The Rheolau Arms Rotafix Building Materials The Hub: Café, Shop, Post Office The Copper Beech Inn Abercrave Inn
Coelbren	<ul style="list-style-type: none"> Prices Arms Kellie's Craft Supplies Coelbren Welfare Hall Tea Rooms
Seven Sisters	<ul style="list-style-type: none"> Nitelite Security Services Seven Sisters Post Office Call in Coffee Shop & Fish Bar Costcutter Seven Sisters Sawmill
Ystradgynlais	<ul style="list-style-type: none"> TLT Supermarket Cambrian Gallery Antiques
Caer-Lan/Caerbont	<ul style="list-style-type: none"> Continental Service Station, Garage and Body Shop Miller Tools Pulse Form and Fitness Celtic Composites Caerbont Automotive Instruments Speedy Cables ArbTS Tree Surveys

12.7.30 Due to the contained nature of the site, local topography and the relative distance of the above businesses from the site, it is not considered likely that these businesses would incur a material loss or gain as a result of proposed development. Therefore, it is considered that the sensitivity of these businesses is generally low.

Wider Study Area

12.7.31 The business receptors identified within the wider study area have been set out in Table 12.9 below and are shown on Volume III, Figure 12.6.

Table 12.9: Business Receptors within wider study area

Settlement	Business Name
Seven Sisters	<ul style="list-style-type: none"> Nitelite Security Services Seven Sisters Post Office

Settlement	Business Name
	<ul style="list-style-type: none"> • South Wales Reptile Supplies • Call in Coffee Shop & Fish Bar • Coelbren Post Office • Costcutter • Seven Sisters Sawmill
Nant-Y-Cafn	<ul style="list-style-type: none"> • Garden City Garage • Dulais Valley Quads • Valley Autocare
Crynant	<ul style="list-style-type: none"> • The Gradon Public House • Crynant Tyres and Exhaust • Y Cwtch Café • Valley Mill Workshop • Knotts MOT Centre • Purple Paw Grooming • Dalavon Doggy Daycare & Home Boarding • Sindy's Kitchen • MW Phillips Chemist • Crynant Stores • Crynant Cattery
Cilfrew	<ul style="list-style-type: none"> • Family Fare General Store • Cilfrew Post Office • Kaye's Kreations Florist • Coco Loco Salon • Neath Coachbuilders • Cilfrew Fish Bar
Aberdulais	<ul style="list-style-type: none"> • Aberdulais Family Fayre Supermarket • Cymru Cakes • Our Crafty Cwtch Craft Shop

12.7.32 Given that the businesses are located adjacent to the existing railway line, and any potential impact would be transient in nature it is considered that these businesses have a low sensitivity to change and are unlikely to experience direct impacts as a result of the scheme.

Land Use

Local Study Area

12.7.33 The area within the development boundary is currently in use as an opencast coal mining site known as the 'Nant Helen Extension'. The coal mined at the site is processed at the adjacent coal washery, processing and distribution centre located closer to the village of Onllwyn at the south east corner of the development boundary (approximate NGR: 284569 210565). The current site owner, Celtic Energy, has permission to mine at the site until December 2021.

- 12.7.34 Celtic Energy has recently secured planning permission (Refs: P2020/0362 and 20/0738/FUL) to restore the site known as the Nant Helen Complementary Restoration Earthworks. It is understood these restoration works area planned for 2021.
- 12.7.35 Given the site's current use as an opencast coal site it is allocated within the Powys LDP as a Permitted Working Area for minerals and a 'Sandstone Category 2 Resource Safeguarding Area' and a Coal Resource Safeguarding Area.
- 12.7.36 There are two housing allocations within the local study area. These include a 1.9ha site for approximately 68 units in Seven Sisters (LDP reference: H1/LB/26) and a 0.6ha site for approximately 16 units in Banwen (LDP reference: H1/LB/24).
- 12.7.37 As noted, above, a total of 115.7ha within the development boundary which is designated common land under the Commons Act 2006. It is understood that there is a statutory expectation that once coal mining activities cease the land will be returned to its Common Land status unless an application is made to the Planning Inspectorate to de-register the land under Section 16 of the Act¹⁶.
- 12.7.38 There is no BMV agricultural land on or surrounding the development boundary area with the majority of land being classified as Grade 4, Grade 5 or Non-Agricultural land¹⁷. There is a designated SSSI to the east of the site in Coelbren.
- Wider Study Area**
- 12.7.39 In addition to the development boundary, the proposed development would also utilise the existing railway line to facilitate deliveries etc. during construction and operation. As described above, for the purposes of this assessment, the area comprising the existing railway line and the immediate surrounds is known as the wider study area.
- 12.7.40 The existing railway line extends from Aberdulais in the south to Onllwyn in the north where it connects with the existing Nant Helen Processing and Distribution Centre.
- 12.7.41 The railway line largely follows the path of the Dulais River. It generally passes through open countryside with steep changes in topography as it extends further up the valley. The line passes through a number of settlements including (from south to north) Aberdulais, Cilfrew, Crynant, Seven Sisters before terminating just north of Onllwyn. For this reason, there are a number of residential properties within reasonably close proximity of the line.
- 12.7.42 Consultation undertaken with the signaller on a visit to site in January 2020 confirmed that there are currently in the region of 1 freight train

¹⁶ UK Government (2020) <https://www.gov.uk/government/collections/common-land-guidance>

¹⁷ Lle Portal (2019) Predictive Agricultural Land Classification (ALC) Map. Available online at: <http://lle.gov.wales/map/alc#b=europa&l=908h:893h:1326:&m=-3.4,52.5,8> [date accessed: 06.01.20]

movements per day on the existing rail line, however the line could safely accommodate up to 3 movements without significant investment or change being required. Line speeds are currently between 15 and 30 miles per hour (mph).

- 12.7.43 The wider study area is located entirely within the boundary of the Neath Port Talbot local authority area.
- 12.7.44 According to the Neath Port Talbot LDP proposals map there are 2 housing allocations within the wider study area. One in Seven Sisters (as mentioned above) and a small housing allocation for 21 units in Crynant (LDP reference: H1/LB/25). In addition, there is a larger allocation for 300 units across 11.6 units in Tonna at the end of the existing rail line (LDP reference: H1/11). There are no other site allocations according to the LDP.

Tourism & Recreation

- 12.7.45 The wider study area is located within the Dulais Valley historically known for its coal mining heritage. This forms part of the area's tourism offering which includes the Cefn Coed Colliery Museum¹⁸ in Crynant, located adjacent to the existing rail line.
- 12.7.46 A survey undertaken in 2016 found that 64% of visitors to Neath Port Talbot stated that the reason for their visit was to enjoy the landscape, countryside and beaches. The Dulais Valley is known for being part of 'waterfall country'¹⁹ and is particularly popular with those seeking to appreciate the natural landscape at sites such as Henrhyd Falls, situated approximately 2 miles north east of the development boundary and Aberdulais Falls situated approximately 10 miles south of the development boundary at the bottom of the existing rail line.
- 12.7.47 The Dulais Valley has also become known for its opportunities for adventure sports and outdoor pursuits for example quad biking, archery and clay pigeon shooting²⁰. In addition, the area is popular with walkers with noteworthy trails including the Dulais Valley Heritage Trail which extends along the existing rail line, following the Dulais river from Aberdulais to Onllwyn.
- 12.7.48 Other notable tourist attractions within the wider area include the Wales Ape and Monkey Sanctuary in Caehopkin (approximately 1.3 miles north of the development boundary), the National Showcaves Centre for Wales at Dan-yr-Ogof (approximately 5 miles north of the development boundary) and Forest Fawr Geopark (situated approximately 13 miles north of the development boundary).
- 12.7.49 Specific accommodation providers and specific information regarding recreational routes within the study area is provided below.

¹⁸ <https://www.npt.gov.uk/1655>

¹⁹ Visit NPT (2020) <http://www.visitnpt.co.uk/1806> [date accessed: 13.01.20]

²⁰ For example see: <http://www.dulaisvalley-quads.co.uk/> and <http://www.crynant-shooting-ground.co.uk/>

Accommodation Businesses

Local Study Area

12.7.50 Accommodation providers within the local study area (i.e. within 1km of the development boundary) have been included within the table below:

Table 12.10: Accommodation Providers within local study area

Settlement	Accommodation Name	Description
Abercrave	Abercrave Inn	Public house with rooms located to the east of Abercrave
	The Hub at Abercrave	Bed and breakfast accommodation comprising 3 rooms and a self-catering apartment associated with the additional café and post office use.
	Copper Beech Inn	Public house with rooms situated to the east of Abercrave village centre.
	Hafan y Coed	Bed and Breakfast accommodation east of Abercrave village centre.
	Maesyfron Holiday Home	2-bedroom holiday home located on Maesyfron in Abercrave village.
	Rheolau Arms	Public house with rooms located off the A4067 west of Abercrave village centre.
	River Cottage	2-bedroom holiday let located off Dan-y-Fron in Abercrave.
	Traditional Cottage	2-bedroom miners cottage holiday rental located off the A4067.
	Detached Studio	Studio/Annexe holiday accommodation located just off the A4067 in Abercrave.
	Brecon Beacons Holiday Home	3-bedroom modern cottage holiday let off Maes-y-Cribarth
Old School Cottage	2-bedroom stone built traditional cottage located in the Maes-y-Cribarth area of Abercrave.	
Caehopkin	Brook Cottage	2-bedroom former miners' cottage in use as a holiday home. Situated south east of Caehopkin off the A4221.
	The Miner's Cottage	2-bedroom holiday home
	Tynpant Barn	4-bedroom barn conversion holiday let. Located off Heol y Gwydde in Caehopkin.

Settlement	Accommodation Name	Description
Coelbren	Tonyfildre Farm	Holiday accommodation on working farm.
	The Likkle House	2-bedroom holiday let off Brynawelon, Coelbren
	Waterfall Country Apartments	4 no. 1 bedroom/studio holiday lets located at the rear of the Prices Arms, Coelbren
Onllwyn	Walkers Paradise Annexe	Annexe/chalet accommodation located south of the A4109 in Onllwyn.
Seven Sisters	Period House Let	7-bedroom Victorian house used for holiday lettings off Dulais Road.

12.7.51 Due to the contained nature of the site, local topography and the relative distance of the above accommodation providers from the development boundary, it is not considered likely that these tourism-related businesses would incur a material loss or gain as a result of proposed development. Therefore, it is considered that the sensitivity of these businesses is generally low. The location of the individual businesses can be seen in Volume III, Figure 12.5.

Wider Study Area

12.7.52 Accommodation providers within the wider study area have been included within the table below:

Table 12.11: Accommodation Providers located within Wider Study Area

Settlement	Accommodation Name	Description
Onllwyn	Walkers Paradise Annexe	Annexe/chalet accommodation located south of the A4109 in Onllwyn.
Seven Sisters	Period House Let	7-bedroom Victorian house used for holiday lettings off Dulais Road.
Crynant	Crynant Cottages	3 no. holiday cottages sleeping between 5 no. and 7 no. persons located on outskirts of Crynant village centre.
Cilfrew	Lonewolf Campsite	Campsite at Glyn-Y-Mul Farm approximately 1.3km north east of Cilfrew village, adjacent to river Dulais.

12.7.53 Given that no work is propose to the existing rail line and the transient nature of trains using the line, the baseline for these businesses will remain largely unchanged. It is not therefore anticipated that they will

experience loss or change and as such are considered to have a low sensitivity.

Recreation Network

12.7.54 In order to understand whether the proposed development would impact upon existing footways, bridleways and cycle routes, an assessment of the recreation network has been undertaken both within the local study area and the wider study area and has been summarised below.

Local Study Area

12.7.55 In NPT there is a total of 777.3km of PRow access comprised of footpaths, bridleways, BOATs²¹. In Powys, there is over 9,250 km of public rights of way²² perhaps owing to the size and rural nature of the county. The PRow network around the site as well as within the development boundary, as per the relevant definitive maps is shown in Volume III, Figure 12.3.

Table 12.12: PRow in local study area

Local Authority Area	PRow Reference	Description
Neath Port Talbot	28/26.D.Hi/3	East/West bridleway running to the south of the development boundary.
	28/30.D.Hi/2	Footpath extending north from the A4109 in Seven Sisters to the development boundary. Crosses the 28/26.D.Hi/3 to the south of the Onllwyn washery.
	31/32.D.Hi/1	Footpath extending west to east at the southern boundary of the washery site.
	31/MO.ANO2/3	Short section of footpath extending north/south linking 31/32.D.Hi/1 to 31/33.D.Hi/2.
	31/33.D.Hi/2	Short section of footpath extending north/south along the eastern washery boundary.
	31/33.D.Hi/4	Footpath extending south towards Banwen.
	31/33.D.Hi/1	Footpath outwith the redline boundary extending north off footpath 31/33.D.Hi/2.
	31/32.D.Hi/2	Footpath extending east off 31/33.D.Hi/2 towards Toncastell.
	31/15.D.Hi/1	Footpath extending west to east from the 28/26/D.Hi/3 bridleway south of the washery site to the A4109 in the village of Onllwyn.
	31/15.D.Hi/2	Footpath beginning adjacent to the residential dwelling at number 56 Wembley Avenue in Onllwyn extending east before joining the A4109.

²¹ Neath Port Talbot Council (2020) Public Rights of Way Improvement Plan (2020-2030), https://www.npt.gov.uk/media/13237/final_rowip-march-2020.pdf [date accessed: 06.04.2020]

²² Powys County Council (2019) Rights of Way Improvement Plan 2018-2028, <https://en.powys.gov.uk/article/2439/Rights-of-Way-Improvement-Plan> [date accessed: 06.04.2020]

Local Authority Area	PRoW Reference	Description
	31/14/.D.Hi/1	Footpath south of the development boundary and the A4108 running east/west connecting to footpath 31/14.D.Hi/3 extending east/west largely parallel to the A4108.
	31/14.D.Hi/3	Footpath extending north/south off footpath 31/14/.D.Hi/1.
	31/15.D.Hi/2	Footpath extending directly off the A4108 to the south east.
	31/9.D.Hi/2	Short section of footpath extending off footpath 31/14.D.Hi/3
	31/10.D.Hi/1	Footpath running south from the village of Onllwyn.
Powys	19	Footpath extending north from 28/26.D.Hi/4 (in NPT) within the redline boundary to the west.
	40	Footpath extending north from 28/26.D.Hi/4. Within the redline boundary of the site for a short time before extending further north towards Penrhos.
	90	Footpath extending east through the site, off footpath number 40 as described above.
	50	A continuation of footpath 90 (as described above). Extends south east before joining footpath number 49 towards the washery site and further south into the village of Onllwyn.
	49	Footpath extending north/south through the development boundary. Meets with footpath number 50 and extends into the village of Onllwyn.
	52	Short footpath at the north of the development boundary (within the redline) linking footpath number 49 with bridleway number 76
	76	Short bridleway located at the northern development boundary.
	17	Footpath extending off bridleway number 76 to the west towards the A4221 in Abercrave.
	11	Footpath to the west, outwith the development boundary extends largely north/south towards.
	10	Footpath extending east/west at the southern development boundary. Extends off footpath 31/15.D.Hi/1 (within NPT).
	7	Footpath extending off footpath number 49 near the Onllwyn washery site northwards towards the A4221.
	16	Footpath at the north (outwith the redline boundary) leading towards Ynyswen.
	18	Footpath to the north of the development boundary, outside the redline, running parallel to the A4221.
	12	Short section of footpath, north of the development boundary extending off Heol-y-Gwydde.
	13	Short section of footpath to the north of the development boundary connecting Heol-y-Gwydde with the A4067.
	20	Bridleway at the north of the development boundary, extending east off Heol Tawe in Abercrave.

Local Authority Area	PRoW Reference	Description
	89	Short section of footpath within Abercrave running east/west parallel with Heol Tawe.
	55	Footpath at the north of the development boundary (outwith the redline boundary) connecting the villages of Caehopkin and Abercrave.

12.7.56 In addition to walking and horse-riding routes there is also one National Cycle Network (NCN) route within the local study area. Route 43 begins at the north of the development boundary at approximate NGR: 283656 211979 in the village of Caehopkin²³. This is shown on Figure 12.3.

12.7.57 The route extends south from Caehopkin for approximately 49km to Swansea city centre. In Swansea it connects to route number 4 also known as the Celtic Trail.


12.7.58 The sensitivity of the individual PRoWs included within the above table is presented within the assessment of effects.

Wider Study Area



12.7.59 In addition to PRoW and other recreational routes in the vicinity of the the local study area, an analysis of recreational routes within the wider study area has also been undertaken.



12.7.60 All of the PRoW’s within the wider study area are situated within the NPT local authority area. There are a number of points where designated PRoW cross the existing rail line. These crossing points have been assessed through site visits carried out by the project team and have been summarised below including site photos to demonstrate the nature of crossings along the line where applicable.


Table 12.13: PRoW/Access Network – Wider Study Area

PRoW Reference	Description
21/14/1	PRoW extending east/west across railway line between residential properties on Penscynor Lane in Cilfrew. 

²³ See: <https://osmaps.ordnancesurvey.co.uk/52.71819,-1.65624,8>

PRoW Reference	Description	
21/17/1 and 21/18/1	Shorter PRoW extending south/south east from New Road, Cilfrew.	<p>No crossing point on the PRoW itself but both PRoW lead to the same gated crossing point which looks to be for public access due to signage in situ.</p> 
21/19/1	PRoW extending north from path 21/18/1 towards Main Road in Cilfrew. Smaller PRoW 21/15/3 and 21/15/1 extend off this path at its southernmost point extending west towards Main Road. There is no railway crossing point associated with this PRoW.	
25/6.D.Lo/1	Footpath extending west from Neath Road to the south of the village of Cryant. Route extends north of the treatment works ending at junction with Maes-Mawr Road. There is no railway crossing point associated with this right of way.	
25/1.D.Hi/1	Bridleway extending east/west from Brynawel in Crynant, links into another bridleway, 25/11.D.Lo/2	
25/MO.ANC1 9/1	Short 'L' shape footpath connecting Station Road and Main Road in Crynant. There is no railway crossing point associated with this right of way.	
25/3.D.Hi/1	Footpath extending east from Brynawel in Crynant links into associated footpaths, 25/3.D.Hi/2. There is no railway crossing point associated with this right of way.	
25/4.D.Hi/1	Footpath extending east from the A4109 to the north of Crynant. Extends across the railway at the end of Heol Las Fawr before extending north to the east of Gould Farm.	<p>Manual gated crossing point over the railway line.</p> 
25/9.D.Hi/12	Bridleway running parallel to the railway line and A4109 extends from the end point of footpath 25/9.D.Hi/1 north to where it intersects with footpath 28/9.D.Hi/10 to the south of the village of Seven Sisters. There is no railway crossing point associated with this right of way.	

PRoW Reference	Description	
28/16.D.Hi/1	<p>Footpath extending north from bridleway 25/9.D.Hi/12 towards Seven Sisters. After the railway path extends west towards Dulais Road.</p> <p>Footpath crosses railway to the south of Seven Sisters.</p>	<p>Manual gated crossing, on day of site visit gate chained open.</p> 
28/18.D.Hi/1	<p>Footpath extending west from the railway line towards Dulais Road. Crossing at railway line is not part of the PRoW and therefore assumed this is used for private access. There is no railway crossing point associated with this right of way.</p>	
28/19.D.Hi/1	<p>Footpath extending east from Dulais Road before extending north running parallel to the railway line. There is no railway crossing point associated with this right of way.</p>	
28/31.D.Hi/3	<p>Footpath extending north/south, running parallel to railway line linking to footpath 28/31.D.Hi/1 in Seven Sisters.</p>	
28/31.D.Hi/1	<p>Footpath running from Seven Sister RFC to Martyn’s Avenue.</p>	<p>Footpath passes underneath railway line viaduct and as such no crossing in situ.</p> 
28/29.D.Hi/1	<p>Footpath extends north from the railway line along High Street in Seven Sisters. There is no railway crossing point associated with this right of way.</p>	

PRoW Reference	Description	
31/37.D.Hi/1	Footpath extends from Ty Newydd, eastwards across railway line and Golwg-y-bryn.	Manual wooden gated crossing with signage. 
31/14.D.Hi/1	Footpath situated between residential properties on the A4109 (Golwg-y-Bryn) extending through agricultural fields to the east. There is no railway crossing point associated with this right of way.	
31/15.D.Hi/2	Footpath staggering the A4109 (Golwg-y-Bryn) extending west towards the Onllwyn Washery and east from residential properties on A4109 extending through agricultural fields before re-joining the A4109 further east. There is no railway crossing point associated with this right of way	

12.7.61 In addition to the PRoW identified above, there are several crossing points which are not designated PRoW but do provide access to individual/multiple properties and agricultural holdings. Any impact on these crossing points will also be investigated within the assessment of effects as part of access considerations for local residents and businesses.

12.7.62 As shown within the table above, the existing crossing points vary in terms of design and standards. In areas towards the bottom of the existing rail line, which are more residential there are more formal crossing points with more signage, CCTV etc. Further north along the line, the crossing points are more informal.

12.8 Future Baseline Conditions

12.8.1 The below assessment has been prepared in relation to a future baseline i.e. based on a remediated site after the current mining operations has ceased and the site has been restored and had Celtic Energy’s Earthworks completed, i.e. the Nant Helen Complementary Restoration Earthworks.

12.8.2 In relation to PRoW this includes some alterations to the current definitive map (Figure 12.3).

12.8.3 It is considered that if the proposed development was not progressed to implementation, the ‘future’ baseline conditions would remain as described above. Whilst there may be long term changes in terms of economic profile, population and land use, this would be unlikely to cause dramatic variations to the baseline data as presented.

12.9 Design mitigation

12.9.1 Design mitigation measures have been incorporated within the design development process and are therefore considered as part of the assessment process.

12.9.2 Where relevant, the socio-economic assessment considers specific technical design mitigation presented in other technical chapters of relevance to the socio-economic assessment e.g. air quality and traffic and transport.

12.10 Assessment of effects

12.10.1 This section presents the assessment of potential socio-economic effects during both construction and operation. The assessment considers potential effects within the local study area and the wider study area.

12.11 Assessment of effects from construction

12.11.1 This assessment considers the potential socio-economic effects of the proposed development during construction.

Economy and Labour Market

12.11.2 The construction of the proposed development is expected to create employment opportunities over a minimum 2-year period.

12.11.3 Construction is currently anticipated to commence in 2021 and would comprise three phases as presented in the introduction to this assessment. It is anticipated that the overhaul facility at the current washery site could become operational by 2023 with the site being fully operational, including the test track facility by the end of 2025.

12.11.4 Estimates included within the OBC suggest that depending on the phase of the project, between 80-244 jobs could be created during construction (both direct and indirect) construction jobs.

12.11.5 It is expected that approximately 80 jobs would be created during Phase 1 of the works, rising to 244 should the development progress to Phase 3.

12.11.6 The proposed employment would comprise a number of different roles including project managers, environmental managers, site and civil engineers and specialist rail engineers.

12.11.7 Research by the Construction Industry Training Board (CITB) found that the average mean distance travelled to work for construction workers is 22 miles²⁴. In the context of the proposed development a

²⁴ CITB (2015) Workforce and Mobility Skills in the UK Construction Sector 2015, <https://www.citb.co.uk/documents/research/workforce%20mobilty%202015/uk%20mobility%20report%202015.pdf>

22-mile buffer taken from the development boundary would include workers living in: Brecon and Llandoverly to the north, Llandeilo and Ammanford to the west, Llanelli, Swansea, Neath and Port Talbot to the south and Merthyr Tydfil, Aberdare and surrounding settlements to the east.

- 12.11.8** As noted within the baseline in Section 12.7, there is a relatively high percentage of construction workers in the local study area. It is therefore considered to be a fair assumption that a reasonably high proportion of local construction employment could be sourced from within the local communities surrounding the site.
- 12.11.9** The main exception to this is likely to relate to any specialist rail-related construction services which may need to be drawn from a wider area/specialist contractor.
- 12.11.10** For the purposes of the assessment it has been assumed that the abovementioned ‘specialist workforce’ would comprise approximately 10-20% of the total (22-45 jobs at peak employment). This would mean the remaining jobs would primarily be sourced from the local area and wider region depending on the appointed contractor.
- 12.11.11** A main contractor is yet to be appointed to carry out the works, however it should be noted that procurement would be carried out in consideration of the Welsh Government’s Community Benefits Guidance²⁵. The guidance sets out how projects can deliver benefits to Wales and to local communities through targeted recruitment and training, and supply chain initiatives. It is expected that that potential developers/operators would be asked to confirm ways in which they would maximise benefits for the local economy in line with the guidance.
- 12.11.12** As well as providing direct employment benefits, the proposed development would also bring economic benefits due to induced spending in the local area from the construction workers. In addition, wider benefits from induced spend, e.g. accommodation would potentially be felt of the more specialist non-local workforce.
- 12.11.13** Given the length of the construction programme and the nature of the proposed development it has been assumed that non-local construction worker accommodation would be temporary and would utilise local serviced accommodation rather than longer term housing rentals. According to The Construction Industry Joint Council: Working Rule Agreement, which covers over 500,000 workers within the UK construction industry, incorporates a subsistence (lodging) allowance of £43.27 per night²⁶ which would be spent on accommodation within

²⁵ Welsh Government (2014) Community Benefits: Delivering Maximum Value for the Welsh Pound <https://gov.wales/sites/default/files/publications/2019-09/community-benefits-delivering-maximum-value-for-the-welsh-pound-2014.pdf>

²⁶ BATJIC (2019) Constitution and Working Rule Agreement 2019/2020, <https://www.fmb.org.uk/media/44309/constitution-and-working-rule-agreement-2019-2020.pdf>

the local area throughout the construction period. The impact of this on the tourism industry is addressed further below.

- 12.11.14 The sensitivity of local communities and the local economy is considered to be medium and magnitude of impact during construction moderate, leading to a *moderate beneficial* effect on the local economy and employment which is significant.

Local Businesses and Local Residents: Access

- 12.11.15 Based on current information, it is not anticipated that there would be any direct effects on identified business, local residents and their access (e.g. severance during construction works) within the local or wider study area. Accesses for local business/residents situated within close proximity to the development boundary would be retained at all times through construction programming and this would include the retention of suitable accesses for emergency vehicles.
- 12.11.16 In light of the above, the focus has been on potential indirect effects within the local and wider study areas largely related to construction traffic and impact on the local road and rail network.
- 12.11.17 As noted within the baseline, the sensitivity of business receptors within the local study area and within the wider study area is considered to be low.
- 12.11.18 Identified businesses and residents within the local study are taken to include those living in the main settlements around the development boundary as well as the business and tourism receptors identified in the baseline section. It is also taken to include local farming operations within 1km of the development boundary.
- 12.11.19 Any increase in traffic using local roads as a result of the construction of the proposed development could have the potential to affect access to businesses within the local study area. The way in which any impacts of this have been mitigated is set out below.
- 12.11.20 In terms of vehicular accesses to the site, during construction it is proposed that these remain the same as per the current site accesses to Nant Helen Coal Mining operation. This includes three access points: 1 no. at the junction of the A4109 Wembley Avenue with Onllwyn Road, 1 no. at the A4221 Celtic Energy – Nant Helen access road, and 1 no. at the A4221 Washery and Distribution centre access (which would be used by HGVs only).
- 12.11.21 All of the site access routes will be connected to the local road network and it is likely that there would be an increase in HGV traffic accessing the site. Increased traffic on the localised road network may therefore increase the potential for short-term road delays affecting access to tourism related businesses.
- 12.11.22 A Construction Traffic Management Plan (CTMP) would be prepared to mitigate as far as possible any negative impacts associated with

construction traffic, for example it is proposed to utilise the least sensitive roads for access to the site.

- 12.11.23 Subject to the successful implementation of the CTMP, the Traffic and Transport chapter concludes that any residual effects associated with the construction phase will be of a temporary nature and the magnitude will be either ‘minor’ or ‘negligible’.
- 12.11.24 Given the low sensitivity of businesses within the study area, it is therefore considered that there will be a *minor adverse* impact on access within the local study area during the construction phase which is not significant.
- 12.11.25 It is expected that the existing railway will be used during construction for deliveries, however, it is currently estimated that there would be no increased train movements along the line compared to current levels of usage.
- 12.11.26 On this basis it is considered that access for local residents and businesses within the wider study area would be maintained throughout construction via existing crossing points.
- 12.11.27 It is therefore concluded that there would be *negligible* effect on access for local residents and businesses situated within the wider study area during construction which would not be significant.

Local Businesses: Indirect Amenity Effects

- 12.11.28 There would be no direct effects on business receptors identified either within the local study area or the wider study area. As such only potential indirect effects have been considered.
- 12.11.29 Based on the sensitivity criteria presented at the outset of this chapter, the sensitivity of local businesses within the local and wider study area, including local tourism businesses, is considered to be low.
- 12.11.30 Construction activity within the development boundary has the potential to result in temporary adverse amenity effects for residents within the local study area.
- 12.11.31 Given the distance between local business receptors and the development boundary, and the topography of the local area it is considered that these are unlikely to be significant from a socio-economic perspective, particularly with appropriate mitigation measures in place which have been identified within other assessment chapters (e.g. noise mitigation).
- 12.11.32 It should also be noted that construction effects would be temporary in nature.
- 12.11.33 In summary, based on the wider assessment chapters it is considered that sensitivity of businesses in the local study area during construction is low, and the magnitude of the impact is considered to

be minor. This results in a *minor adverse* effect which is not significant.

- 12.11.34 On the basis that there would be no increased train movements along the existing rail line during construction it is considered that from a socio-economic perspective there would be *no impact* on the amenity of local businesses in the wider study area during construction of the proposed development.

Local Residents: Indirect Amenity Effects

- 12.11.35 Construction activity within the development boundary has the potential to result in temporary amenity effects for residents within the local study area. Given the distance between neighbouring properties and the development boundary, it is considered that the magnitude of these effects would be minor, and therefore not significant from a socio-economic perspective.
- 12.11.36 Further detail in relation to specific amenity effects such as noise and air quality have been assessed in detail within the relevant ES Chapters. These chapters also identify appropriate mitigation measures, where required to reduce the likelihood of significant effects.
- 12.11.37 In summary, based on the wider assessment chapters it is considered that the construction phase may lead to temporary *minor adverse* amenity effects within the local study area, these would not be considered to be significant from a socioeconomic perspective.
- 12.11.38 Further information on the proposed mitigation measures is provided within the CTMP.
- 12.11.39 The sensitivity of residents within the local study area during construction is considered to be low, and the magnitude of the impact is considered to be minor. This results in a *minor adverse* effect which is not significant and would be temporary in nature.
- 12.11.40 On the basis that there would be no increased train movements along the existing rail line during construction it is considered that from a socio-economic perspective there would be *no impact* on the amenity private property in the wider study area during construction of the proposed development.

Recreation and Public Rights of Way

- 12.11.41 The PRoW within the local study area would experience both direct and indirect effects during construction.
- 12.11.42 Utilising the existing Sustrans Cycle Route to the north of the site, and the existing bridleway to the south of the site, the intention is that existing routes which would experience direct impacts will be permanently diverted to create improved multi-user routes around the site. Such diversions would be completed in advance of any works and

where possible and safe to do so, access on the PRow surrounding the site would be maintained.

- 12.11.43** The existing PRow network surrounding the site is shown in Figure 12.3.
- 12.11.44** Table 12.14 below sets out the PRow which would be directly impacted by the proposed development and the proposed mitigation.
- 12.11.45** The table sets out the broad principles of the PRow strategy, whereby existing routes are either extinguished/diverted and replaced by new routes which the overall aim of creating a better connected, recreational network. It is however acknowledged that some of the routes (e.g. the new bridleway provision) are located outside the proposed development boundary. Requisite further applications to be able to agree the specific details of the proposed diversions and to be able to carry out the works will be made at a later date in collaboration with Neath Port Talbot Council and Powys County Council.
- 12.11.46** The changes to the PRow network are being developed by NPTCBC and PCC within a Public Rights of Way Management Strategy. This will set out in detail proposed changes to the PRow that would be affected by the proposed development.
- 12.11.47** When considering magnitude, the assessment focuses on the type and extent of potential diversion. For example, a minor realignment would be considered negligible whereas a longer diversion would be considered minor.

Table 12.14: PRow Assessment of Effects

PRow Ref.	Descriptor	Sensitivity	Proposed Mitigation	Magnitude	Significance of Effects
40	Footpath extending north from 28/26.D.Hi/4. Within the redline boundary of the site for a short time before extending further north towards Penrhos.	Medium	Minor deviation to be implemented as part of future baseline and as such no mitigation would be required. Diversion would be permanent.	Minor	Minor Adverse
19	Footpath extending north from 28/26.D.Hi/4 (in NPT) at the western side of the proposed development within the redline boundary.	Medium	Footpath would be extinguished however, the footpath doesn't lead to any destination and does not connect communities. A new footpath link to be created by extending off the existing route 40. This would follow the perimeter of the northern development boundary prior to connecting to existing footpath number 17 to the north of the site	Negligible	Negligible

PRoW Ref.	Descriptor	Sensitivity	Proposed Mitigation	Magnitude	Significance of Effects
			(which would remain as existing). This new route would ensure that north/south is retained. As such the magnitude is considered to be negligible.		
31/15. D.Hi/1	Footpath running east west, located within the site's development boundary before extending south towards village of Onllwyn,	Low	No changes proposed to the existing route alignment.	Negligible	Negligible
66, 45 (bridle-way) and 28/26. D.Hi/5	Linked bridleway and footpath extending off footpath number 28/26.D.Hi/4 near the Onllwyn washery site northwards towards the A4221.	Low	Minor deviation of existing alignment implemented as part of the future baseline. This is to the very south of the redline boundary. Diversion would be permanent.	Minor	Minor Adverse
90 and 50	Linked footpaths extending from the west of the south to the south east towards Onllwyn.	Medium	Routes would be permanently extinguished. Given their given their low value and the fact that the same level of connectivity would be provided by new footpath/bridleway links to the north this is not considered to be significant.	Minor	Minor Adverse
49 and 52	Linked footpaths extending from Caehopkin through the development boundary to the village of Onllwyn.	Medium	Route would be diverted as part of future baseline however, the proposed development would require the extinguishment of the route, which would be permanent. This would result in longer north east-south east movements being required from Caehopkin to Onllwyn.	Moderate	Moderate Adverse
7	Short footpath extending north from footpath 49 to site boundary.	Medium	Footpath to be extinguished following minor deviations as part of the future baseline. Given the relatively short section of path and limited connectivity of existing route the magnitude is considered to be minor.	Minor	Minor Adverse

PRoW Ref.	Descriptor	Sensitivity	Proposed Mitigation	Magnitude	Significance of Effects
11	Short section of footpath linking bridleway number 76 and footpath 18 at the north of the development boundary.	Medium	Route would be permanently extinguished. It is considered that suitable mitigation would be provided through the creation of new routes to the north of the site, specifically a proposed new bridleway connection which would largely follow the existing NCN alignment. The new bridleway section would extend along the northern boundary of the proposed development, south west before terminating in Ystradgynlais. This bridleway would mean the connection between Penrhos to Tynewydd would be retained.	Minor	Minor Adverse
76	Short section of bridleway linking footpath numbers 17 and 11. Crosses cycle route at northern site boundary.	Medium	Route would be permanently extinguished. However, suitable mitigation would be provided through the creation of new routes to the north of the site and as such the magnitude of the loss (particularly given the length of the existing route) is considered to be negligible.	Negligible	Minor Adverse
31/32. D.Hi/1	Footpath extending west to east at the southern boundary of the washery site.	Low	No changes currently proposed to the existing route alignment.	Minor	Minor Adverse
31/MO. ANO2/ 3	Short section of footpath extending north/south linking 31/32.D.Hi/1 to 31/33.D.Hi/2.	Low	Route is likely to be extinguished. Footpath is a short section and does not offer a critical link between communities. As such the sensitivity is low and magnitude negligible and mitigation provided by alternative routes.	Minor	Minor Adverse

PRoW Ref.	Descriptor	Sensitivity	Proposed Mitigation	Magnitude	Significance of Effects
31/33. D.Hi/2	Short section of footpath extending north/south along the eastern washery boundary.	Medium	Route is likely to be extinguished. Footpath is a short section and does not offer a critical link between communities. As such the sensitivity is low and magnitude negligible and mitigation provided by alternative routes.	Minor	Minor Adverse
Sustrans Cycle Route 43	Sustrans Cycle Route 43 runs along site's northern boundary.	Medium	Route may require temporary diversion during construction works. This would be for a limited time period.	Minor	Minor Adverse

- 12.11.48** It should be noted that the majority of the abovementioned PRoW are currently temporarily closed or suspended where they interact the development boundary owing to the existing coal mining operations at Nant Helen. As mentioned previously, planning permission has been granted for the Nant Helen Complementary Earthworks scheme to restore the site. It is not anticipated that the PRoW would be brought back into use prior to construction of the proposed development and this should be taken into account.
- 12.11.49** Whilst all of the PRoW directly impacted (with the exception of the Sustrans Cycle Route) would require permanent diversion prior to the construction of the proposed development, the intention is for the diversions to provide a beneficial impact upon recreational routes in the area by creating more circular, multi-user routes which are better interconnected.
- 12.11.50** In consideration of the above, and the sensitivity of the various PRoW as outlined in Table 12.14, the majority of PRoW within the study area during construction would experience changes of a *minor adverse* impact which would not be significant. The exception to this would be routes 49 and 52 which would experience *moderate adverse* effects due to the linkage it currently provides between the settlements of Onllwyn and Caehopkin and the medium sensitivity of these PRoW.
- 12.11.51** The remainder of the PRoWs identified in Table 12.12 would only experience indirect amenity effects during construction which would primarily be noise and visual effects. Due to distance between the proposed development and these PRoW, and the transient nature of the users, it is considered that any effect would be very short term, minor in magnitude and would not be significant.
- 12.11.52** Within the wider study area, it is currently anticipated that train movements along the existing railway would not increase beyond current usage during the construction of the proposed development. It

is therefore considered that the existing PRow within the wider study area as identified in Table 12.13 within the baseline could continue to operate as normal during construction.

- 12.11.53 It is therefore considered that there would be *no impact* on recreation and the operation of PRow within the wider study area during construction.

Land Use

- 12.11.54 As identified within the baseline section, a large proportion of the development boundary lies within an area known as Mynydd-y-Drum which is designated as Common Land.
- 12.11.55 The construction of the proposed development would result in the permanent loss of a large proportion of this Common Land at Mynydd-y-Drum. The sensitivity of the existing Common Land is considered to be high.
- 12.11.56 NPTCBC/PCC are in the process of developing a Common Land Strategy which will set out the approach for managing the issue of Common Land. In order to mitigate the loss of any Common Land, it would be proposed to deregister the current site by way of an application under section 16 of the Commons Act 2006. As part of the land being deregistered, there would be a requirement for suitable replacement land to be made available.
- 12.11.57 The potential replacement sites are currently being assessed to ensure that they would be of suitable quality and meet the tests of replacement land, and landowner negotiations are ongoing. As such no further detail can be provided at this point. The application for Common Land deregistration is separate to the planning application process.
- 12.11.58 On the basis that suitable replacement land will be provided and there would be no net loss of Common Land in this area as a result of the proposed development, the magnitude of this change is considered to be negligible, leading to a *minor adverse* effect which would not be significant.

12.12 Assessment of effects from operation

Economy and Labour Market

- 12.12.1 An assessment of the employment potential of GCRE has been made within the OBC for the proposed development. This considers the direct on-site employment that the various activities could support.
- 12.12.2 The OBC has found that between 61 (during phase 1) and 118 (phase 3) direct jobs could be created at GCRE. In addition, it concludes that there is potential for between 55 and 75 indirect jobs could be created through supply chain and increased visitors to the area.

- 12.12.3 As noted within the OBC many of these jobs will be high skilled, and it is anticipated that not all will come from the immediate local community at first due to new capabilities being required. Notwithstanding this, there will be a number of required roles e.g. site and facilities management, security, rail infrastructure maintenance, train maintenance and hospitality which could be filled from the wider study area. There is also the potential for additional (up to approximately 60) academic jobs to be created alongside the main project.
- 12.12.4 Based on the information presented within the baseline section of this assessment the sensitivity of local communities in terms of the economy and labour market is considered to be medium. Given the lower number of local jobs expected to be derived from the scheme the magnitude of impact is considered to be low.
- 12.12.5 In addition, GCRE would look to provide training opportunities and employment opportunities through partnerships with local Further Education institutions such as Neath College and Coleg y Cymoedd and with Welsh universities. This could lead to an increase in potential for more local jobs at the site in the future.
- 12.12.6 The economy and labour market within the study area is considered to be of medium sensitivity, and the magnitude of impact is considered to be minor. It is concluded that permanent employment resulting from the proposed development would have a *minor beneficial* effect which is not significant.

Local Business and Local Residents: Access

- 12.12.7 It is noted that the proposed development has the potential to result in increased trip generation within the local study area by road and rail, however as noted within the Transport and Traffic Chapter these effects are not expected to be significant and the sensitivity of receptors in terms of access is considered to be low.
- 12.12.8 The proposed development would not result in any significant permanent physical changes to the local highway network with accesses to the site remaining similar to the current situation.
- 12.12.9 In addition, mitigation measures would be put in place such as a site wide Travel Plan and use this as a means of monitoring the transport situation and encouraging sustainable transport journeys.
- 12.12.10 It is not anticipated at this stage that train movements to and from the site would increase above current levels. On this basis, the railway crossing points within the local study area would remain unaffected and there would not be further severance created for surrounding communities. The magnitude of impact on road and rail is therefore considered to be negligible.

- 12.12.11 Overall it is considered that, from a socio-economic perspective, this would result in a *negligible* effect on access within the local study area which is not significant.
- 12.12.12 Access to private properties and business within the wider study area has also been assessed. On the basis that there would be no increase in frequency or speed of train movements necessitating changes to the current crossing points it is considered that there would be *no impact* on access for receptors within the wider study area during the operation of the proposed development.

Local Businesses and Local Residents: Indirect Amenity Effects

- 12.12.13 On the basis that train movements to and from the site would not increase beyond current levels during operation of the site it is considered that the amenity impact on businesses and residents within the local study area would not be significant and therefore the magnitude of impact is considered to be low.
- 12.12.14 With appropriate mitigation measures where these have been identified in other assessment chapters (e.g. noise mitigation) it is considered that the indirect amenity impacts within the local study area from a socio-economic perspective would constitute a *minor adverse* impact which would not be significant.
- 12.12.15 On the basis that the usage of the existing rail line is not expected to increase during the operation of the proposed development it is considered that there would be no adverse indirect amenity effects from a socio-economic perspective within the wider study area.
- 12.12.16 It is recognised that there could be potential adverse amenity effects on local businesses and private properties in proximity of the existing rail line should usage increase significantly. These impacts would primarily relate to noise and air quality and the potential impacts are discussed in more detail in the relevant ES Chapters.

Recreation and Public Rights of Way

- 12.12.17 The PRoW within the study area would experience direct and indirect effects.
- 12.12.18 The direct effects to PRoW have been discussed in detail from paragraph 12.12.16 above. The following PRoW would experience direct permanent effects which would continue to operation: 40, 19 31/15.D.Hi/1, 66, 45 28/26.D.Hi/5, 90, 50, 49, 7, 11, 76 and 52.
- 12.12.19 As noted above, the intention is to divert these routes to create more coherent, multi-user recreational routes around the site based around the existing bridleway to the south and Sustrans cycle route to the north.
- 12.12.20 Although this would result in permanent changes to the baseline, this is considered to be beneficial to users in the long term. In

consideration of this and the sensitivity of PRow identified in Table 12.14, it has been concluded that the direct effects on PRow during operation would have a *neutral* impact which would not be significant.

- 12.12.21 The remainder of PRow within the local study area as identified within Table 12.12 may experience minor indirect effects during operation, primarily in relation to the visual impact of the proposed development.
- 12.12.22 Given the transient nature of users of the PRow network and the sensitivity of the PRow, the development and the existing use of the site as a coal mining operation, there is considered to be a *negligible* effect on Public Rights of Way during operation as a result of the proposed development which is not significant.
- 12.12.23 Given that train movements along the existing rail line are not expected to increase in frequency as a result of the proposed development it is not considered that there would be any adverse direct or indirect impacts on PRow in the wider study area
- 12.12.24 There is considered to be a *negligible* effect on PRow within the wider study area (as identified in Table 12.13) during the operation of the proposed development which would not be significant.

Future Land Use

- 12.12.25 It is not considered that the proposed development would impact any future land uses coming forward, as such there would be no impact.

12.13 Mitigation and enhancement

- 12.13.1 The outline CEMP and CTMP include measures that are considered as standard good practice that would be implemented by the construction contractor to reduce the likelihood of effects or their magnitude if they were to occur.
- 12.13.2 Works would also be carried out in accordance with any additional permitting requirements, for example further applications required to divert PRowS.

12.14 Assessment Summary Matrix

	Potential Effect	Receptor (s)	Direct/ Indirect	Sensitivity of Receptor	Magnitude	Mitigation	Residual Impact / Significance
Construction	Creation of construction jobs and training opportunities	NPT/Powys Economy and Labour Market	Indirect	Medium	Low	Work with local stakeholders to ensure that construction employment opportunities could be sourced from the local communities.	Moderate Beneficial
	Induced spend by construction workforce	Local businesses	Indirect	Medium	Medium	N/A	Moderate Beneficial
	Construction traffic and access implications (Local Study Area)	Local businesses	Indirect	Low	Minor	Traffic mitigation measures to be secured through the Framework CTMP.	Minor Adverse
	Construction traffic and access implications (Local Study Area)	Local businesses	Indirect	Low	Minor	Traffic mitigation measures to be secured through the Framework CTMP.	Minor Adverse
	Amenity Effects (Local Study Area)	Local businesses (incl. tourism related businesses) Local Residents	Indirect	Low	Minor	Air Quality and Noise – measures outlined in assessments and to be secured through Outline CEMP.	Minor Adverse
	Amenity Effects (Wider Study Area)	Local businesses (incl. tourism related businesses) Local Residents	Indirect	Low	Negligible	Air Quality and Noise – measures outlined in assessments and to be secured through Outline CEMP.	No impact
	Temporary disruption to National Cycle Network	Sustrans Cycle Route 43	Direct	Medium	Minor	Mitigation measures to be secured through the Framework CTMP.	Minor Adverse

Construction & Operation	Permanent diversions/Extinguishments to recreational routes (Local Study Area)	PRoW references: 40, 66, 45, 28/26.D.Hi/5, 90, 50, 7, 11, 76, 31/32.D.Hi/1, 31/33.D.Hi/2, 31/MO.ANO2/	Direct	Low/Medium	Minor	Diversions and new routes provided in order to mitigate the permanent loss of routes.	Minor Adverse
	Permanent diversions/Extinguishments to recreational routes (Local Study Area)	PRoW reference: 19, 31/15.D.Hi/1	Direct	Low/Medium (see Table 12-14)	Negligible	Diversions and new routes provided in order to mitigate the permanent loss of routes.	Negligible
	Permanent diversions/Extinguishments to recreational routes (Local Study Area)	PRoW reference: 49, 52	Direct	Medium	Moderate	Diversions and new routes provided in order to mitigate the permanent loss of routes.	Moderate Adverse
	Visual effects from recreational routes in close proximity to the development boundary.	Land Use	Indirect	Low	Negligible	Consideration should be paid to site's current use as an operational coal mining site.	Negligible
	Loss of designated Common Land	Land Use	Direct	High	Negligible	Suitable replacement land to be provided, resulting in no net loss of Common Land.	Minor Adverse
Operation	Permanent employment creation	NPT/Powys Economy and Labour Market	Indirect	Medium	Medium	Whilst suitable job roles for the local employment workforce may be limited initially to the necessity for specialist roles, there is direct local employment associated with the site as well as the potential for education and training opportunities.	Minor Beneficial
	Changes in volume of traffic on the local road network	Local Businesses Local Residents	Indirect	Low	Negligible	Effects resulting from increased trip generation are not expected to be significant	Negligible

13 Health and wellbeing

13.1 Introduction

- 13.1.1 This chapter sets out the assessment of likely significant effects relating to health and wellbeing arising from the construction and operation of the proposed development.
- 13.1.2 The health and wellbeing assessment applies a broad definition of health, encompassing physical and mental wellbeing and quality of life. This understanding of health is captured in the World Health Organisation (WHO) definition:
- “Health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity”.*
- 13.1.3 The health and wellbeing assessment is based on the identification of ‘health determinants’ i.e. the social, economic and environmental factors that can influence the health and wellbeing of the population. It assess the beneficial and adverse health and wellbeing effects associated with changes to health determinants resulting from the proposed development.
- 13.1.4 The assessment predominantly focuses on the population and local communities in areas surrounding the site and follows the study areas of other relevant topics, including landscape and visual (Chapter 9), noise (Chapter 10), socio-economics (Chapter 12) and air quality (Chapter 14).

13.2 Review of proposed development

- 13.2.1 The aspects of the proposed development relevant to the health assessment will be similar to other topics which inform the assessment. Further detail is provided in these chapters, but notable aspects of the design relevant to health include:
- Potential employment and training opportunities during construction and operation;
 - Impact on access and transport during construction and operation;
 - Impacts on existing Public Rights of Way (PRoW) and recreational network of the local area during construction and operation; and
 - Noise, air quality and visual impacts on neighbourhood amenity during construction and operation.

13.3 Legislation, policy context and guidance

Policy context

Wellbeing of Future Generations (Wales) Act 2015

13.3.1 This legislation sets a requirement for public bodies to consider improving social, economic, environmental and cultural well-being of Wales. There are seven well-being goals in relation to these objectives, including ‘a healthier Wales’. This aims to create a society which maximises people’s physical and mental wellbeing. It seeks to create:

- a compassionate nation;
- an active nation;
- place making and designing-in community health and wellbeing that supports health communities; and
- seamless, preventative organisations and services that benefit health.

Planning policy Wales (2018)¹

13.3.2 The Planning Policy for Wales aims to deliver the vision set out in the Wellbeing of Future Generations Act. A key planning principle as part of this document is to facilitate accessible and healthy environments, which includes creating high quality and inclusive environments in which people can live, work, travel and play.

Neath Port Talbot CBC Local Development Plan (2011-2026)

13.3.3 Strategic Policy SP2 Health includes the development of sustainable, safe and confident communities. It includes a commitment to improve accessibility within and between communities to encourage active travel and the provision of new employment opportunities.

Powys Local Development Plan (2011-2026)

13.3.4 The Powys Local Development plan does not have specific policies related to health but has a broad overarching theme to support healthy communities. It has a specific objective to promote development that supports community wellbeing and cohesion, including encouraging healthy lifestyles.

¹ Welsh Government. Planning Policy Wales, 2018. Available at: <https://gov.wales/planning-policy-wales>

Relevant guidance

Wales Health Impact Assessment Support Unit (WHIASU) Health Impact Assessment – A practical guide (2011)

- 13.3.5 The WHIASU Guidance describes the process and methods used to undertake a health assessment and provides resources to support the assessment. It includes checklists for identifying the health determinants and vulnerable groups relevant to the health assessment being undertaken. This checklist has been used to inform the health determinants assessed in this chapter.

Rapid Health Impact Assessment Tool, National Health Service (NHS) London Healthy Urban Development (Unit) (2017)

- 13.3.6 HUDU work with local and national organisations across the UK on behalf of the NHS to enable health and planning sectors to work together. The HUDU tool is designed to assess the likely health impacts of development plans and proposals and identifies those determinants of health which are likely to be influenced by a specific development proposal.

IMPACT Urban Health Impact Assessment methodology, Liverpool University (2015)

- 13.3.7 The IMPACT methodology sets out a process for assessing health effects and improving health outcomes.

13.4 Scoping and consultation

Scoping

- 13.4.1 The Scoping Report sets out the approach taken for the health and wellbeing assessment. This was submitted to Neath Port Talbot County Borough Council and Powys County Council in September 2019.
- 13.4.2 Table 13.1 sets out the comments received in the Scoping Opinion related to the health and wellbeing assessment.

Table 13.1: Response to scoping opinion

Scoping opinion clause	Response
Ensure relevant assessments within the ES are cross-referred to in the assessment.	Relevant assessments have been referred to throughout the health assessment.
Consider the impact of the increase in use of the rail link and the impact this has on communities the route passes through.	This has been considered throughout the assessment. The baseline study area extends to include those areas along the rail link and where relevant, impacts on these communities are considered in the assessment.

Consultation

- 13.4.3 No further consultation comments were received during the preparation of the health assessment.

13.5 Methodology

Overview

- 13.5.1 The health and wellbeing assessment is based on the identification of ‘health determinants’, i.e. the social, economic and environmental factors that can influence the health and wellbeing of a population. The assessment assesses the beneficial and adverse health effects associated with changes to health determinants resulting from the proposed development.
- 13.5.2 The study area for the health and wellbeing assessment is based on the spatial distribution of the environmental and socio-economic impacts of the proposed development and the location of sensitive receptors. It predominantly focuses on local communities surrounding the site and along the branch line, and also follows the study areas of other topics, such as transport, noise and socio-economics.
- 13.5.3 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The health assessment methodology is however based on a review of evidence, linking changes in health determinants to potential health outcomes.

Methodology for establishing baseline conditions

- 13.5.4 The baseline consists of a community profile of the area surrounding the site. This is summarised in Section 13.7 and set out fully in Appendix 13A.
- 13.5.5 Using publicly available data, the community profile presents a summary of the demographic, social and health characteristics of the population. Sources include Office of National Statistics (ONS) census and mid-year data, Public Health the Welsh Index of Multiple

Deprivation (WIMD) 2019, StatsWales, NHS Wales Informatic Services and the Public Health Wales Observatory.

- 13.5.6 The community profile provides an overview of the population's resilience to health effects, and the prevalence and distribution of vulnerable sub-groups who may be more sensitive to changes in health determinants (e.g. deprived communities, people with existing health problems or disabilities, older people and children).

Methodology for evidence review

- 13.5.7 Publicly available literature has been reviewed to identify evidence linking health determinants with health outcomes, including government publications, research papers and peer-reviewed journal articles.

- 13.5.8 The full evidence review is set out in Appendix 13B and forms the basis of the qualitative assessment of health effects of the proposed development that is set out in Section 13.8.

Assessment methodology

- 13.5.9 Once the community profile and evidence review have been established, the assessment is undertaken in the following stages:

Assessment of effects

- 13.5.10 A qualitative assessment of the likely significant health effects is undertaken based on the level of exposure of the population to changes in health determinants.
- 13.5.11 A review of the health determinants set out in the WHIASU guidance was undertaken and the following health determinants are assessed in this chapter:
- Social capital²;
 - Transport and connectivity;
 - Open space and nature;
 - Neighbourhood quality (covering air quality, noise and visual amenity);
 - Climate change; and
 - Employment and economy.
- 13.5.12 The assessment identifies potential impacts related to the different stages of development (i.e. construction and operation) and identifies whether these would result in changes to health determinants that

² The ONS (2015) defines social capital as: '*social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust.*' (Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/measuringnationalwellbeing/2015-01-29>)

would be beneficial or adverse, direct or indirect and long-term or temporary. It also takes into account any mitigation measures embedded into the design of the proposed development.

13.5.13 The approach for defining significance considers:

- the magnitude of the impact on a health determinant; and
- the size and sensitivity of the population exposed to the impact.

13.5.14 Most potential health effects cannot be reliably quantified because there are currently no robust or scientifically widely agreed upon methods for quantifying them, or because the types of data required cannot realistically be obtained. It is possible in theory to quantify health effects from increased exposure of a large population to noise and air emissions. However, given the relatively short duration of impacts and small number of people likely to be exposed, it would not be possible to identify a statistically significant effect. Therefore, a quantitative assessment of health effects was scoped out.

Magnitude

13.5.15 The magnitude of an impact relates to its severity and/or scale. Magnitude is determined by professional judgement, based on defined assessment criteria (Table 13.2). The characteristics of an impact (i.e. whether direct or indirect, secondary or cumulative, short, medium or long-term, permanent or temporary, reversible or irreversible) is assessed and the magnitude classified as high, medium, low or very low. The assessment of magnitude also considers the nature of potential health outcomes associated with the change, e.g. effects on physical or mental health conditions, quality of life, or comfort.

Table 13.2: Methodology for assessing magnitude of impact

Magnitude	Guidelines
High	<p>A substantial change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> • assessed as ‘major’ by relevant environmental topics (where applicable³); • likely to be perceived by the population as a major change; • has the potential to affect the occurrence of acute or chronic mental or physical illness; • long term duration or permanent.
Medium	<p>A moderate change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> • assessed as ‘moderate’ by relevant environmental topics (where applicable³);

³ Other EIA topics’ assessment results are not always relevant to the health assessment. For example, a ‘major’ effect on an individual receptor would not necessarily constitute a major change to a health determinant that would affect the population as a whole. Professional judgement is required when using information from other topics in the health assessment.

	<ul style="list-style-type: none"> likely to be perceived by the population as a moderate change; has the potential to improve / reduce mental wellbeing or quality of life, exacerbate / alleviate symptoms of existing illness, or cause nuisance impacts; medium to long-term duration.
Low	<p>A minor change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> assessed as ‘minor’ by relevant environmental topics (where applicable³); likely to be perceived by the population as a minor change; has the potential to lower or raise wellbeing in terms of levels of comfort and contentment (for example in relation to noise, odour, or visual amenity); short to medium term duration.
Negligible	A ‘negligible’ magnitude of impact is likely to be perceptible and localised. It may have the potential to lower or raise wellbeing in terms of levels of comfort and contentment.

Population exposure

13.5.16 The level of population exposure is defined by a combination of two factors: the size of the population exposed to an impact and its vulnerability to health effects. The size of the exposed population is judged on a scale of high, medium, low and very low, dependent on geographical area and number of people exposed. The vulnerability of the population is also judged on a scale of high, medium, low and very low based on indicators of the health and social status of the population (**Table 13.3**). More vulnerable populations include those with higher levels of social deprivation or relatively poor health status.

Table 13.3: Guidelines for the assessment of population exposure and vulnerability

Rating	Guidelines	
	Population exposure	Population vulnerability
High	A high level of exposure would occur over a wide geographical area and/or be likely to affect a large number of people (e.g. over 500).	Affected population includes a higher than national average proportion of vulnerable or disadvantaged groups (such as children or older people) who are more likely to experience adverse health effects as a result of the impact in question.
Medium	A medium level of exposure would occur over a relatively localised area and/or be likely to affect a moderate-large number of people (e.g. 100-500).	Affected population includes an average or close to average proportion of vulnerable or disadvantaged groups who are more likely to experience adverse health effects as a result of the impact in question.
Low	A low level of exposure would cover a small, local area and/or affect a small number of people (e.g. fewer than 100).	Affected population includes a below average proportion of vulnerable or disadvantaged groups who are more likely to experience adverse health effects as a result of the impact in question.

Very low	A very low level of exposure would affect a small number of individuals.	Not applicable (no population is considered)
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13.5.17 Population exposure and population vulnerability are then combined to give an overall judgement on population sensitivity, on a scale of high, medium, low or very low (**Table 13.4**).

Table 13.4: Population sensitivity matrix

Population exposure	Population vulnerability			
	High	Medium	Low	Very low
High	High	High	Medium	Low
Medium	High	Medium	Low	Low
Low	Medium	Low	Low	Very low
Very low	Low	Low	Very low	Very low

Significance criteria

13.5.18 To determine overall significance of impact, the assessment matrix provided in **Table 13.5** was used. This classifies significance of health impacts as major, moderate, minor or negligible. For the purpose of the EIA, a significant impact is defined as any health impacts **identified as moderate and above**.

Table 13.5: Significance of impact

Magnitude of impact	Population sensitivity			
	High	Medium	Low	Very low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Minor
Very low	Minor	Minor	Negligible	Negligible

Mitigation

13.5.19 If required, a description of further measures to be incorporated to reduce the adverse and/or enhance the beneficial effects of the proposed development on health determinants is described.

Design mitigation

13.5.20 A number of mitigation measures incorporated into the design are relevant to the health assessment including:

- A Construction Traffic Management Plan (CTMP) including traffic measures such as safe access routes, correct signage and wayfinding;

- Noise barriers (2m high on the northern and southern sides of the test track and 3m high along the southern perimeter of the washery facility and sidings);
- A landscape bund on the eastern side of the track;
- Mitigation planting to screen the site and minimise visual impact;
- Train carriages to be unlit during any night-time operations; and
- Positioning taller features (overhead line equipment and trains) furthest back from the embankment and planting to ensure screening is most effective.

13.5.21 Further measures are described in the relevant environmental topic chapters.

Assumed construction practices

13.5.22 An outline construction environmental management plan (CEMP) has been prepared for the proposed development (Appendix 3A). Construction practices relevant to the health assessment include:

- Construction activity will typically be confined to 08.00-18.00 hours, Monday to Friday and 08.00-13.00 hours on Saturdays.
- Where working is required outside of the above hours for safety or engineering practicability reasons, the works to be carried out during these extended hours will be discussed and agreed with the local Environmental Health Officer in advance of the works commencing
- Minimising the emissions of dust and particulate matter through prevention or reducing at source;
- Locate dusty and noisy activities away from receptors as far as possible;
- Ensure all vehicles and machinery are switched off when not in use; and
- Develop and implement a stakeholder communication plan.

13.5.23 Further measures are described in the relevant environmental topic chapters.

13.6 Limitations and assumptions

13.6.1 The assessment draws on the assessment outputs from other disciplines within the ES (traffic and transport (Chapter 5), landscape and visual (Chapter 9), noise (Chapter 10), socio-economics (Chapter 12) and air quality (Chapter 14)) that are relevant to the health determinants considered in the health assessment.

- 13.6.2** The assessment considers the residual impacts identified by the above disciplines, that is, after mitigation measures, such as landscape planting, have been taken into account. It also assumes that any mitigation outlined by these topics would be effective. The findings from these assessments inform the judgements made within the assessment.
- 13.6.3** Literature and baseline data used in the health assessment is limited to readily available public and published sources.
- 13.6.4** The health assessment identifies the impacts on the determinants of health, but there is less certainty regarding the resulting health effects of that impact as it is often dependent on a range of other factors. For example, the proposed development may improve opportunities for active travel, but the uptake of those opportunities by the population is less certain due to the individual choices people make.

13.7 Baseline Environment

A detailed description of the community profile is set out in Appendix 13A. The key findings are set out below.

- 13.7.1** Data related to population, health and wellbeing is provided at a variety of scales. Where possible, the lowest scale is used. The following study areas are used throughout the baseline:
- Local authority level: Powys and Neath Port Talbot (NPT);
 - Ward level: Aber Craf and Tawe Uchaf (Powys) and Onllywyn and Seven Sisters (NPT); and
 - Lower Super Output Area (see **Table 13.6**).

Table 13.6: LSOAs within the study area

LSOAs in proximity to the proposed development	
Aber Craf – W01000426	Tawe-Uchaf – W0100496
Aberdualis – W0100887	Ynyscedwyn – W0100502
Crynant – W0100918	Ystradgynlais 1 – W0100504
Onllywn – W01000944	Ystradgynlais 2 – W0100505
Seven Sisters – W0100965	

- 13.7.2** At the local authority level, NPT has a population of 142,906 and Powys has a population of 132,447⁴. Both areas have high elderly populations, with 21% of NPT and 27% of Powys aged 65 and over, compared with 18% across Wales.

⁴ Office for National Statistics (ONS), 2018. Mid-year population estimates. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates>

13.7.3 In terms of ethnicity, data from the 2011 Census shows that between 98% and 100% of residents in the LSOAs in proximity to the proposed development identify as white ethnicity⁵.

13.7.4 The Welsh Index of Multiple Deprivation (2019) (WIMD)⁶ provides a measure of relative deprivation across Wales. **Table 13.7** shows the overall deprivation rank for the LSOAs in proximity to the proposed development. It indicates that generally the areas around the site are not very deprived, with the exception of Ystradgynlais 1 which is considered to be one the most deprived areas in Wales.

Table 13.7: WIMD 2019 deprivation scores

LSOA	WIMD – overall deprivation		WIMD – health deprivation	
	WIMD Score ¹	WIMD Rank ²	WIMD Score ¹	WIMD Rank ²
Aber Craf	950	4	616	4
Aberdualis	735	4	700	4
Crynant	1206	5	948	4
Onllywn	508	3	398	3
Seven Sisters	552	3	432	3
Tawe-Uchaf	847	4	955	4
Ynyscedwyn	1198	5	895	4
Ystradgynlais 1	117	1	105	1
Ystradgynlais 2	821	4	711	4

¹Where 1 is most deprived and 1909 is the least deprived
²Where 1 is most deprived 10% of LSOAs and 5 is the least deprived 50%

13.7.5 **Table 13.7** also shows Ystradgynlais 1 to be one of the most deprived areas of Wales in terms of health deprivation, whereas the other LSOAs are considered to be relatively healthy.

13.7.6 In terms of healthy lifestyles, The Public Health Wales Observatory identifies that approximately 18% of children ages 11-16 are considered to be physically active, and both Powys and NPT have the same percentage as this national average⁷. For adults, Powys has a much higher rate of physical activity, with 64% of adults considered to be physically active (defined as 150 minutes or more of physical activity in a week), compared with 53.1% nationally⁸. NPT however is below average, with only 48.4% of adults considered to be physically active.

⁵ Office for National Statistics (ONS), 2011. 2011 Census – ethnicity. Available at: <https://www.nomisweb.co.uk/census/2011>

⁶ Welsh Index of Multiple Deprivation, 2019. Available at: <https://wimd.gov.wales/explore?lang=en#domain=overall&z=8&lat=52.4137&lng=-4.2000>

⁷ Public Health Wales Observatory, 2017/18 data. *Physical activity in adolescents*. Available at: <https://public.tableau.com/profile/publichealthwalesobservatory>

⁸ Public Health Wales Observatory, 2016/17 – 2018/19 data. *Physical activity in adults*. Available at: <https://public.tableau.com/profile/publichealthwalesobservatory>

- 13.7.7** The socio-economic baseline (Chapter 12) has also been used to inform this assessment in terms of employment and economy. It states that according to the 2011 Census, at the local level, economic activity is low with a total economic activity of 61.6% compared to 62.3% for NPT, 69.6% for Powys and 65.8% across Wales⁹.
- 13.7.8** In NPT 75.7% of those aged 16-64 are economically active with an employment rate of 72.7%. These figures fall just below the Welsh figures of 76.5% and 73.2% respectively. In Powys, 78.1% are economically active, with the overall employment rate standing at 76%¹⁰.
- 13.7.9** In terms of key sectors across the local area, the largest employment sector (by broad industrial group) is health which employs 20.4% of total employees. Other notable sectors include construction, manufacturing and accommodation and food services each of which employ 10% of the local working population¹¹.

13.8 Assessment of effects

Assessment of effects from construction

Transport and connectivity

- 13.8.1** Evidence shows that accessibility for local residents to community facilities, public services and employment has a direct positive effect on human health (see Appendix 13B).
- 13.8.2** There are a number of Public Rights of Way (PRoW) which traverse the site. These link east to west connecting villages including Penrhos and Onllwyn onto Banwen, and north to south between Caehopkin and Severn Sisters. The Route 43 of the National Cycle Network (NCN) also runs adjacent to the north edge of the site. Further details are provided in Chapter 5, Traffic and Transport.
- 13.8.3** All PRoW that traverse the site are currently not in operation due to the existing coal mining operations at Nant Helen. Planning permission associated with the earthworks to restore the existing coal mining site has been granted, but it is not anticipated that the PRoW would be restored prior to construction of the proposed development.
- 13.8.4** All PRoW which would experience direct impacts would therefore be permanently diverted to created improved routes for different users which navigate around the site. Any required diversions would be completed in advance of works and where safe to do so, access on the PRoW network surrounding the site would be maintained during

⁹ Office for National Statistics (ONS), 2011. 2011 Census – economic activity. Available at: <https://www.nomisweb.co.uk/census/2011> ONS Census (2011)

¹⁰ ONS (2019) Annual Population Survey, Estimate 12 months to June. Available at:

<https://www.nomisweb.co.uk/query/construct/components/date.asp?menuopt=13&subcomp=>

¹¹ ONS (2015) Business Register and Employment Survey

construction. Further detail will be set out within a Public Rights of Way and Common Land Strategy, to be submitted as part of the Outline Planning Application.

- 13.8.5 Additionally, along the branch line, there are a number of points where designated PRoW cross the existing rail line (See Chapter 12 Socio-economics, Table 12.13). During construction train movements along the railway would not increase beyond current usage. Therefore, it is anticipated that the use of these PRoW along the branch line would continue as normal.
- 13.8.6 In terms of road connectivity, the site is well-connected to an existing network of major A-roads. The traffic and transport assessment (Chapter 5) sets out that during the construction phase, the road network would operate within the existing capacity without noticeable queues or delays to drivers, pedestrians or cyclists. Construction traffic will also access the site via existing entrances, with HGVs using the A4221 Washery and Distribution centre access.
- 13.8.7 Nevertheless, the presence of increased HGVs during construction may give rise to perceptions of additional road safety risks, particularly for vulnerable groups (such as children, older people and disabled people).
- 13.8.8 A CTMP would form part of planning condition. The transport assessment (Chapter 5) sets out a number of measures including: the provision of alternative walking routes to ensure safe access across the all PRoW and construction traffic measures, such as correct signage and wayfinding, to minimise highway disruptions.
- 13.8.9 Therefore, the impact on transport and connectivity during construction is expected to result in a low magnitude. The PRoW that currently traverse the site are not in use and would be diverted prior to construction. Additionally, the increase in construction vehicles it not anticipated to be noticeable. The population sensitivity is assessed as low based on:
- Low population exposure: as delays or route changes due to construction activity are not anticipated; and
 - Medium population vulnerability: due to the presence of a small number of vulnerable groups in the local area.
- 13.8.10 Therefore, this is likely to result in a temporary **minor** adverse effect which is **not significant**.

Open space and nature

- 13.8.11 As described above, a number of PRoW traverse the site or are in proximity. The NCN 43 is also adjacent to the northern site boundary. However, the PRoW that traverse the site are currently not in use.

- 13.8.12 The health evidence base (Appendix 13B) sets out a range of evidence demonstrating the mental and physical health and wellbeing benefits associated with green and open space. Benefits include: physical benefits associated with obesity, life expectancy and blood pressure; attention and cognitive benefits; self-reported benefits in terms of health and life satisfaction; and community cohesion.
- 13.8.13 The presence of construction activity could deter the use of the local walking and cycling routes due to concerns around construction noise, emissions and visual intrusion impacting the amenity of these routes. The landscape and visual assessment (Chapter 9) identifies moderate to major (significant) adverse effects from a number of viewpoints used by recreational receptors. This is due to the presence of construction works including: the laying of track bed and track; erection of overhead line equipment; erection of signals, fencing and acoustic barriers; and construction of vehicle access route alongside the track.
- 13.8.14 However, the PRow network surrounding the site is extensive (See the Transport Assessment) and therefore a range of alternative recreational routes would be available in proximity to the proposed development. A Public Rights of Way and Common Land Strategy is also submitted as part of the Outline Planning Application and includes a more detailed approach to managing impacts on the PRow network. Overall the Strategy seeks to create a more circular, multi-user recreational route.
- 13.8.15 Therefore, the impact is expected to result in a medium magnitude health effect due to the temporary reduction in the amenity of the rural PRow network. However, a Public Rights of Way and Common Land Strategy will develop long-term improvements to the network. The population sensitivity is low based on:
- Low population exposure: due to the relatively small population in the rural area, the transient nature of PRow users, and the range of alternative PRow available;
 - Low population vulnerability: this effect is the same across all groups, including those with vulnerabilities.
- 13.8.16 Therefore, this is likely to result in a temporary **minor** adverse effect, which is **not significant**.

Climate change

- 13.8.17 The construction period for the proposed development is between 2021 and 2025. It is not considered that there would be a significant change in the local climate over this time period which would affect health.
- 13.8.18 The construction works have the potential to contribute to climate change. The climate change assessment (Chapter 15) estimates that it would result in 67.5 KtCO₂e of GHG emissions, representing 0.2% of

the emissions for the Neath Port Talbot and Powys region combined. Whilst this would be a significant effect from a climate change perspective, this change in emissions would not be perceptible by local residents and therefore there would be no effects from a health and wellbeing perspective.

Air quality, noise and neighbourhood quality

- 13.8.19** Construction activities and increased Heavy Goods Vehicles (HGV) traffic on roads could result in adverse changes to the outdoor neighbourhood amenity. This is due to increased noise, dust and changes in visual amenity from construction activities and from construction traffic on the local road network.
- 13.8.20** The health evidence review (Appendix 13B) demonstrates that changes in air quality can affect respiratory health and air quality is considered a major health problem by the WHO. Additionally, excessive noise can interfere with people's daily activities, disturb sleep, cause cardiovascular and psychophysiological effects, reduce performance and provoke annoyance responses and changes in social behaviour.
- 13.8.21** The noise assessment (Chapter 10) has not identified any significant residual noise effects from construction traffic or activities.
- 13.8.22** Although air quality can affect respiratory health, the scale of impact from changes in air quality is too small to give rise to any measurable effects on the health of the population (Chapter 14). The CEMP also includes a number of measures in relation to air quality including the development of a Dust Management Plan, keeping dust-causing activities away from receptors, erecting barriers around dusty activities and no idling vehicles. Further measures are described in Chapter 14.
- 13.8.23** Nevertheless, it is likely that the community will be concerned about the health effects of construction emissions, particularly with regards to children's health and those with existing respiratory conditions. Additionally, dust from construction sites has the potential to cause nuisance and irritation.
- 13.8.24** The visual assessment (Chapter 9) identifies a major adverse impact on residential receptor's views south from the western edge of Ynswen, as construction activities or the northern embankment would be very visible within an otherwise rural backdrop. The assessment also identifies moderate adverse impacts on residential receptor views from Ystradgynlais Footpath 4 and north/north-west from properties on the A1049, due to the presence of construction activity in views which feature open landscapes.
- 13.8.25** The combination of impacts on environmental amenity has the potential to give rise of negative feelings in relation to quality of life

and the local environment. This could change behaviours, such as deterring the use of outdoor spaces during the construction phase.

13.8.26 The impact is expected to result in a low magnitude health effect. There is likely to be a temporary impact on mental wellbeing and quality of life, but mitigation measures are in place to manage impacts. The population sensitivity is assessed as medium based on:

- Medium population exposure: due to the temporary nature of construction activities and mitigation measures in place; and
- Medium population vulnerability: due to the presence of a small number of vulnerable groups in the local area.

13.8.27 Therefore, this is likely to result in a temporary **minor** adverse effect which is **not significant**.

Employment and economy

13.8.28 As set out in the socio-economic assessment (Chapter 12), it is estimated that between 80 and 244 jobs could be created during construction. It is anticipated that approximately 10 and 20% of these jobs would be specialist jobs, whilst the remaining jobs would primarily be locally sourced (see Chapter 12 Socio-economics).

13.8.29 The proposed development would also support a wider supply chain and service industries in the local area, such as food outlets and accommodation providers. Any new employment or increase in profit generated by the construction workforce is likely to bring positive effects to the local economy and be beneficial to the wellbeing of the local communities within these supply chains.

13.8.30 As outlined in the socio-economics baseline, the 2018 Business Register and Employment Survey (BRES) identified that 10% of the population work in the construction industry and therefore the construction of the proposed development is likely to support a sizeable local workforce.

13.8.31 The socio-economic baseline also shows that Powys and NPT have similar levels of unemployment to the national level. The IMD Employment score (see health baseline, Appendix 13A) however does indicate some areas of employment deprivation at the more local level, for example in LSOA Ystradgynlais 1.

13.8.32 The health evidence review (Appendix 13B) describes how good employment is known to have psychological benefits, improve life expectancy and enable healthier lifestyle choices (as a result of reliable income).

13.8.33 Therefore, the impact on employment and economy is expected to result in a low magnitude effect as it is likely to generate local employment and local spending over the duration of the construction period. The population sensitivity is assessed as high based on:

- Medium population exposure: due to the relatively high construction workforce in the local area: and
- High population vulnerability: due to the presence of some areas of local employment deprivation.

13.8.34 This is likely to result in a temporary **moderate beneficial** effect which is **significant**.

Assessment of effects from operation

Transport and connectivity

13.8.35 The transport assessment (Chapter 5) does not identify any increase in driver or pedestrian delay during operation of the proposed Development.

13.8.36 Appropriate footpaths will also be provided along Onllwyn Road to the site entrance, allowing for a safe pedestrian crossing around Onllwyn Road and Wembley Avenue. The development will also connect with the NCN 43 to enable cycling accessibility.

13.8.37 Additionally, any PRoW directly impacted by the proposed development will be diverted and a Public Rights of Way and Common Land Strategy is to be submitted as part of the outline planning application. This Strategy seeks to create a more coherent network of PRoW, suitable for multiple users.

13.8.38 Along the branch line are a number of points where designated PRoW cross the branch line, further details and images are provided in Chapter 12 Socio-economics. During operation train movements are not expected to increase in frequency and therefore no impacts on PRoW along the branch line are anticipated.

13.8.39 Therefore, the operation of the proposed development is anticipated to result in a low magnitude health effects as the development is not anticipated to cause significant disruption to road users, cyclists or pedestrians. Measures are also in place to improve local connectivity and the PRoW network, resulting in an overall beneficial effect. The population sensitivity is assessed as low based on:

- Low population exposure: due to the transient nature of users and improved connectivity; and
- Low population vulnerability.

13.8.40 This is likely to result in a **minor beneficial** effect which is **not significant**.

Open space and nature

13.8.41 As described above, there is an extensive network of PRoW in proximity to the site. Many of these routes would be used for

recreational purposes and allow access to the open space and nature of the surrounding area.

13.8.42 A Public Rights of Way and Common Land Strategy is submitted as part of the outline planning application. Overall, this Strategy seeks to create a more circular and coherent network of PRow suitable for different users, based on the existing bridleway to the south of the site, and the NCN to the north.

13.8.43 However, the landscape and visual assessment (Chapter 9) identifies significant adverse effects on recreational receptors, due to views of rail infrastructure and passing trains, from the following views:

- south-east from Ystradgynlais Bridleway 61 within the Brecon Beacons National Park;
- south from Ystradgynlais Footpath 64 within the Brecon Beacons National Park;
- east from Ystradgynlais Footpath 4;
- south from National Cycle Network Route 43; and
- south-west from Tawe-Uchaf Footpath 5.

13.8.44 Rail infrastructure and facilities at the location of the old coal washery would be visible from:

- south from the Trig Point on Cribarth;
- south-west from dismantled Neath & Brecon Railway line; and
- north from Sarn Helen Roman Road and Byway 28/39.N.Hi/1, along the ridge of Hirfynydd.

13.8.45 Additionally, there would be major significant adverse effects on recreational receptors from views north-east from Ystradgynlais Footpath 10 due to the proximity to rail infrastructure, fast moving trains and facilities associated with the rail testing loops. This would impact the views of immediate rural upland views and the wider views of the Brecon Beacon National Park.

13.8.46 Significant adverse effects on views north-east from Ystradgynlais Footpath 10, south from Trig Point on Cribarth, south from Ystradgynlais Footpath 64 and from the NCN Route 43 are expected at year 15 of operation. This is due to the proximity of the proposed development which would dominate views and change the character of the cycleway.

13.8.47 As described above, the evidence base (Appendix 13B) sets out how access to open space and nature can have beneficial effects on mental and physical health and wellbeing. Therefore, significant changes to the tranquillity of these routes and the rural surroundings could reduce access to associated health and wellbeing benefits.

13.8.48 This is likely to result in a medium magnitude effect due to the long-term changes to the recreational routes in the area. However, the Mitigation Strategy seeks to improve the overall PRoW network for different users. The sensitivity is assessed as low based on:

- Low population exposure: due to the relatively small population in the rural area, transient users of the PRoW and the range of alternative PRoW available;
- Low population vulnerability.

13.8.49 Therefore, effects on health are assessed as **minor adverse**, which is **not significant**.

Climate change

13.8.50 The proposed development seeks to minimise greenhouse gas emissions by measures including using the existing rail and road network and the provision of new footpath connections to Onllwyn and connection to the NCN 43 route to encourage active travel to the site. However, the operation of the proposed development would still generate greenhouse gas emissions and within the climate change assessment (see Chapter 15) all emissions are considered significant.

13.8.51 From a health perspective, this is likely to result in a very low magnitude effect as any changes in emissions are unlikely to be perceptible to the local population. The sensitivity is assessed as low based on:

- Low population exposure: and
- Low population vulnerability: this effect is not anticipated to exacerbate vulnerabilities.

13.8.52 Therefore, this is anticipated to have a **negligible** effect on health, which is **not significant**.

Air quality, noise and neighbourhood quality

13.8.53 The visual assessment identifies a major adverse effect on residential receptors during the first year of operation from the view south from western edge of Ynswen due to the presence of rail infrastructure including: overhead line equipment; signals, fencing and acoustic barriers. This would be visible across the hillside, introducing urban features into the current rural view.

13.8.54 Additionally, during the first year of operation moderate adverse effects on residential receptors are identified, due to the presence of rail infrastructure and passing trains, from the following views:

- western edge of Ynswen;
- south from Tanygarth, Abercraf;

- east from Gwrhyd Road, Pen-Rhiwfawr, on the north-eastern lower slopes of Mynydd Uchaf;
- south-west from Station Road, Coelbren and western end of Tawe-Uchaf Footpath 1;
- north-east from School Road, Ystalyfera; and
- north / north-west from properties on the A1049.

13.8.55 Therefore, local residents would experience a significant change to the existing rural environment. By year 15 of operation all views would reduce to minor adverse effects which is not significant. This is due to screening of the infrastructure by established mitigation planting implemented as part of the Nant Helen Complementary Restoration Earthworks or mitigation planting as part of this proposed development.

13.8.56 The noise assessment does not identify any significant operational effects. Significant embedded mitigation measures, such as noise barriers and landscape bunds, are included in the design to minimise noise impacts, as described in paragraph 13.5.20. Nevertheless, sensitivity to noise is subjective and some people may be particularly sensitive to even small changes in noise, even those that are assessed as not significant. As a result, operation of the proposed development could result in disturbance to local communities in proximity to the site due to changes in the noise environment, including some night-time operation.

13.8.57 The scale of impact from changes in air quality during operation is assessed as negligible and would not give rise to any measurable effects on the health of the population (see Chapter 14 Air quality).

13.8.58 The combined impact on air quality, noise and neighbourhood quality is expected to result in a low magnitude health effect. In consideration of the other assessments long-term impacts are assessed as not significant. The population sensitivity is assessed as medium based on:

- Medium population exposure: due to impacts likely to be localised to a small number of residents in proximity to the proposed development; and
- Medium population vulnerability: due to the presence of some vulnerable groups in the local area.

13.8.59 Therefore, effects on health are assessed a **minor adverse** effect which is not **significant**

Employment and economy

13.8.60 As set out in the socio-economic chapter, approximately 179 jobs will be created at GCRE. Between 55 and 75 indirect jobs could also be created through the supply chain. Additionally, GCRE would look to

provide training and employment opportunities through partnerships with local further education institutions.

13.8.61 As outlined in the socio-economic baseline, the 2018 BRES Survey identifies pockets of the local population (ward level) in relevant industries such as business administration and support services (9.6%) and transport and storage (3.1%) (see Chapter 12, Socio-economics). Additionally, as set out in paragraph 13.8.31 of this chapter, pockets of employment deprivation exist locally.

13.8.62 The impact on employment and economy is expected to result in a very low magnitude effect as it is likely to generate employment opportunities relevant to a small proportion of the local workforce. The jobs are anticipated to be highly skilled and therefore may not come from the immediate community. The population sensitivity is assessed as medium based on:

- Low population exposure: due to the provision of a small number of jobs created which are relevant to a small proportion of the local workforce; and
- High population vulnerability: due to the presence of some areas of income and employment deprivation.

13.8.63 Therefore, this is likely to result in a **minor beneficial** effect which is **not significant**.

Social capital

13.8.64 Connectivity and severance relate closely to social capital, with actual and perceived barriers potentially reducing access to key social networks and facilities.

13.8.65 As described in paragraph **Error! Reference source not found.**, operation of the proposed development is likely to result in a small increase in road transport.

13.8.66 However, this increase in road trip generation is not expected to be significant or result in any physical changes to the local highway network (see Chapter 5 Traffic and Transport). Additionally, the number of trains along the branch line are not anticipated to increase during operation and therefore the P_{RoW} network along the branch line will not be impacted by operational activities.

13.8.67 In addition, mitigation measures would be put in place, such as a site wide Travel Plan which will be used as a means of monitoring the transport situation and encouraging sustainable transport journeys.

13.8.68 Therefore, this is likely to result in a very low magnitude effect as the increased trip generation is not anticipated to be noticeable. The population sensitivity is assessed as very low based on:

- Very low population exposure; and

- Very low population vulnerability: this effect is not anticipated to exacerbate vulnerabilities.

13.8.69 Therefore, this is likely to result in a **negligible** health effect which is **not significant**.

13.9 Mitigation and enhancement

13.9.1 The health assessment takes into account mitigation measures incorporated by traffic and transport, air quality, noise and vibration, socio-economics and LVIA to reduce the adverse effects of the proposed development on people and the environment. There are no health related mitigation measures proposed additional to those.

13.10 Residual effects

13.10.1 No further mitigation is proposed and therefore the effects are as described above.

13.11 Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Residual Significance
Affects from construction traffic and activity on local traffic levels and access	Residents in proximity to the proposed development and along the branch line	Low	Low	Not significant (minor adverse)	N/A	N/A	Not significant (minor adverse)
Impacts from construction activity on access to the surrounding open space and natural environment, and the recreational enjoyment of the local PRow network.	Residents in proximity to the proposed development and along the branch line, and recreational users of the wider PRow network	Medium	Low	Not significant (minor adverse)	N/A	N/A	Not significant (minor adverse)
Effects from construction activities and traffic on neighbourhood quality (including air quality, noise and visual amenity).	Residents in proximity to the proposed development and along the branch line	Medium	Low	Not significant (minor adverse)	N/A	N/A	Not significant (minor adverse)
Increased access to employment opportunities during construction	Job seekers, particularly those in the construction industry	High	Low	Significant (moderate beneficial)	N/A	N/A	Significant (moderate beneficial)
Impact on local traffic levels and accessibility during operation of the proposed development	Residents in proximity to the proposed development and along the branch line	Low	Low	Not significant (minor beneficial)	N/A	N/A	Not significant (minor beneficial)
Impact due to operational activity on access to the surrounding open space and natural environment, and the recreational enjoyment of the local PRow network	Residents in proximity to the proposed development and along the branch line	Low	Medium	Not significant (minor adverse)	N/A	N/A	Not significant (minor adverse)
Impacts on climate change associated with operation of the proposed development.	Local and wider community	Very low	Low	Not significant (Negligible)	N/A	N/A	Not significant (Negligible)

Effects from operational activities and traffic on neighbourhood quality (including air quality, noise and visual amenity).	Residents in proximity to the proposed development and along the branch line	Medium	Low	Not significant (minor adverse)	N/A	N/A	Not significant (minor adverse)
Increased access to employment opportunities during operation.	Job seekers and local residents	Medium	Very low	Not significant (minor beneficial)	N/A	N/A	Not significant (minor beneficial)
Impacts on social capital during operation	Residents in proximity to the proposed development and along the branch line	Very low	Very low	Not significant (negligible)	N/A	N/A	Not significant (negligible)

14 Air Quality

14.1 Introduction

14.1.1 This chapter describes the likely significant effects of the proposed development on air quality. It outlines the methodology of assessment, the baseline conditions and the likely significant air quality effects associated with the construction and operation of the proposed development. Mitigation measures which would be implemented to minimise the effect of the proposed development on air quality are also described, where relevant.

14.2 Review of proposed development

14.2.1 The development proposals for GCRE are described in detail in Chapter 3 of the ES. In relation to air quality the proposed development is likely to generate changes to the amount of traffic which has the potential for causing an adverse air quality impact due to the emissions from construction and operational traffic.

14.2.2 The proposed development involves the testing of new rail locomotives and rail infrastructure. In the short to medium term, both activities would include the use of diesel locomotives introducing a new source of air pollutant emissions into the locality. Pollutants relevant to the assessment include particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂) and sulphur dioxide (SO₂).

14.3 Legislation, policy context and guidance

14.3.1 The key national, regional and local legislation and policy, as well as technical guidance have been considered in relation to this assessment.

Legislation

European Air Quality Management

14.3.2 In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC). This Directive defined the policy framework for 12 air pollutants, including NO₂, known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant were set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive), which sets limit values for NO₂ and particulate matter (amongst other pollutants) in ambient air.

14.3.3 In May 2008, the Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above (apart from the 4th Daughter Directive) and makes provision for extended compliance deadlines for NO₂ and PM₁₀.

14.3.4 The limit values defined in the Directive are legal requirements and compliance with these is reported on an annual basis by the Department for Environment, Food and Rural Affairs (Defra). The Directive requires the UK to be divided into zones for the purposes of air quality management and assessment.

14.3.5 The EU Directive was transposed into national legislation in Wales by the Air Quality Standards (Wales) Regulations 2010¹ (National Assembly for Wales, 2010).

National objectives

14.3.6 The current Air Quality Strategy for England, Scotland, Wales and Northern Ireland² was published in 2007. This set the strategy for meeting the air quality objectives. The Local Air Quality Management (LAQM) system, required to be undertaken by local planning authorities under the Environment Act 1995, assesses where the UK objectives may be exceeded. Where exceedances are recorded an Air Quality Management Area (AQMA) must be declared by the local authority and an Air Quality Action Plan (AQAP) prepared to implement measures to improve air quality in these areas.

¹Welsh Government 2010, Air Quality Standards (Wales) Regulations 2010

²Defra et al 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland

Air Quality Standards and Limit Values

- 14.3.7** Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment, i.e. effects occur after a prolonged period of exposure to elevated concentrations. Other pollutants have standards expressed as 24-hour, 1-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment, i.e. after a relatively short period of exposure. Some pollutants have standards expressed in terms of both long and short-term concentrations.
- 14.3.8** The air quality EU limit values and Welsh air quality standards applicable to the proposed development are shown in Table 14-1. Other pollutants have been screened out of this air quality assessment, since they are not likely to cause exceedances of their respective standards.

Table 14-1: Air quality standards for human health and vegetation

Pollutant	Averaging period	EU Limit Value / Welsh standard
Human health		
Nitrogen Dioxide (NO ₂)(a)	Annual mean	40µg/m ³
	1-hour mean	200µg/m ³ not to be exceeded more than 18 times a year (99.8 th percentile)
Fine Particulate Matter (PM ₁₀)(a)	Annual mean	40µg/m ³
	24-hour mean	50µg/m ³ not to be exceeded more than 35 times a year (90.4 th percentile)
Very Fine Particulate Matter (PM _{2.5})(a)	Annual mean	25µg/m ³
Sulphur Dioxide (SO ₂)	1-hour mean	350 µg/m ³ Not to be exceeded more than 24 times a year
	15- minute mean	255 µg/m ³ Not the be exceeded more than 35 times a year
Protection of vegetation		
Oxides of Nitrogen (NO _x)(b)	Annual mean	30µg/m ³
(a) The Air Quality Standards (Wales) Regulations 2010, No. 1433 (b) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe		

- 14.3.9** The United Nations Economic Commission for Europe (UNECE) and the World Health Organisation (WHO) have set a critical level for NO_x (30µg/m³), for the protection of vegetation. Therefore, the

statutory nature conservation agency's (Natural Resources Wales, NRW) policy is to apply the $30\mu\text{g}/\text{m}^3$ criterion as a benchmark, on a precautionary basis, in internationally designated conservation sites and in Sites of Special Scientific Interest (SSSI).

- 14.3.10 In addition, critical loads for nitrogen deposition have been set that represent the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem.

Policy context

Well-being of Future Generations (Wales) Act 2015

- 14.3.11 The Act³ has well-being goals and objectives to achieve through implementation of sustainable development. Changes in air quality can have an impact on the health of ecological habitat and humans. As such, the goals to create 'a resilient Wales' and 'a healthier Wales' are applicable.
- 14.3.12 In order for Welsh Ministers to understand the progress being made to achieving the well-being goals, national indicators have been set. One of these national indicators relates to levels of NO_2 in the air. The Well-being of Future Generations Act aims to reduce pollution exposure by assessing a weighted population average to NO_2 on an annual basis.

Planning Policy Wales, Edition 10, December 2018

- 14.3.13 The 10th edition of Planning Policy Wales⁴ (PPW10) was published in December 2018. It sets out land-use and planning policy for Wales. The new planning policy incorporates principles derived from the Well-being of Future Generations (Wales) Act 2015.
- 14.3.14 The policy document is set out in themes, with air quality predominantly addressed in the Distinctive and Natural Places theme. Air Quality and Soundscape section of PPW10 highlights the importance that air quality has in a positive experience of place, public health, amenity and well-being. Specific reference is made to the contribution the planning system should make to achieving a healthier Wales through reducing population exposure to air pollution, whilst also tackling high pollution hotspots. Additionally, preventing the creation of any new or worsening of existing air quality pollution problems is important.

³ Wellbeing of Future Generations (Wales) Act 2015

⁴ Welsh Government (2018) Planning Policy Wales Edition 10 (PPW10)

Local planning policy

Neath Port Talbot County Borough Council Local Development Plan

14.3.15 Neath Port Talbot County Borough Council (NPTCBC) adopted their Local Development Plan (LDP)⁵ in January 2016 with it covering the years 2011-2026. The LDP recognises the importance of good air quality for health, quality of life and amenity. Policies relevant to air quality include:

SP16 Environmental Protection – *“Air, water and ground quality and the environment generally will be protected and where feasible improved through the following measures: ... Ensuring that proposals have no significant adverse effects on water, ground or air quality and do not significantly increase pollution levels; Ensuring the developments do not increase the number of people exposed to different levels of pollution.”*

EN 8 Pollution and Land Stability – *“Proposals which would be likely to have an unacceptable adverse effect on health, biodiversity and/or local amenity or would expose people to unacceptable risk die to the following will not be permitted: ... Air pollution.*

EN 9 Developments in the Central Port Talbot Area – *“Developments in the central Port Talbot Area that could result in breaches of air quality objectives during their construction phase, will be required to be undertaken in accordance with a Construction Management Plan submitted as part of the planning process and agreed by the council.*

Pollution: Supplementary Planning Guidance

14.3.16 This guidance⁶ provides details about pollution issues in NPTCBC and sets out the relevant matters that will need to be taken into consideration when developments are being planned in the County Borough. Concerns about air quality relate to two main areas: direct impacts on human health and amenity and ecological impacts affecting natural habitats and species.

AIRWISE Clean Air for Everyone (2013) – Neath Port Talbot County Borough Council

14.3.17 Airwise is NPTCBC’s Strategy for improving air quality. The aims of the Airwise Strategy are:

- To ensure air quality in Neath Port Talbot allows residents and visitors to enjoy time outdoors without risking their health;

⁵ Neath Port Talbot County Borough Council Local Development Plan 2011-2026

⁶ Pollution (Supplementary Planning Guidance) 2016

- To ensure air quality throughout the Council Borough is better than the standards required by EU and UK legislation;
- To achieve consistently good air quality in Port Talbot so that the local authority can revoke the Air Quality Management Area status by compliance with LAQM air quality objectives;
- To better inform the public on issues relating to air quality; and
- To reduce nuisance dust and thereby improve quality of life.

Powys County Council Local Development Plan (2011-2026)

14.3.18 The Powys County Council (PCC) Local Development Plan (LDP)⁷ was adopted in 2018 and sets out the local planning policy. There is one policy relevant to air quality:

DM14 Air Quality Management – *“Development proposals will only be permitted where any resultant air pollution does not cause or lead to an unacceptable risk of harm to human health or the natural environment. Proposals will need to demonstrate that measures can be taken to overcome any significant adverse risk, with particular attention being paid to:*

- *National Air Quality Strategy objectives and any Air Quality Management Areas*
- *The critical levels for the protection of habitats and species within a European site or Site of Specific Environmental Interest in accordance with Policy DM2.*

Relevant guidance

Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction

14.3.19 The IAQM provide guidance to development consultants and environmental health officers (EHO) on how to assess air quality impacts from construction. The IAQM document⁸ provides a method for classifying the significance of effect from construction activities based on the ‘dust magnitude’ (high, medium or low) and proximity of the proposed development to the closest receptors. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented. Experience has shown that once the appropriate mitigation measures are applied, in most cases the resulting dust impacts can be reduced to negligible levels.

⁷ Powys Local Development Plan 2011-2026

⁸ IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1)

Local Air Quality Management Policy and Technical Guidance

- 14.3.20 The 2016 policy note from Defra, LAQM.PG(16)⁹, provides additional guidance on the links between transport and air quality and the links between air quality and the land-use planning system. It summarises the main ways in which the land-use planning system can help deliver compliance with the air quality objectives. This is relevant to any external organisations who may wish to engage with the local authority to assist in the delivery of their statutory duties on managing air quality.
- 14.3.21 The LAQM Technical Guidance 16 (LAQM TG(16))¹⁰ is designed to support local authorities in carrying out their duties to review and assess air quality in their area. LAQM TG(16) is published at the UK level and is relevant to England, Scotland, Wales and Northern Ireland with the exception of London. It provides detailed guidance on how to assess the impact of measures using existing air quality tools. Where relevant, this guidance has been taken into account in this assessment.

EPUK/IAQM Land-Use Planning and Development Control

- 14.3.22 The 2017 Land-Use Planning & Development Control guidance document¹¹ produced by the Environmental Protection UK (EPUK) and IAQM provides a framework for professionals operating in the planning system to provide a means of reaching sound decisions, with regards to the air quality implications of development proposals.
- 14.3.23 The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes associated with the development.

⁹ Defra (2016) Local Air Quality Management Policy Guidance. PG(16)

¹⁰ Defra (2016) Local Air Quality Management Technical Guidance.TG(16)

¹¹ EPUK/IAQM, (2017) Land-Use Planning & Development Control: Planning for Air Quality

14.5 Scoping and consultation

Scoping

14.5.1 This chapter has been scoped to include:

- Effects on human and ecological receptors due to the generation of construction dust during the construction phase;
- Effects on human and ecological receptors from traffic movements during construction; and
- Effects on human and ecological receptors during operation of the proposed development.

14.5.2 There were four responses relating to air quality, these are shown in Table 14-2.

Table 14-2: Response to scoping opinion

Scoping opinion clause	Response
<p>From: Neath Port Talbot – Air Quality Officer</p> <p>NPT have confirmed that they are content with the scope set out in the submissions. All potential impacts should be covered both during construction and operation, taking into account a long term need for monitoring.</p> <p>There is no mention of any potential increase in the use of the rail link both during construction and operation. This should be addressed through assessment of use of (and any potential increase in use of) the rail link, followed by an assessment of any impacts on air quality.</p>	<p>Additional rail emissions have been considered and screened out of assessment due to the location of emissions being more than 30m from residential receptors. This is discussed further in section 14.7.</p> <p>It is not considered that long term air quality monitoring is required for this development as the risk of exceedance of air quality objectives is low.</p>
<p>From: Powys County Council – Environmental Health Officer</p> <p>Confirmation they are satisfied with the proposed assessments in respect of air quality.</p>	N/A
<p>From: Powys County Council- Planning and Highways Consultant</p> <p>A zone of influence has been identified as being up to 200m in the biodiversity chapter due to air quality impacts during construction works.</p>	200m usually refers to the area beyond roads that will be assessed for changes in air pollutant concentrations due to changes in traffic emissions.
<p>From: Natural Resources Wales – Development Planning Advisor</p> <p>With regards to ecology - Evaluation of the impacts of the scheme should include: direct and indirect; secondary; cumulative; short, medium and long term; permanent and temporary; positive and negative, and construction, operation and decommissioning phase and long-term site</p>	The impacts of the construction, operation and decommissioning of the proposed development on air quality will be considered.

Scoping opinion clause	Response
security impacts on the nature conservation resource, landscape and public access.	

Consultation

14.5.3 Further consultation has been carried out with local authorities to confirm the appropriateness of the assessment in light of new information regarding the operation of the proposed development since the issue of the Scoping Report. This is summarised in Table 14-3.

Table 14-3: Response to representations from stakeholders on scope of air quality assessment

Stakeholder	Comment
Powys County Council _ Environmental Health Officer	Agreement that the assessment of rail impacts on human receptors can be screened out based on guidance outlined in LAQM TG(16).
Powys County Council – Biodiversity Officer	No response received.
Neath Port Talbot – Environmental Health Officer	Agreement that the assessment of rail impacts on human receptors can be screened out based on guidance outlined in LAQM TG(16).
Neath Port Talbot – Biodiversity Officer	No response received.

14.7 Methodology

Overview

14.7.1 This section outlines the approach for assessing the baseline air quality and likely significant effects on air quality from construction and operation of the proposed development.

14.7.2 The overall approach to the air quality assessment comprises:

- a review of the existing air quality conditions at the site and up to 2km of the proposed development;
- an assessment of the potential changes in air quality arising from the construction and operation of the proposed development due to changes in traffic and rail emissions; and
- formulation of mitigation measures, where necessary, to ensure any adverse effects on air quality are minimised.

Methodology for establishing baseline conditions

14.7.3 Existing or baseline air quality refers to the concentration of pollutants of interest for this assessment NO₂, PM₁₀ and PM_{2.5} that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

14.7.4 A desk-based review of the following data sources has been undertaken to determine baseline conditions of air quality at and in the vicinity of the proposed development and the study area in this assessment.

- NPTCBC Air Quality Progress Report¹²;
- Powys County Council Air Quality Progress Report¹³
- Defra Local Air Quality Management website¹⁴;
- UK Air Information Resource website¹⁵; and
- Natural Resources Wales (NRW) register on industrial installations¹⁶.

¹² Neath Port Talbot County Borough Council (2019) Air Quality Progress Report [Accessed: June 2020]

¹³ Powys County Council (2019) Air Quality Progress Report [Accessed: June 2020]

¹⁴ Defra; *Local Air Quality Management (LAQM) Support*; Available at <http://laqm.defra.gov.uk> [Accessed: January 2020]

¹⁵ Defra; *UK Air Information Resource*; Available at <https://uk-air.defra.gov.uk/interactive-map> [Accessed: January 2020]

¹⁶ NRW Environmental permits industrial sites Available at: <http://lle.gov.wales/catalogue/item/EnvironmentalPermittingRegulationsIndustrialSites/?lang=en> [Accessed: June 2020]

14.7.5 The review included the local authority air quality monitoring data for recent years (2014-2019) and local background pollutant concentrations.

Construction dust

14.7.6 Construction dust effects have been assessed using the qualitative approach described in IAQM guidance⁸, which considers the potential for dust emissions from the following activities:

- Demolition;
- Earthworks (i.e. soil stripping, ground levelling, excavation and land);
- Construction; and
- Trackout (i.e. incidental movement of dust and dirt from the construction or demolition site onto the public road network).

14.7.7 For each of the above activities, the guidance considers three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in PM₁₀ exposure.

14.7.8 The methodology accounts for the scale at which the above effects are likely to be generated (classified as small, medium or large). The distance of the closest human and ecological receptors and background PM₁₀ concentrations are taken into account in order to determine the sensitivity of the surrounding area. An overall risk factor is derived based on the sensitivity of the area, background concentrations and the likely magnitude of construction dust effects. Appropriate mitigation measures will be identified and proposed to reduce the risk to air quality during construction. Further detail on the construction dust assessment methodology and assessment tables are included in Appendix 14A.

Screening of traffic emissions

14.7.9 The EPUK/IAQM screening criteria¹¹ for areas in or outside an AQMA were used as appropriate across the road network. Meeting any of the respective criteria indicates that detailed dispersion modelling of road traffic emissions is likely to be required.

14.7.10 The screening criteria in relation to change in traffic flows and road realignment are as follows:

- For an area within or adjacent to an AQMA:
 - A change of Light Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT) movements;

- A change of Heavy-Duty Vehicle (HDV) flows of more than 25 AADT movements; and
- Realign roads, i.e. changing the proximity of receptors to traffic lanes 5m where change is 5m or more and the road is within an AQMA.
- For areas elsewhere:
 - A change of LDV flows of more than 500 AADT movements; and
 - A change of HDV flows of more than 100 AADT movements.

Screening of rail emissions

14.7.11 LAQM TG(16)¹⁰ provides guidance on when an assessment of rail emissions is appropriate. There are two scenarios considered as potentially causing exceedances.

Stationary locomotives

14.7.12 Locations where diesel or steam locomotives are stationary for periods of 15 minutes or more and relevant exposure within 15m could potentially cause an exceedance of the short term mean SO₂ objective.

Moving locomotives

14.7.13 Rail lines that are identified with heavy traffic of diesel passenger trains, relevant exposure within 30m of moving locomotives and background NO₂ concentrations above 25 µg/m³ could potentially cause an exceedance of the annual mean NO₂ objective.

Sensitive human receptors

14.7.14 A desk-top study was undertaken to identify the sensitive receptors at and around the proposed development. Sensitive receptors include those residential properties/schools/hospitals that are likely to experience a change in pollutant concentrations due to the operation of the proposed development. The nearest sensitive human receptors are more than 30m from the operational test track. These are shown in Figure 14.1.

Sensitive ecological receptors

14.7.15 The proposed development is located near Nant Lech and Gorsllywyn Onllywyn SSSIs. Nant Lech SSSI is located more than 200m from the operational test track. Gorsllywyn Onllywyn SSSI is located 100m from the stabling track. These are shown in Figure 14.1.

Assessment of significance

14.7.16 For the assessment of impacts and significance at sensitive human receptors, the approach described in the EPUK/IAQM guidance¹¹ has been used (Table 14-4). This is considered to be best practice for undertaking air quality assessments.

14.7.17 Impact descriptors are determined based on the magnitude of incremental change as a proportion of the relevant assessment level, in this instance the air quality standards. The change is then examined in relation to the predicted total pollutant concentrations in the assessment year and its relationship with the relevant air quality standard (Table 14-4).

Table 14-4: Impact descriptors from EPUK/IAQM guidance

Predicted concentration relative to air quality standard	% Change in concentrations relative to air quality standard			
	1%	2-5%	6-10%	> 10%
< 75%	Negligible	Negligible	Minor	Moderate
76-94%	Negligible	Minor	Moderate	Moderate
95-102%	Minor	Moderate	Moderate	Major
103-109%	Moderate	Moderate	Major	Major
> 110%	Moderate	Major	Major	Major

Changes of less than 0.5% are described as negligible.
Slight and substantial impacts from the EPUK/IAQM guidance have been called 'minor' and 'major' respectively for this assessment.

14.7.18 The impact descriptors at each of the assessed receptors have been used as a starting point to make a judgement on the overall significance of effect of the proposed development, however other influences have also been accounted for, such as:

- The existing future air quality in the absence of the proposed development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

14.7.19 In circumstances where the proposed development can be judged in isolation, the guidance suggests that a 'moderate' or 'major' impact is likely to give rise to a significant effect and a 'negligible' or 'minor' is not likely to result in a significant effect.

14.7.20 With regards to impact on ecological receptors, the IAQM guidance^{Error! Bookmark not defined.} recommends that concentrations of

oxides of nitrogen (NO_x) are used as the main basis for evaluating the potential for significant effects. An increase in annual mean NO_x concentration of more than 0.4µg/m³ cannot be dismissed as imperceptible. If the increase is not imperceptible at an ecological site, and the NO_x critical level (30µg/m³) is exceeded, then changes in nutrient nitrogen deposition should be calculated to assist the evaluation of significance.

Assumed construction practices

- 14.7.21 An outline construction environmental management plan (CEMP) has been prepared for the proposed development (Appendix 3A). The mitigation measures include those for minimising the emissions of dust and particulate matter through prevention or reducing at source.
- 14.7.22 The outcome of the assessment will feed into the outline CEMP to ensure that the CEMP includes all the necessary mitigation measures based on the risk of dust soiling, human health and ecological impact from the construction of the proposed development.

14.8 Limitations and assumptions

Assumptions

- 14.8.1 The speeds used for the assessment were based on the designated speed limits, not a modelled or estimated average speed.

14.10 Baseline environment

Baseline ambient air quality refers to the concentrations of pollutants of interest for this NO₂, PM₁₀ and PM_{2.5} that are already present in the atmosphere from various sources such as industrial processes, commercial and domestic activities, agriculture, traffic and natural sources.

Industrial processes

- 14.10.1** Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes, regulated through the Pollution Prevention and Control (PPC) system^{17,18}. The larger, more polluting processes are regulated by NRW and the smaller, less polluting ones by the local authorities. Local authorities tend to regulate only for emissions to air, whereas NRW regulates emissions to air, water and land.
- 14.10.2** A review of the Annual Progress Reports for NPTCBC and PCC does not identify any planning applications for new installations within 2km of the proposed development.
- 14.10.3** A review of the industrial sites database under Environmental Permitting Regulation does not identify existing installations within 2km¹⁹.
- 14.10.4** The impact of Part A and Part B processes is assumed to be included in the background monitoring and Defra background concentrations.

Road traffic

- 14.10.5** In recent decades, transport atmospheric emissions on a national basis have grown to match or exceed other sources in respect to many pollutants, particularly in urban areas. Vehicle emissions are likely to be the dominant source of air pollution in the study area. The main pollutants associated with road traffic are NO₂, PM₁₀ and PM_{2.5}.

Local authority air quality monitoring

- 14.10.6** NPTCBC and PCC undertake air quality monitoring using automatic monitors and passive diffusion tubes in their respective administrative

¹⁷ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

¹⁸ The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390

¹⁹ Natural Resources Wales. Environmental Permitting Regulations – Industrial Sites. <http://lle.gov.wales/catalogue/item/EnvironmentalPermittingRegulationsIndustrialSites/?lang=en>

regions. No automatic or diffusion tube monitoring sites are within 2km of the proposed development.

- 14.10.7 PCC have not declared any AQMAs in the local authority area.
- 14.10.8 PCC carried out monitoring in Newtown in 2018 and 2019. This is approximately 85km north-east of the proposed development and is therefore not considered representative of local air quality. The only other monitoring carried out is an Automatic Urban and Rural Network (AURN) monitor in Aston Hill which is approximately 90km north-east of the proposed development and is therefore not considered representative of local air quality.
- 14.10.9 As part of the review and assessment process, NPTCBC declared an AQMA for Taibach Margam, Port Talbot in 2000 for exceedances of the annual mean PM₁₀ air quality objective.
- 14.10.10 NPTCBC carries out both automatic and passive monitoring at various locations in its area. However, the nearest monitoring sites to the proposed development are roadside diffusion tubes approximately 10km south-west in Pontardawe. These are not considered to be representative of the area where the project is located as they are roadside rather than background sites.

Background air quality mapping

- 14.10.11 Defra publishes background pollutant mapping²⁰ for every 1km x 1km grid square across the UK. Background pollutant mapping has been reviewed for those grid squares in which the proposed development lies and is presented in Table 14-5.
- 14.10.12 In the absence of any monitoring within 2km of the proposed development, background air quality concentrations are considered to be representative of air quality concentrations.

²⁰ Defra, Background Pollutant Mapping, <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>

Table 14-5 Defra estimated background pollutant concentrations for the proposed development grid squares

Local authority	OS grid square		2019 concentrations ($\mu\text{g}/\text{m}^3$)				2020 concentrations ($\mu\text{g}/\text{m}^3$)			
	X	Y	NO ₂	NO _x	PM ₁₀	PM _{2.5}	NO ₂	NO _x	PM ₁₀	PM _{2.5}
Powys County Council	281500	211500	3.8	4.8	9.9	6.2	3.6	4.6	9.8	6.1
	281500	210500	3.8	4.8	8.9	5.9	3.6	4.5	8.9	5.8
	282500	211500	3.6	4.6	11.1	6.4	3.5	4.4	11.0	6.3
	282500	210500	3.7	4.7	8.9	5.9	3.5	4.5	8.8	5.8
	283500	211500	3.7	4.7	9.7	6.1	3.6	4.5	9.6	6.0
Neath Port Talbot County Borough Council	281500	209500	4.0	5.0	9.0	6.0	3.8	4.8	8.9	5.9

14.12 Assessment of effects

Assessment of effects from construction

Construction traffic

- 14.12.1** Traffic data for the assessment was screened using the criteria for roads not located within an AQMA set out in section 14.7.10. The changes in traffic flows due to the proposed development during the construction phase are shown in **Table 14-6**. There is no change in traffic speeds. A detailed assessment of construction traffic emissions can be screened out as none of the screening criteria are met as a result of the construction of the proposed development.
- 14.12.2** The impact of construction traffic on sensitive human and ecological receptors is considered to be negligible. **Error! Reference source not found.**

Table 14-6: Construction traffic

Scenario	Additional LDV due to the proposed development	Additional HDV due to the proposed development	Screened in/out
Construction (2022)			
A4067 North	38	13	Screened out
A4067 South	10	0	Screened out
A4221 West of washery	48	13	Screened out
A4221 East of washery	25	93	Screened out
A4109 North of Onllwyn	0	0	Screened out
A4109 South of Onllwyn	117	26	Screened out
Onllwyn Road	117	26	Screened out
A4109 North of Glynneath	25	93	Screened out
A4109 West of A465	13	93	Screened out

Construction dust assessment

- 14.12.3** The proposed development is largely laying of foundations for rail track and associated infrastructure. Dust can be generated due to activities such as demolition, earthworks, construction and trackout. There will be minimal earthworks as this will be delivered by the restoration of Nant Helen. Earthworks will be limited to foundations for the new rail infrastructure and buildings.

Sensitive receptors

- 14.12.4** Receptors are defined as those properties that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction of the proposed development.
- 14.12.5** An ‘ecological receptor’ refers to any sensitive habitat affected by dust soiling. This includes direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna.

Dust emission magnitude

- 14.12.6** Each dust-generating activity has been assigned a dust emission magnitude using a conservation approach. The dust emission magnitude for each activity is shown in **Table 14-7**.
- 14.12.7** The Onllwyn washery will be demolished to make space for the proposed rail infrastructure, much of the earthworks for the development will be delivered via the Nant Helen development and construction will be limited to laying of the rail infrastructure and associated buildings.

Table 14-7: Dust emission magnitude for construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	Small	Potentially dusty construction material as concrete forms part of the material to be demolished, estimated total volume to be demolished <20,000 m ³ .
Earthworks	Small	Estimated total site area where earthworks might occur <2,500 m ² , clay soil at the site, total material moved will be <20,000 tonnes, <5 heavy earth moving vehicles active at any one time.
Construction	Small	The total volume of buildings to be constructed is <25,000 m ³ , potentially dusty construction materials.
Trackout	Small	<10 HDV outward movements in any one day, the surface material is tarmac, which has a low potential for dust release. No unpaved road is expected.

Sensitivity of area

- 14.12.8** The site is primarily within the existing Nant Helen Open Cast mine plus the Onllwyn Washery and Distribution Centre. There are more than 10 high-sensitivity receptors within 20m of the site boundary. High-sensitive receptors can be defined as where users can expect to enjoy a high level of amenity such as residential properties. The people or property would be expected to be present continually, or at least regularly for extended periods. It can also be noted that there is a scheduled monument that is within 20m of the RLB, this is considered to have low sensitivity to dust.

14.12.9 As such, the area's sensitivity to dust soiling has been classified as *high* in accordance with the IAQM guidance^{Error! Bookmark not defined.}. The construction dust distance buffers are shown in Figure 14-2.

The average Defra background PM₁₀ concentrations for the grid squares where the proposed development is located (Table 14-5

- 14.12.10 **Table 14-5)** all fall below the 24µg/m³ threshold. The sensitivity of the area has therefore been assigned as *Low* as there are less than 10 high-sensitivity receptors within 20m of the proposed development.
- 14.12.11 There is a medium-sensitivity ecological receptor within 20m of the site boundary (the Gorsllwyn Onllwyn SSSI). Medium-sensitivity receptors are defined as locations where there is a particularly important plant species and locations with a national designation where features may be affected by dust deposition.
- 14.12.12 As such, the area’s sensitivity to ecological impacts has been classified as *medium* in accordance with the IAQM guidance.

Risk of impacts

- 14.12.13 Taking into consideration the dust emission magnitude and the sensitivity of the area, the proposed development has been classified as *medium* risk to dust soiling, *negligible* risk to human health impacts and *low* risk to ecological impacts from demolition, earthworks, construction and trackout (Table 14-8).
- 14.12.14 Specific mitigation to minimize risk of dust soiling and human health impacts of the proposed development is described in section 14.13. Overall, *low risk* mitigation will be considered for the proposed development with *medium risk* demolition specific measures.

Table 14-8 Summary dust risk table prior to mitigation

Activity	Risk of Dust Soiling	Human Health Risk	Ecological
Demolition	Medium Risk	Negligible	Low Risk
Earthworks	Low Risk	Negligible	Low Risk
Construction	Low Risk	Negligible	Low Risk
Trackout	Low Risk	Negligible	Negligible

Assessment of effects from operation

Operational traffic

- 14.12.15 Traffic data for the assessment was screened using the criteria for roads not located within an AQMA set out in section 14.7.10. The changes in traffic flows due to the proposed development during the operational phase are shown in Table 14-9. There is no change in traffic speeds. A detailed assessment of operational traffic emissions can be screened out as none of the screening criteria are met as a result of the operational traffic from GCRE.
- 14.12.16 The impact of operational traffic on sensitive human and ecological receptors is considered to be negligible and therefore not significant.**Error! Reference source not found.**

Table 14-9: Traffic data summary

Scenario	Additional LDV due to the proposed development	Additional HDV due to the proposed development	Screened in/out
Operation (opening year 2024)			
A4067 North	47	0	Screened out
A4067 South	13	0	Screened out
A4221 West of washery	60	0	Screened out
A4221 East of washery	31	60	Screened out
A4109 North of Onllwyn	0	0	Screened out
A4109 South of Onllwyn	146	0	Screened out
Onllwyn Road	146	0	Screened out
A4109 North of Glynneath	31	60	Screened out
A4109 West of A465	16	60	Screened out

Operational rail

- 14.12.17** Screening criteria for rail emissions are outlined in sections 14.7.12 and 14.7.13.
- 14.12.18** There are no human receptors within 30m of the proposed test tracks. There is one human receptor within 30m of the proposed connection to the branch line. The branch line will have a maximum of one train movement on it per day and cannot be considered as a line with heavy traffic of diesel locomotives on it. Background NO₂ is 3.6-4.0 µg/m³ across the proposed development area.
- 14.12.19** There are no human receptors within 15m of the stabling tracks where locomotives will be stationary.
- 14.12.20** Due to the distance of receptors from the test tracks and the infrequency of locomotives on the branch line, an assessment of rail emission impacts on human receptors can be screened out and the impact can be considered negligible.
- 14.12.21** There is no guidance for the assessment of air quality impacts on ecological receptors from rail emissions. The nearest ecological receptor Gorslywn Onllywyn SSSI is 100m from the stabling track.
- 14.12.22** By applying the same guidance from LAQM TG(16)¹⁰ used in screening impacts on human receptors, an assessment of rail impacts on ecological receptors can be screened out and the impact can be considered negligible.

14.13 Mitigation and enhancement

Mitigation of effects from construction

14.13.1 This section presents the specific mitigation to minimise the risk of dust soiling, human health and ecological impacts required for the proposed development. These mitigation measures are included in the outline CEMP.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the proposed development boundary. This may be the environment manager/engineer or the site manager;
- Display the head or regional office contact information; and
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.

Site management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log-book.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary;

- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Avoid bonfires and burning of waste materials.

Demolition

- Ensure effective water suppression is used during demolition operations;
- Avoid explosive blasting using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Avoid scabbling (roughening of concrete surfaces) if possible; and
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;

- Record all inspections of haul routes and any subsequent action in a site log book; and
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Mitigation of effects from operation

- 14.13.2 The impact from operation on air quality is considered to be negligible therefore no operational mitigation is proposed.

14.14 Residual effects

Residual effects from construction

- 14.14.1 The construction dust mitigation is designed to reduce the impact of construction dust on air quality to a negligible impact therefore no residual effects from construction are anticipated.

Residual effects from operation

- 14.14.2 The impact from operation on air quality is considered to be negligible therefore no operational residual effects are anticipated.

14.15 Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Dust soiling and particulate matter concentrations during construction (construction dust assessment)	Residential properties and ecological habitats	High	Small	N/A.	See dust mitigation in section 14.13 and outline CEMP.	Negligible	Not significant.
Construction traffic emission impacts	Human and ecological receptors	High	Negligible	N/A	N/A	Negligible	Not significant.
Operational traffic and rail emission impacts	Human and ecological receptors	High	Negligible	N/A	N/A	Negligible	Not significant.

15 Climate Change

15.1 Introduction

15.1.1 This chapter of the Environmental Statement provides the context, baseline data, methodology and approach, assessment results and mitigation measures. The climate change topic consists of two parts:

- effects on climate – this considers the impacts of greenhouse gas (GHG) emissions from the scheme; and
- vulnerability of the scheme to climate change – the Climate Change Resilience (CCR) assessment considers the resilience of the project in the context of projected future changes in climate variables.

15.1.2 The combined effects of the scheme and potential changes in climate variables on the receiving environment during construction and operation are considered in each topic in the relevant chapter of the ES. A more comprehensive consideration of the ‘in-combination climate impacts’ (ICCI) is provided in Appendix 15C: ICCI Table.

15.1.3 Climate change projections are imbedded into the future baseline of the technical assessments. Current and future climate baselines will be outlined from paragraph 15.6.9 for key climate parameters, including winter and summer temperature and precipitation, using UK Climate Projections 2018 (UKCP18).

15.1.4 Climate change is considered in both the assessment of scheme effects and the design of mitigation and enhancement measures. This consideration is mostly qualitative, based on the future climate trends set out from paragraph 15.6.14 to 15.6.18.

15.2 Review of proposed development

15.2.1 The proposed development comprises of a rail testing, maintenance, research development and storage facility, known as the Global Centre of Rail Excellence (GCRE) and the site of the Onllwyn Washery and Nant Helen Open Cast mine. The development proposals for GCRE are described in Chapter 3 of this report.

15.2.2 GCRE will result in GHG emissions during both construction and operation. During construction, the main sources of emissions will be the embodied emissions in materials and construction activities on site. The operation of buildings, testing facilities and supporting infrastructure will also result in emissions predominately due to energy consumption.

15.2.3 The resilience of the GCRE facilities to future changes in climate variables and subsequent impacts are also considered in this chapter.

15.3 Legislation, policy context and guidance

International legislation

Paris Agreement

- 15.3.1 Adopted in 2015 and entered into force in November 2016, the Paris Agreement is an international climate agreement aiming to limit global temperature increase this century to less than 2 degrees Celsius above pre-industrial levels.
- 15.3.2 It additionally establishes a goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.

EIA Directive 2014/52/EU

- 15.3.3 The Directive 2014/52/EU states that EIAs shall identify, describe and assess the direct and indirect significant effects of climate change relevant to the project. The regulations implementing this directive were transposed into UK legislation in May 2017.

National legislation

Climate Change Act 2008

- 15.3.4 The Climate Change Act 2008 committed the UK to its first statutory carbon reduction target to reduce carbon emissions by at least 80% from 1990 levels by 2050. The Climate Change Act 2008 (2050 Target Amendment) Order 2019 amended the Climate Change Act 2008 by introducing a target for at least a 100% reduction of GHG emissions (relative to 1990 levels) in the UK by 2050, following advice from the Committee on Climate Change. The 100% reduction is often referred to as 'net zero' GHG emissions.
- 15.3.5 The Climate Change Act requires that that five-yearly carbon budgets are set and not exceeded to ensure that regular progress is made towards the target. The first three carbon budgets were set in 2009, with the fourth and fifth following in 2011 and 2016 respectively.
- 15.3.6 The carbon budgets, as set out in the Carbon Budgets Order 2009, the Carbon Budget Order 2011 and the Carbon Budget Order 2016, are based on an 80% reduction as legislated by the Climate Change Act 2008. At the time of undertaking this assessment, they have not been updated to reflect the target for 100% reduction in emissions set out in the Climate Change Act 2008 (2050 Target Amendment) Order 2019. The Committee on Climate Change report that to meet future carbon budgets and the 100% reduction target for 2050 it will require the government to apply more challenging measures.

- 15.3.7** The Climate Change Act also established a requirement for government to undertake a climate change risk assessment (CCRA) every five-year period and develop a programme for adaptation action in response to the risks identified. The UK Government's second UK CCRA was published in 2017. It establishes six priority risk areas for action over the following five years: flooding and coastal change; health and well-being from high temperatures; water shortages; natural capital; food production and trade; and pests and diseases and invasive non-native species. It is based on the independent evidence report published by the Committee on Climate Change.
- 15.3.8** The CCRA identifies significant risks to national infrastructure, including transport networks, from embankment and bridge failure, river, surface/ groundwater and coastal flooding, erosion, and increases in the frequency and severity of extreme weather such as high winds, high temperatures, lightning, storms and high waves. It highlights the need for infrastructure to be located, planned and designed and maintained to be resilient to climate change, including severe weather events. It also recognises that more action is needed to encourage information sharing between infrastructure operators to improve overall risk management. Mitigation and enhancement in terms of GCRE's climate resilience is discussed from paragraph 15.6.21 where the identification and implementation of any adaptation measures is considered.

Well-being of Future Generations (Wales) Act 2015

- 15.3.9** The Well-being of Future Generations (Wales) Act 2015 requires public bodies to carry out sustainable development which is the process of improving the economic, social, environmental and cultural well-being of Wales by taking action aimed at achieving the well-being goals.
- 15.3.10** The Act establishes seven well-being goals, which specifically reference acting on climate change. As such, the Act requires all public bodies to embed climate change into their decision-making.

Environment (Wales) Act 2016

- 15.3.11** The Environment (Wales) Act 2016 requires Welsh Ministers to meet greenhouse gas reduction targets for Wales and establishes a 2050 emission target of 80% reduction in net emissions from the baseline year (1990 or 1995 depending on the specific greenhouse gas). Progress to this target is supported by interim emissions targets set out for every 10 years until 2050 and carbon budgets established for five-yearly periods. In June 2019, Welsh Government committed to adopting the Committee on Climate Change's recommendation to change the emissions reduction target to 95% by 2050, with an ambition to reach net zero emissions by 2050. Regulations to amend

the existing 2050 target and related carbon budgets will be brought to Welsh Assembly in 2021.

Prosperity for all: A Low Carbon Wales

- 15.3.12 Prosperity for all: A low carbon Wales was published in March 2019. It sets out how Wales aims to meet the first carbon budget (2016-2020) and consequently the 2020 interim target through 100 policies and proposals across Ministerial Portfolios.

Prosperity for all: A Climate Conscious Wales

- 15.3.13 Prosperity for all: A Climate Conscious Wales (2019) to influence partners in Wales to take action. The document aims to raise awareness of climate adaptation and offers knowledge and best practice to improve climate resilience.

Local policy

Neath Port Talbot County Borough Council Local Development Plan (2011-2026)

- 15.3.14 The Local Development Plan (LDP) includes a policy and a strategic objective relating to sustainable development. Of particular relevance is overarching objective OB1 of the plan which states: *“Minimise the causes and consequences of climate change through reduced greenhouse gas emissions and adapt to climate change through consideration of its effects in the design and location of new development.”*
- 15.3.15 Strategic Policy SP1 also focuses on climate change stating the measures that will be implemented to address climate change causes and consequences. The policy sets out measures to be implemented with a focus on reducing impacts associated with transport. Measures are also set out to address risk of flooding and minimise habitat fragmentation.

Powys County Council Local Development Plan (2011-2026)

- 15.3.16 The Local Development Plan (LDP) for Powys contains objectives relating to climate change and flooding.
- 15.3.17 Of particular relevance, LDP Objective 4 states: *“To support the transition to a low carbon and low waste Powys through all development, including the reduction of waste to landfill and by directing development away from high risk flood areas and, where possible, to reduce or better manage existing flood risk for communities, infrastructure and business.”*

Neath Port Talbot We Want (Well-being Plan 2018 – 2023)

- 15.3.18 The Neath Port Talbot Well-being Plan was released in March 2018 as required under the Well-being of Future Generations (Wales) Act.
- 15.3.19 The plan identifies the opportunity for environmental and community resilience including adaptation and improving resilience to future climate change.

Towards 2040 – the Powys Well-being Plan

- 15.3.20 The Powys Well-being Plan was released in May 2018, as required under the Well-being of Future Generations (Wales) Act.
- 15.3.21 The plan contains well-being steps that seek to achieve the well-being goals. The steps relevant to climate change include Step 7 and Step 8.
- 15.3.22 Step 7: Develop a carbon positive energy strategy that maximises green energy production. Powys has an abundance of potential energy resources and will be a centre for environmental research, sustainable and green technologies and renewable energies. Powys will export renewable energy through investment and development of locally owned solar panels, hydro and other schemes. Powys will have charging infrastructure to support electric cars and vehicles.
- 15.3.23 Step 8: Develop a sustainable environment strategy. Powys has a sustainable and resilient environment that will help mitigate climate change.

Neath Port Talbot Council Decarbonisation and Renewable Energy Strategy (2020)

- 15.3.24 The Neath Port Talbot Council Decarbonisation and Renewable Energy Strategy outlines the Council’s overarching vision and objectives to reduce carbon emissions. It sets out what the Council has already achieved and identifies the potential opportunities that exist. The document is an integral part of the Council’s overall sustainability drive and the associated action plan framework will assist the Council in meeting its carbon footprint reduction aspirations.

Neath Port Talbot Environment Strategy (2008-2026)

- 15.3.25 This is Neath Port Talbot County Borough Council’s first Environment Strategy. The purpose of the Environment Strategy is to “provide the framework within which to achieve an environment that is clean, healthy and thriving, has improving economic prosperity and is valued by the residents, businesses and visitors of the County Borough”.

15.4 Scoping and consultation

Scoping

15.4.1 This chapter has been scoped to include two parts:

- effects on climate – this considers the impacts of GHG emissions from the scheme through the GHG assessment; and
- vulnerability of the scheme to climate change – this considers the resilience of the project in the context of projected future changes in climate variables through the CCR assessment.

15.4.2 There was one response relating to climate change, involving the installation of renewable energy generation to mitigate the effects of climate change - see Table 15.1 below.

Table 15.1 Response to scoping opinion

Scoping opinion clause	Response
Renewable energy developments have significant Landscape and Visual impacts and would therefore require a Landscape and Visual assessment. It was advised that consideration of natural mitigation of climate change, such as soil treatment, woodland planting and creation of wetlands should be included.	The Scoping Report, at para 15.6, refers to installing renewable energy generation to mitigate the effects of climate change. Such development should be included in the description of development, the nature of the development clarified and if it involves stand-alone features, these should be properly assessed as part of the LVIA.

Consultation

15.4.3 Internal meetings with the design team and EIA specialists have discussed the impacts of the proposed development on climate change and proposed mitigation measures against increasing GHG emissions. For the GHG assessment, liaison with transport and air quality specialists within Arup was undertaken to ensure consistency of approach between topics. For the CCR assessment, liaison with the drainage design specialist team was undertaken to understand risks and mitigation measures associated with flooding. Consultation with other EIA topic leads has been undertaken to ensure that the baseline for all topics considers future changes in climate variables.

15.5 GHG emissions assessment

Methodology

15.5.1 The GHG emissions are quantified using the principal steps outlined in Publicly Available Specification 2080:2016 Carbon Management in Infrastructure (PAS 2080), as shown in **Figure 15.1 Principal steps of GHG emissions quantification**.



Figure 15.1 Principal steps of GHG emissions quantification¹

In order to adequately capture direct and indirect emissions associated with the proposed development, a lifecycle approach is adopted. Lifecycle phases are outlined in

WHOLE LIFE CARBON ASSESSMENT INFORMATION														
PROJECT LIFE CYCLE INFORMATION										SUPPLEMENTARY INFORMATION BEYOND THE PROJECT LIFE CYCLE				
[A1 – A3]			[A4 – A5]		[B1 – B7]					[C1 – C4]				[D]
PRODUCT stage			CONSTRUCTION PROCESS stage		USE stage					END OF LIFE stage				Benefits and loads beyond the system boundary
[A1]	[A2]	[A3]	[A4]	[A5]	[B1]	[B2]	[B3]	[B4]	[B5]	[C1]	[C2]	[C3]	[C4]	
Raw material extraction & supply	Transport to manufacturing plant	Manufacturing & fabrication	Transport to project site	Construction & installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction Demolition	Transport to disposal facility	Waste processing for reuse, recovery or recycling	Disposal	Reuse Recovery Recycling potential
					[B6] Operational energy use									
					[B7] Operational water use									

Figure 15.2 Lifecycle stages for a whole life carbon assessment as per EN 15978

15.5.2 below. The GHG emissions assessment scope includes the before use stages (A) and the use stages (B). In order to maintain consistency with other chapters in the EIA the before use stages will be referred to as the construction phase, with use stages being referred to as the operational phase. GHG emissions from decommissioning are not assessed as part of this assessment as decommissioning has been scoped out of the assessment as established during Scoping.

¹ Construction Leadership Council & the Green Construction Board (2016) PAS 2080:2016 Carbon management in infrastructure. BSI Limited, London, UK. <https://shop.bsigroup.com/forms/PASs/PAS-2080/> [Accessed July 2020]

WHOLE LIFE CARBON ASSESSMENT INFORMATION														
PROJECT LIFE CYCLE INFORMATION												SUPPLEMENTARY INFORMATION BEYOND THE PROJECT LIFE CYCLE		
[A1 – A3]			[A4 – A5]		[B1 – B7]					[C1 – C4]				[D]
PRODUCT stage			CONSTRUCTION PROCESS stage		USE stage					END OF LIFE stage				Benefits and loads beyond the system boundary
[A1]	[A2]	[A3]	[A4]	[A5]	[B1]	[B2]	[B3]	[B4]	[B5]	[C1]	[C2]	[C3]	[C4]	
Raw material extraction & supply	Transport to manufacturing plant	Manufacturing & fabrication	Transport to project site	Construction & installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction Demolition	Transport to disposal facility	Waste processing for reuse, recovery or recycling	Disposal	Reuse Recovery Recycling potential
					[B6] Operational energy use									
					[B7] Operational water use									

Figure 15.2 Lifecycle stages for a whole life carbon assessment as per EN 15978²

- 15.5.3 GHG emissions arising from the Project are quantified through the conversion of ‘activity data’ (such as material quantities, energy consumption and transport kilometres travelled) into GHG emissions using a series of emission factors.
- 15.5.4 As this is an outline planning application, there are some instances where the ‘activity data’ are derived from benchmarks to approximately calculate GHG emissions of the proposed development.
- 15.5.5 These emissions factors and benchmarks, their data sources and assessment methodology for each aspect of the development included in the GHG emissions assessment are summarised in **Table 15.2**.
- 15.5.6 The GHG emissions assessment was undertaken on the basis of the information available at the time of assessment. Where assumptions have been made, they have been selected to present the expected average (where the appropriate information is available) to worst-case scenario for the particular item/factor. Within **Table 15.2**, instances are explicitly mentioned where a worst-case scenario is adopted.

² RICS (2017) Whole life carbon assessment for the built environment 1st edition
http://www.rics.org/Global/Whole_life_carbon_assessment_for_the_BE_PGguidance_2017.pdf [Accessed June 2020]

Table 15.2 Methodology for estimating emissions sources included in the GHG emissions assessment

	Assessment methodology	Data sources
Stage A – Construction		
Rail testing infrastructure	Embodied emissions within rail testing infrastructure have been calculated using the RSSB Rail Carbon tool, based on design take-off quantities, using emissions factors from the ICE databases (version 1.6a, 2.0 and 3.0).	RSSB Rail Carbon tool Available at: https://www.railindustrycarbon.com/Account/LogOn?ReturnUrl=%2f University of Bath: Sustainable Energy Research Team (2019) Inventory of Carbon and Energy V1.6a, V2.0 ³ & V3.0 (ICE) Available at: https://circularecology.com/embodied-carbon-footprint-database.html
Buildings	Embodied emissions of building materials have been calculated based on the estimated floor area of each building, using benchmarks for typical buildings of each type.	RICS (2012) Methodology to calculate embodied carbon of materials Available at: https://www.igbc.ie/wp-content/uploads/2015/02/RICS-Methodology_embodied_carbon_materials_final-1st-edition.pdf
Public realm	Public realm (access roads, lighting, ancillary civil works) emissions have been calculated using conversion factors from the ICE databases (version 2.0 and 3.0).	University of Bath: Sustainable Energy Research Team (2019) Inventory of Carbon and Energy V2.0 ³ & V3.0 (ICE) Available at: https://circularecology.com/embodied-carbon-footprint-database.html
Plant	Energy requirement of plant machinery has been established from BSI standards.	BSI British Standards BS 5228-1:2009 Available at:

³ Version 2.0, and to a lesser extent Version 1.6a, of the ICE databases are used in addition to Version 3.0 because they contain useful emissions factors, not present in Version 3.0 – such as that for reinforced concrete, rammed soil and general UK steel. These emissions factors are integrated within RSSB Rail Carbon tool packages.

	Assessment methodology	Data sources
	Emissions have been calculated using the BEIS (2020) conversion factors for UK generated electricity.	https://shop.bsigroup.com/ProductDetail?pid=000000000030258086 BEIS (2020) UK Government GHG Conversion Factors for Company Reporting Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020
Transport	Emissions from transport have been calculated using the BEIS (2020) Conversion Factors.	BEIS (2020) UK Government GHG Conversion Factors for Company Reporting Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020
Stage B – Operation		
Buildings – operation	The emissions from operation over the life of the buildings have been estimated based on the ratio of embodied emissions in the phases ‘to practical completion’ and ‘operational’, applied to the benchmarks for calculating embodied emissions of building materials (as described above). Using this method, a benchmark that defined the emissions during the operation phase was developed and applied to each building type.	RICS (2017) Whole life carbon assessment for the built environment Available at: https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf
Buildings – maintenance and refurbishment	The embodied emissions from maintenance and refurbishment over the life of the buildings have been estimated based on the ratio of embodied emissions in the phases ‘to practical completion’ and ‘in use’, applied to the benchmarks for calculating embodied emissions of building materials (as described above).	RICS (2017) Whole life carbon assessment for the built environment Available at: https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf

	Assessment methodology	Data sources
	Using this method, a benchmark that defined the embodied emissions during the operation phase was developed and applied to each building type.	
Access and ancillary civils	<p>Energy requirements for lighting have been estimated for access roads on a linear basis and that for walkways and parking areas on an area basis, using benchmarks developed based on Arup’s professional experience.</p> <p>Emissions calculated over the 60-year design life using projected emissions intensity of the electricity grid.</p> <p>An allowance for maintenance and refurbishment has been included based on asset life expectancies.</p>	<p>Arup professional experience</p> <p>BEIS (2019) Green Book supplementary guidance: Table 1</p> <p>Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal</p>
Transport emissions	<p>Emissions from transport have been calculated using the BEIS (2019) Conversion Factors. Diesel-powered vehicle emissions are calculated over the 60-year design life using projected emissions intensity of diesel fuel.</p>	<p>BEIS (2019) Green Book supplementary guidance: Table 1</p> <p>Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal</p>
Rolling Stock and Infrastructure Testing	<p>The energy requirements of Rolling Stock and Infrastructure Testing has been estimated based on data published by the Office of Rail and Road (ORR) and Rail Industry Decarbonisation Taskforce.</p> <p>Hydrogen powered vehicle emissions are zero over the 60-year design life.</p> <p>Electric and diesel-powered vehicle emissions are calculated over the 60-year design life using projected emissions intensity of the electricity grid and diesel fuel, respectively.</p> <p>An allowance for maintenance and refurbishment has been included based on asset life expectancies.</p>	<p>ORR data portal</p> <p>Available at: https://dataportal.orr.gov.uk/</p> <p>Rail Industry Decarbonisation Taskforce (2019) Final Report to the Minister for Rail</p> <p>Available at: https://www.rssb.co.uk/en/Research-and-Technology/Sustainability/Decarbonisation/Decarbonisation-our-final-report-to-the-Rail-Minister</p> <p>BEIS (2019) Green Book supplementary guidance: Table 1</p> <p>Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal</p>

	Assessment methodology	Data sources
Habitat emissions	These activities are not expected to make a material contribution to the lifetime GHG emissions of the development, therefore have been excluded from the assessment.	

Significance Criteria

15.5.7 The Institute of Environmental Management and Assessment (IEMA) guide to assessing GHG emissions and evaluating their significance⁴ publishes the over-arching principle:

“The GHG emissions from all projects will contribute to climate change; the largest inter-related cumulative environmental effects...as such any GHG emissions or reductions from a project might be considered to be significant...”

15.5.8 In accordance with this guidance, any carbon emissions associated with the proposed development can be deemed significant. Accordingly, initiatives to mitigate emissions are recommended from paragraph 15.5.21 **Error! Bookmark not defined..**

Limitations and assumptions

15.5.9 The limitations of the GHG emissions assessment are as follows:

- The GHG assessment uses benchmarks to create an approximate carbon output for development types based on aggregated data from published sources, rather than site or product-specific emissions profiles.
- Bulk infrastructure has also been excluded, which includes water pipes, energy grid connection and communication lines as this information is currently unavailable at this stage in design.

15.5.10 Assumptions made in the GHG emissions assessment are included in Table 15.3.

Table 15.3 GHG emissions assessment assumptions

Emissions source	Assumptions
Construction	
Rail testing infrastructure	Where specific material quantities have not been provided for certain assets, RSSB Rail Carbon tool packages have been applied and are based on structures built for real-world projects. Packages used during the assessment include that for Overhead Line Electrification (package multiplied by number of structures required), drainage (assumed along entire length of track) and acoustic barriers (based on length of acoustic barriers in design drawings). Duel-loop track assumed over single-loop track for rolling stock testing as a worst-case scenario for emissions.
Buildings	The building areas have been based on design drawings where available and otherwise the areas of similar buildings from previous Arup projects. Buildings have been assigned to a typology which represents most closely the use type of the building.

⁴ IEMA (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance

Emissions source	Assumptions																																																																																				
	<p>The benchmarks for embodied carbon in buildings are based on collated life cycle assessment data for the production stage emissions (refer to</p> <div data-bbox="435 378 1323 887" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">WHOLE LIFE CARBON ASSESSMENT INFORMATION</p> <p style="text-align: center; margin: 5px 0;">PROJECT LIFE CYCLE INFORMATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">[A1 – A3]</th> <th colspan="2" style="text-align: center;">[A4 – A5]</th> <th colspan="5" style="text-align: center;">[B1 – B7]</th> <th colspan="4" style="text-align: center;">[C1 – C4]</th> </tr> <tr> <th colspan="3" style="text-align: center;">PRODUCT stage</th> <th colspan="2" style="text-align: center;">CONSTRUCTION PROCESS stage</th> <th colspan="5" style="text-align: center;">USE stage</th> <th colspan="4" style="text-align: center;">END OF LIFE stage</th> </tr> <tr> <th style="text-align: center;">[A1]</th> <th style="text-align: center;">[A2]</th> <th style="text-align: center;">[A3]</th> <th style="text-align: center;">[A4]</th> <th style="text-align: center;">[A5]</th> <th style="text-align: center;">[B1]</th> <th style="text-align: center;">[B2]</th> <th style="text-align: center;">[B3]</th> <th style="text-align: center;">[B4]</th> <th style="text-align: center;">[B5]</th> <th style="text-align: center;">[C1]</th> <th style="text-align: center;">[C2]</th> <th style="text-align: center;">[C3]</th> <th style="text-align: center;">[C4]</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">Raw material extraction & supply</td> <td style="text-align: center; vertical-align: top;">Transport to manufacturing plant</td> <td style="text-align: center; vertical-align: top;">Manufacturing & fabrication</td> <td style="text-align: center; vertical-align: top;">Transport to project site</td> <td style="text-align: center; vertical-align: top;">Construction & installation process</td> <td style="text-align: center; vertical-align: top;">Use</td> <td style="text-align: center; vertical-align: top;">Maintenance</td> <td style="text-align: center; vertical-align: top;">Repair</td> <td style="text-align: center; vertical-align: top;">Replacement</td> <td style="text-align: center; vertical-align: top;">Refurbishment</td> <td style="text-align: center; vertical-align: top;">Deconstruction Demolition</td> <td style="text-align: center; vertical-align: top;">Transport to disposal facility</td> <td style="text-align: center; vertical-align: top;">Waste processing for reuse, recovery or recycling</td> <td style="text-align: center; vertical-align: top;">Disposal</td> </tr> <tr> <td colspan="5"></td> <td colspan="5" style="text-align: center;">[B6] Operational energy use</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td colspan="5" style="text-align: center;">[B7] Operational water use</td> <td colspan="4"></td> </tr> </tbody> </table> </div> <p>Figure 15.2 Lifecycle stages for a whole life carbon assessment as per EN 15978</p> <p>). As the production of materials are typically the largest proportion of before use stage emissions for buildings, these have been taken to be the entire construction phase emissions.</p> <p>Further detail of the benchmarks used to calculate the emissions and the emissions breakdown per asset are included in Appendix 15A: GHG Assessment.</p>	[A1 – A3]			[A4 – A5]		[B1 – B7]					[C1 – C4]				PRODUCT stage			CONSTRUCTION PROCESS stage		USE stage					END OF LIFE stage				[A1]	[A2]	[A3]	[A4]	[A5]	[B1]	[B2]	[B3]	[B4]	[B5]	[C1]	[C2]	[C3]	[C4]	Raw material extraction & supply	Transport to manufacturing plant	Manufacturing & fabrication	Transport to project site	Construction & installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction Demolition	Transport to disposal facility	Waste processing for reuse, recovery or recycling	Disposal						[B6] Operational energy use														[B7] Operational water use								
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<p>Access and ancillary civils</p>	<p>The car parks and walkways (ancillary civils) are assumed to be constructed as per the elements detailed below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Type</th> <th style="text-align: left;">Element for the ICE database</th> </tr> </thead> <tbody> <tr> <td>Carpark</td> <td>Asphalt, 5% binder (150mm)</td> </tr> <tr> <td>Walkways</td> <td>Concrete - General (100mm)</td> </tr> <tr> <td>Access roads</td> <td>Asphalt, 5% binder (200mm) with typical aggregate subbase (320mm)</td> </tr> </tbody> </table> <p>Ancillary civil works are assumed to occupy 10% of the main hardstanding areas. For example, car parks occupy 10% of the area of access roads and walkways occupy 10% of the area of buildings.</p>	Type	Element for the ICE database	Carpark	Asphalt, 5% binder (150mm)	Walkways	Concrete - General (100mm)	Access roads	Asphalt, 5% binder (200mm) with typical aggregate subbase (320mm)																																																																												
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<p>Plant</p>	<p>Plant working hours are assumed to be 85 hours per week. Construction duration estimates for plant machinery is recorded in Chapter 3.</p>																																																																																				
<p>Transport</p>	<p>Assumptions on workforce numbers and distance travelled during construction based on that stated in Chapter 12: Socio Economics and the Transport Assessment. Construction period is assumed to be 4.5 years, with multiple construction activities able to be undertaken simultaneously. It is assumed that each construction worker drives to Site in a small diesel-engine van with two people per vehicle.</p> <p>Mode of transport of material to site based on Traffic Flows as set out in the Transport Assessment. A project assumption is that materials will be sourced as locally as possible.</p>																																																																																				
<p>Operation</p>																																																																																					

Emissions source	Assumptions																
Buildings	<p>Operational energy consumption benchmarks for buildings have been derived from typical breakdowns of whole life carbon emissions for different building types proposed in the RICS (2017) document.</p> <p>The ratios for embodied emissions from the phases ‘to practical completion’ and ‘in operation’ are as summarised below:</p> <table border="1" data-bbox="427 483 1307 674"> <thead> <tr> <th>Building type</th> <th>Carbon emissions to practical completion</th> <th>Carbon emissions in operation</th> <th>Ratio</th> </tr> </thead> <tbody> <tr> <td>Office</td> <td>35%</td> <td>33%</td> <td>94%</td> </tr> <tr> <td>Warehouse</td> <td>47%</td> <td>24%</td> <td>51%</td> </tr> <tr> <td>Residential⁵</td> <td>51%</td> <td>31%</td> <td>61%</td> </tr> </tbody> </table>	Building type	Carbon emissions to practical completion	Carbon emissions in operation	Ratio	Office	35%	33%	94%	Warehouse	47%	24%	51%	Residential ⁵	51%	31%	61%
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Warehouse	47%	24%	51%														
Residential ⁵	51%	31%	61%														
Access and ancillary civils	<p>Lighting is operated for an average of 12 hours per night, 365 days per year. These are considered the worst-case scenario and could be improved by light reduction design measures.</p>																
Transport emissions	<p>Assumptions on workforce numbers and distance travelled during operation based on that stated in the OBC and the accompanying Transport Assessment. It is assumed that local traffic is not affected by the operation of GCRE and transport emissions are associated only with full-time employees commuting to and from the Site. Each employee drives to Site in a small diesel-engine van with one person per vehicle. Workers travelling to and from Site as a result of indirect employment are excluded from the assessment. Employee shifts are assumed to be 12 hours.</p>																
Rolling Stock Testing	<p>Rolling Stock Testing is operational 24 hours per day for 252 days of the year. Trains are 70% electric-powered, 20% hydrogen-powered and 10% diesel-powered for the first 5 years. Thereafter, trains are 75% electric and 25% hydrogen-powered. Average speed of the trains is assumed to be 70 mph.</p> <p>Hydrogen powered vehicle emissions are assumed to be zero over the 60-year design life. In this scenario fuel is ‘green’ hydrogen produced from 100% renewable electricity. It is also assumed that hydrogen fuel would be zero carbon at the point of use.</p> <p>Lighting for sidings is operated for an average of 12 hours per night, 365 days per year. These are considered the worst-case scenario and could be improved by light reduction design measures.</p>																
Infrastructure Testing	<p>Infrastructure Testing is operational 24 hours per day for 105 days of the year. Trains are 100% electric powered for the duration of the 60-year appraisal period. Average speed of the trains is assumed to be 40 mph.</p> <p>Lighting for sidings is operated for an average of 12 hours per night, 365 days per year. These are considered the worst-case scenario and could be improved by light reduction design measures.</p>																
Maintenance and refurbishment																	
Buildings	<p>In-use energy consumption benchmarks for buildings have been derived from typical breakdowns of whole life carbon emissions for different building types proposed in the RICS (2017) document.</p> <p>The ratios for embodied emissions from the phases ‘to practical completion’ and ‘in use’ are as summarised below:</p> <table border="1" data-bbox="427 1872 1307 1928"> <thead> <tr> <th>Building type</th> <th>Carbon emissions to practical completion</th> <th>Carbon emissions in use</th> <th>Ratio</th> </tr> </thead> <tbody> </tbody> </table>	Building type	Carbon emissions to practical completion	Carbon emissions in use	Ratio												
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⁵ Residential benchmark included for staff accommodation building

Emissions source	Assumptions			
		Office	35%	32%
	Warehouse	47%	29%	62%
	Residential ⁵	51%	18%	35%

Future baseline environment

- 15.5.11** The future baseline considers the site following the Nant Helen Complementary Earthworks Project in addition to the restored Nant Helen Coal mine, in the absence of GCRE. The site under the future baseline conditions will have minimal sources of GHG emissions. Carbon sinks on site are also limited to minimal man-made habitats within the washery area. The operation of the Site as a rail testing, maintenance, research, development and storage facility will result in no further habitat loss from that associated with the Nant Helen Complementary Earthworks Project.
- 15.5.12** Traffic (and the associated emissions) will increase on the roads surrounding the development as a result of worker journeys to and from the Site during the construction and operational phases.

Design mitigation

- 15.5.13** The benchmarks used to undertake the GHG emissions assessment are assumed to reflect a development built and operated according to standard practice. Therefore, it is recommended that opportunities for mitigation should be regularly reviewed and integrated where practicable as the design develops.
- 15.5.14** Suggested mitigation to reduce GHG emissions during the construction and operational phases are summarised in paragraphs 15.5.21 to 15.5.25.

Assessment of effects

- 15.5.15** The GHG emissions resulting from the construction and operation of the proposed development are summarised in Table 15.4 and illustrated in **Figure 15.3**. Operational emissions have been estimated over the 60-year appraisal period of the scheme.

Table 15.4 Total CO₂ emissions by emission sources⁶

Emissions source	Emissions over appraisal period (tCO _{2e})
Construction	
Rail testing infrastructure	30,400
Buildings	23,400

⁶ Note that numbers are rounded to nearest hundred.

Access and ancillary civils	4,700
Plant	15,000
Transport	1,900
Operation	
Buildings	12,200
Access and ancillary civils	800
Transport	1,900
Rolling Stock testing	13,200
Infrastructure testing	23,000
Maintenance and refurbishment	
Rail testing infrastructure	12,700
Buildings	14,600
Public realm	1,500
Total	
	155,300

15.5.16 Further detail of the benchmarks used to calculate the emissions and the emissions breakdown per asset are included in Appendix 15A: GHG Assessment.

Assessment of effects from construction

15.5.17 The construction phase of the development would result in 75.5 ktCO₂e of GHG emissions, based on the scope of the assessment outlined in this chapter. This is significant as any increase in GHG is considered significant, in accordance with IEMA guidance (see paragraph 15.5.7).

15.5.18 For context, the emissions from the proposed development can be compared to the annual emissions from both the Neath Port Talbot and Powys regions. In 2017, the total reported emissions for all sectors was 7,560 and 838 ktCO₂e⁷ in Neath Port Talbot and Powys respectively. Construction is over approximately 4.5 years and therefore equates to approximately 0.2% of emissions of the Neath Port Talbot and Powys regions combined. Emissions from construction comprise 0.1% of the estimated Welsh industry sector carbon budget for the period of 2021-2025 (CB2)^{8,9}. Sector specific carbon budgets for CB2 have not yet been published, however based

⁷ National Atmospheric Emissions Inventory (2017) Local Authority CO₂ interactive maps <http://naei.beis.gov.uk/data/local-authority-co2-map> [Accessed July 2020]

⁸ Welsh Government (2019) Prosperity for all: A low carbon Wales <https://gov.wales/low-carbon-delivery-plan> [Accessed July 2020]

⁹ Welsh Government (2019) Industry sector emission pathway: factsheet <https://gov.wales/industry-sector-emission-pathway-factsheet> [Accessed July 2020]

on the following assumptions it has been estimated to be 63.3 MtCO_{2e}:

- The industry proportion of the carbon budget remains constant at 32.8% for CB2.
- The percentage reductions achieved in each carbon budget period are approximately in line with those for the future legislated target years (2030, 2040).
- The values are based on data presented in Prosperity for All: A Low Carbon Wales. This document maps a pathway for Wales to reduce its emissions by 80% by 2050 from a 1990. Welsh Government have increased this target to 95%, with an ambition to reach net zero by 2050. Therefore, updates are required and it is likely that future carbon budgets will need to be smaller than those presented here.

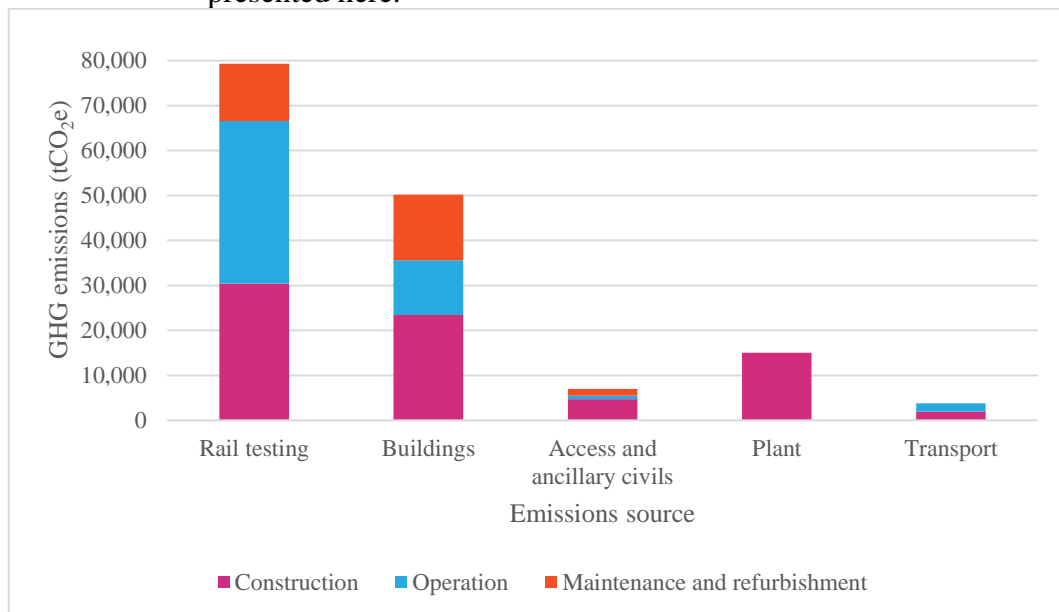


Figure 15.3 Total CO₂ emissions by emission sources

Assessment of effects from operation

15.5.19 The operational phase of the development will result in 79.8 ktCO_{2e} of GHG emissions over the 60-year appraisal period, based on the scope of the assessment outlined in this chapter. This includes:

- 12.2 ktCO_{2e} from the annual energy consumption of buildings;
- 36.2 ktCO_{2e} from the operation of Rolling Stock and Infrastructure testing at the facility; and
- 28.7 ktCO_{2e} from embodied emissions due to maintenance and refurbishment activities over the 60-year period.

15.5.20 In the first year of operation (2023), the annual emissions from energy consumption relating to transport and the rail testing facility and access and ancillary civils operations will be 1.20 ktCO_{2e} (see **Table**

15.5), this is considered significant in accordance with IEMA guidance (see paragraph 15.5.7). This equates to 0.01% of the total reported emissions in Neath Port Talbot and Powys in 2017.

Table 15.5 Total CO₂ emissions by emission sources in opening year of operation^{6,6}

Emissions source	Annual emissions in opening year, 2023 (tCO ₂ e/year)
Operation	
Buildings	N/A ¹⁰
Access and ancillary civils	100
Transport	13
Rolling Stock testing (operational 2024)	0
Infrastructure Testing	1,100
Total	
	1,200

Mitigation and enhancement

- 15.5.21 The GHG emissions assessment provides an indication of the emissions associated with the construction and operational phases of the proposed development. As all emissions from the development are considered significant under the definition in paragraph 15.5.7, mitigation actions should be implemented to reduce the GHG emissions from the development.
- 15.5.22 PAS 2080 provides a framework for the management of carbon projects in the built environment. The use of PAS 2080 to guide the approach to reducing GHG emissions associated with the proposed development, along with further mitigation measures which are outlined below.
- 15.5.23 At this stage in the project programme, when the details of construction are in outline only and no contractor has yet been appointed, mitigation measures which are outlined in the sections below **are only recommendations** to be evolved during detailed design stage. These mitigation measures are therefore not accounted for in the assessment of significance of effects and the outcomes of the assessments remain as stated above.

Mitigation of effects from construction

- 15.5.24 The following measures are recommendations for ways to mitigate GHG emissions, that would otherwise be generated during the construction phase:

¹⁰ Operational emissions for buildings are benchmarked in their totality, over the 60-year design life, therefore emissions in the opening year cannot be shown.

- Improve baseline understanding over the lifecycle of the project. Clause 10 of PAS2080 sets out the process for ensuring continuous improvement with respect to carbon management, including actions required of each value chain member to ensure lessons learned from the project and elsewhere are integrated where relevant;
- Identify highest impact materials (concrete, steel and plastic) and seek ways to reduce these specifically. The GHG assessment identifies the rail testing infrastructure as the most carbon intensive so designers could target these areas in their design and reduce materials where possible;
- Reduce the quantity of materials required by implementing efficient design;
- Implement the principles of designing out waste to reduce the embodied emissions used to manufacture materials that are subsequently wasted. This might, for example, include off-site manufacturing and modular construction;
- Target best in class for key materials and deliver this through the procurement process; select alternative materials that have a lower emissions intensity e.g. recycled material, cement substitutes and best EPD ratings;
- Use of alternative power sources for operation of plant on site where applicable. Hybrid plant is widely available and can significantly decrease gas oil consumption for activities such as excavation. Smaller items of plant can run on biofuels.
- Where possible, use a green tariff for energy supplied from the grid for use during construction; and
- Implementation of low carbon logistics, through local procurement and route optimisation, in addition to green travel plans for staff working on site.

Mitigation of effects from operation

15.5.25 The following measures are recommendations for design interventions to mitigate the impact of GHG emissions during the operation of the proposed development:

- Take a ‘fabric first’ approach to building design in order to improve the thermal efficiency of buildings and reduce heating and cooling energy requirements during operation. Including consideration of orientation and design;
- Select energy efficient infrastructure, equipment and fittings in order to reduce energy demand during operation;
- Assess energy supply options, and develop an energy strategy for the proposed development, which focuses on connections to low carbon energy sources (e.g. mine water heat recovery or renewable

power¹¹) where possible, in order to reduce the emissions intensity of the energy consumed;

- Design for operation, consider service-based material and selection of durable materials with low requirements for maintenance and replacement over the operational life of the development, with consideration of appropriate selection of materials; and
- Implement practices for carbon sink creation by targeting: (i) opportunities within the washery for small-scale habitat creation (e.g. tree planting) and enhancements of the retained marshy grassland and acid grassland-heathland; and (ii) opportunities on the embankments created around the tracks, providing additional area for the establishment of vegetation¹².

15.5.26 In paragraph 15.6 of the Scoping Report, on-site renewable energy generation is recommended to mitigate the effects of climate change. As this is the outline design stage, no energy strategy for the site has yet been produced. Therefore, on-site renewable energy generation has not been included in the description of development and has subsequently not been assessed as part of the LVIA. This option will be assessed further at a future design stage.

15.6 CCR assessment

Methodology

15.6.1 The approach and methodology for the CCR assessment is as follows:

- analysis of relevant climate change and weather data, emissions scenarios and probability levels;
- assessment of climate hazards;
- identification of potential risks from these climate hazards to the assets and occupants of the proposed development;
- consideration of the resilience of the proposed development within the context of any incorporated mitigation measures, including resilience measures which are embedded within the design due to regulations and design guidelines; and
- identification of need for any further resilience measures to protect the proposed development against the effects of climate change.

15.6.2 The CCR assessment is composed of three main parts: the identification of climate hazards and benefits; the assessment of

¹¹ Neath Port Talbot Council (2020) Decarbonisation and Renewable Energy Strategy <https://www.npt.gov.uk/media/13541/dare-strategy-may-20.pdf?v=20200522162830> [Accessed August 2020]

¹² Management and monitoring of any created / enhanced vegetation will be crucial to ensure that soil health is maintained, and rates of carbon sequestration remain as high as possible.

likelihood and consequences; and the evaluation of significance. These are shown in Table 15.6 and

15.6.3 Table 15.7.

Table 15.6 Qualitative five-point scale of likelihood of climate change risks

Level	Descriptor	Description
A	Very unlikely	Event only occurs in exceptional circumstances and would not be expected to occur in the lifetime of the development
B	Unlikely	Based on the current design, engineering and maintenance standards, the event is not expected to occur more than once during the lifetime of the development
C	As likely as not	Event may occur at least once during the lifetime of the development
D	Likely	Event is expected to occur several times during the lifetime of the development
E	Very likely	Event is expected to occur many times during the lifetime of the development

Table 15.7 Qualitative five-point scale of consequences of climate change risks

Level	Descriptor	Disruption	Financial	Safety	Damage
1	Minimal	Minor disruption to rolling stock and/or infrastructure testing within a single day <30 mins	Insignificant financial loss.	Minor harm or near miss -no adverse human health effects or complaints.	No damage to assets
2	Minor	Minor disruption (<30 mins) to rolling stock and/or infrastructure testing for multiple days.	Additional operational costs. Minor financial loss.	Lost time to injury or medical treatment, short term impact on persons affected.	No permanent damage. Some minor restoration work required.
3	Moderate	Rolling stock and/or infrastructure testing on hold for up to 2h each day for multiple days or for greater than 2h in a single day.	Moderate financial loss.	Long-term injury or illness, prolonged hospitalisation or inability to work.	Widespread damage and loss of service. Damage recoverable by maintenance and minor repair. Partial loss of local infrastructure

4	Major	Rolling stock and/or infrastructure testing on hold for 1 day or for greater than 2 hr for multiple days.	Major financial loss.	Single fatality/ multiple long-term injuries- emergency response	Extensive damage requiring extensive repair.
5	Catastrophic	Rolling stock and/or infrastructure testing on hold for multiple days.	Significantly high financial loss.	Multiple fatalities - emergency response	Permanent damage and/or loss of service Retreat and translocation of development.

15.6.4 For the CCR assessment, the timeframe for the risk assessment has been selected to align with the start and end of the operational life.

15.6.5 Due to the short temporal phase of construction, it is assumed that the mitigation measures put in place by the Construction Environmental Management Plan (CEMP) would take into account current weather events and the impacts of climate change already being experienced in the UK. Therefore, the construction phase is scoped out of the CCR assessment. An outline CEMP is included in Appendix 3A.

Significance criteria

15.6.6 The significance of the risks identified in the CCR assessment is based upon the likelihood of a hazard having an impact on the proposed development, and the consequence of the impact. The potential likelihood and consequence of impacts to the proposed project were assessed using a qualitative five-point scale as shown in **Table 15.8**.

Table 15.8 Significance matrix

			Consequence				
			1	2	3	4	5
			Minimal	Minor	Moderate	Major	Catastrophic
Likelihood	A	Very Likely	Medium	Medium	High	Very High	Very High
	B	Likely	Low	Medium	Medium	Very High	Very High
	C	As Likely as Not	Low	Low	Medium	High	High
	D	Unlikely	Very Low	Very Low	Low	Medium	Medium
	E	Very unlikely	Very Low	Very Low	Low	Low	Medium

15.6.7 Any risk equal to or above “medium” is considered significant.

Limitations and assumptions

15.6.8 The limitations of the CCR assessment are as follows:

- there is uncertainty in the climate change projections used – the UKCP18 Weather Generator is subject to certain limitations which are addressed in detail in the Weather Generator Report published by UKCP¹³;
- the assessment is qualitative except for the assessment for flood risk and drainage design which is quantitative and takes into account climate change allowances;
- the evidence base relating to climate change impacts for some assets and environmental topics is limited due to material uncertainty in projections for specific climate variables (in particular extreme wind and storm events).

15.6.9 The CCR assessment is based on the following assumptions:

- the assessment has assumed that mitigation measures for effects assessed by other topics will be implemented effectively;
- a CEMP will be developed for the construction phase that will be effectively implemented and provide appropriate mitigation for extreme weather-related effects during construction.

Future baseline environment

15.6.10 The future baseline environment for the CCR assessment include consideration of:

- Current climate conditions; and
- Projected future climate conditions.

15.6.11 The description of future climate conditions and extreme climate events will be based upon climate change projection data from the UKCP18. UKCP18 data is the most comprehensive and widely used data set of climate projections covering the UK.

15.6.12 This section presents future projected climate conditions for the area encompassing the proposed scheme for the 2020s and 2080s¹⁴. Future projections for extreme weather events have been projected for the 2020s and 2060s, as there is only data up until 2079. These periods cover the assumed construction period and assumed 60-year operational life.

¹³ UKCP09 (2010) UK Climate Projections science report: Projections of future daily climate for the UK from the Weather Generator, <http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87944&filetype=pdf> [Accessed July 2020]

¹⁴ The time periods for climate projections are selected based on the lifespan and stages of the proposed development

- 15.6.13** Using the historical baseline, two methods were implemented to establish the future climate baseline:
- The changes in average climate projections were obtained from the UKCP18 probabilistic projections of climate change¹⁵; and
 - The changes in extreme weather events were obtained using UKCP18 regional projections.
- 15.6.14** Climate change projections for a range of meteorological parameters are presented for different probability levels within the Representative Concentration Pathway 8.5 (RCP8.5)¹⁶ high emission scenario for the near-term and long-term future time periods. **Table 15.10** **Table 15.9** presents changes in extreme weather events for the 2020s and 2060s, such as number of heavy rainy days and presents expected changes in in climate conditions, such as mean temperature and precipitation for the 2020s and 2080s.
- 15.6.15** Temperatures in the area are projected to increase in both winter and summer. The largest increase in temperature is projected to be in the mean daily maximum temperature in summer, which is expected to increase by 5.4°C to 23.4°C in the 2060s, relative to the baseline in the high emissions scenario.
- 15.6.16** Mean precipitation rates in the region are anticipated to change, increasing from 5.2% to 22.1% in the winter and decreasing by 10.3% to 37.6% in the summer during the 2020s and 2060s.
- 15.6.17** Specific humidity is expected to increase from 4.1% to 21.5% in the winter from the 2020s to 2060s. During summer, there is an increase from 3.9% in the 2020s to 17.9% in the 2060s.
- 15.6.18** The mean number of hot days, when the maximum temperature is above 25°C, is anticipated to increase from 3.4 to 30.6 per year in the 2060s for the high emissions scenario. The average number of days in a given year, when the mean daily temperature is below 0°C, is anticipated to decrease from 57.5 to 25.6 in the 2060s under the high emissions scenario.
- 15.6.19** In the case of extreme precipitation, the number of days with heavy rain (precipitation greater than 25mm/day) in a given year is expected to increase from 20.4 in the baseline period to 24.4 in the 2060s. The average annual number of dry spells (periods of at least ten consecutive days with no precipitation) is projected to increase from 2.7 to 3.7 for the 2060s in the high emissions scenario.

¹⁵ Met Office, “UK Climate Projections (UKCP) - Met Office,” 2018. [Online]. Available: <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index>.

¹⁶ The RCP8.5 global warming scenario represents a very high baseline emission scenario, representing the 90th percentile of no-policy baseline scenarios available at the time.

Table 15.9 UKCP18 baseline climate data and climate change projections for the local area (based on 25km grid cell, 287500, 212500) for the 2020s and 2060s (under the RCP8.5 high emissions scenario). Biased corrected absolute values from script are shown.

Parameter		Baseline (1981-2010)	2020s (2010-2039)			2060s (2050-2079)		
			Min.	Mean	Max.	Min.	Mean	Max. ¹⁷
Temperature	Number of frost days (daily minimum temperature equal or lower than 0°C)	57.5	30.5	44.5	64.0	18.1	25.6	37.8
	Heatwaves (2 days with maximum temperature higher than 29°C and minimum temperature higher than 15°C)	0.1	0.0	0.4	1.2	1.0	3.5	7.6
	Number of hot days (daily maximum temperature higher than 25°C)	3.4	2.8	8.7	20.9	14.1	30.6	50.7
Precipitation	Dry spells (10 days or more with no precipitation)	2.7	2.3	2.9	3.7	3.1	3.7	4.9
	Annual number of days when precipitation is greater than 25mm per day (Met Office definition of ‘heavy rain’)	20.4	14.0	21.7	30.1	18.1	24.4	31.6

¹⁷ 12 regional models are used in UKCP18 to project the variables for extreme weather events. The min. (minimum) and max. (maximum) values shown here are the minimum projection from the 12 models and maximum projection from the 12 models for the given parameter.

Table 15.10 UKCP18 climate change projections for climate variables for the local area (based on 25km grid cell, 287500, 212500) for the 2020s and 2080s (under RCP8.5 high emissions scenario)

Parameter		Baseline (1981-2010)	Anomalies from baseline for 2020s (2010-2039)			Anomalies from baseline for 2080s (2070-2099)		
			10 th percentile	50 th percentile	90 th percentile	10 th percentile	50 th percentile	90 th percentile
Temperature (°C, % change from baseline)	Mean winter daily temperature	3.5	-0.1	0.6	1.4	1.0	2.9	4.9
	Mean summer daily temperature	14.0	0.2	0.9	1.6	1.9	4.7	7.7
	Mean daily winter minimum temperature	0.8	-0.1	0.6	1.4	1.0	3.0	5.3
	Mean daily summer maximum temperature	18.0	0.3	1.1	2.0	2.0	5.4	8.9
Precipitation (mm, % change from baseline)	Winter mean precipitation rate	7.3	-3.3	5.2	14.2	1.6	22.1	46.0
	Summer mean precipitation rate	4.3	-26.5	-10.3	5.8	-66.6	-37.6	-8.6
Specific humidity (% change from baseline) ¹⁸	Winter	-	-1.6	4.1	10.0	6.4	21.5	38.2
	Summer	-	-1.2	3.9	8.7	3.3	17.9	33.5

¹⁸ No UKCP18 baseline climate data available for specific humidity

Design mitigation

15.6.20 Detail of the embedded mitigation measures associated with each identified climate change risk are included in the risk register in Appendix 15B: CCR Assessment. These include building standards which consider climate change, the operational (climate) ranges of equipment and maintenance standard for roads.

Assessment of effects

Assessment of effects from operation

15.6.21 The risks identified in the CCR assessment have a ‘Low’ to ‘Medium’ risk rating due to the mitigation measures embedded in the design. These measures are outlined in Appendix 15B: CCR Assessment. Three risks identified have a ‘Medium’ risk rating. These include:

- Increased number of extremely hot days causing rail bucking and/or associated misalignment properties (very unlikely with catastrophic consequence);
- Increased risk of rail breaks due to extreme cold conditions given cold weather events have the potential to be more extreme (very unlikely with catastrophic consequence); and
- Increased wind loading on trains running at high cant deficiencies¹⁹ on test tracks can lead to increased overturning force on moving trains. There is a potential risk of derailment by overturning during an extreme weather event (very unlikely with catastrophic consequence).

Mitigation and enhancement

Mitigation of effects from operation

15.6.22 Risks that were identified as medium risk in the CCR assessment have mitigation measures set out in **Table 15.11**.

Table 15.11 Mitigation of effects from operation of CCR assessment

Risk	Mitigation
Rail buckling and/or associated misalignment problems.	The design shall take into account climate change requirements including effects of increased in temperature. Track buckles are triggered by the presence of at least one other factor (a disturbance, a deficiency or incomplete preparatory maintenance work). Thus, track work will be restricted and maintenance staff shall be deployed ahead of any hot weather event to assess rail infrastructure, in accordance

¹⁹ Cant deficiency involves travelling through a curve faster than the balance speed and produces a net lateral force to the outside of the curve.

Risk	Mitigation
	with Network Rail standards. Climate change allowances are also considered for steel material selection (including stressing for continuous welded rail (CWR)). Maintenance and monitoring measures to be put in place with particular focus on preventing derailment due to a track fault.
Increase risk of rail breaks due to extreme cold conditions	The design shall take into account climate change allowances for steel material selection and stressing of CWR. Maintenance and monitoring measures will also be put in place with particular focus on preventing derailment due to a track fault. Specific maintenance to adjustment switch gaps and overlaps, expansion joints, insulated joints, ball and claw settings in switch and crossing (S&C) and alignment monitoring will be undertaken ahead of cold weather events.
Increased overturning force on moving trains. Potential risk of derailment by overturning during extreme weather event.	Design of track system to ensure that all vehicles meet or exceed the minimum acceptable intrinsic roll-over wind speed, as defined within Railway Group Standards.

15.6.23 Additionally, due to the uncertainties involved in adapting to future climate change, an adaptive pathway approach²⁰ is recommended for monitoring and managing climate risks in the future. A clear plan, with climate related trigger points for review should be developed to support this, including an understanding of interdependencies.

²⁰ Adaptation pathways is a planning approach addressing the uncertainty and challenges of climate change decision-making. It enables consideration of multiple possible futures and allows analysis/exploration of the robustness and flexibility of various options across those multiple futures.

15.7 Residual effects

- 15.7.1 The mitigation measures associated with GHG emissions outlined in this chapter are recommendations to be evolved during detailed design stage and are therefore not accounted for in the residual effects.
- 15.7.2 The proposed development would result in net positive GHG emissions during both the construction phase and operational phase. Emissions from construction are mostly associated with the embodied carbon within construction materials, and emissions from operation are for the most part associated with the energy consumption and maintenance and refurbishment of rail testing operations and buildings.
- 15.7.3 Rail infrastructure designed as part of the scheme has the potential to be affected by climate change. A number of potential risks have been identified and assessed; these will be mitigated by applying robust design standards or relevant mitigation measures will be incorporated in the relevant asset management processes. Three risks have been deemed significant and mitigation is identified above in Table 15.11.

15.8 Assessment summary matrix

15.8.1 Significant impacts are summarised in the Table below, refer to Appendix 15B: CCR Table for the full assessment of impacts.

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Increased number of extremely hot days causing rail bucking and/or associated misalignment properties	Rail	Medium	Catastrophic	Major	The design shall take into account climate change requirements including effects of increase in temperature. Track buckles are triggered by the presence of at least one other factor (a disturbance, a deficiency or incomplete preparatory maintenance work). Thus, track work will be restricted and maintenance staff shall be deployed ahead of any hot weather event to assess rail infrastructure, in accordance with Network Rail standards. Climate change allowances are also considered for steel material selection (including stressing for CWR). Maintenance and monitoring measures to be put in place with particular focus on preventing derailment due to a track fault.	Medium	Medium
Increased risk of rail breaks due to extreme cold conditions	Rail	Medium	Catastrophic	Major	The design shall take into account Climate change allowances for steel material selection and stressing of CWR. Maintenance and monitoring measures will also be put in place with particular focus on preventing derailment due to a track fault. Specific maintenance to adjustment switch gaps and overlaps, expansion joints,	Medium	Medium

					insulated joints, ball and claw settings in S&C and alignment monitoring will be undertaken ahead of cold weather events.		
Derailment by overturning during an extreme weather event	Rail	Medium	Catastrophic	Major	Design of track system to ensure that all vehicles meet or exceed the minimum acceptable intrinsic roll-over wind speed, as defined within Railway Group Standards.	Medium	Medium