Powys

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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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. BCL136- Land at Abercrave Station is a small (1.07 ha) area of common land to the north of the site.

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 5-15
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 5-15
A description of the likely significant effects of the development on the environment and, where appropriate, any proposed monitoring arrangements.	Chapters 5-15
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 5-15
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 5-15
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 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 standards[1].

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

2.7.11 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 Project delivery

2.8.1 It should be noted that GCRE is intrinsically linked to the previous Nant Helen earthworks' consents (20/0738/FUL and P/2020/0362) in terms of site delivery and should GCRE gain permission, the earthworks would be designed in detail to accommodate the facility. Should consent be granted, the earthworks delivery programme would align with the requirements of GCRE such that the on completion of the earthworks, work would begin on GCRE straight away, or with a short gap in construction activities. At this stage in project development, it is therefore anticipated that works would begin on the earthworks in late 2021 / early 2022 (following discharge of necessary planning conditions). The duration of these works is estimated to be in the region of 12 months, with work on the GCRE then estimated to start in late 2022 / early 2023.

2.9 Future baseline for site

2.9.1 Based on the project delivery of GCRE and the Nant Helen Earthworks, the EIA considers the existing (i.e. pre-restoration) conditions as the baseline, 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 defines 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.

2.10 Cumulative effects

2.10.1 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:

- **Nant Helen Restoration works (committed development)**

2.10.2 As the restoration is committed, the baseline for this assessment is, in most cases, the restored site.

2.10.3 Consequently, the assessment for GCRE already includes consideration of the restoration works in the assessment. No further assessment is required to identify cumulative effects.

- **Nant Helen Earthworks (committed development)**

2.10.4 As the earthworks are committed, the baseline for this assessment is, in most cases, the restored site.

2.10.5 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.

2.10.6 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.

2.11 Assumptions and limitations

2.11.1 It has been assumed that information provided by third parties, including publicly available information and databases is correct at the time of publication.

2.11.2 Assumptions and limitations specific to environmental aspects are discussed in the relevant topic assessment chapters of this ES.

2.12 Project team

2.12.1 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.

2.12.2 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.

2.13 ES Structure

2.13.1 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 Appendic**es – 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.

2.14 Application documents

2.14.1 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. These are represented on Figure 1.3 (site layout) and the Figure 1.6 (Illustrative Masterplan). and are described in more detail within this chapter of the ES. These components form the basis of the EIA 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 paladin type 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 600m^2) 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, upto 120m^2, 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 two storeys; 30m x 10m x 15m in size, with a floorspace of up to 900m^2.

Infrastructure testing research and development centre

3.1.13 During Phase 1, the research and development centre would be up to 480m^2, (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 1000m^2, (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)40m x (l) 400m and two roads would be (h)12m x (w)40m 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) and up to 350m^2, 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. Carriage 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 heaving moving machinery for cleaning. It would be one storey up to (l)35m x (w)10m x (h)12m, 350m^2, and able to service trains up to 400m. It would include a CET point with canopy housing heavy, moving . 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 (0700-1900) 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 the A4221 Celtic Energy – Nant Helen access road, and the A4221 Washery and Distribution centre access. Secondary access can also be taken from the existingjunction of the A4109 Wembley Avenue with Onllwyn Road.

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; • 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 shunters cabins which are likely to be a portacabin with basic amenities from which the shunter will move around the facility opening / closing hand points to enable train	Phase 1	Yes

Project component	Description summary	Phase of development introduced	Included in full facility (i.e. on completion of Phase 3)
	movements. Situated at a satellite location near sets of points to increase efficiency of train movements. Small cabins of approximately 10mx3mx 3m.		
Security measures	Security measures would include: • CCTV; • 7,200m of 2.1m paladin type fencing, approximately 2m away from track, to be located around the perimeter of the outer track and maintenance track.	Phase 1	Yes
Civils works	To include: • drainage ditches, • ponds and culverts, • retaining walls in the south of the site; • 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 anticapted 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 frequncy.

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 communitities, acousic 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 Acoustics 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 10.4)

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 communitities to the east of the facility. The earthworks would be programmed to align with the requirements of GCRE such that the on completion of the earthworks, work would begin on GCRE. There would be insufficient time between the earthworks and GCRE for habitats to become established.

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 Planning Policy Wales 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 Sustainable Draiainge Systems (SuDS). This includes 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. SuDS Approving Body (SAB) approval is required before construction of drainage systems can commence on new and redeveloped sites.

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 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	High tonnage infrastructure 4.5km test track with 25kV overhead line electrification. Bi-directional rail access from N&B branch line.	12 months

Phase	Components included	Construction duration
infrastructure testing (operational 2023):	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. Infrastructure testing R&D facility – modular site cabin buildings with advanced IT for monitoring of infrastructure tests. External storage space – concrete hardstanding area with vehicle access for storage of materials & equipment for testing.	
Phase 2 – Rolling Stock Testing (operational 2024)	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. 12 full-length stabling roads. Rolling stock maintenance shed. 2 roads at 400m length, 2 roads at 250m length. Internal and external storage spaces. Carriagewash. Improved (permanent) staff facilities. Those introduced in phase 1 will be removed. Provision of overnight accommodation, in addition to all previous functions. Upgrade of all points to electric points. Central control centre – panel from which all train movements are controlled. Points are changed electronically. Infrastructure testing R&D facility – relocated to location shown on Figure 1.3	12 months
Phase 3 – Aspirational inclusions (operational 2025)	Rolling stock R&D / education facility. Stationary testing facilities and associated laboratories. Rolling stock maintenance facility. 10 ‘through’ sidings, south of the N&B branch line	18 months

3.3 Operational details

3.3.1 The majority of the rolling stock & infrastructure testing at GCRE would be underataken 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 environemtnal 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)	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: **Day - 175 | Evening – 35 | Night – 50** 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. **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
Train movements on inner track (infrastructure testing)	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: **Day – 170 | Evening – 25 | Night – 35** 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

Operation	Details
	assumed that the track would operate on average over a year for three evenings and two night-times per week. **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 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 sidings in the washery area	A maximum of 1 train per day transported from outside of the facility, up the branch line (assumed as diesel-hauled, as the branch line is not electrified) onto the sidings to the north of the maintenance sheds for storage. Likely to be 10-12 cars long (250m-300m long) travelling 15-30mph along the branch line. 10-16 movements per day within the facility from one siding to another at speeds of max. 5mph. Train movements would not take place in evenings or night-time, bar those trains which would be starting or finishing a test run on the rolling stock test track and therefore going from the sidings to the test . For the purposes of the noise assessment: **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 oftesting.
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).). Train movements onto and off of these sidings would therefore be very infrequent.
Rolling stock dismantling/ decommissioning	If decommissioning of trains is carried out on site then this would consist of the dismantling of trains to retain components which could then be re-used. These dismantling works would be carried out on the apron to the north of the maintenance sheds and/or inside the maintenance sheds themselves, and would be no more noisy than routine maintenance works. Outdoor decommissioning/train dismantling activities would not take place during evening or night-time. During night-time, maintenance would be carried out with the shed doors closed.
Maintenance works	The maintenance facility would be able to host multiple train operators / manufacturers simultaneously, meaning the likelihood of continuous

Operation	Details
	maintenance is increased. It is possible that maintenance would be carried out 24/7.
Carriage wash facility	It has been assumed that the wash will be in use for 10% of the time during the daytime; for 3% of the time during the evening and 1% of the time during the night-time.
Staff car park	The staff car park would be located north of the staff facilities building
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 Following pre-application consultation, some changes were made to the design in terms of ecological mitigation, noise barrier locations/heights and drainage. These changes have been made in response to comments and potential concerns raised by statutory consultees and NPTCBC/PCC.

4.1.18 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 5.6, 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.

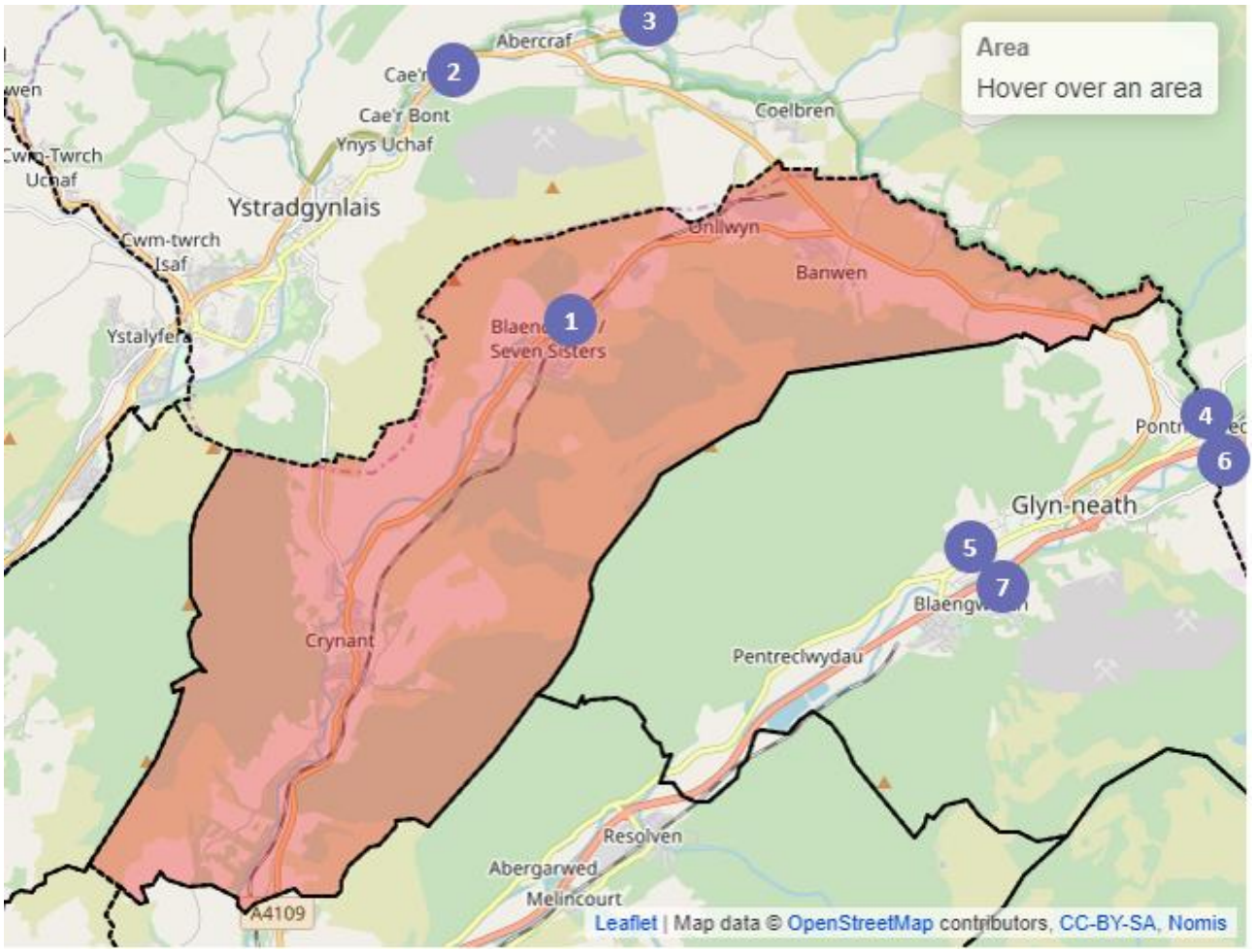


Figure 5-1: Potential traffic routes (Neath Port Talbot MSOA)

5.2.4 The outline transport strategy for the proposed development, as detailed in the TA (TA – Volume III, Appendix 9.1) 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 Hierarchy[1],which requires new development to prioritise walking, cycling and public transport ahead of private motor vehicles.

[1] Welsh Government (2021) Planning Policy Wales Edition 11

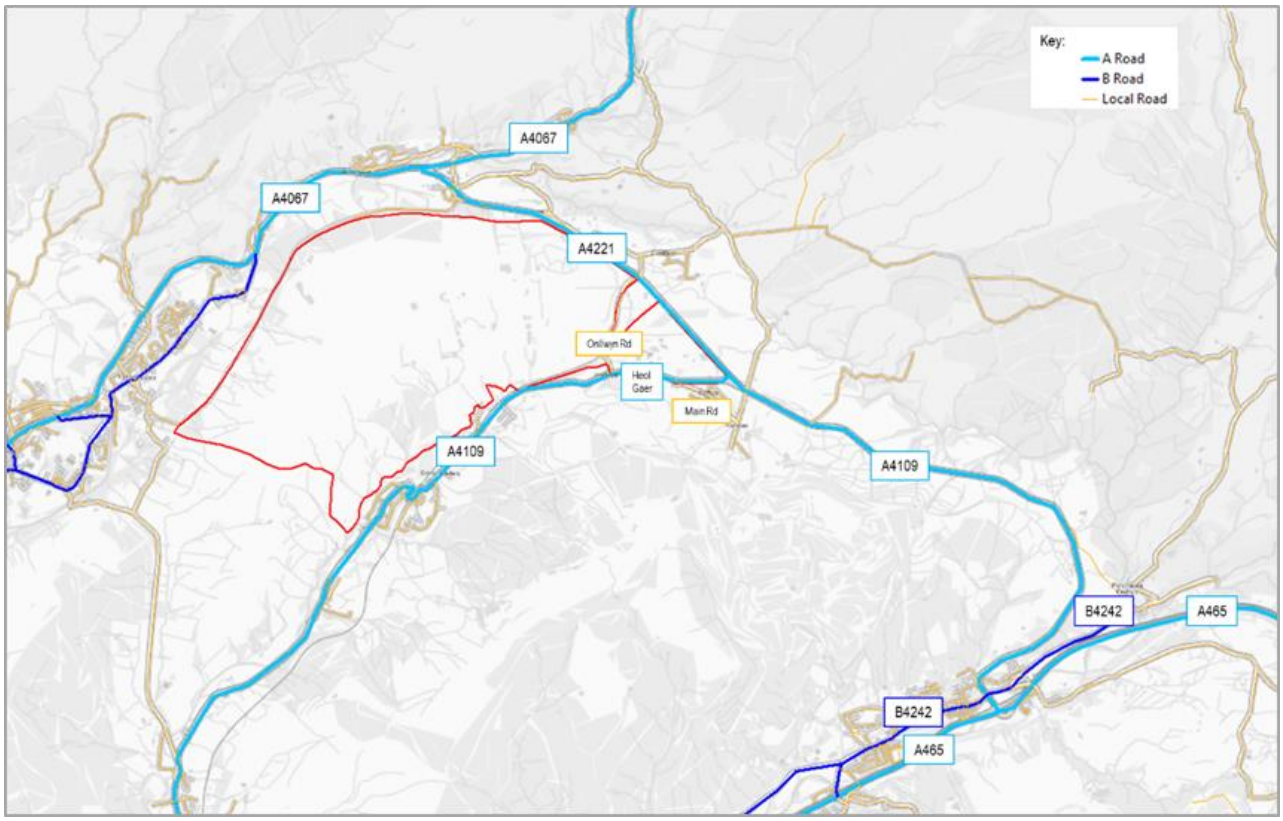


Figure 5-2: Highway Network

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 Note18: 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 11, 2021 – 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	
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. 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. 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. 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. 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,	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.

please contact the Countryside Services and Outdoor Recreation team.	
Highways No response received to date	n/a
Powys County Council consultation via email	
Discussion with 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. 'Whilst I have no issue with the count locations agreed, 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. 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?'	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.
PAC Response with Neath Port Talbot and Powys County Borough Council via email	
Discussion with N&PT in relation to the current planning application and their concerns: 1. Both LAs have instructed the resurvey to take place as soon as possible during Covid but excluding the October half term to enable a better representation of traffic movements. This would include a 7-day ATC and 12 hour Classified Junction Turning Count on a neutral day of all previous survey points plus 2 additional junctions – Onllwyn Road/Coelbren crossroads and the Celtic Energy access on the A4221. 2. NPTCC and PCC raised concerns of the facility attracting train enthusiasts/unplanned visitors. It is likely that any such visitors would arrive by car and without a designated area for such visitors to park, there is a potential risk of visitors parking on the highway or PROWs. NPTCBC and PCC have therefore requested for car parking opportunities to be explored 3. Distribution of flows to be reconsidered – Powys distribution is too low. Current distribution closely linked to existing census travel to work but will be amended/uplifted to provide a robust case for Powys. 4. More detail required on Active Travel and Wembley/Onllwyn Road junction – what is required? Traffic orders/Visitor provision? 5. The TA future scenario is currently only carried out for 11 years and should be 15 6. Consideration of emergency access required 7. Include note of new development within Glynneath although impact will be negligible but should be mentioned within TA	1. A resurvey was undertaken using a seven-day Automatic Traffic Count (ATC) during the period Wednesday 9th December to Tuesday 15th December 2020. All Junction Turning Counts 1-8 were also re-surveyed with the addition of two additional junctions. During the ATC re-survey period in December, schools were required to change to home schooling due to increased COVID-19 restrictions which came into force on Monday 14th December. COVID-19 has had an impact on the number of journeys undertaken but for the purpose of this assessment it has been assumed that in the medium-term traffic volumes in the area will resume previous trends/volumes. The average traffic flows from the December re-surveys were lower than the January survey data. Through dialogue with NPT and PCC it was agreed that in order to provide a robust assessment the December data would not be used for junction analysis except for the additional two junctions. The ATC data comparison is included as Appendix E of the TA for reference (TA – Volume III, Appendix 9.1). 2. It is acknowledged that the facility may attract train enthusiasts and leisure trips passing by who would try to view GCRE. Although no formal provision for viewing the facility is currently proposed, recognising the sensitivity of some of the likely activities / testing which the facility would accommodate, and the

8. Site is on hill – so expected that mode split will be car dominant, and this should be reflected within TA 9. Construction Method Statement required.	potential impact of such visitors has been considered following concerns raised by NPTCBC and PCC. Some potential car parking locations are indicated in Appendix F of the TA. Given that no formal viewing area is currently proposed, it is recommended that the traffic generated from these types of visitors is monitored and an appropriately worded condition added to any future decision in terms of the implementation of suitable traffic management measures should visits of this nature cause concerns. Scope for mitigation is further acknowledge within the Transport Implementation Strategy of the TA (TA – Volume III, Appendix 9.1). 3. Workforce distribution has been redistributed from Neath to Powys with an uplift from 5% to 10% as agreed with the LAs. 4. Infrastructure standard of crossing facilities along Onllwyn Road will be agreed on in the reserved matters process as Onllwyn Road creates severance between the bridleways and paved footpaths across the GCRE site. Pedestrian access to the site will be provided from Onllwyn Road by provision of a surfaced footway and the requirement for an improved crossing at the Wembley Avenue priority T. This would include an improved crossing of Wembley Avenue to Onllwyn Road to include, as a minimum, dropped kerbs and tactile paving. 5. This has been revised and modelled within the assessment for 15 years. 6. A4221/Onllwyn Road – This will only be a secondary access and is not considered a main access point to site however should still be considered within the TA. Emergency access will be possible via multiple other access points. Further consideration in construction and operational plans will be developed when a contractor is appointed. 7. Acknowledged new development within Glynneath within the TA. Impact is negligible as agreed with NPTCBC and therefore not included within the assessment. 8. Mode share has not been considered within the assessment and it is assumed that all trips will be made by car, for a robust assessment. 9. A construction method statement has been included in the TA which should be included within the Framework Construction Traffic Management Plan which will be developed once a contractor is appointed post permission. This is further acknowledged in chapter 7.2 of the TA (TA – Volume III, Appendix 9.1)

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 (TA – Volume III, Appendix 9.1) 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 Nant Helen access priority-controlled T Junction;
3. A4221 and Onllwyn Road priority-controlled staggered junction;
4. A4221 and CPL South Wales Coal priority-controlled T-Junction;
5. A4221 and A4109/Heol Gaer priority-controlled T-Junction;
6. Onllwyn Road and A4109 priority-controlled T-Junction;
7. A4109 and A465 priority-controlled T-Junction; and
8. 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 2035 Traffic Flow; and
- Year 2035 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 be 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 Eight 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 Routeing 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.

5.5.19 A sensitivity test has been carried out, which tests a higher percentage of construction delivery traffic travelling to/from the west via the A4067 from Ystradgynlais. Deliveries from the west are likely to come from J45 of the M4 and take the A4067 to the site. The construction delivery access will remain as before via the Washery Access.

Methodology for assessment of effects from Operation

5.5.20 Both the distribution and assignment of staff, visitors (i.e. testing teams) and deliveries have been assessed.

5.5.21 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.

5.5.22 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).

5.5.23 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.

5.5.24 GCRE will attract visiting testing teams once operational. It has been assumed that a typical test team of around 30 people would arrive/depart daily in four minibuses during the AM and PM peak hours for a robust analysis. The distribution of which is estimated based on the likely geographical spread of hotel and accommodation, assuming that each testing team will remain local during their test trials. Majority of accommodation is located within Swansea, and some located nearer the site via Ystradgynlais and Glynneath. During the operational phase of the development, it is assumed that visitors will primarily be routed via the A4109 as this is the most direct route to the main access from Swansea.

5.5.25 After some concern expressed by the LA’s from consultation on staff and visitor routing, a sensitivity test has been carried out. All those travelling to/from the west of GCRE will travel via the A4221/Onllwyn Road staggered junction as this is seen to be the most likely route if travelling to the southern access of GCRE located on Onllwyn Road/Wembley Avenue. Prior to this it was assumed all those travelling from the west will access GCRE via the Washery access due to the Onllwyn Road access being a secondary access.

5.5.26 Significance Criteria

Significance of Receptors

5.5.27 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.

5.5.28 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.

5.5.29 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.

5.5.30 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

5.5.31 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.

5.5.32 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

5.5.33 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.

5.5.34 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.

5.5.35 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

5.5.36

5.5.37 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.			
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.	To be assessed on case by case basis using professional judgement with consideration given to accident assessment included within the TA (TA – Volume III, Appendix 9.1) and the forecast increase in traffic flows resulting from the development			

5.5.38 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

5.5.39 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 2035, 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	On-way Daily Deliveries Veh	On-way Daily Staff Veh	On-way Train Deliveries
Phase 1	Earthworks (for Track)	0	4	0
	Power	3	6	0
	Staff Facilities	2	4	0
	Train Storage	5	20	12
	High Tonnage Infrastructure Test Loop	5	24	10
	Signalling	2	3	0
	Infrastructure, Access Roads & Rail Crossings	2	3	0
	Miscellaneous	16	14	0
Phase 2	Earthworks (for proposed trackwork)	0	4	0
	Power	1	2	0
	Rolling Stock and Infrastructure Testing	3	24	0
	Large Railroad Test Loop	9	53	27
	Carriage Wash Facility	1	2	0
	Central Control Centre	1	2	0
	Staff Facilities	1	2	0

Phase	Construction Element	On-way Daily Deliveries Veh	On-way Daily Staff Veh	On-way Train Deliveries
	Additional Track - Testing Facilities	2	8	2
	Train Storage	5	18	11
	Access Roads and Rail Crossings	9	19	0
Phase 3	Earthworks (for proposed trackwork)	0	4	0
	Switches and Crossings Upgrades	1	2	0
	Additional Infrastructure	2	6	0
	Rolling Stock Decommissioning	1	2	0
	Train Storage	13	23	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)	142	0	76	76
PM Peak Hour (15:00-16:00)	0	142	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 (Extant AADT of 147 vehicle at the Nant Helen Access and 177 vehicles at the Celtic Energy Access) ;
- No committed development sites within the study area;
- Seasonality factors of +23% applied to observed January 2020 traffic counts and +64% applied to the observed December 2020 traffic counts to account for difference in traffic flows during January and December survey period;
- 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
  - 2035 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	57%
2	Via A4067 South to/from Ystradgynlais	10%
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	-	-

#	Route	Construction Deliveries	Operational Deliveries
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%

5.6.10 A sensitivity test has been carried out, which tests a larger percentage of construction delivery traffic travelling to/from the west via the A4067 from Ystradgynlais. Deliveries from the west are likely to come from J45 of the M4 and take the A4067 to the site. The construction delivery access will remain as before via the Washery Access. The construction delivery vehicle distributions are show in Table.5-9 for the sensitivity test.

Table.5-9: Sensitivity Test - Construction Delivery Trip Assignment summary

#	Route	Construction Deliveries
1	Via A4109 South to/from Seven Sisters/Neath	20%
2	Via A4067 South to/from Ystradgynlais	10%
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	30%

Site Access

5.6.11 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.

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

5.6.13 There is an additional secondary access from Onllwyn Road via the Onllwyn Road/A4221 staggered junction but as a secondary access. A sensitivity analysis has been carried out to assess the A4221/Onllwyn Road junction however, any car parking will likely be near the A4221 Washery and Distribution centre access. During operation, it is assumed that car users will use the existing washery access if travelling from west or east on the A4221, and the Onllwyn Road/Wembley access if traveling from the south. Onllwyn Road will be discouraged from being used from the A4221. Management of the access is further covered withing the Framework Travel Plan within the TA (TA – Volume III, Appendix 9.1).

5.6.14 Emergency access will be possible via multiple access points. Further consideration in construction and operational plans will be developed when a contractor is appointed.

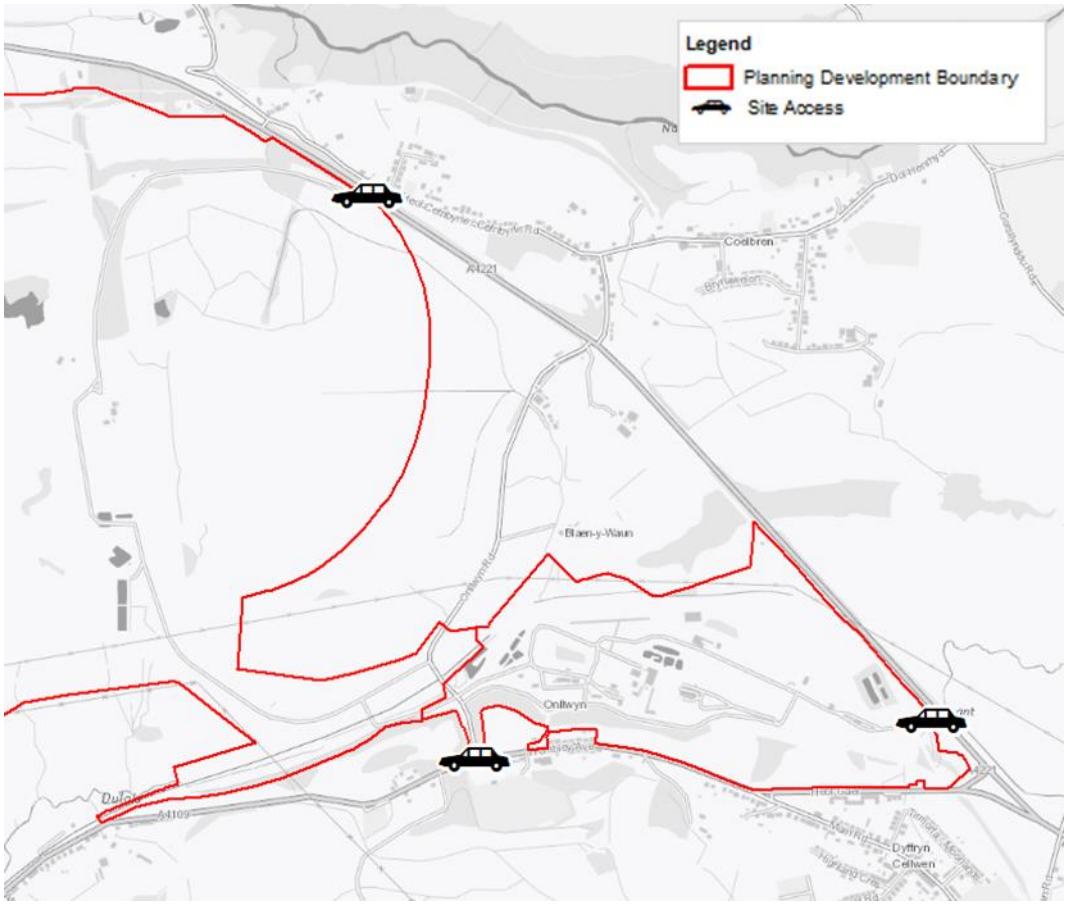


Figure 5-3: Site Access

Operational: Traffic increase assessment

5.6.15 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.

5.6.16 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 5-10: 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**

5.6.17 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 5-11.

Table 5-11: 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%

5.6.18 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 5-12.

5.6.19 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 5-12: 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

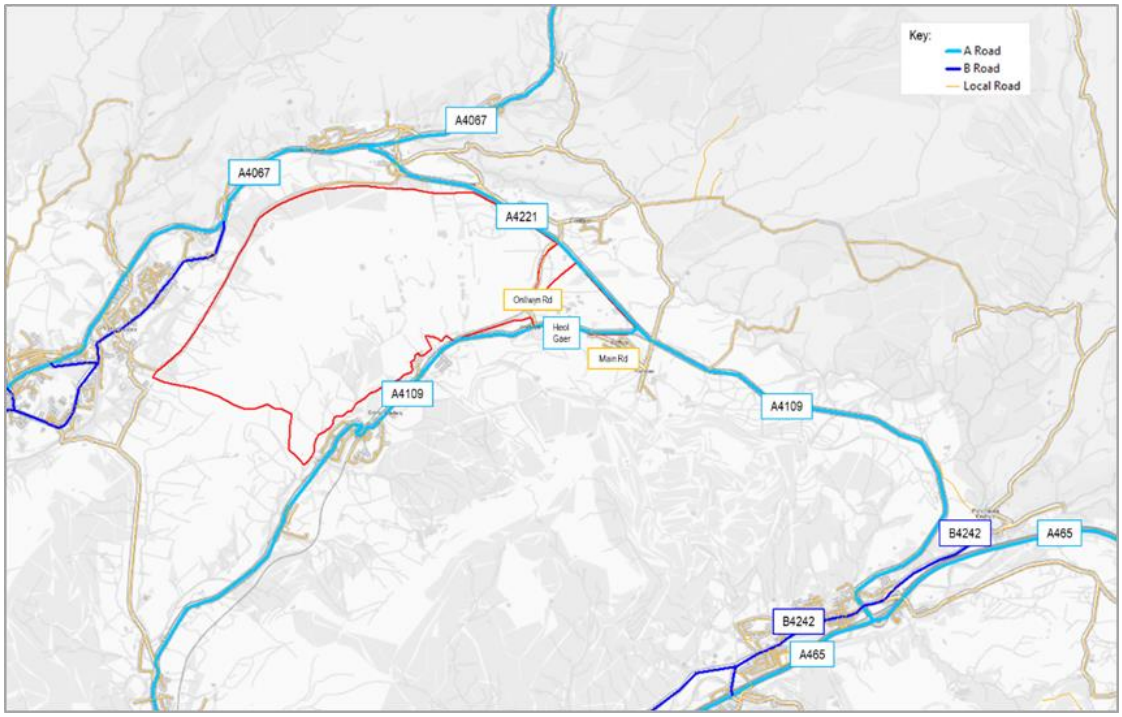


Figure 5-4: Highway Network

5.6.20 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.

5.6.21 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.

5.6.22 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

5.6.23 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.

5.6.24 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.

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

Rail

5.6.26 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.

5.6.27 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

5.6.28 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.

5.6.29 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.

5.6.30 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**. More details are provided in Chapter 12 in relation to proposed changes to the PRoW network across the site.

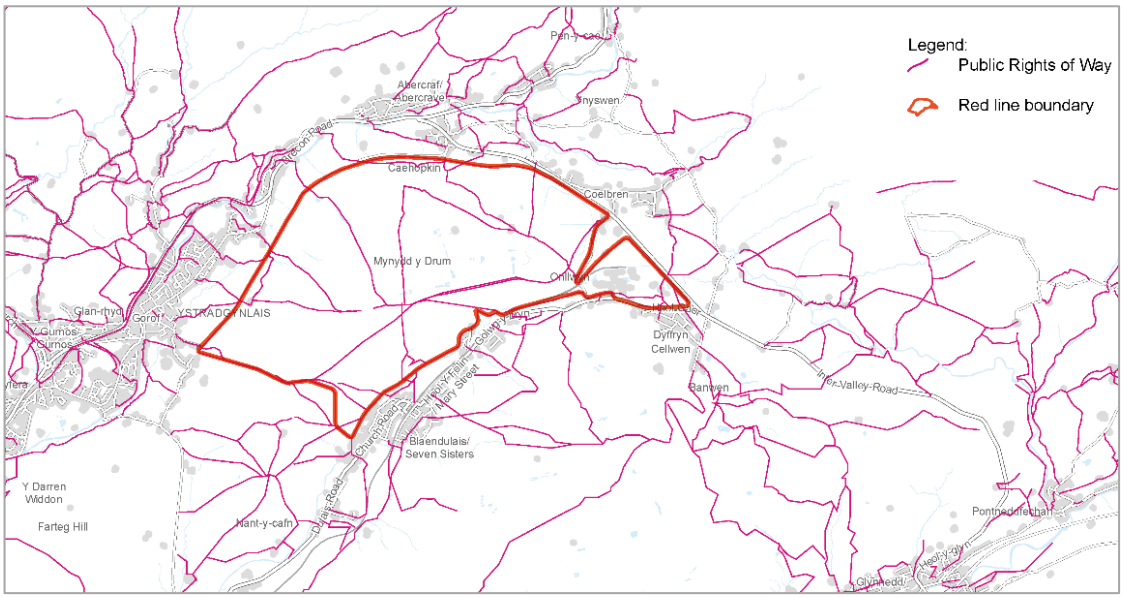


Figure 5-5: Public Right of Way (PRoW) within vicinity of the project.

Cycling

5.6.31 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**.

5.6.32 The Active Travel Map for both Neath and Powys do not show any future routes that are planned near the site that would directly affect GCRE. The closest active travel routes planned are walking routes within Seven Sisters along the A4109 and an integrated cycle way between Seven Sisters and Banwen away from the road and through the grass land that lies between. The Active Travel map of proposed future routes is shown within the TA (TA – Volume III, Appendix 9.1).

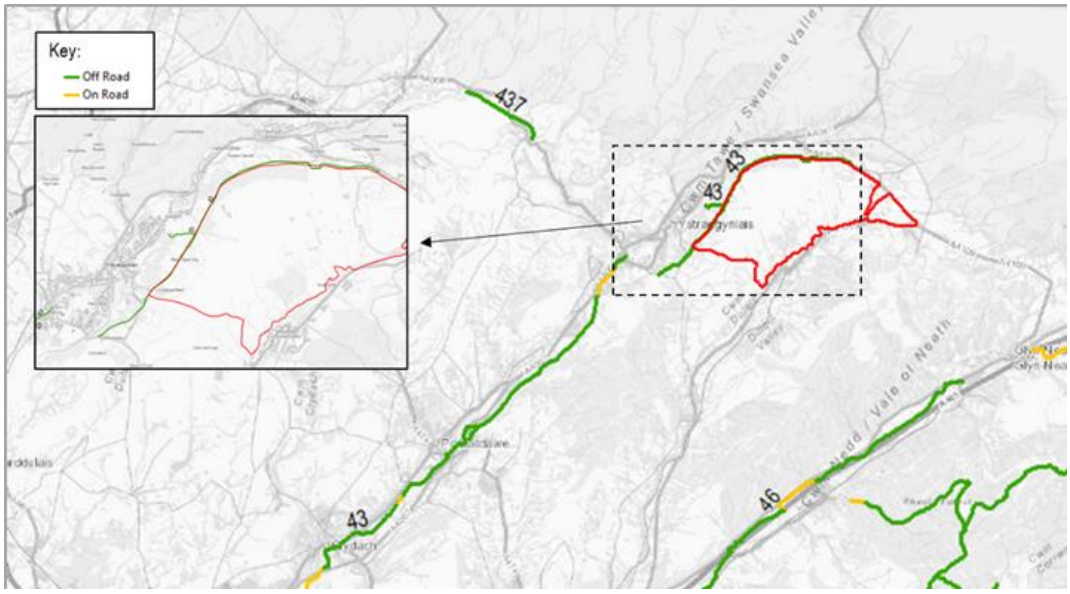


Figure 5-6: National Cycle Network (NCN)

5.6.33 Existing Traffic Flows

5.6.34 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.

5.6.35 Automatic Traffic Counts (ATC) were carried out at the following locations:

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

5.6.36 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 4: A4221 and CPL South Wales Coal priority-controlled T-Junction;
- JTC 5: A4221 and A4109/Heol Gaer priority-controlled T-Junction;
- JTC 6: Onllwyn Road and A4109 priority-controlled T-Junction;
- JTC 7: A4109 and A465 priority-controlled T-Junction; and
- JTC 8: A4109 and B4242 signalised junction.

5.6.37 Surveyed traffic flows for the identified AM (08:00-09:00) and PM (15:00-16:00) peak hours as well as 24-hour AADT are illustrated spatially within the Appendix A of the TA (TA – Volume III, Appendix 9.1), Figures A1-A4. Corresponding figures showing the percentage HGVs are presented within the Appendix of the TA (TA – Volume III,

Appendix 9.1) as Figures A5-A6. A high proportion of HGV movements were recorded which might be anticipated as a result of the extant land use in the study area.

5.6.38 A resurvey was undertaken using a seven-day Automatic Traffic Count (ATC) during the period Wednesday 9th December to Tuesday 15th December 2020. This was instructed by both LAs to give a better representation of the traffic. All Junction Turning Counts 1-8 were also re-surveyed with the addition of two additional junctions. The additional surveys are JTC 2: A4221 and Nant Helen priority-controlled T-Junction, and JTC 3: A4221 and Onllwyn Road priority controlled staggered junction.

5.6.39 During the ATC re-survey period in December, schools were required to change to home schooling due to increased COVID-19 restrictions which came into force on Monday 14th December. COVID-19 has had an impact on the number of journeys undertaken but for the purpose of this assessment it has been assumed that in the medium term traffic volumes in the area will resume previous trends/volumes.

5.6.40 The average traffic flows from the December re-surveys were lower than the January survey data. Through dialogue with NPT and PCC it was agreed that in order to provide a robust assessment the December data would not be used for junction analysis except for the additional JTC 2 and JTC 3.

5.6.41 The ATC data comparison is included within Appendix E of TA (TA – Volume III, Appendix 9.1) for reference.

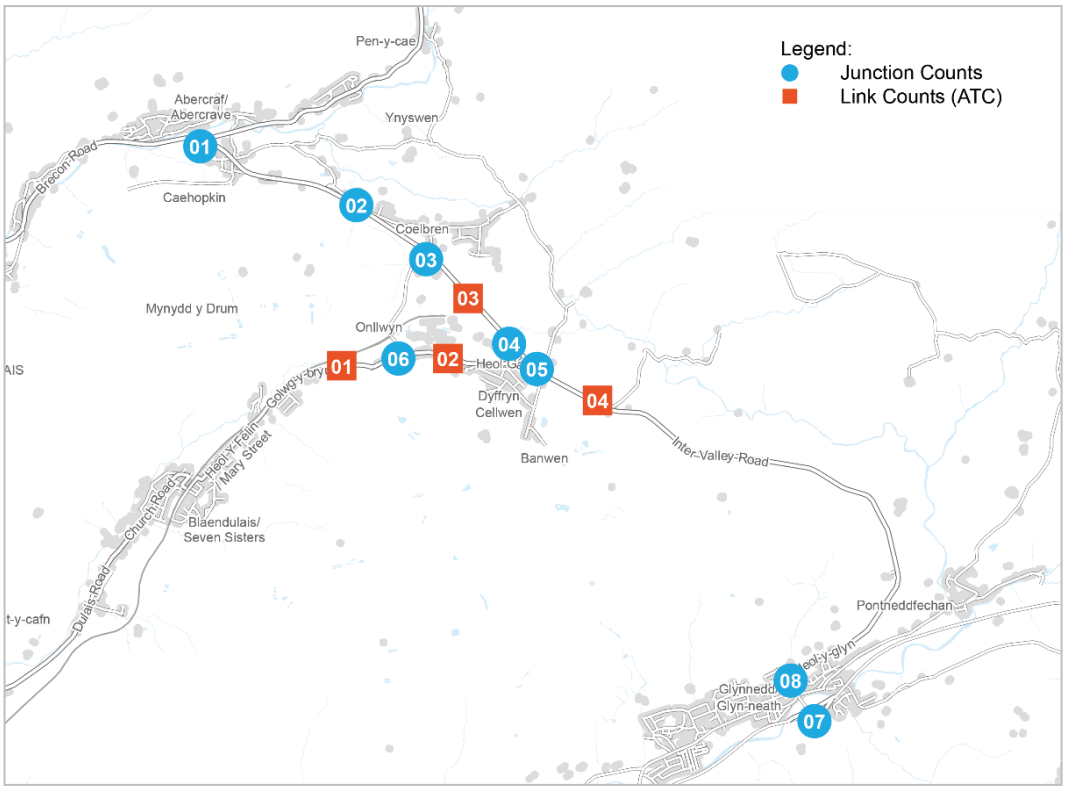


Figure 5-7: Traffic count survey locations

Table 5-13: Surveyed Traffic flows

Survey Point	AM Peak (PCUs) / HGV (%)	PM Peak (PCUs) / HGV (%)	Average Annual Daily (Vehs) / HGV (%)
ATC 1: A4109, west of Onllwyn Road	171 / 13%	142 / 17%	2,057 / 17%
ATC 2: A4109 Main Road, west of Heol Bryn Seion	115 / 17%	156 / 13%	1,463 / 21%
ATC 3: A4221, south of Onllwyn Road	326 / 17%	276 / 17%	2,711 / 26%
ATC 4: A4109 Inter-Valley Road, east of Roman Road	360 / 16%	338 / 16%	3,540 / 24%
JTC 1: A4067 and A4221 priority-controlled T-Junction	618 / 8%	550 / 7%	6,413/ 5%
JTC 2: A4221 and Nant Helen priority-controlled T-Junction	282 / 9%	355 / 17%	3,423 / 5%
JTC 3: A4221 and Onllwyn Road priority controlled staggered junction	327 / 7%	397 / 9%	3,930 / 6%
JTC 4: A4221 and CPL South Wales Coal priority-controlled T-Junction	326 / 40%	313 / 44%	3,046 / 12%
JTC 5: A4221 and A4109/Heol Gaer priority controlled T-Junction	351 / 77%	374 / 69%	4,330 / 8%
JTC 6: Onllwyn Road and A4109 priority controlled T-Junction	183 / 8%	219 / 4%	2,090 / 5%
JTC 7: A4109 and A465 priority controlled T-Junction	740 / 7%	837 / 9%	8,751 / 5%
JTC 8: A4109 and B4242 signalised junction	456 / 41%	483 / 47%	5,178 / 5%

5.6.42 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.

5.6.43 Road Traffic Collision Assessment

5.6.44 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.

5.6.45 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.

5.6.46 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.

5.6.47 Receptor Sensitivity Classification

5.6.48 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 5-14.

5.6.49 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 5-14: 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 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

Ref	Road Link/Receptor	Location	Receptor Sensitivity	Justification
				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 eight key junctions surrounding the site 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.

5.7.3 Figure 5-9 shows the worst-case scenario of HGV percentage impact of the construction traffic from the sensitivity test carried out.

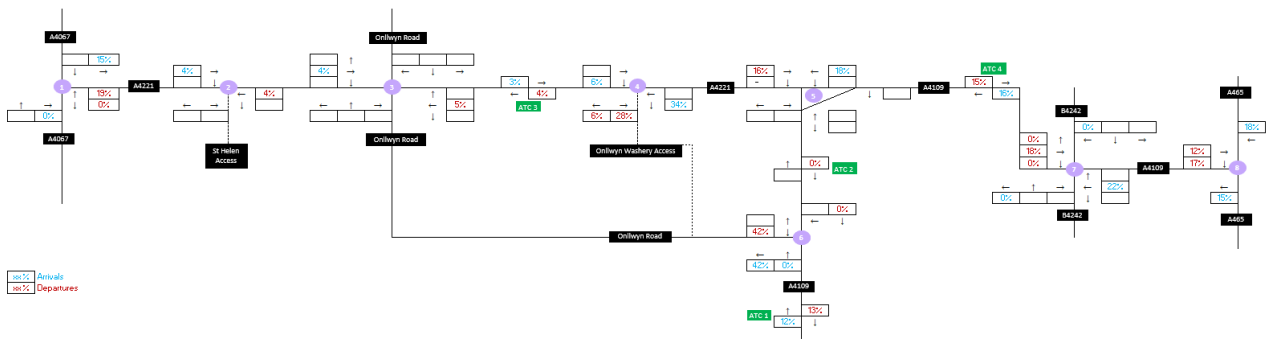


Figure 5-8: Construction Delivery HGV percentage increase from surveyed Baseline, AADT %Vehicle

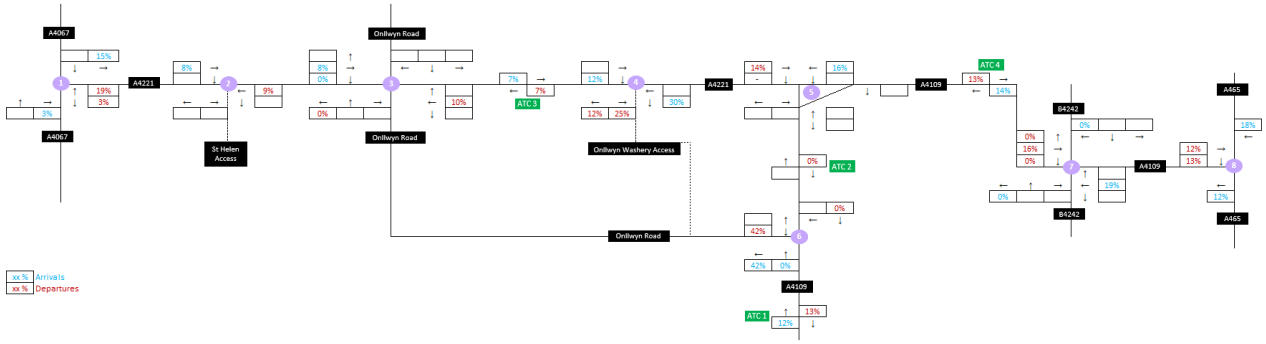


Figure 5-9: Sensitivity Test - Construction Delivery HGV percentage increase from surveyed Baseline, AADT %Vehicle

Severance

5.7.4 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: Construction traffic HGV increase in peak hours.

Ref	Road Link	Receptor Sensitivity	Percentage Increase (HGV)	Sensitivity Test- Percentage Increase (HGV)
1	A4221	Medium	4%	8%
2	A4067 North	Medium	15%	15%
3	A4067 South	Low	0%	3%
4	A465	Low	18%	18%
5	A4019	Medium	16%	14%
6	B4242/A4109 junction	Medium	22%	19%
7	B4242	Low	0%	0%
8	Onllwyn Road	Low	42%	42%
9	Heol Gaer	Medium	0%	0%
10	Main Road	High	0%	0%
11	Pedestrian level crossings	High	0% (train frequency anticipated to remain the same as present)	0% (train frequency anticipated to remain the same as present)

5.7.5 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 42% in the AM Peak and the PM Peak, which is classified as a Minor impact. Therefore, it is predicted that any environmental effects associated with severance would be **negligible** with regards to severance.

5.7.6 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

5.7.7 With predicted traffic growth and additional construction traffic, all eight 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

5.7.8 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 has a negligible impact on all receptors.

5.7.9 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

5.7.10 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.

5.7.11 The receptor link, A4067 North could have a temporary HGV increase of 15% 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.

5.7.12 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.

5.7.13 The impact is therefore deemed to be minor. 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 **negligible** and therefore not significant.

5.7.14 The receptor link A465 will experience an estimated 18% 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**.

5.7.15 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 16%. The sensitivity link is medium, and therefore the predicted environmental effects associated would be **negligible**.

5.7.16 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 22% 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 **negligible**.

5.7.17 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 42% in HGVs and therefore classed as moderate. 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 **negligible** adverse effect.

Fear and intimidation

5.7.18 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.

5.7.19 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

5.7.20 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

5.7.21 The temporary increase in the HGV component of traffic flow in the busiest phase of construction is deemed to have a negligible effect on severance, pedestrian and cycle delay, fear and intimidation, driver delay and accident and safety.

5.7.22 The temporary increase in the HGV component of traffic flow from the sensitivity test in the busiest phase of construction is deemed to have a negligible effect on severance, pedestrian and cycle delay, fear and intimidation, driver delay and accident and safety.

5.7.23 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.

5.7.24 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 eight 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.

5.8.2 Figure 5-10, presents the percentage impact of the operational traffic on all links within the study area in the peak hours.

5.8.3 Figure 5-11 presents the percentage impact of the operational traffic from the sensitivity analysis of all links within the study area in the peak hours.

5.8.4 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.

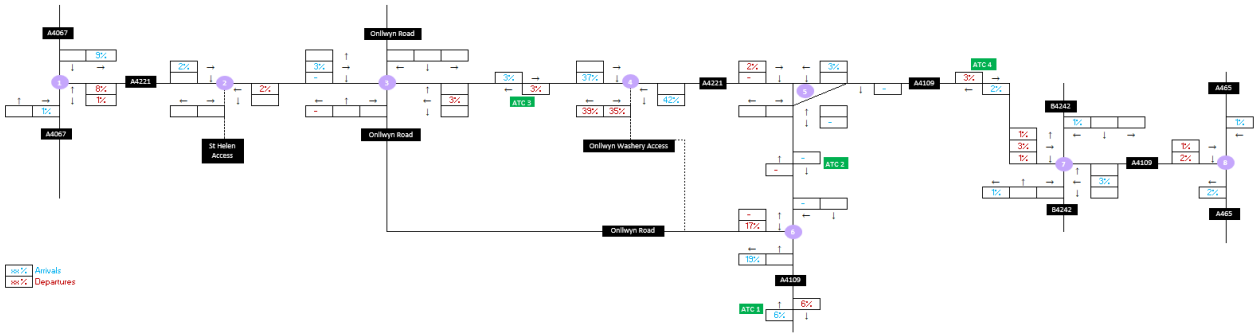


Figure 5-10: Operational traffic percentage increase from surveyed baseline (Staff, visitors & deliveries), AADT Vehicle %

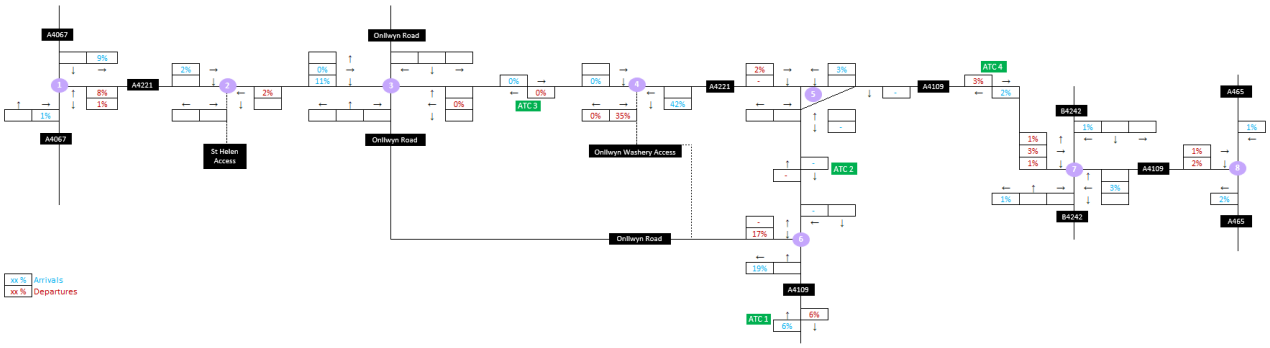


Figure 5-11: Sensitivity Test: Operational traffic percentage increase from surveyed baseline (Staff, visitors & deliveries), AADT Vehicle %

Severance

5.8.5 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 5-16: Operational traffic PCU increase in peak hours.

Ref	Road Link	Receptor Sensitivity	Percentage Increase (traffic)	Sensitivity Test - Percentage Increase (traffic)
1	A4221	Medium	20%	20%
2	A4067 North	Medium	43%	43%
3	A4067 South	Low	8%	8%
4	A465	Low	19%	19%
5	A4019	Medium	19%	19%
6	B4242/A4109 junction	Medium	22%	22%
7	B4242	Low	10%	10%
8	Onllwyn Road	Low	72%	72%
9	Heol Gaer	Medium	0%	0%
10	Main Road	High	0%	0%
11	Pedestrian level crossings	High	0% (train frequency anticipated to remain the same as present)	0% (train frequency anticipated to remain the same as present)

5.8.6 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 moderate impact. Therefore, it is predicted that any environmental effects associated with severance would be **negligible**.

5.8.7 A4067 North has a medium 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 minor impact. Therefore, it is predicted that any environmental effects associated with severance would be **negligible**.

5.8.8 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

5.8.9 With predicted traffic growth and additional operational traffic, all eight 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

5.8.10 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

5.8.11 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.

5.8.12 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 72% 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

5.8.13 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.

5.8.14 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

5.8.15 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

5.8.16 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.

5.8.17 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 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 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 (ULEWs) and will have a minimum of 10% of car parking spaces to have ULEV charging points as encouraged by PPW Edition 10.

5.9.18 Scope for the mitigation of unplanned visitors and more detailed work will be developed during the detailed design/reserved matters and the following should be considered:

- A specific visitor allocation in the day given in a non-peak hour which allows visitors and train enthusiasts to park within the GCRE site and view the facility;
- Parking regulations applied to surrounding local highways to discourage on street parking;
- Provision of a Park and Ride facility for visitors which performs a bus tour of GCRE on set days.

5.9.19 At this point in time, and given the commercial sensitivities of some of the likely testing/activity within the site, these types of visits would not be encouraged and mitigation should only be implemented should future monitoring show that visitors of this nature are causing problems on the local highway network. Precise wording of any conditioning and monitoring scheme will be decided on during the reserved matters process.

5.10 Residual Effects

5.10.1 Table 5-17 and Table 5-18 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 5-17: 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	Minor	Negligible	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.	Negligible	Negligible
Pedestrian Amenity	A4067 North	Medium	Minor	Negligible	The timings and number of HGV deliveries will be confirmed, and unlikely to occur all within the AM or PM peak hour.	Negligible	Negligible
Pedestrian Amenity	B4242/A4109 junction	Medium	Minor	Negligible	The timings and number of HGV deliveries will be confirmed, and unlikely to occur all within the AM or PM peak hour.	Negligible	Negligible
Pedestrian Amenity	Onllwyn Road	Low	Moderate	Negligible	Facilities to be provided if deemed necessary by appointed contractor to ensure safe pedestrian and cyclist crossings to improve pedestrian and cycling amenity	Negligible	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 5-18: 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	Moderate	Negligible	To encourage sustainable modes of transport to/from the site	Negligible	Negligible
Severance	A4067 North	Medium	Minor	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 control building 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 5-19 and Table 5-20 below which presents the residual traffic impact summary of the development during construction and once operational respectively.

Table 5-19: 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 5-20: 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 11 (2021) (PPW11), 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, PPW11 encourages planning authorities to promote opportunities for the incorporation of geological features within the design of development.

6.3.10 PPW11, 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 1997-115 & EN 1997-216) 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	**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). **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). **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. **Land Contamination:** Human health (High sensitivity land use scenario e.g. residential with gardens and allotments).
High	**Geology:** Of medium national and high regional geological/ geomorphological importance with limited potential for replacement (e.g. GCR sites, regionally important site). **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). **Surface water:** WFD Class 'Good' Major Cyprinid Fishery Species protected under EU or UK habitat legislation **Land Contamination:** Human health (Lower sensitivity land use scenario e.g. mixed use (residential without gardens), public open space)
Medium	**Geology:** Of low regional and high local geological/ geomorphological importance with some potential for replacement (e.g. allocated RIGS or recommended RIGS). **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). **Surface Water:** WFD Class 'Moderate' **Contamination:**

Value (sensitivity)	Typical Descriptors
	Receptor which is of regional importance. Human health (Low sensitivity land use scenario e.g. commercial, industrial)
Low (or Lower)	**Geology:** Of local geological/geomorphological importance with potential for replacement (e.g. non-designated exposure). **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). **Surface Water:** WFD Class 'Poor' **Land Contamination:** Human health (Lower sensitivity land use scenario e.g. construction site). Receptor which is of local importance.
Negligible	**Geology:** Of little local geological/geomorphological interest. **Land Contamination:** Receptor with low importance and rarity.

Table 6.3: Criteria and EIA Definitions of Impact Magnitude

Magnitude of Impact	Typical Criteria Descriptors
Major	**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) **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) **Land Contamination:** Major effect upon receptor. Severe or irreversible effect on human health. Temporary severe or irreversible effect on ground/surface water quality. (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	**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)

Magnitude of Impact	Typical Criteria Descriptors
	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) **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)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	**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) **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) **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)
	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).
Negligible	**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) **Controlled Waters (aquifers/surface water):** Non-measurable change to quality, level and flow. (Adverse) **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)
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
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 mapping[17], the BGS 1:50,000 geological mapping[18] and the BGS GeoIndex online viewer[19]. 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 1904[20] and the second in 1988[21].

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 5º and 15º. 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 Glyncorrwg 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 Glyncorrwg 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 Glyncorrwg, 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 Specical Scientific Interest (SSSI) data sets[22], 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) website[23], 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 LANDMAP[24]. 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 Glyncorrwg 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 viewer[27] 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 website[28] 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 Wales[29].

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 EnviroInsight[30] 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 opencast[31], 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	Britiash 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 workers 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 contaminates	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 C-P, 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 habitats[2] 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).

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 (Amendment) (EU Exit) Regulations 2019

7.3.2 The Conservation of Habitats and Species Regulations (Amendment) (Eu Exit) Regulations 2019 (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 Sites or the National Site Network.

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 (Amendment) (Eu Exit) Regulations 2019[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 Wilde 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 Council (PCC) 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 (Amendment) (Eu Exit) Regulations 2019 (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) (Edition 11)

7.3.59 Planning Policy Wales[5] (WG, 2021) 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 11 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

[5] https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

benefit for biodiversity" (para 6.4.5). This policy and subsequent policies in Chapter 6 of PPW 11 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 PPW 11, 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.

Future Wales

7.3.62 Future Wales – the National Plan 2040 provides the National Development Framework for Wales, setting out the direction for development in Wales until 2040. It addresses national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate resilience, developing strong ecosystems and improving the health and well-being of communities in Wales. It is a spatial plan and therefore sets out a direction of where development and infrastructure should be located for the good of the communities in Wales.

7.3.63 The principles of the Well-being of Future Generations Act are embedded within the plan, to facilitate sustainable development. Importantly, it sets out how biodiversity needs to be safeguarded, and how actions should secure the maintenance and enhancement (net gain) of biodiversity, ecosystem resilience and green infrastructure, and part of development proposals.

United Kingdom Biodiversity Action Plan (UK BAP)

7.3.64 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.

7.3.65 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)

7.3.66 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.'

7.3.67 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

7.3.68 The Powys Local Biodiversity Action Plan[6] 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

7.3.69 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

7.3.70 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].

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

7.3.71 Guidance for specific species, groups and other ecological features is discussed in individual relevant sections or is provided in the ecological baseline reports (Volume 2, Appendices C-P).

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.

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
PCC ecologist	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. 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. 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. 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	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. 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. 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.

Scoping opinion clause	Comment	Response
	considered that the ZoI in relation to assessment of cumulative effects to biodiversity should also be extended to take these factors into account. 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 form 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.'	
NPTCBC ecologist	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: • 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 SINCs 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: (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	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. The requirement of habitat loss / gain will be included in an Ecological Protection Plan and Habitat Management Plan. 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.

Scoping opinion clause	Comment	Response
	functioning); (e) the adaptability of ecosystems. • Also, an assessment of impacts upon bird habitat (Section 9a Habitat Regulations); 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	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. 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. We would advise that information is provided to the local authority considering how the restoration works will work alongside the new proposal. 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. 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. 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	The impact assessment is undertaken in accordance with CIEEM guidance, and considers the various types of impacts i.e. direct and indirect etc. Plans include details of the Project i.e. red line boundary. This ES chapter considers the impacts from restoration works (recently revised submission by Celtic Energy) and the earthworks, as well as impacts from GCRE. All targeted species surveys have been undertaken in accordance with relevant best practice guidance, and any limitations are detailed within each survey report. 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. The ES details the requirements for a Habitat management plan to ensure the long-term maintenance of habitat and species mitigation / compensation. 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.

Scoping opinion clause	Comment	Response
	the requirements for a licence and set out how the works will satisfy the three requirements as set out in the Habitat Regulations. 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. We would expect the developer to contact other relevant people/organisations for biological information/records relevant to the site and its surrounds. 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. 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. 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.	The presence of marsh fritillary has been considered in this Chapter. 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 7.22 and 7.23. Impacts from GCRE are considered to be limited to potential disturbance / degradation, since it will not be directly affected during the GCRE works.

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 SINCs 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

7.8.1 Details of survey methodologies used to collate data for the 'existing ecological baseline' (as described in Section 7.14) are provided in Appendix 7A. This includes an Extended Phase 1 habitat Survey, National Vegetation Classification (NVC) survey, fungi survey, invertebrate survey, amphibian survey, reptile survey, breeding bird survey, wintering bird survey, bat roosting and activity survey, notable mammal survey, badger survey and otter survey.

7.8.2 Additionally, the habitat creation and restoration plan, provided as part of the Nant Helen Complementary Earthworks application forms part of the Future Baseline which is relevant to the GCRE project impact assessment, since the site's restoration is a condition of earthworks planning application. This is shown in Figure 7.11, in addition to the existing baseline information.

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 (ZoI)' 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 7.3.

Table 7.3: 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

Ecological Feature	Maximum Zone of Impact from the Site Boundary
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 ZoI 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 ZoI 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 ZoI.

7.9.3 For marsh fritillary, the maximum ZoI is 15 km, due to this species existing in metapopulations and being known to range up to 15 km from its primary habitat[7].

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 features[8]:

Table 7.4: Criteria used for determining ecological value of a feature.

Importance of ecological feature	Criteria
International and European	Natura 2000 sites including: SPAs; potential SPAs (pSPAs); SAC; candidate or potential SACs (cSACs or pSACs); and Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites and Biosphere Reserves.

[7] 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.

[8] 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
	Areas, which meet the published selection criteria for those sites listed above but which are not themselves designated as such. Resident, or regularly occurring, populations of species, which may be considered important at an International or European level.
National	Designated sites including: SSSIs; Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and National Nature Reserves (NNRs). Areas, which meet the published selection criteria for those sites listed above but which are not themselves designated as such. Areas of habitats of principal importance for conserving biodiversity (i.e. listed in response to the requirements of the Environment (Wales) Act 2016). Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory. Resident, or regularly occurring, populations of species, which may be considered important at National level.
County	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. Areas which meet the published selection criteria[9] for those sites listed above but which are not themselves designated as such. 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. 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 guidelines[1], 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

[9] Wildlife Sites Guidance Wales (Wales Biodiversity Partnership, 2008) - A Guide to Develop Local Wildlife Sites System in Wales.

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 integrity[10] of a defined site or ecosystem and/or the conservation status[11] 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.

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

[10] 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.
[11] 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.

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 C-P). 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 Existing Baseline and Future Baseline Conditions

7.14.1 Appendix 7B details the ecological baseline recorded during surveys in 2019, within the Study Area, including the Nant helen site and Washery area which occur within the red line boundary of the GCRE project and which is hereafter referred to as the ‘existing baseline’. This existing baseline information was used to assess impacts from the Nant Helen Complementary Earthworks Project (which was granted planning in 2020), although it is noted that the washery site included in the study area for the earthworks application was not within the red line boundary for this project.

7.14.2 A ‘Future Baseline’ has been used to assess potential impacts from the GCRE project (Figure 7.11). The Future Baseline considers the Site at the time of the GCRE Project commencing, which is not anticipated to be more than two years from the completion of the Nant Helen earthworks but with the habitats detailed in Nant Helen restoration plan (which includes habitats required as part of the Nant Helen earthworks and Celtic Energy restoration applications) having been created, and newly established. In addition, the Future Baseline, includes habitats which are adjacent to the Nant Helen earthworks, and which will be retained and protected during the earthworks. Some of these newly created habitats and retained habitats will also be

subject to some enhancements through long term management. These retained habitats which now form part of the Future Baseline, also include habitats within the washery, which are not directly affected by the Nant Helen Earthworks.

7.14.3 Figure 7.11 illustrates the Future Baseline habitats relevant to the GCRE project (i.e. within the ZoI), and Table 7.16 in Appendix 7S, describes the habitats and likely species present (and the assumptions made), in addition to the assumed status of habitats and species in nature conservation terms. It also details the protected sites present within the site boundary and within the wider ZoI for the GCRE project.

7.14.4 Habitats of the Future Baseline created as part of the Nant Helen earthworks and Celtic Energy application which occur within the Nant Helen site, comprise: acid grassland, enclosed pasture and broadleaved woodland, hedgerows, heathland, peatland-mire complex, wetland and lichen / fungi rich habitats. These will be subject to long term management.

7.14.5 Newly created habitats, replacing those lost during the Nant Helen earthworks will be quickly established by mobile species. Where habitats are enhanced, such as those which occur adjacent to the GCRE works in the Nant Helen site, including marshy grassland, acid grassland / heathland and wetland, it is considered likely that in the long term these will support higher numbers of some species including notable species recorded within the area of the Site such as dingy skipper. New species could also move into the Site such as marsh fritillary. However, at the time of GCRE commencing, it is unlikely that habitats will have been enhanced sufficiently to support higher numbers / new species, and therefore it is considered appropriate to assume the same species and population sizes are present within these newly created habitats, as those in the existing baseline (and therefore that marsh fritillary are absent from the GCRE site).

7.14.6 Within the Nant Helen site, the GCRE project site also supports retained habitats unaffected by the Nant Helen Complementary Restoration Earthworks (detailed in the existing baseline) which now occur within the GCRE project ZoI. This includes habitats such as acid grassland, marshy grassland, heathland, wetlands, broadleaved and conifer woodland, and watercourses (Afon Dulais, Afon Llech, Afon Tawe, Afon Camnant and their tributaries). Some of these habitats will also be subject to long term management to enhance their ecological value, as part of the Nant Helen Complementary Earthworks and Celtic Energy restoration applications.

7.14.7 Species within retained habitats within the Nant Helen site are anticipated to be the same as the existing baseline, as they will be protected during the Nant Helen earthworks.

7.14.8 The Washery site, which is adjacent to the Nant Helen site and therefore unaffected by the Nant Helen earthworks, is included within

the GCRE Project boundary. Within the Washery there is a mosaic of habitats, namely: marshy grassland, species rich grassland (neutral and acid), heathland, waterbodies, scrub, plantation and woodland, in addition to buildings, existing railway sidings and hardstanding. A tributary of the Afon Dulais also lies partially within the Washery site (in the area of the sidings).

7.14.9 Habitats within the Washery are known to support common amphibians (common frog, common toad, smooth and palmate newt), reptiles (common lizard), breeding birds (skylark, linnet, grasshopper warbler, willow warbler, dunnock, lapwing, house sparrow, bullfinch and reed bunting), wintering birds (starling, house sparrow and mistle thrush), roosting bats (tree with low suitabilty and buildings with low to moderate suitability) and foraging bats (largely common and soprano pipistrelle, and noctule and myotid bats). No evidence of badger, otter or notable mammals was found in the Washery, and habitat present were considered to offer limited opportunities for these species. No suitable habitats for water vole or dormouse have been recorded.

7.14.10 In addition, protected sites, as detailed in existing baseline, which are retained and protected as part of the Nant Helen Complementary Restoration Earthworks Project, and occur within the ZoI of the GCRE Project, will be included within the Future baseline. Details of statutory and non statutory designated sites are detailed below in pararaphs 7.14.11 – 7.14.12.

Statutory Designations

7.14.11 Fifteen statutory designated sites occur within 15 km of the Site. They comprise three 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 7.5 and 7.6 below and shown in Figures 7.2 and 7.3.

Table 7.5: 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	Annex I habitats that are a primary reason for selection of this site include Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles. 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 *Quercus petraea* woodland, ash *Fraxinus excelsior* woodland (some of which is referable to Annex I type 9180 *Tilio-Acerion* 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 *Festuca altissima* and the ferns *Dryopteris aemula, Hymenophyllum tunbrigense* and *Asplenium viride.*	2.9 km south-east
Cwm Cadlan	SAC	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caeruleae*) for which this is considered to be one of the best areas in the United Kingdom. Alkaline fens for which this is considered to be one of the best areas in the United Kingdom.	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 7.6: Nationally Statutory designated sites within 5 km of the Site

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Nant Llech	SSSI	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. Bird life is rich and the uncommon soldier beetle (*Podabrus alpinus*) has been recorded from the wood.	100 m north-east

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Gors Llwyn, Onllwyn	SSSI	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. 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 (*Carum verticillatum*), meadow thistle (*Cirsium dissectum*) and sharp-flowered rush (*Juncus acutiflorus*). These plants form a clearly defined community of extremely limited distribution in Europe, occurring only along the southern Atlantic seaboard.	40 m east
Caeau Ton-y-Fildre	SSSI	The site comprises two unimproved herb-rich pastures on the north bank of Nant y Bryn. The western field supports a wide range of species characteristic of damp, flushed peaty pasture, including globeflower (*Trollius europaeus*), meadow thistle, whorled caraway and marsh arrowgrass (*Triglochin palustris*). Notable species in the eastern field include greater butterfly-orchid (*Platanthera chlorantha*), saw-wort (*Serratula tinctorial*), dyer's greenweed (*Genista tinctora*) and petty whin (*G. anglica*). Over 100 species of flowering plants and ferns having been recorded. The area also supports invertebrates, especially butterflies.	260 m east
Waun Ton-y-Spyddaden	SSSI	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. 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 (*Nardus stricta*), heath rush (*Juncus* squarrosus), deergrass (*Scirpus cespitosus*) and sheep's-fescue (*Festuca ovina*). This changes into grass heath communities of brown bent (*Agrostis canina*), red fescue (*Festuca rubra*), lousewort (*Pedicularis sylvatica*) and heath spotted-orchid (*Dactylorhiza maculata* spp. e*ricetorum*), which in turn grade into purple moor-grass/sedge associations.	2.2 km north-east
Rhos Hen-Glyn-Isaf	SSSI	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.	2.7 km north-west

Site Name	Designation	Features	Approximate Distance and Orientation from Site
		A large part of the site supports a sward dominated by purple moor-grass, sedges and common cottongrass (*Eriophorum angustifolium*). Other species include bog pimpernel (*Anagallis tenella*), round-leaved sundew (*Drosera rotundifolia*)., few-flowered spike-rush (*Eleocharis quinqueflora*), common butter-wort (*Pinguicula vulgari*) and devil's-bit scabious (*Succisa pratensis*). Additional interest is provided by stands of alder (*Alnus glutinosa*) and by ditches which support species such as hemp-agrimony (*Eupatorium cannabinum*), bogbean (*Menyanthes trifoliata*), bog pondweed (*Potamogeton polygonifolius*) and the locally uncommon fern (*Osmunda regalis*).	
Mynydd Du	SSSI	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 *Calluna vulgaris* and bilberry *Vaccinium myrtillus.* 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 (*Galium boreale*), dwarf willow (*Salix herbacea*), lesser meadow-rue (*Thalictrum minus*) and roseroot (*Sedum rosea*), together with a rich moss and liverwort flora.	3 km north
Ogof Ffynnon Ddu	SSSI	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.	3.3 km north-east
Ogof Ffynnon Ddu - Pant Mawr	SSSI, NNR	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 (*Convallaria majalis*), soft-leaved sedge (*C. montana*), mountain melick (*Melica nutans*), lesser meadow-rue (*Thalictrum minus*) and the nationally rare hairy greenweed (*Genista pilosa*). These areas of sheltered, deep heather provide suitable habitat for nightjar (*Caprimulgus europaeus*), 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.	3.3 km north-east
Nant y Rhos	SSSI	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	3.5 km south-west

Site Name	Designation	Features	Approximate Distance and Orientation from Site
		species-rich fen meadow vegetation, which includes large populations of meadow thistle and whorled caraway. 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 (*Carex pulicaris*), carnation sedge (*C. panicea*) and tawny sedge (*C. hostiana*).	
Craig y Rhiwarth	SSSI	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. 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.	3.6 km north-east
Dyffrynoedd Nedd a Mellte a Moel Penderyn	SSSI	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. 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.	2.9 km south-east
Caeau Nant y Llechau	SSSI	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.	4.5 km east

Non-Statutory Designations

7.14.12 Eight non statutory sites occur within 1km of the GCRE boundary. These are adopted Sites of Importance for Nature Conservation (SINCs). They are listed in Table 7.7 below.

Table 7.7: 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 (*Epipactis palustris*), brookweed (*Samolus valerandi*), marsh arrowgrass, marsh cinquefoil (*Potentilla palustris*), Marsh pennywort (*Hydrocotyle vulgaris*), bogbean and water horsetail (*Equisetum fluviatile*).	Partially within the site boundary; occurs in the northern part of the Washery.
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 (*Carex arenaria*), a significant indicator species of Open Mosaic Coal Tip Habitats.	Partially within the site boundary; occurs in the north eastern part of the Washery
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 (*Scutellaria minor*), sneezewort (*Achillea ptarmica*) and devil's-bit scabious.	Within the site; occurs in the south eastern part of the Washery.
Intervalley Road, Banwen	SINC	This site comprised a marshy grassland field, crossed by a small ditch, an abandoned railway line supportng sparse species-rich neutral grassland and adjacent areas of marshy and species-poor semi-improved grassland with small areas of dense and scattered scrub and planted trees. The site was bordered to the east and north by roads and to the west by a line of trees and rugby ground.	Immediately adjacent; south of the Washery.
Adjacent to Gorsllwyn	SINC	The site comprises a series of fields supporting marshy grassland, acid grassland and semi-improved neutral grassland, bordered to the north by a small stream, the south and east by a road and open to the west. There is a small ditch to the south and small areas of dense and scattered scrub are present.	Immediately adjacent, north of the Washery.
Banwen Pond	SINC	This former colliery site includes marshy, acid and neutral grasslands, heath and scrub along with a large fishing pond and smaller wildlife ponds	500 m south of the Site.

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Aberhenwaun Uchaf	SINC	The site supports extensive marshy grassland with areas of acid grassland, semi-improved neutral grassland and scattered scrub. The qualifying features include lowland meadow, lowland dry acid grassland and purple moor grass and rush pasture. Devil's bit sacbious is also present.	350 m south.
Land behind Marigold Place	SINC	The site is dominated by purple moor grass with mosaics of wet heath and acid grassland. Qualifying features include purple moor grass and rush pasture, lowland meadows, lowland dry acid grassland and invertebrates including dingy skipper, marsh fritillary ad narrow-bordered bee hawkmoth. Devil's bit sacbious is also present.	800 m south.

7.14.13 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).

7.15 Evaluation of Receptors – Future Baseline

7.15.1 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.

7.15.2 As discussed in Section 7.14, the Future Baseline will be used for the impact assessment of the GCRE Project, which will comprise the Site as described in the Nant Helen Complementary Earthworks ES in addition to the existing baseline of the Washery site.

7.15.3 Table 7.16 in Appendix 7S details the Evaluation of all ecological receptors within the ZoI of the GCRE project. This also details a summary of the existing baseline evaluation, in relation to the Future Baseline evaluation, to provide context.

7.15.4 Figure 7.10 illustrates the Future Baseline habitat evaluation.

7.15.5 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 habitats. As such the evaluation of these ecological receptors for the Future Baseline does not change from that of the existing baseline as described in Table 7.16 in Appendix 7S.

7.15.6 Ecological receptors which are unaffected by the Nant Helen Complementary Earthworks will retain the same ecological value, also detailed in Table 7.16 in Appendix 7S. It is noted however that when assessed separately, some of the ecological receptors such as species groups, are valued lower than the existing baseline due to the site supporting less suitable habitats for these species.

7.15.7 Potential changes to protected sites, habitats and species groups are summarised below:

Sites

7.15.8 No statutory or non statutory sites will be directly affected by the Nant Helen earthworks, but will be protected during the works. The GCRE project considers the same protected sites as those detailed within the existing baseline, and are valued as follows:

7.15.9 Three European sites (all SACs), within the GCRE ZoI are protected under the Habitat Regulations 2019, and by National and Local Planning Policy; as such they are of **International value**.

7.15.10 Twelve SSSIs, within the GCRE ZoI, are protected under the Wildlife and Countryside Act 1981 (as amended), and by National and Local Planning Policy; as such they are of **National value.**

7.15.11 Eight SINCs, within the GCRE ZoI, are protected under National and Local Planning Policy; as such they are of **County value.**

Habitats

7.15.12 Habitats recreated as part of the Nant Helen earthworks restoration project, will be subject to management to maintain and enhance their value – all habitats should aim to qualify as Section 7 / UK BAP habitats and as a mosaic qualify the site as a SINC. It is acknowledged that some habitats namely peatland – mire and fungi rich habitats, will take longer to establish (between 20 – 30 years), however the mosaic of habitats created within the Site, providing they are created and managed in accordance with landscape and ecology recommendations, (and be sufficiently species rich) should still meet the criteria as habitats of conservation significance i.e. Section 7 / UK BAP and or SINC habitats.

7.15.13 The retained habitats within the Nant Helen site such as broadleaved woodland (including ancient woodland, waterbodies, acid grassland, marshy grassland and heathland) will continue to be of **County value**, being Section 7 / UK BAP habitats and qualifying these areas as a SINC. Additionally, these retained habitats will be subject to management measures which will enhance their value in the longer term.

7.15.14 Washery habitats, which will not be directly affected by the Nant Helen earthworks, will be the same value as the existing baseline i.e. Section 7 / UK BAP, and will therefore be of **County value**.

7.15.15 As such, the site is considered to have an overall **County value** for habitats.

Fungi

7.15.16 As discussed above under 'Habitats' above, fungi rich habitats will take between 20 – 30 years to establish, and as such at the time of the Project commencing newly created areas for fungi habitat within the Nant Helen site are considered to provide limited value for fungi, and likely to be of **Less than Local Value**.

7.15.17 Where habitats are retained within the Nant Helen Site, these will continue to support fungi rich habitats, and therefore be of **County value.** This includes areas of acid grassland such as extensive areas within the smaller track loop.

7.15.18 Habitats within the Washery which are fungi rich, will be of **County value**.

7.15.19 Although the newly established habitats are considered to be of lower value to fungi during their early years of establishment, since a number of fungi rich habitats will still exist within the GCRE site, it is considered to have an overall **County value** for fungi**.**

Invertebrates

7.15.20 Retained habitats within the Nant Helen site will continue to support notable invertebrate species and would therefore retain the same value i.e **County Value**. Newly created habitats are likely to quickly establish with invertebrate species within the site, and would therefore provide a similar value as the existing baseline (i.e. **County Value)**.

7.15.21 It is possible, that in the long term the value of enhanced habitats within the Nant Helen site will be more favourable to invertebrates including those not currently present in the Site but which are known to be present in the wider area such as marsh fritillary. In the short term however, and at the time of GCRE commencing, these habitats are considered to be of similar value to invertebrates as the existing baseline and marsh fritillary are assumed to be absent.

7.15.22 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline for invertebrates i.e. **County value.**

7.15.23 As such, the site is considered to have an overall **County value** for invertebrates**.**

Amphibians

7.15.24 Retained habitats within the Nant Helen site will continue to support notable amphibian species and would therefore retain the same value i.e **Local Value**. Newly created habitats are likely to quickly establish with amphibian species within the site, although it is noted that newly created acid grassland is likely to have limited value for amphibians**.**

7.15.25 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to amphibians due to the increase in the number of wetland habitats, although at the time of GCRE commencing it is likely a similar population size would be present. Therefore, these habitats would be of **Local value** for amphibians.

7.15.26 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline for amphibians i.e. **Local value**.

7.15.27 As such, the site is considered to have an overall **County value** for amphibians**.**

Reptiles

7.15.28 Retained habitats within the Nant Helen site will continue to support notable reptile species and would therefore retain the same value i.e **Local Value**. Newly created habitats are likely to quickly establish with reptile species within the site.

7.15.29 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to reptiles due management of habitats, although at the time of GCRE commencing it is likely a similar population size would be present. Therefore these habitats would be of **Local value** to reptiles.

7.15.30 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline for reptiles i.e. **Local value.**

7.15.31 As such, the site is considered to have an overall **Local value** for reptiles**.**

Breeding Birds

7.15.32 Retained habitats within the Nant Helen site will continue to support notable breeding bird species and would therefore retain the same value i.e **County Value**. Newly created habitats are likely to quickly establish with breeding bird species within the site.

7.15.33 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to breeding birds due management of habitats, although at the time of GCRE commencing it is likely a similar population size, and variety of species, would be present. Therefore these habitats would be of **County value.**

7.15.34 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline i.e. **County value**.

7.15.35 As such, the site is considered to have an overall **County value** for breeding birds**.**

Wintering Birds

7.15.36 Retained habitats within the Nant Helen site will continue to support notable wintering bird species and would therefore retain the same value i.e **County Value**. Newly created habitats are likely to quickly establish with wintering bird species within the site.

7.15.37 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to wintering birds due management of habitats, although at the time of GCRE commencing it is likely a similar population size, and variety of

species, would be present. Therefore these habitats would be of **County** value to Wintering birds.

7.15.38 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline i.e. **County** value.

7.15.39 As such, the site is considered to have an overall **County value** for wintering birds.

Badger

7.15.40 Retained habitats within the Nant Helen site will continue to support badgers and would therefore retain the same value i.e **Less than Local Value**. Newly created habitats will also be suitable for badgers. These will have a **Less than local** value for badgers.

7.15.41 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline i.e. **Less than Local** value.

7.15.42 As such, the site is considered to have an overall **Less than Local value** for badgers**.**

Otter

7.15.43 Retained habitats within the Nant Helen site will continue to support otter and would therefore retain the same value i.e **Local Value**. Newly created habitats are likely to be used by otter, particularly wetland habitats. These habitats would be of **Local value.**

7.15.44 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to otter due management of habitats, although at the time of GCRE commencing it is likely a similar population size, would be present. Therefore these habitats would be of **Local value** to otter.

7.15.45 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline i.e. **Local value**.

7.15.46 As such, the site is considered to have an overall **Local value** for otter**.**

Roosting bats

7.15.47 Retained habitats within the Nant Helen site will continue to support roosting bats and would therefore retain the same value i.e **Local Value**. Newly created woodland habitats are likely to take some time to be utilised by roosting bats.

7.15.48 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to roosting bats due management of habitats, and natural development of features within trees / buildings for bats etc , although at the time of GCRE

commencing it is likely that there would be less opportunities for roosting bats. Therefore these habitats would be of **Less than Local** value to roosting bats.

7.15.49 The Washery, which is unaffected by the Nant Helen earthworks, will have the same value as the existing baseline i.e. **Local** value

7.15.50 Although the newly established are considered to be of lower value to roosting bats during their early years of establishment, since a number of potentially suitable roosting habitats will still exist within the GCRE site, it is considered to have an overall **Local value** for roosting bats**.**

Foraging bats

7.15.51 Retained habitats within the Nant Helen site will continue to support foraging bats and would therefore retain the same value i.e **County Value**. Newly created habitats are likely to be quickly utilised by foraging bats within the site.

7.15.52 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to foraging bats due management of habitats, although at the time of GCRE commencing it is likely a similar population size / range of species, would be present. Therefore these habitats would be of **County** value to foraging bats.

7.15.53 The Washery, which is unaffected by the Nant Helen earthworks, will have a lower value than the existing baseline when considered separately i.e**. Local value,** due to the low bat activity index and absence of rarer bat species.

7.15.54 As such, the site is considered to have an overall **County value** for foraging bats**.**

Notable Mammals

7.15.55 Retained habitats within the Nant Helen site will continue to support notable mammal species and would therefore retain the same value i.e **Local Value**. Newly created habitats are likely to quickly utilised by notable mammals.

7.15.56 It is possible, that in the long term the value of enhanced habitats within the Nant Helen Site will be more favourable to notable mammals due management of habitats, although at the time of GCRE commencing it is likely a similar population size, range of species, would be present. Therefore these habitats would be of **Local Value.**

7.15.57 The Washery, which is unaffected by the Nant Helen earthworks, will have a lower value than than the existing baseline, when considered separately due to supporting sub-optimal habitats for notable mammal species. i.e. **Less than Local Value.**

7.15.58 As such, the overall value of notable mammals within the GCRE ZoI, will be **Local value.**

INNS

7.15.59 It is an offence to spread them from the site, as plants listed under Schedule 9 plants of the Wildlife and Countryside Act 1981 (as amended), however these species are not considered to be a valued ecological receptor. INNS are however included to ensure legal compliance.

7.16 Embedded Mitigation

Construction

7.16.1 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), Guidance for Pollution Prevention (GPP) and Institute of Air Quality Management (IAQM) guidance are implemented. All construction activities will be carried out in accordance with Construction Industry Research and Information Association (CIRIA) best practice guidance.

7.16.2 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.

7.16.3 The CEMP will include details of the management of dust and vehicle emissions through the production and implemention of dust and traffic management plans, which will eliminate impacts on air quality. Measures will comprise management of earthworks / exposed soils, appropriate storage of materials, regular inspections, wheel washing systems, covering vehicles carrying materials during transport and use of sprinkler or water bowsers to dampen excavations and or haul routes.

7.16.4 The CEMP will include details of the management of noise and vibrations, through the production and implementation of a management plan. This will include the sensitive siting of noisy equipment away from sensitive receptors and all plant and machinery habing silencers fitted. Construction activity will typically be confined to 08.00-18.00 hours, Monday to Friday and 08.00-13.00 hours on Saturdays, and where working is requiried outside of these 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 and Suitably Qualified Ecologist (SQE) in advance of the works commencing.

7.16.5 The CEMP will include details of best practice measures implemented during construction to protect ecology. In particular these include:

- **Ecological Protection Plan (EPP):** a plan will be prepared prior to any site clearance / construction works commencing on Site, and be submitted to the LPA and NRW for approval. The plan will include details of mitigation measures, which are required during site clearance / construction to ensure the protection of adjacent protected sites, notable habitats and protected / notable species.
- **Toolbox Talks** will be provided by a suitably experienced ecologist to all site personnel to inform them of ecological features at the Site including INNS, protected and notable species prior to the commencement of construction works. An associated registry of attendance will be signed and kept as a record and a copy of the toolbox talk left at the Site office.
- **Lighting:** If any task lighting is required outside daylight hours (typically 30 minutes after sunrise and up to 30 mins before sunset), directional lighting (towards the ground) with minimal upward spill will be implemented, to avoid light spill into adjacent habitats to avoid disturbance to commuting and foraging nocturnal protected species.
- **Species buffers:** Where protected / notable species are found during pre-construction checks (including for 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.
- **Excavations:** Good practice working methods will be adhered to which prevent any adverse impacts to otters, badgers or other mammals at the Site. Materials or plant will not be left overnight in an area that may prohibit access for to commuting otters and or badgers and excavations will not be left uncovered overnight. If any excavations are required to be left open overnight, a ramp will be provided / created to allow any animals to escape.
- **Trees:** Measures to protect trees to be retained within and immediately adjacent to the Site and access route will be implemented in line with the British Standard BS5837:2012 and recommendations made within the Arboricultural Impact Assessment.
- **Vegetation Clearance**

- **Breeding Birds:** vegetation clearance within the breeding bird season (March-August inclusive) should be avoided to prevent damage or destruction of occupied nests or harm to breeding birds. If this cannot be achieved, works within the core bird nesting season will require an inspection for breeding birds and their occupied nests by a suitably experienced ecologist no more than 24 hours prior to any works commencing. If nesting birds are found during the pre-construction checks, a buffer around the nest will be implemented of at least 5 metres as agreed with the ecologist and further work within the immediate and surrounding area will be delayed until young have fledged and left the nest, and the nest is no longer in use.
- **Invasive Non-Native Species:** All equipment and footwear will be cleaned thoroughly before entering the site with a suitable disinfectant. In addition, all equipment and footwear will be thoroughly cleaned and disinfected when leaving site.

- **Expert Advice:** If any protected species or signs of protected species such as a badger sett, or INNS are encountered during the works, all work in the vicinity is to stop immediately and a suitably qualified ecologist contacted as soon as possible for advice.
- **Access:** to the working areas will be via designated tracks only, and storage of materials will be at pre-agreed locations**.**
- **Traffic:** Any traffic plans produced will ensure that vehicle traffic is restricted to agreed low limits.
- **Litter:** 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 or placed within a secure location.

Design Mitigation

7.16.6 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. These are detailed within the Water Chapter (Chapter 11) and Figure 7.9.

7.16.7 This will include culverts 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.

7.16.8 Culverts, at appropriate locations, will provide wildlife corridors beneath the railway track, particularly for passage to local bat species. Although the exact design specification and location of culverts which provide wildlife corridors won't be provided until the detailed design stage indicative locations are shown in Figure 7.9.

7.16.9 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 Sustainable Drainage Approval body approval (SABS). The Simple Index Approach is the recognised method of assessing water quality within the Welsh Government Statutory Standards for SuDS.

7.16.10 SuDS, as details within the Drainage Strategy and shown on Figure 7.9, will also provide biodiversity value through the use of native planting, as guided by input from landscape and ecology experts to ensure the creation of species rich wetland habitats.

7.16.11 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.

7.16.12 Landscape design will comprise native tree and shrub planting to within the Site, to provide screening and new habitat. This is detailed within the Landscape Chapter (Chapter 9) and shown in Figure 7.9. Planting and other landscape measures will be implemented during the earliest, suitable planting season. Tree and shrub species will be comprise locally sourced broadleaved native species. Furthermore, tree and plants will be sourced in accordance with Defra / NRW and industry guidance to prevent the spread of disease and INNS.

7.16.13 As detailed in the Noise Chapter (Chapter 10) noise mitigation will be integrated into the design through the construction of noise barriers at locations where noise levels during operation are modelled as being above existing levels.

7.16.14 In addition, the re-use of suitable materials within undeveloped areas including colliery spoil within the washery and embankments will provide a suitable substrate for the natural establishment of local grassland flora, heathland, lichen and fungi assemblages.

7.17 Assessment of Effects

7.17.1 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.

7.17.2 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.

7.17.3 A scheme wide summary of the main potential impacts is provided below.

Habitat Loss

Habitat Loss

7.17.4 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 largely be within existing areas of development.

7.17.5 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 affect one SINC within the washery but will not affect any protected sites in the site or the wider area.

7.17.6 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 and woodland. 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 comprising marshy grassland and acid grassland, as well as some mixed woodland.

7.17.7 The operation of the Site as a rail testing, maintenance, research, development and storage facility will result in no further habitat loss.

7.17.8 Opportunities exist within the Washery for small-scale habitat creation, inlcuding species rich grassland and wetland, to mitigate for habitat loss (some of which would also complement services such as drainage), creation of species rich grassland within the sidings area, in

addition to the enhancement of the retained marshy grassland and acid grassland within the Washery.

7.17.9 Landscaping will also create species rich broadleaved woodland across the site, and SuDS will provide new wetland habitats.

7.17.10 These retained and newly created habitats will provide opportunities suitable for a variety of fauna which are present in the local area.

7.17.11 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

7.17.12 The majority of habitats within the Nant Helen site which are affected by the GCRE Project comprise newly established short grassland and woodland 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 as habitat connectivity will be maintained. The proposed road in the eastern part of the Nant Helen site will be located through marshy grassland, acid grassland and an area of connecting waterbodies which are proposed as part of the Nant Helen Complementary Restoration Earthworks application, and will therefore be fragmented.

7.17.13 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.

7.17.14 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).

7.17.15 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.

7.17.16 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 not 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

7.17.17 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.

7.17.18 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.

7.17.19 Changes in air quality can affect habitats and vegetation, particularly those sensive to increases in nitrogen oxides (NOx), sulphur dioxide (SO_2) and ammonia (NH_3), 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.

7.17.20 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.

7.17.21 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.

7.17.22 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

7.17.23 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.

7.17.24 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).

7.17.25 During operation permament 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

7.17.26 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.

7.17.27 Harm / mortality could also occur during operation particularly as a result of collision with trains and site 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.

7.17.28 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.

7.18 Assessment of Impacts and Significance

7.18.1 The following sections characterise and evaluate the significance of potential impacts of the scheme on ecological receptors during the construction and operational phases.

7.18.2 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.

7.18.3 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 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.
- Non-statutory Designated Sites - eight SINCs: Gorsllwyn Meadows, Onllwyn Coal Washery, Dyffryn Cellwen, Banwen Pond, Intervalley Road, Adjacent to Gorsllywn and Aberhenwaun Uchaf and Land behind Marigold Place.
- Mosaic of habitats (as detailed in the Future baseline) –marshy grassland, enclosed pasture, acid grassland, broadleaved woodland, waterbodies, peat-mire habitat, heathland / acid grassland, neutral grassland, scrub, mixed woodland, short ephemeral vegetation. Also buildings, hardstanding and bare ground
- 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.

7.18.4 As detailed in the existing baseline survey information (Appendix B) dormouse and water vole were considered unlikely to be present within the site, and habitats of the Future baseline would also not be suitable.

7.18.5 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 or from changes associated with air 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).

7.19 Assessment of Construction and Operational Impacts

Statutory Designated Sites

7.19.1 A draft Habitat Regulations Assessment (HRA) has been prepared and is detailed in Appendix 7W Likely effects on European sites (together with nationally and locally designated sites) are discussed below.

Habitat Loss and Degradation

7.19.2 Potential effects could occur to nearby SACs during construction and operation. Coedydd Nedd a Mellte SAC's closest compartment is 2.9 km from the proposed works. Cwm Cadlan is 9.5 km from the proposed works. The closest compartment of Blaen Cynon is located 9.2 km from the Site. Impacts to European Sites are also detailed within the separate HRA included in Appendix 7W, Volume 2.

7.19.3 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. Due to their distance from the site potential effects on these two SACs are limited to [1] water quality effects: pollutants (fuel, chemical spills, dusk and vehicle and train 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 (vehicle traffic and operation of trains): increases in levels of nitrogen oxides (NOx), sulphur dioxide (SO2) and ammonia (NH3), which can be absorbed directly or indirectly.

7.19.4 Cwm Cadlan SAC and Blaen Cynon SAC are not hydrologically connected to the Project area, and therefore there is no pathway for effects from changes in water quality. There is the potential for changes in water quality to adversely affect Coedydd Nedd a Mellte SAC, since it is located is in the downstream catchment of the Site during construction and or operation, although at 2.9 km from the proposed works it is considered that any pollution / sedimentation of connecting watercourses would have been diluted, and any effects would not be significant to the SAC.

7.19.5 Standard best practice pollution control measures as detailed in Section 7.16, and which will be incorporated into a CEMP, will avoid adverse effects as a result of changes in water quality, and ensure the protection of Coedydd Nedd a Mellte SAC, therefore complying with UK legislation.

7.19.6 As discussed in the Air quality chapter (see Chapter 14; air quality), only SACs within 2km were screened in based on existing air quality guidance, therefore excluding Coedydd Nedd a Mellte SAC, Cwm Cadlan SAC and Blaen Cynon from the assessment. The closest SAC is Coedydd Nedd a Mellte SAC which occurs 2.9km to the south east of the site. The air quality assessment reports potentially significant effects from nitrogen deposition on ecological receptors, including protected sites; however, considering that effects of nitrogen deposition on the nearest SSSI (Gorsllwyn), which occurs immediately to the south east of the washery, are only significant at 50m or less from the development, it is considered that effects from nitrogen deposition on any other protected sites which occur at further distances to the south east (including Coedydd Nedd a Mellte SAC, Cwm Cadlan SAC and Blaen Cynon SAC) would not be significant.

7.19.7 Blaen Cynon 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 habitat[7]. Marsh fritillary are also known to be present in the SINC: Land at Marigold Place, approximately 900 m south of the Site, the Wildlife Trust Nature Reserve, approximately 1.5 km north west of the Site, at Rhos Common, Crynant, approximately 3.5 km south west of the Site, in addition to being present in Ystradgynlais further to the north. These marsh fritillary

sites are considered to contribute to a significant metapopulation within the region.

7.19.8 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 (or Rhos pasture) that supports the larval foodplant devil's-bit scabious (and therefore the habitat often used by this species) is present within and adjacent to the Site, invertebrate surveys[12] found no evidence of marsh fritillary using habitats within the Site. Surveys assessed the majority of Rhos pasture habitat within the Site as being 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). Devil's-bit-scabious was however, abundant in the south west of the Nant Helen site (adjacent to the Afon Dulais, approximately 1 km south of the Site), as well as occasional plants being present in other areas of marshy grassland.

7.19.9 Therefore, marsh fritillary, or metapopulations of this species (associated with local populations), are not considered to be using the Site. Furthermore, although there would be a loss of marshy grassland / Rhos pasture habitat within the Site, this would exclude the area with abundant devil's bit scabious in the south west of the Site and be limited to degraded Rhos pasture, which supports little or none of this food plant. The extent of degraded habitat lost would also be a very small proportion of what is available within the wider area.

7.19.10 The loss and disturbance of habitats proposed through the Nant Helen earthworks, is detailed in the Ecology Chapter of the Environmental Impact Assessment for the Nant Helen Complementary Earthworks project. As such, the potential construction impact is greatly reduced and considered to have no likely effect on the habitats associated with the marsh fritillary within the suitable habitat in the wider area in relation to the GCRE Project.

7.19.11 Potential construction and operational impacts to known or suitable marsh fritillary habitat could comprise indirect effects for example from changes in air or water quality. The likelihood of effects is considered to be low, due to the distance of these habitats from the Site however as discussed above in regard to other SACs, standard best practice will avoid such effects and ensure the protection of these marsh fritillary sites. No direct effects to marsh fritillary or suitable habiat are anticipated, during construction due to the distance of suitable / known habitat from the Site, and their assumed absence from the Site.

7.19.12 During operation, there is the potential risk of marsh fritillary mortality as a result of collision with high speed trains which will be

[12] Further ecological details provided in the: Nant Helen Invertebrate Report; Arup (2019) prepared for Celtic Energy

in operation. There is also the potential risk of collision of marsh fritillary with vehicles within the Site during operation. The potential risk from train / vehicle traffic is dependant on individuals of this species being present within the Site. Currently, the Site supports no suitable habitat however the future baseline supports marshy grassland managed to increase its species richness, and as such has the potential to support a higher abundance of devil's bit scabious and be more suitable for marsh fritillary.

7.19.13 Impacts on butterfly mortality from collison with trains, has not been well researched although studies on vehicle traffic collision have shown that there can be a significant risk of mortality to butterflies dependant on various factor such as the presence of species rich verges[13]. It is acknowledged, however, that the risk of collision with train traffic is likely to be significantly lower than with road / highway traffic, due to the lower number of trains travelling at one location on a track. In addition, potential collision with vehicles on roads within the Site, is considered to be a low risk since the proposed roads will not be used frequently.

7.19.14 Therefore despite the potential presence of marsh fritillary within habitats adjacent to the train tracks and roads, the anticipated low volume of train and vehicle traffic is not considered to be a significant collision risk to local marsh fritillary populations, or metapopulations. In addition, there would be no potential adverse impacts on the Blaen Cynon SAC metapopulations. More importantly, the enhancement of marshy grassland within the Site for marsh fritillary is considered to be a significant benefit to important metapopulations of this species and should outweigh the potential low risk of species mortality from collision.

7.19.15 Any impacts on SSSIs, would also be of significance at an National level, due to their designated status. The Nant Llech SSSI (designated for its stream and associated cliff communities and woodland), Gors Llwyn SSSI (designated for its mire and acid pasture) and Caeau Ton-y-Fildre SSSI (designated for its unimproved herb-rich pastures) are hydrologically connected to the Site. As such there is the potential for these SSSIs to be adversely affected by changes in water quality (both surface and groundwater) during construction for example as a result of pollution events and or surface run-off with a high sediment load, in addition to changes in water quantity for example increasing run off as a result of the removal of vegetation or additional discharges. It is not anticipated that the proposed construction acivities would affect the groundwater regime, and or groundwater dependant ecosystems such as these SSSIs however (details provided in Chapter 11; water).

[13] 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

7.19.16 During operation, potential impacts to water quality and ground water quality could occur through accidental spills from train or vehicle traffic. As discussed in the Water Chapter, these impacts can be mitigated through best practice design mitigation (detailed in Section 7.16) such as the track drainage systems and SuDS. There are potential risks of pollution as a result of effluent from the washery site during operation, which will require detailed mitigation measures regarding the drainage system here to be provided at the reserved matters stage. There is also the potential for pollutants within surface water features to infiltrate into groundwater. Measures such as slab tracks to direct effluent into specific drainage systems will ensure there is no seepage of pollutants into groundwater. Further mitigation measures are detailed within Section 7.21 and 7.22 (and Chapter 11; water), which will ensure there are no significant residual effects on SSSIs as a result of changes in water quality on SSSIs.

7.19.17 Changes to groundwater and surface water quality during operation may impact designated sites. The changes in extent of hardstanding through the proposed test track and washery site may result in increases in the volume of surface water run off. In addition, there is the potential for the removal of existing discharge to surface water features resulting in a change of surface water quantity. No additional discharges are proposed however and surface water run off will be treated by the SuDS design (i.e. ponds and swales), ensuring that any water discharged into surface waters will maintain the existing hydrological regime.

7.19.18 These SSSIs could also be affected by changes in air quality as a result of increases in dust, or pollutants such as nitrogen oxides (NOx), sulphur dioxide (SO2) and ammonia (NH3). Air quality assessments have identified potential impacts from air quality as a result of train emissions (namely NOx), and dust, during construction and operation, although these effects are only considered likely to effect nearby ecological receptors such as Gors Llwyn (see Chapter 14; air quality). Effects from car emissions during construction and operation have been screened out of the air quality assessment.

7.19.19 Standard best practice pollution control measures as detailed in Section 7.16, will avoid adverse effects as a result of dust and or changes in water quality, as discussed above.

7.19.20 Modelling has shown potential impacts on Gors Llwyn SSSI, as a result of an increase in nitrogen deposition above 1% of the lower critical load. Significant effects are possible up to 100 m from the Site boundary (and into the SSSI). Gors Llwyn SSSI habitats within the area modelled for air quality impacts support raised bog, one of the most sensitive habitats to nitrogen deposition (with critical loads being 5-10 kg N/ha/yr) along with associated habitats such as marshy grassland. Studies have shown that nitrogen deposition impacts on bog habitats may comprise loss of species such as ling heather (*calluna vulgaris)* and dominance by some species such as hare's tail

cottongrass (*Eriophorum vaginatum*). General effects on from nitrogen deposition on sensitive habitats comprises the dominance of nitrogen loving species, which can outcompete other plants particularly those which are sensitive to changes in nitrogen – leading to the plant communities associated with the SSSI/habitat becoming more simplified in structure and less diverse in species.

7.19.21 At the closest point of modelling with Gorsllywn SSSI (and predicted highest levels of nitrogen deposition), the baseline nitrogen levels are 17.7 kg N/ha/yr and modelled to increase from 17.6 kg N/ha/yr to 17.8 kg N/ha/yr as a result of the train operations within the site, therefore with a 0.6% change of 0.1 kg N/ha/yr). However in relation to the lower critical load, there is a 2.1% change. This demonstrates that although the % change is greater than 1%, it is a very small change in relation to high baseline levels, and even without the development there would be a significant changes in nitrogen deposition required to reduced levels to the lower critical load. Guidances states that where baselines are already high, scope for further declines in air quality will necessarily be limited[14], since if a site is currently exceeding its critical loads and not achieving its relevant biodiversity objectives, then damage to the site is already likely to be occurring or has already happened.

7.19.22 It is also acknowledged that the air quality modelling was based on highly conservative assumptions in relation to the type of diesel trains and likely emissions. Should other trains be used, it is highly likely the emission of nitrogen dioxides would be reduced (by at least a third), and therefore levels of nitrogen deposition reduced significantly. Therefore any effects would potentially not be significant should other lower emission diesel trains be used. In addition, any significant effects will be temporary as after 5 years, it is proposed that diesel trains will be replaced with zero emission trains (i.e. electric or hydrogen) if it is possible to do so. If this is not possible, low emission diesel trains will be used; therefore ensuring that there are significantly lower diesel emissions during operation after 5 years. With the use of lower emission diesel or zero emission trains it is anticipated that there would be no significant effects on Gorsllywn SSSI.

7.19.23 Considering the above, it is not anticipated that there would be actual adverse effects on Gorsllwyn SSSI, although it is recommended that a precautionary approach is taken with regard to air quality impacts as a result of emissions by updating modelling data, further to any additional information being provided on the train operation to confirm potential effects from nitrogen deposition. Unless it can be shown that there are no significant changes further mitigation should be implemented to manage potential increases in nitrogen deposition for example through sympathetic grazing, which can help reduce small quantities of nitrogen through accumulation in livestock and

[14] CIEEM (2021) Advisory note: Ecological Assessments of Air Quality Impacts

maintain habitats in favourable condition by reducing the dominance of competitive species. Long term monitoring of the key habitats would also be required, and adjustments made to management in discussion with NRW subject to the results of any monitoring. This would need to complement existing grazing undertaken as part of the SSSI management.

7.19.24 Further mitigation is detailed in Sections 7.21 and 7.22, in addition to 7.25 (monitoring) to address potential temporary effects from nitrogen deposition on Gorsllwyn SSSI, and to protect the SSSI in accordance with relevant UK legislation.

Non Statutory Designated Sites

7.19.25 Two SINCs: Onllwyn Coal Washery and Dyffryn Cellwen occur within the Site boundary, in the northern and southern part of the Washery. One SINC, Gorsllywn Meadow, falls partially within the Site boundary, in the northern part of the Washery site. There are also five other SINCs within 1 km of the Site. Any effects would be of significance at a County level, should they occur. A small area of the Onllwyn Coal Washery is within the development footprint, and therefore habitats will be lost as a result (the total extent is approximately 1 ha, of open mosaic grassland habitat and marshy grassland). There is no development within the boundary of the Gorsllywn Meadow SINC, or Duffryn Cellwen SINC and therefore there will be no habitat loss within these designated habitats, although there is the potential for impacts from habitat degradation. Habitat degradation could take the form of direct physical disturbances during construction from vehicles etc, although standard best practice mitigation such as the implementation of Heras fencing around these local sites will be implemented. There is also the potential for habitat pollution to all three SINCs, as a result of changes in water quality or air quality – as discussed above in regard to SACs and SSSIs, in addition to changes water quantity as a result of an increase insurface run off. There are also potential impacts on SINCs within the wider area, as as a result of changes in water quality / quantity, including Adjacent to Gors Llwyn, Intervalley Road, Banwen Pond, Onllwyn coal washery, Gorsllwyn meadows, Blaendulais mashy grassland, Land at marigold Place and Aberhenwaun SINCs which comprise marshy grassland (as well as other habitats), and are likely to be hydrologically connected to the Site. As discussed in Chapter 11; Water, it is not anticipated that there would be any impacts on the hydrological or groundwater regime therefore impacts on SINCs are not anticipated. Potential pollution / sedimentation or changes in surface water quantity will be treated through the implementation of standard best practice mitigation during construction and the implementation of SuDS during operation, in addition to specific treatment of effluent where required as discussed in Section 7.16 and 7.21.

7.19.26 Air quality effects on the majority of SINCs are considered to be negligible due their distance fom the Site, and have been screened out within the Air Quality Chapter assessment (Chapter 14). SINCs: Onllwyn Coal Washery, Dyffryn Cellwen and Gorsllywn Meadow which occur within the Site boundary, due to their proximity could be affected by changes in air quality however. As discussed within the Air quality chapter, and above in relation to SSSIs (paragraphs 7.20.18 – 7.20.22), significant effects on these SINCs is possible, via dust during construction and emissions during operation. Based on modelling although conservative assumptions have been made in relation to the type of diesel train used and subsequent emission levels. Additionally, it is acknowledged that potential effects are likely to be temporary for the 5 year period until all trains are zero emission or significantly reduced as described in 17.19.22.

7.19.27 Modelling has shown potential impacts on two of the three SINCs within the site boundary including Gorsllywn meadows and Onllwyn coal washery, as a result of an increase in nitrogen deposition above 1% of the lower critical load, during operation. These SINCs support purple moor grass and rush pastures and acid grassland which have critical loads of 10 – 15 kg N/ha/yr. These habitats are therefore less sensitive to nitrogen deposition, compared to others such as bog habitats within the nearby Gorsllwyn SSSI although impacts could comprise the dominance of competitive species, and result in a less species rich grassland. Similarly to modelling for the SSSI, there are only small changes in nitrogen deposition in relation to the baseline however.

7.19.28 There is a % change of 0.9 kg N/ha/yr (gorswllwyn meadows), 0.7 kg N/ha/yr (onllwyn coal washery – receptor point 1) and 0.9 kg N/ha/yr (onllwyn coal washery – receptor point 2). However in relation to the lower critical load, there is a 1.6% change for gorsllwyn meadows SINC, and for onllwyn coal washery there is a 1.3% change (receptor point 1) and 1.6% change (receptor point 2).

7.19.29 This demonstrates that although the % change is greater than 1%, it is a very small change in relation to high baseline levels, and even without the development there would be a significant changes in nitrogen deposition required to reduced levels to the lower critical load. A stated in CIEEM guidance, if these sites are already being damaged by high levels of nitrogen, it is likely that small increases are unlikely to result in significant effects on these SINC habitats.

7.19.30 It is also acknowledged that the air quality modelling was based on highly conservative assumptions in relation to the type of diesel trains and likely emissions. Should other trains be used, it is highly likely the emission of nitrogen dioxides would be reduced (by at least a third), and therefore levels of nitrogen deposition reduced significantly. Therefore any effects would potentially not be significant should other lower emission diesel trains be used. In addition, any significant effects will be temporary as after 5 years, it is proposed that diesel

trains will be replaced with zero emission trains (i.e. electric or hydrogen) if it is possible to do so. If this is not possible, low emission diesel trains will be used; therefore ensuring that there are significantly lower diesel emissions during operation after 5 years. With the use of lower emission diesel or zero emission trains it is anticipated that there would be no significant effects on SINCs within the site boundary.

7.19.31 Similary to the conclusion on likely effects to the SSSI from nitrogen deposition, it is not anticipated that there would be actual adverse effects on the two SINCs within the site. However, it is recommended that a precautionary approach is taken with regard to air quality impacts as a result of emissions by updating modelling data, further to any additional information being provided on the train operation to confirm potential effects from nitrogen deposition. Unless it can be shown that there are no significant changes further mitigation should be implemented to manage potential increases in nitrogen deposition for example through sympathetic grazing and long term monitoring habitats. As detailed above under 'SSSIs' sympathetic grazing can help reduce small quantities of nitrogen through accumulation in livestock and maintain habitats in favourable condition by reducing the dominance of competitive species. Long term monitoring would be required to ensure any grazing is successful in maintaining species diversity.

7.19.32 The implementation of best practice mitigation as detailed in Section 7.16 is considered sufficient to address potential impacts from dust and changes in water quality on SINCs.

7.19.33 Additional measures are required as detailed in Sections 7.21 and 7.22, in addition to 7.25 (monitoring) to address potential temporary effects from nitrogen deposition.

7.19.34 A Wildlife Trust Reserve is located approximately 1.5 km west of the Site. With the implementation of standard best practice mitigation measures for water and air quality, similarly to SINCs, potential adverse effects will be avoided. No effects from nitrogen deposition are anticipated during operation due to the distance of the Wildlife Trust site from the project boundary. Potential effects on marsh fritillary and mitigation are discussed above in paragraphs 7.19.7 – 7.19.14.

7.19.35 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 boundary[15]. As previously discussed in the separate technical note (Appendix 7R, 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

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

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, namely increases in dust during construction and nitrogen deposition as a result of train emissions during operation. It should not be disturbed / lost as a result of the GCRE development however.

7.19.36 Modelling has shown potential impacts on the area of ancient woodland within the Site boundary (AW8) and others within the vicinity of the Site (AW4, 5, 6 and 7) within the site boundary, as a result of an increase in nitrogen deposition above 1% of the lower critical load, during operation. AW8 supports broadleaved woodland which has a critical load of 10 - 20 kg N/ha/yr), therefore being less sensitive to nitrogen deposition, than other habitats such as bog within the nearby Gorsllwyn SSSI. AW8 has been shown to support mature oak woodland (NVC category W11 *Quercus petraea – Betula pubescens – Oxalis acetosella* woodland). Frequent ground flora species include creeping soft-grass, bluebell and wood sorrel. Mosses and liverworts were recorded within the woodland including mosses: *Mnium hornum, Polytrichastrum formosum, Plagiothecium undulatum, Kindbergia praelonga, Rhytidiadelphus squarrosus, Dicranum majus, Hypnum cupressiforme, Brachythecium rutabulum, Eurhynchium striatum Plagiothecium undulatum* and liverworts *Lophocolea bidentata, Chiloscyphus polyanthos (L.) Corda* and *Diplophyllum albicans.* No survey information is available on the other ancient woodlands (AW4, 5, 6 and 7) as identified in the ancient woodland inventory/map, to verify their status as ancient woodland or describe the woodland structure and composition, since these were outside of the study area.

7.19.37 Impacts from nitrogen deposition on woodland vegetation composition is not well understood, however reports have documented an increase in nitrogen deposition resulting in reductions in soil carbon-nitrogen ratio, acidification and increased nitrate leaching[14]. There are potential effects on woodland through the increase in nitrogen tolerant species which out compete many bryophytes (mosses and liverworts) and plants, degrading the ecological integrity of the woodland. Trees can also suffer from discolouration/bleaching and increased susceptibility to drought, frost and diseases. In addition woodland fungi and lichen have been shown to be particularly sensitive to nitrogen deposition including ectomycorrhizal species (associated with tree roots). Adverse effects on ectomycorrhizal species can affect tree health, and effects on lichen can affect invertebrates communities present[16].

7.19.38 Similarly to modelling for the SSSI and SINCs, there are only small changes in nitrogen deposition in relation to the baseline. For AW8

[16] https://www.woodlandtrust.org.uk/media/1687/ammonia-impacts-on-ancient-woodland.pdf

the baseline nitrogen levels are 19 kg N/ha/yr and modelled to increase from 17.6 kg N/ha/yr to 17.8 kg N/ha/yr as a result of the train operations within the site (with a 1.3% change of 0.1 kg N/ha/yr). However in relation to the lower critical load, there is a 2.3% change. The other woodlands (AW4-7) have changes between 1.0 and 1.3% in relation to the lower critical load, therefore showing that these are much less in relation to AW8.

7.19.39 This demonstrates that although the % change is greater than 1%, it is a very small change in relation to high baseline levels, and even without the development there would be a significant changes in nitrogen deposition required to reduced levels to the lower critical load. As stated in CIEEM guidance, if these sites are already being damaged by high levels of nitrogen, it is likely that small increases are unlikely to result in significant effects on these habitats.

7.19.40 It is also acknowledged that the air quality modelling was based on highly conservative assumptions in relation to the type of diesel trains and likely emissions. Should other trains be used, it is highly likely the emission of nitrogen dioxides would be reduced (by at least a third), and therefore levels of nitrogen deposition reduced significantly. Therefore any effects would potentially not be significant should other lower emission diesel trains be used. In addition, any significant effects will be temporary as after 5 years, it is proposed that diesel trains will be replaced with zero emission trains (i.e. electric or hydrogen) if it is possible to do so. If this is not possible, low emission diesel trains will be used; therefore ensuring that there are significantly lower diesel emissions during operation after 5 years. With the use of lower emission diesel or zero emission trains it is anticipated that there would be no significant effects on ancient woodlands within vicinity of the site.

7.19.41 Similary to the conclusion on likely effects to the SSSI and SINCs from nitrogen deposition, it is not anticipated that there would be actual adverse effects on the ancient woodland sites. However, it is recommended that a precautionary approach is taken with regard to air quality impacts as a result of emissions by updating modelling data, further to any additional information being provided on the train operation to confirm potential effects from nitrogen deposition. Unless it can be shown that there are no significant changes further mitigation should be implemented to manage potential increases in nitrogen deposition, such as dedicated woodland management prescriptions. This will include management such as grazing which ensures ground flora does not become dominated by nitrogen loving species, and will also reduce accumulation of nitrogen through the use of livestock. Long term monitoring of the key habitats would also be required, and adjustments made to management in discussion with NRW subject to the results of any monitoring.

7.19.42 As discussed above in relation to SINCs, the implementation of best practice mitigation as detailed in Section 7.16 is considered sufficient

to address potential impacts from dust and changes in water quality on ancient woodland, however additional measures are required as detailed in Sections 7.21, 7.22, in addition to 7.25 (monitoring) to address potential temporary effects from nitrogen deposition.

Habitats

Habitat loss

7.19.43 Habitats within Nant Helen will have been cleared as part of the Nant Helen Complementary Earthworks, and will support establishing acid grassland and some woodland on the newly created embankments and cuttings (which form part of the Future Baseline, along with adjacent habitats which have been retained or created – see Figure 7.11). As such, areas of newly established acid grassland and a small area of woodland will be lost from the tracks (approximately 66 ha, including the working width of the railway track) where new railway infrastructure is installed. The proposed road in the eastern extent of the Nant Helen site, and partly within the washery will also require further habitat loss (4 ha). Habitats affected by the road will comprise largely marshy grassland, acid grassland and new waterbodies in addition to smaller areas of mixed woodland.

7.19.44 GCRE works will also affect habitats within the Washery (see Figure 7.11) (approximately 7 ha) and around the sidings (approximately 4 ha) The majority of habitat loss in the washery will comprise buildings, hardstanding, tarmac surfaces and spoil / bare ground (man-made habitats created for the Washery operations) i.e. habitats with negligible conservation value. Other habitats likely to be lost, due to being in the footprint of the development will include neutral grassland, acid grassland, dry heath – acid grassland mosaic, scrub, ponds and ephemeral vegetation. Species rich acid, neutral and marshy grassland are considered to be notable habitats of conservation value. Habitat loss will be limited to very small areas of these habitats however. There will also be loss of habitats from the area of the sidings namely marshy grassland, and a smaller amount of ephemeral habitats and mixed woodland. A detailed breakdown of habitats is provided in Table 7.18 in Appendix 7T.

7.19.45 Habitats affected may support eyebright (*Euphrasia arctica ssp borealis*) - a notable species recorded in the NVC surveys, in the washery acid grassland habitats. None of the other notable vascular plants will be affected however.

7.19.46 Table 7.8 below details the extent of loss against each habitat type (across the washery, sidings and Nant Helen site), in addition to habitat retention and creation. A summary of habitat loss is also provided below (and explained in Table 7.17 in Appendix 7T):

- Marshy grassland = 17.80 ha

- Acid grassland = 51.33 ha
- Neutral grassland = 1.76 ha
- Dry heath – acid grassland = 0.98 ha
- Enclosed pasture = 4.17 ha
- Mixed woodland = 0.76 ha
- Broadleaved woodland = 18.96 ha
- Scrub = 1.62 ha
- Ephemeral vegetation = 5.30 ha
- Waterbodies / wetland habitats = 1.86 ha
- Total habitat loss = 104.54 ha

7.19.47 Due to the collective value of habitats within the Site, effects of habitat loss would be significant at a **County level,** in the absence of mitigation.

7.19.48 The operation of the Site as a rail testing, maintenance, research, development and storage facility will result in no further habitat loss.

7.19.49 Embedded mitigation is detailed in Section 7.16 (and illustrated on Figure 7.9), and details how the Site design will incorporate new landscaping and drainage in the form of SuDS, in addition to the creation of other habitats in undeveloped areas including acid grassland and marshy grassland (See Figure 7.9). This will include the track embankments in the Nant Helen site, around the sidings and within the washery. Areas of acid grassland will also provide suitable conditions for the establishment of acid grassland, and lichen and heathland communities. In addition, areas of short acid grassland, including where coillery spoil has been re-used will be suitable for the establishment of fungi.

7.19.50 As shown in Figure 7.9, affected waterbodies will be relocated eastwards within retained marshy grassland to avoid impacts of the proposed road.

7.19.51 In summary habitat creation / retention comprises:

- Marshy grassland = 10.05 ha of the existing marshy grassland SINC within the GCRE boundary (Gorsllwyn meadows and duffryn cellwen) retained within the washery will be enhanced through long term management. Additionally 51.65 ha will be retained within the GCRE project boundary.
- Acid grassland = 74.68 ha created around the sidings and on track slopes/embankments. This will be suitable for heathland, lichen and fungi establishment. 12.01 ha (of the existing SINC onllwyn coal washery) will be retained within the washery and subject to long term management.

- Mixed woodland = 1.98 ha will be retained and subject to enhancements through management.
- Broadleaved woodland = 23.08 ha will be created as a result of the site's landscaping for screening purposes. In addition 2.51 ha will be retained within the GCRE project boundary (north of the tracks).
- Waterbodies / wetland habitats = 50. 90 ha of ponds and wetland habitat will be created within the site. This includes SuDs which will comprise ponds, swales and ditches.
- Total habitat creation = **148.66 ha**
- Total habitat retention and enhancement = **24.04 ha**

7.19.52 In addition, retained and newly created habitats will be enhanced for example through their long term protection and sympathetic management.

Table 7.8: Table summarising loss per habitat type against habitat creation and habitat retention. This doesn't include calculations for buildings and areas of hardstanding or bare ground, and excludes the habitats proposed as part of the Nant Helen Restoration plan (which form part of the previous earthworks application). Numbers are shown in the detailed breakdown of habitat loss/gain in Tables 7.17 and 7.18 in Appendix 7T. It should also be noted that calculations are approximate since they are based on approximate GIS polygons within the Future baseline plan (7.9) and the habitat creation/enhancement plan (7.11).

Habitats affected (excluding buildings and hardstanding)	Total extent of habitat within red line boundary of GCRE	Habitat loss (Ha)	Habitat creation (ha)	Habitat retention and enhancement (Ha)	Habitats retained and protected (Ha)	Description of changes to habitat
Marshy grassland	139.98	17.80		10.05 (existing SINC)	51.65	Small areas of marshy grassland will be lost from the sidings and the Nant Helen site as a result of GCRE infrastructure and the access road. A small area of marshy grassland will also be lost as a result of landscaping planting required for GCRE. There will be no loss of marshy grassland from the washery site, and these areas will be retained and subject to management to enhance their value for nature conservation.
Acid grassland	231.94	51.33	74.68	12.01 (existing SINC)		Small areas of acid grassland will be lost from the washery and sidings and the Nant Helen site as a result of the GCRE infrastructure. A small area of acid grassland will also be lost as a result of landscaping planting required for GCRE. There will be larger area of acid grassland lost from the Nant Helen site at the locations of the tracks, where there will be newly establishing grassland on the recently formed earthworks. An area of existing acid grassland which forms the Onllwyn coal washery SINC will be retained and subject to long term management to enhance its value

						for nature conservation. New acid grassland will establish on the embankments and cuttings of the tracks within the Nant Helen site replacing lost acid grassland and woodland which forms part of the landscaping for the Nant Helen earthworks application.
Neutral grassland	1.76	1.76				A small area of neutral grassland which occur around the periphery of the washery buildings will be lost as a result of GCRE infrastructure: buildings and access road.
Dry heath / acid grassland	24.11	0.98				A small area of dry heath / acid grassland will be lost from the Washery.
Enclosed pasture	62.82	4.17				A small area of enclosed pasture will be lost as a result of landscaping planting required for GCRE.
Mixed woodland	4.18	0.76		1.98		A small area of mixed woodland (semi-natural and plantation) will be lost from the washery and the sidings as a result of GCRE infrastructure including the access road. A small area of plantation which is retained in the washery will be subject to management to enhance its value for nature conservation.

Broadleaved woodland[17]	27.11	18.96	23.08		2.51	New planting proposed as part of the Nant Helen earthworks habitat creation and enhancement will be lost where it is located on the northern track. There will be new broadleaved woodland creation as part of landscaping that is required for GCRE.
Conifer	2.60				2.60	An area of conifer will be retained north of the main track.
scrub	2.13	1.62				A small area of scrub will be lost from the washery site.
Ephemeral vegetation	5.30	5.30				A small area of ephemeral vegetation will be lost from the washery site.
Waterbodies / wetland features	8.70	1.86	50.90			Three ponds location within the smaller GCRE track will be disturbed/lost as a result of the access track but will be relocated east of the track. There are a large number of waterbodies and wetland features such as ditches/swales that will be created for GCRE as part of the SuDS design.
Total	505.56	**104.54**	**148.66**	**24.04**	56.76	

[17] including new planting lost from Nant Helen habitat creation and enhancement plan, and new landscaping comprising broadleaved woodland planting.

7.19.53 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no significant residual effects on habitats as a result of the proposals. Section 7.25 details the specific requirements of long term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats.

Habitat Severance / Fragmentation

7.19.54 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 form the Future Baseline), and will therefore be fragmented. As detailed above under 'habitat loss' impacts to waterbodies will be mitigated for through the re-siting of this habitat.

7.19.55 In addition, the development within the Nant Helen site will include infrastructure which could act as an additional barrier, to the establishment of habitats and movement of species including high palisade fencing (during construction and operation) around the perimeter of the Site, stock fencing along the interior perimeter of the tracks (and enclosing grazed pasture) and noise barriers located at various locations around the track (within the Washery and Nant Helen site) (see also the Noise Chapter for further details). Palisade fencing will be approximately 1.8 m high and noise barriers will be 2 m high. Locations of fencing / barriers is shown on the Illustrative masterplan.

7.19.56 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.

7.19.57 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.

7.19.58 There will be new culverts and realignment in one section of a tributary of the Afon Dulais, where it occurs in the sidings. At this section the stream has a stony channel, and at the time of the survey was dry in sections. The majority of this section was also very overgrown at the time of the survey with bramble and other tall ruderals and scrub. The adjacent habitats were grazed pasture. No signs of protected species were found within this section of the Afon Dulais. 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. The watercourse is not considered to provide optimal habitat for fish passage. As such the proposed culvert is not considered to fragment the Afon Dulais, or affect the hydrology of adjacent habitats.

7.19.59 The Afon Dulais tributary will be realigned in close proximity of the Dulais headwaters. The realignment will cause modification of a natural system and as such further mitigation measures will be required. Mitigation will need to ensure that the natural features of the stream are protected and that the volume and flow rate is maintained.

7.19.60 Due to the collective value of habitats within the Site, effects of habitat fragmentation / severance would be significant at a **County** level, in the absence of mitigation

7.19.61 In addition to embedded mitigation measures, further mitigation measures, namely relating to the re-alignment of the Afon Dulais tributary, are also detailed in Section 7.21, 7.22 and 7.25. It is considered that providing these mitigation measures are implemented, there should be no significant residual effects as a result of habitat fragmentation / severance. Impacts to species from barrier effects are discussed in the relevant sections below.

Habitat Disturbance / Degradation

7.19.62 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 and Chapter 11; Water).

7.19.63 Wetland habitats within the Site or in connectivity to the Site, such as ponds, wet heathland, marshy grassland and mire are sensitive to changes in ground and surface water quality / quantity. These changes can occur during construction and or operation as a result of pollution

events or changes in surface run-off (and increased sediment mobilisation). In addition, changes in the volume of surface run off and volume of groundwater may impact wetland habitats. Impacts to wetland habitats would also have an adverse effect on any notable species that these habitats support.

7.19.64 As discussed in the Water Chapter, the majority of accidental spills occur from train or vehicle traffic during construction and operation. These spills can be addressed by best practice construction methods during operation and track drainage systems and SuDS during operation, as outlined in Section 7.16. There are potential risks of pollution as a result of effluent from the Washery site. These risks will require detailed mitigation measures regarding the Washery drainage system to be provided at the reserved matters stage. There is also the potential for pollutants within surface water features to infiltrate into groundwater. Measures such as slab tracks to direct effluent into specific drainage systems will ensure there is no seepage of pollutants into groundwater.

7.19.65 Water levels within the Site will also be managed through SuDS and it is not anticipated that there would be any impacts on groundwater levels as a result of the proposed works during construction or operation.

7.19.66 Wetland and 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. The Air Quality assessment details that impacts from air quality are unlikely as a result of vehicle emissions during construction and operation, and have therefore been screened out. There are potential impacts from dust although these are limited to during construction and only considered likely to affect nearby receptors. Potential effects from dust can be addressed by best practice design mitigation as detailed in Section 7.16. Additionally the air quality assessment identified potential significant impacts on sensitive habitats within designated sites, particularly bog, marshy grassland and mature woodlands (i.e. within SSSIs, SINCs and ancient woodland), as a result of nitrogen deposition. These are discussed under ‘protected sites’ above (7.19.20-7.19.22; 7.19.26 – 7.29.31; and 7.19.36 – 7.29.41), and it is considered unlikely that any increases in nitrogen would result in significant effects on habitats within these protected sites, and if they do occur it will be a temporary effect until lower emission diesel or zero emission trains are used (which is anticipated). However, taking a precautionary approach, management post construction has been recommended to mitigate for potential temporary effects on sensitive habitats such as grazing and woodland management, which will control the dominance of nitrogen loving plants and maintain species diversity within these habitats.

7.19.67 Other habitats within proximity of the train operation which could be affected by changes in nitrogen, comprise either those within other SINCs (such as dyffryn cellwen) which is shown not to be significantly affected by air quality modelling and other retained habitats in the area of Nant Helen or the Washery which largely comprises marshy grassland, acid grassland, broadleaved woodland including newly established habitats as part of the Nant Helen Restoration works. These will be subject to the same management (as conditioned by the Nant Helen earthworks application) which is proposed to mitigate for effects within protected sites i.e. grazing and woodland management, and as such no further measures are considered required to address potential effects as a result of nitrogen deposition on these habitats.

7.19.68 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.

7.19.69 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. The implementation of best practice design and construction mitigation including the production of an INNS management plan, as discussed in Section 7.16 will ensure that any potential disturbance of INNS is avoided.

7.19.70 Due to the collective value of habitats within and adjacent to the Site, effects of habitat disturbance would be significant at a **County level,** in the absence of mitigation

7.19.71 With the implementation of best practice mitigation during design and construction, the majority of potential disturbance / degradation effects on habitats will be avoided. As discussed in the Water Chapter, further mitigation will be required to treat effluent from the Washery site, and is discussed further in Sections 7.21 and 7.22. In addition, further measures are required to protected sensitive habitats within protected sites from potential effects of nitrogen deposition, and which are also detailed in Sections 7.21, 7.22 and 7.25, including monitoring. It is considered that with the implementation of this additional mitigation, there should be no residual significant effect on habitats as a result of disturbance/degradation.

Fungi

Habitat Loss and Disturbance

7.19.72 As previously discussed under ‘Habitats’ in paragraphs 7.19.43 to 17.19.48, the GCRE Project area within Nant Helen site will largely affect newly establishing acid grassland, marshy grassland and some new woodland planting. With the exception of the marshy grassland the other habitats will be newly planted post Nant Helen earthworks,

and will therefore have limited or negligible value for fungi. Areas of marshy grassland within the Nant Helen site are considered unlikely to support a high number or diverse range of fungi (see Figure 7.7). As such no fungi rich habitat are likely to be affected by construction within the Nant Helen site.

7.19.73 Construction and associated site clearance within the Washery will result in the loss and or disturbance of small areas of valuable fungi habitats. Two areas of confirmed 'county' importance for fungi (area 3 and 6) and one area of 'local' importance (area 5), are within the Site boundary in the Washery area (as shown in Figure 7.7). Only part of area 3 is within the development footprint however, and will therefore be lost / disturbed during construction.

7.19.74 The partial loss / disturbance of the fungi habitat is considered to be significant at a **County level.**

7.19.75 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 suitable materials including coal spoil within the Site (where fungi communities currently exist), therefore providing a suitable substrate for the establishment of a diverse fungi assemblages at other locations within the Washery (such as at the location of the sidings). 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. These habitats are shown in Figure 7.9. However, whilst fungi habitats will re-establish, it is likely to take a longer period of time (approximately 20-30 years), than the majority of newly created habitats and mitigation measures should therefore also be put in place to allow for this such as a long-term management and monitoring plan.

7.19.76 Mitigation measures to address the habitat loss / disturbance are detailed in Sections 7.21, 7.22 and 7.25. It is considered that with the implementation of this additional mitigation, there should be no residual significant effect on fungi rich habitats as a result of habitat loss / disturbance in the long term.

Invertebrates

Habitat Loss

7.19.77 Newly established grassland and woodland on embankments and cuttings created by the Nant Helen earthworks will be lost as a result of the GCRE project, at the location of new tracks, and also marshy grassland and waterbodies at the location of the new road.

7.19.78 Invertebrates including potentially notable species are considered likely to quickly utilise new habitats such as established grassland, woodland and waterbodies created as part of the earthworks, and

therefore forming part of the Future Baseline. Species are likely to comprise similar species to those currently present in similar habitat in the Nant Helen site such as dingy skipper. Although habitats created as part of the Nant Helen earthworks restoration will be subject to further enhancements as part of the Nant Helen earthworks, it is considered likely that at the time of GCRE commencing this habitat will provide the same value for invertebrates as the existing baseline.

7.19.79 Construction within the Washery site will result in the small-scale loss of habitats (species-rich ruderal grassland, acid grassland, waterbodies, mixed woodland and heathland), some of which are of county importance to invertebrates due to supporting rare / notable species namely: the small blue and dingy skipper butterfly which occurs in open areas with ruderal vegetation such as grassland in the eastern part of the washery (partially designated as Onllwyn coal washery SINC). Habitats which support other rare species such as rare flea beetle (*M. rustica*), the scarce blue damselfly banded general soldier fly rare reed beetle (*P rustica*) rare crane fly (*T. marginella*) rare weevil (*G. veronicae* and *B. lutulentus)* will be protected (these are associated with marshy grassland of gorsllwyn meadows SINC)

7.19.80 In the absence of mitigation, the loss / degradation of notable invertebrate habitat is considered to be significant at a **County level.**

7.19.81 As discussed under 'Habitats' in paragraphs 7.19.49 – 7.19.53 there will be small-scale habitat creation within the Washery including species rich grassland, as well as enhancements of retained habitats namely marshy grassland. Embankments of the test track will provide newly establishing acid grassland habitat. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by notable invertebrates present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management.

7.19.82 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to notable invertebrates within the local area.

7.19.83 As such any habitat loss is not considered to have a significant impact on notable invertebrates.

7.19.84 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no significant residual effects on invertebrate habitats as a result of the proposals. Section 7.25 details the specific requirements of long term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats, and are suitable for notable invertebrates present locally. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats.

Habitat Fragmentation / Severance

7.19.85 Habitat loss within the Nant Helen or washery site will not result in any fragmentation of key habitat corridors for notable invertebrates.

7.19.86 No effects from habitat fragmentation / severance are anticipated on notable invertebrate populations as a result of the proposed construction or operation phase of GCRE.

Habitat Disturbance / Degradation

7.19.87 Habitats important for notable invertebrates may also be adversely affected if construction / operation activities were to inadvertently damage / degrade habitats.

7.19.88 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible that invertebrate habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.89 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.90 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local invertebrate populations.

7.19.91 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25. It is considered that with the implementation of this additional mitigation, there should be no residual significant effect on local invertebrates populations as a result of habitat disturbance / degradation.

Harm / Mortality

7.19.92 As discussed under 'Statutory Designated Sites' in paragraphs 7.19.7 to 7.19.14 there are potential effects of harm / mortality on some of the notable invertebrates occurring within the Site, in particular butterflies (including marsh fritillary), due to collision risk with trains and vehicles during operation of the GCRE Project. Any collision risk is likely to be low due to the low volume of train and vehicle traffic within the site however.

7.19.93 Habitats within the future baseline will be more species rich, and support food plants for a range of butterflies, including potentially devil's bit scabious, the food plant of marsh fritillary. The enhanced species richness of habitats within the Site will be a significant contribution to enhancing biodiversity within the Site, and supporting important marsh fritillary metapopulations within the area (as well as other local invertebrate populations). This likely increase in invertebrates within the Site is therefore considered to outweigh the low risk of collision during the operation of GCRE.

7.19.94 As such adverse effects on invertebrate populations from harm / mortality are not considered to be significant at population levels**.** No additional mitigation is considered to be necessary for potential harm / motality risks to butterly populations.

Amphibians

Habitat Loss

7.19.95 The GCRE development in the Washery will be largely within areas of existing development and man-made habitats. Construction and associated site clearance within the Washery, which will be required for the GCRE Project, will however 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 grassland / heathland and scrub. In addition there will be the loss of newly established grassland and planted woodland 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, marshy and acid grassland 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.

7.19.96 In the absence of mitigation, effects of habitat loss on populations of amphibians would be significant at a **Local level.**

7.19.97 As discussed under 'Habitats' in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery, namely species rich grassland, as well as enhancements of retained habitats including marshy grassland. Embankments of the test track will provide establishing acid grassland habitat, will also provide a large extent of suitable habitat for amphibians within the local area. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by amphibians present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management. The potential

loss of a waterbody at the location of the new road will be mitigated for through the re-siting of the waterbody further east.

7.19.98 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to notable amphibians within the local area.

7.19.99 As such any habitat loss is not considered to have a significant impact on notable amphibians.

7.19.100 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no residual effects on amphibian habitats as a result of the proposals. Section 25 details the specific requirements of long term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats, and are suitable for amphibian species present locally. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for amphibians.

Habitat Severance / Fragmentation

7.19.101 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.

7.19.102 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.

7.19.103 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 temporarily during construction. 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 collision[18].

7.19.104 As such adverse effects on amphibians from habitat fragmentation are not considered to be significant at population levels**.**

[18] Budzic, K. A., & Budzic, K. M. (2014). A preliminary report of amphibian mortality patterns on railways. *Acta Herpetologica*, *9*, 103–107

Habitat Disturbance / Degradation

7.19.105 Habitats important for amphibians may also be adversely affected if construction / operation activities were to inadvertently damage / degrade habitats.

7.19.106 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible that amphibian habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.107 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.108 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local amphibian populations.

7.19.109 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.110 It is considered that with the implementation of this additional mitigation, there should be no residual effect on local invertebrates populations as a result of habitat disturbance / degradation.

Harm / Mortality

7.19.111 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 and areas of newly establishing acid grassland within the Nant Helen site at the location of the track, in addition to retained marshy grassland within the Nant Helen site at the location of the new road.

7.19.112 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 of collision with vehicles, to a lesser extent, during construction and 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 frog[19]. 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 rainfall[20], 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 agility[18].

7.19.113 Evidence from previous surveys undertaken suggest a low amphibian population exists within the Site. 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.

7.19.114 As such adverse effects on amphibian from harm / mortality are not considered to be significant at population levels**.**

7.19.115 It is not an offence to injure or harm widespread species of amphibians, however, mitigation measures recommended in Section 7.21 and 7.22, for legally protected reptiles, are considered appropriate to protect amphibians also.

Reptiles

Habitat Loss

7.19.116 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, and short ruderal grassland. In addition there will be the loss of newly established grassland and planted woodland 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 and areas of marshy grassland and acid grassland where the new road is proposed. Due to the limited extent of habitats affected, it is not considered likely that they would support significant numbers of reptiles. There will be no further habitat loss during operation.

7.19.117 In the absence of mitigation, effects of habitat loss on populations of reptiles would be significant at a **Local** level.

7.19.118 As discussed under ‘Habitats’ in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery, including species rich grassland as well as enhancements of retained habitats,

[19] 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

[20] Heske, E. J. (2015). Blood on the tracks: Track mortality and scavenging rate in urban nature preserves. *Urban Naturalist, 4*, 1–13.

namely marshy grassland. Embankments of the test track will provide grassland habitat, this will also provide a large extent of suitable habitat for reptiles within the local area. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by reptiles present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management.

7.19.119 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to reptiles within the local area.

7.19.120 As such any habitat loss is not considered to have a significant impact on reptile populations.

7.19.121 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no residual effects on reptile habitats as a result of the proposals. Section 7.25 details the specific requirements of long term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats, and are suitable for reptile species present locally. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for reptiles.

Habitat Severance / Fragmentation

7.19.122 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.

7.19.123 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 temporarily. 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.

7.19.124 As such adverse effects on reptiles from habitat fragmentation / severance are not considered to be significant at population levels**.**

Habitat Disturbance / Degradation

7.19.125 Habitats important for reptiles may also be adversely affected if construction / operation activities where to damage / degrade habitats.

7.19.126 Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible

that reptile habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.127 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.128 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local reptile populations.

7.19.129 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.130 It is considered that with the implementation of this additional mitigation, there should be no residual effect on local reptile populations as a result of habitat disturbance / degradation.

Harm / Mortality

7.19.131 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, and areas of newly establishing acid grassland and retained marshy grassland within the Nant Helen site.

7.19.132 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 construction and operation. Impacts on reptile mortality from collison with trains, has not been well researched and available articles[2122] do not relate to comparable species present on the Site. Similar studies on impacts to amphibians[18] 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.

7.19.133 It is acknowledged however, 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

[21] 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.
[22] S. C. V. (1996). *Mortalidad de vertebrados en líneas de ferrocarril*. Documentos Técnicos de Conservacion SCV 1, Sociedad Conservación Vertebrados, Madrid.

vehicles on roads within the Site, is considered to be a low risk since these roads will not be used frequently.

7.19.134 Adverse effects on reptile populations as a result of harm / mortality are considered to to of low magnitude, and not significant.

7.19.135 It is an offence to intentionally injure or harm any reptile. Mitigation measures are recommended in Section 7.21 and 7.22, which will ensure compliance within UK legislation. Mitigation will include the design and implementation of a reptile trapping and relocation strategy which includes the identification of a suitable receptor site in connecting habitats.

Birds

Breeding and Wintering birds

Habitat Loss

7.19.136 As set out within the baseline section and associated baseline report for Breeding Birds (Appendix 7I, Volume 2), a range of species were recorded. Key species, including Section 7 species and those listed on Schedule 1 of the Wildlife and Countryside Act are summarised in the Table 7.9 below, including numbers of territories recorded, relevant transect number and associated habitats:

Table 7.9: Summary of bird species recorded within the study area and associated habitats

Species	Conservation Status	Number of Breeding Pairs	Transect Number	Associated Habitats
Lapwing *Vanellus vanellus*	S7	2	2	Old colliery pools (outside GCRE footprint)
Curlew *Numenius arquata*	S7	1	3	One pair west of washery, marshy grassland
Cuckoo *Cuculus canorus*	S7	8	1,4,5	Open grassland and scrub
Skylark *Alauda arvensis*	S7	139	1,2,3,4,5	All grassland types
Starling *Sturnus vulgaris*	S7	1	5	Near residential properties in Seven Sisters (outside GCRE footprint)
Song thrush *Turdus philomelos*	S7	23	1,2,3,4,5	Woodland edges and scrub
Dunnock *Prunella modularis*	S7	5	1,3,5	Woodland edges and scrub

House sparrow *Passer domesticus*	S7	5	3	Around Washery and associated entrance road
Tree pipit *Anthus trivialis*	S7	3	1,2,4	Open grassland with scattered scrub
Bullfinch *Pyrrhula pyrrhula*	S7	6	3,4	Woodland edges and scrub
Linnet *Linaria cannabina*	S7	7	2,3,4	Open grassland with scattered scrub
Lesser redpoll *Acanthis cabaret*	S7	14	2,3,4	Woodland edges and scrub
Crossbill *Loxia curvirostra*	Schedule 1	3	1,4	Mature coniferous woodland
Yellowhammer *Emberiza citrinella*	S7	1	5	Open grassland with scattered scrub
Reed bunting *Emberiza schoeniclus*	S7	32	2,3,4,5	Wetland fringe habitats

7.19.137 Across the winter of 2018/2019, wintering bird surveys undertaken recorded 34 species. With the exception of kestrel, the Section 7 species recorded were common to those observed on site during the breeding bird surveys.

7.19.138 The full list of S7 included kestrel *Falco tinnunculus* (single bird), skylark with returning breeding birds notable from February, starling (small flocks, up to 42 birds on one visit), song thrush (up to seven birds), dunnock (maximum four birds), house sparrow (maximum 15 birds), linnet (maximum four birds) and reed bunting (maximum five birds). No particularly large aggregations of birds or otherwise rare/notable features were recorded. See Appendix 7J for full details.

7.19.139 For this impact assessment, it is assumed a similar range of species will in time occupy the site as described above under Future Baseline, with the Nant Helen Complementary Earthworks restoration in place.

7.19.140 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 acid 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. These may include habitat used by widespread S7 species such as dunnock, linnet and skylark that were recorded in this area during the breeding bird surveys. Additionally, demolition of structures could affect the small population of house sparrow recorded in this area.

7.19.141 In addition, there will be the loss of newly established grassland and woodland in the Nant Helen site and existing marshy grassland and waterbodies in the area of the Nant Helen site. These areas are not considered likely to support significant numbers of breeding birds /

wintering or population sizes but could still support small numbers of ground nesting species such as skylark. There will be no further habitat loss during operation.

7.19.142 Taking a precautionary approach, in the absence of mitigation, effects of habitat loss on local populations of breeding / wintering birds would be significant at a **County level**.

7.19.143 As discussed under 'Habitats' in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery including species rich grassland, as well as enhancements of retained habitats, namely marshy and acid grassland. Embankments of the test track will provide establishing acid grassland habitat, will also provide a large extent of suitable habitat for breeding / wintering birds within the local area. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by birds present within the Site and adjoining habitats, and become more favourable in the long term as management prescriptions are deployed. The potential loss of a waterbody at the location of the new road will be mitigated for through the re-siting of the waterbody further east.

7.19.144 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to breeding and wintering birds within the local area.

7.19.145 Considering the S7 bird species recorded, the provision of a net positive balance of species-rich grassland, will benefit some key species including skylark, lapwing and curlew. Retained and regenerating scattered scrub across the site, combined with grassland habitats will provide suitable habitat for tree pipit, dunnock and linnet populations. These same habitats will also be used by meadow pipit populations and it this species and dunnock that are most likely hosts of local cuckoo populations. Whilst the only yellowhammer territory recorded during baseline was over 1km west of GCRE, newly created grassland habitats and associated scrub will also be suitable for this species.

7.19.146 The provision of a net positive balance of wetland habitats, including swales and drainage ponds around the track loops, with associated native wetland planting, will also benefit key bird populations. These will include reed buntings that are present in good numbers in the local area and ponds may be used by lapwing and other waterbirds. It should be noted that lapwing recorded in baseline surveys used pools with a relatively high level of existing disturbance from mining activity and may therefore habituate to any operational phase disturbance from GCRE.

7.19.147 Retained and planted woodland and associated woodland edge ecotones will provide habitat suitable for local populations of bullfinch, song thrush and lesser redpoll. Retained coniferous woodland will be suitable for common crossbill populations, noting these tend to be nomadic with nesting locations and timings varying between years associated with local cone crop availability.

7.19.148 Habitats created, notably species-rich grassland subject to grazing, will provide foraging habitat for many species including the S7 species starling. This species was not found to nest within the GCRE area, but providing adequate foraging opportunities both in the breeding and wintering period is relevant given results obtained during baseline surveys.

7.19.149 The washery was found to support a small colony of house sparrows with nests found in and around existing structures and adjacent habitats. To assist this small colony, house sparrow nesting boxes (minimum 10) will be installed on the fabric of new structures and/or in adjacent habitats as directed by the project ecologist.

7.19.150 Considering the above habitat provisions, habitat loss is not considered to have a significant impact on local bird populations.

7.19.151 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no residual effects on breeding / wintering habitats as a result of the proposals. Section 7.25 details specific requirements of long-term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats and are suitable for bird species present locally. Additionally, Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for breeding / wintering birds.

Habitat Severance / Fragmentation

7.19.152 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. As such there will be no adverse effects on local bird populations from habitat severance / fragmentation.

7.19.153 However, as discussed below under ‘Harm and Mortality’ there is a mortality risk associated with train collision during the operation of GCRE.

Habitat Degradation

7.19.154 Habitats important for breeding / wintering may also be adversely affected if construction / operation activities were to degrade habitats.

7.19.155 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible

that habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.156 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.157 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local bird populations.

7.19.158 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.159 It is considered that with the implementation of this additional mitigation, there should be no residual effects on local bird populations as a result of habitat disturbance.

Bird Disturbance

7.19.160 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. Displacement of breeding birds is likely to result in abandonment of nests / young, and therefore reduced breeding success.

7.19.161 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.

7.19.162 Taking a precautionary approach, in the absence of mitigation, effects of disturbance on local populations of breeding / wintering birds would be significant at a **County level**.

7.19.163 Common crossbill, has been recorded breeding within the Site, and barn owl, potentially breeding nearby the Site, are Schedule 1 species and afforded protection against disturbance whilst breeding. It should be noted that no active barn owl roosts were actually found in baseline surveys and common crossbill records were some distance away from areas affected by the GCRE works, in and around mature coniferous woodland to the north and south.

7.19.164 It is also acknowledged that there are some species such as curlew and lapwing, which are of conservation significance are more sensitive to disturbances. During baseline surveys a single pair of curlew were

found north west of the washery, with two pairs of lapwing on colliery pools close to Nant Helen mine workings.

7.19.165 Whilst pairs may be displaced, impacts from disturbance during construction will be temporary are not anticipated to significant affect local bird populations in the medium or long term. Additionally, it is noted that where any birds are displaced, they may be able to continue to use suitable habitats in the wider area, including retained and newly created habitats formed as part of GCRE, the Nant Helen Complementary Earthworks project or Nant Helen restoration works.

7.19.166 Impacts from noise during operation will be similar to the existing levels (Chapter 10; noise), and it is therefore anticipated that operational noise will not be a significant disturbance to breeding or wintering birds present within the local area, given habituation to current levels. Furthermore, the design incorporates noise barriers which will reduces noise levels to adjacent habitats including those known / likely to support Schedule 1 species such as common crossbill in coniferous woodland stands.

7.19.167 Operational lighting proposals are largely concentrated in the Washery, although the specific details are currently not available to assess impacts. However, it is assumed that light spill will be controlled and no known roosts of owls or other sensitive species are known in these areas.

7.19.168 Embedded mitigation comprising sensitive vegetation clearance outside of the nesting period as detailed in Section 7.16, will disturbance to nesting birds, and compliance with UK legislation.

7.19.169 To ensure compliance with UK legislation, additional mitigation measures are recommended in Sections 7.21 and 7.22 in the form of pre-construction surveys where vegetation clearance / demolition is proposed during the nesting season, to confirm the absence of nesting birds including Schedule 1 birds.

7.19.170 It is considered that with the implementation of this additional mitigation, there should be no residual effects on local bird populations as a result of disturbance.

Harm / Mortality

7.19.171 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. Embedded mitigation comprising sensitive vegetation clearance as detailed in Section 7.16, will avoid any harm / mortality of nesting birds during construction.

7.19.172 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 studied[19], 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 roads[23]) as well as species which are likely to perch on railway infrastructure such as raptors[19]. 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.

7.19.173 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.

7.19.174 Barn owl are known to be present in habitats adjacent to the Site and have previously been recorded within the Washery though none were recorded when the inside of structures was inspected during 2019. 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.

7.19.175 Collision impacts to species of conservation significance such as barn owl, will be of greater significance compared to more common and widespread species.

7.19.176 Taking a precautionary approach, 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. 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.

7.19.177 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure compliance with UK legislation. This includes the specific requirements to create alternative barn owl nesting habitat (at least one barn owl box) at least 3 km away from the active tracks. This may be located on land controlled by the applicant or by agreement with local landowners. With this in place, no significant effect on local barn owl or other bird populations is likely to occur.

[23]Shawyer, C. and Dixon, N. (1999) Impacts of Roads on Barn owl *Tyto alba* populations. Highways Agency.

Badger

Habitat Loss / Fragmentation

7.19.178 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 (although development is in proximity to these setts, as discussed in disturbance – paragraph 7.19.185). Construction and associated site clearance required for GCRE will be largely within the Washery site where no badger setts have been recorded, although suitable foraging habitats are present. In addition, there will be clearance within the Nant Helen site in newly established areas of grassland and woodland on embankments / cuttings formed by the Nant Helen Complementary Restoration Earthworks, in addition to grassland at the location of the new access road. These habitats are unlikely to support setts, due to the majority being newly created, and existing habitats having no evidence of badger to date; however, these area may potentially provide foraging habitat to badgers. It is noted however that limited badger activity was recorded within the study area and recorded activity was largely concentrated north west of the GCRE site, within woodland outside of the development site (with the exception of outlier setts found within the Nant Helen site). No clearance will be required during operation.

7.19.179 As described under ‘Habitats’ in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery part of the Site as part of the GCRE Project, and additional habitats within the Nant Helen site. Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to badger within the local area. As such any habitat loss is not considered to have a significant impact on local badger populations.

7.19.180 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, fencing around the site infrastructure, which would comprise palisade fencing, could be a barrier to badger movement, although it is considered likely that badgers will 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’.

7.19.181 Adverse effects on local badger populations as a result habitat fragmentation / loss are considered to to of low magnitude, and not significant.

7.19.182 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no residual effects on badger habitats as a result of the proposals. Section 7.25 details the specific

requirements of long term management and monitoring of retained and newly created habitats.

Disturbance

7.19.183 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.

7.19.184 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.

7.19.185 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 during construction. Impacts from disturbance during construction, will be temporary and of low magnitude, and as such are not anticipated to significant affect badgers. Additionally it is acknowledged however that the setts are likely to be used infrequently by badgers, and any badgers displaced from these setts, would have sufficient habitat within the Site and wider area to create new setts.

7.19.186 Impacts from noise during operation will be similar to the existing levels (Chapter 10; noise), and it is therefore anticipated that operational noise will not be a significant disturbance to badgers present within the local area. Furthermore the design incorporates noise barriers which will reduces noise levels to adjacent habitats. Operational lighting proposals are largely concentrated in the Washery, although the specific details are currently not available to assess impacts. As such a precautionary approach is recommended, and further mitigation recommended to avoid / minimise any light spill on badgers.

Badgers are protected from disturbance by UK legislation. Mitigation measures to address disturbance effects are detailed in Sections 7.21 and 7.22, namely the licensed closure of setts prior to construction, which will also ensure compliance within UK legislation. In addition, sensitive lighting is recommended during operation.

Harm / Mortality

7.19.187 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. Embedded mitigation comprising covering open excavations and limiting vehicle traffic to low speeds as detailed in Section 7.16, will avoid harm / mortality of badger during construction.

7.19.188 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 and site clearance.

7.19.189 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 contruction and operation. There is also the risk of collision with vehicles on Site during operation. The risk of collision with trains / road traffic is considered to be a low risk due to the limited activity of badger within the GCRE site (recorded to date), and which is concentrated around outlier setts in proximity to the smaller tracks, as well as woodland west / north west of the GCRE boundary

7.19.190 Adverse effects on local badger populations as a result of harm / mortality are considered to to of low magnitude, and not significant. However, badgers are protected from harm, by UK legislation and mitigation would be required to ensure legal compliance.

7.19.191 Mitigation measures to address the harm and mortality effects are detailed in Sections 7.21 and 7.22, namely the undertaking of pre-construction surveys and provision of suitable wildlife underpasses beneath tracks, which will ensure compliance within UK legislation.

Otter

Habitat Loss

7.19.192 No evidence of otter using the Site has been found. Otter have been recorded west of the Site, along the Afon Dulais (approximately 1km away). It is considered that this species would use the Site for foraging / commuting purposes infrequently due the nature of the Site.

7.19.193 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. Any activity within the site is considered likely to be infrequent however.

7.19.194 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 and scrub habitats. In addition there will be the loss of newly established grassland, planted woodland, 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 in addition to some retained marshy grassland. 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.

7.19.195 In the absence of mitigation, effects of habitat loss on local populations of otter would be significant at a **Local level**.

7.19.196 As discussed under 'Habitats' in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery including species rich grassland, as well as enhancements of retained habitats, namely marshy grassland. Embankments of the test track will provide establishing acid grassland habitat. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by otter present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management. The potential loss of a waterbody at the location of the new road will be mitigated for through the re-siting of the waterbody further east.

7.19.197 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitat to otter within the local area.

7.19.198 As such any habitat loss is not considered to have a significant impact on local otter populations.

7.19.199 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no residual effects on otter habitats as a result of the proposals. Section 25 details the specific requirements of long term management and monitoring of retained and newly created habitats. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for otter.

Habitat Severance / Fragmentation

7.19.200 Part of a tributary of the Afon Dulais will be re-aligned, and a new culverts will be installed (in the area of the sidings). Otter signs have been recorded further along the Afon Dulais, west of the site (approximately 1km) however the affected section provides limited suitability for otter due to being being overgrown with ruderal/scrub vegetation. The design of the new culvert along the Afon Dulais, as detailed in Section 7.16 will avoid impacts on foraging / commuting otter, should they be present, although additional mitigation measures are required to ensure tributary habitats are re-instated post re-alignment to provide suitable connecting habitat for otter and other wildife.

7.19.201 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, fencing around the site infrastructure, which would comprises palisade fencing, could be a barrier to otter movement, although it is considered likely that otter travel into the site via the Afon Dulais and connecting tributaries in the south of the site, which would remain open to otter. As discussed below under 'Harm and Mortality' there is a mortality risk associated with otter crossing the tracks, should they be present in the site.

7.19.202 Adverse effects on local otter populations from habitat loss or fragmentation are not considered to be significant.

7.19.203 Additional mitigation measures are detailed in Sections 7.21, 7.22 and 7.25 which will ensure there will be no residual effects on otter habitats as a result of the proposals. This includes the specific requirements of long term management and monitoring of retained and newly created habitats.

Habitat Disturbance / Degradation

7.19.204 Habitats important for otter may also be adversely affected if construction / operation activities where to damage / degrade habitats.

7.19.205 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible that otter habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.206 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.207 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local otter populations.

7.19.208 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.209 It is considered that with the implementation of this additional mitigation, there should be no residual effect on local otter populations as a result of habitat disturbance / degradation.

Disturbance

7.19.210 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.

7.19.211 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.

7.19.212 Impacts from disturbance during construction, will be temporary and of low magnitude, and as such are not anticipated to significant affect local otter populations. Additionally, it is noted that otter occurrence is likely to be infrequent within the site and where any otter are displaced, they would be able to continue to use suitable habitats in the wider area however, including retained and newly created habitats.

7.19.213 Impacts from noise during operation will be similar to the existing levels (Chapter 10; noise), and it is therefore anticipated that operational noise will not be a significant disturbance to otter present within the local area. Furthermore the design incorporates noise barriers. Operational lighting proposals are largely concentrated in the Washery, although the specific details are currently not available to assess impacts. As such a precautionary approach is recommended, and further mitigation recommended to avoid / minimise any light spill on otter habitats.

Otters and their resting / breeding places are protected from disturbance by UK legislation. Recommended mitigation for otter is detailed in Sections 7.21 and 7.22 to ensure compliance with UK legislation including the undertaking of pre-construction checks to ensure the absence of otter resting / breeding sites within the vicinity of the works. In addition, sensitive lighting is recommended during operation.

Harm / Mortality

7.19.214 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. Embedded mitigation comprising covering open excavations and limiting vehicle traffic to low speeds as detailed in Section 7.16, will avoid harm / mortality of otter during construction.

7.19.215 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 and as such it is considered to be a very low risk of collision with train / road traffic.

7.19.216 Adverse effects on local otter populations from harm / mortality are not considered to be significant.

7.19.217 Mitigation measures to address the harm and mortality effects are detailed in Sections 7.21 and 7.22, namely the undertaking of pre-construction surveys and provision of suitable wildlife underpasses beneath tracks, which will ensure compliance within UK legislation.

Bats

Habitat Loss / Fragmentation

7.19.218 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 acid grassland, heathland and scrub. Bat species recorded foraging / commuting in this part of the Site include common and soprano pipistrelle as well as noctule and myotid bats, which are common and widespread species in the local area. No bat roosts have been recorded within the Washery during comprehensive surveys, although one tree was identified as having low suitability for roosting bats further to climbing inspections and a number of buildings were also assessed as having low to moderate suitability.

7.19.219 In addition there will be the loss of newly established grassland, some woodland 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, in addition to loss of retained marshy grassland where the road is proposed. It is acknowledged however that newly established and woodland are unlikely to support roosting bats.. The potential roosting habitats, previously identified in the existing baseline including a tree with moderate suitability, will have been cleared as part of the Nant Helen Complementary Earthworks, and therefore no further mitigation is required for roosting bats in this part of the site for the GCRE project. Habitats within the Nant Helen site 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 within the Washery site or the Nant Helen site during operation.

7.19.220 It is acknowledged that bats are a mobile animals, and suitable foraging roosting habitat occurs within the Washery. As such, bat roosts, although not recorded during recent surveys, could be present within washery trees / buildings assessed as having suitability. The likelihood of bats using these potential roost sites, will increase as time passes and if a sufficient amount of time has passed between surveys and commencement of construction further surveys will be required to confirm presence / absence. There is a risk that if bats were using any trees / buildings to roost they would be subject to harm or

mortality. Potential mortality effects as a result of habitat loss are discussed in detailed under 'Harm and Mortality' below.

7.19.221 As discussed under 'Habitats' in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery including species rich grassland, as well as enhancements of retained habitats, namely marshy grassland. Embankments of the test track will provide establishing acid grassland habitat, will also provide a large extent of suitable habitat for bats within the local area. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by bats present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management. The potential loss of a waterbody at the location of the new road will be mitigated for through the re-siting of the waterbody further east.

7.19.222 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable foraging and roosting habitats, to bats within the local area.

7.19.223 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.

7.19.224 Adverse effects on local bat populations from habitat fragmentation / loss are not considered to be significant.

7.19.225 Bats and their resting / breeding places are protected by UK and European legislation. Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no significant residual effects on roosting and foraging bats as a result of the proposals, and compliance with UK legislation. Section 7.25 details the specific requirements of long term management and monitoring of retained and newly created habitats to ensure they establish as species rich habitats, and are suitable for bat species present locally. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for roosting and foraging / commuting bats.

Habitat Disturbance / Degradation

7.19.226 Habitats important for bats may also be adversely affected if construction / operation activities where to damage / degrade habitats.

7.19.227 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality,

particularly effects of nitrogen deposition. In addition it is possible that bat foraging/roosting habitats could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.228 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.229 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local bat populations.

7.19.230 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.231 It is considered that with the implementation of this additional mitigation, there should be no residual effects on bat foraging/roosting habitats as a result of habitat disturbance / degradation.

Disturbance

7.19.232 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).

7.19.233 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.

7.19.234 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 densities[24]. Some bat species such as *Nyctalus* and *pipistrellus* species are attracted to short wave light

[24] 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

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.

7.19.235 As discussed above under 'Habitat loss' 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.

7.19.236 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.

7.19.237 Impacts from disturbance during construction, will be temporary and of low magnitude, and as such are not anticipated to significant affect local bat populations. Additionally, it is noted that where any bats are displaced, they would be able to continue to use suitable habitats in the wider area however, including retained and newly created habitats.

7.19.238 Impacts from noise during operation will be similar to the existing levels (Chapter 10; noise), and it is therefore anticipated that operational noise will not be a significant disturbance to any bats roosting / foraging within the local area. Furthermore the design incorporates noise barriers which will reduces noise levels to adjacent habitats. Operational lighting proposals are largely concentrated in the Washery, although the specific details are currently not available to assess impacts. As such a precautionary approach is recommended, and further mitigation recommended to avoid / minimise any light spill on roosting and foraging / commuting bats.

7.19.239 Bats and their roosts are protected from disturbance by UK legislation. Recommended mitigation is detailed in Sections 7.21 and 7.22 to ensure compliance with UK legislation including the undertaking of pre-construction checks to ensure the absence of bat roosts within the vicinity of the works. In addition, sensitive lighting is recommended during operation.

Harm / Mortality

7.19.240 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 further vegetation clearance / demolition is proposed, although as detailed above under 'Habitat loss' is possible they may be roosting within buildings / vegetation at the time of construction (due to the presence of suitable roosting habitats), and could therefore be at risk from harm or mortality. Newly established habitats within the Nant

Helen site which will be affected by the GCRE project will not be suitable for roostibg bats at the time of construction. It is assumed that all suitable habitats within the GCRE footprint in the Nant Helen site will have been cleared as part of the Nant Helen Complementary Earthworks, and therefore there is no risk of harm / mortality to previously identified potential bat roosts in the Nant Helen site.

7.19.241 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 construction and 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 flights[24]. 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.

7.19.242 There is considered to be no risk of collision with OLE, and associated electrocution, since bats will be able to avoid static structures.

7.19.243 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.

7.19.244 Bats are protected from harm, by UK legislation. Recommended mitigation for potential harm / mortality impacts to bats is detailed in Sections 7.22 and 7.23 to ensure compliance with UK legislation, including the undertaking of pre-construction surveys and provision of suitable wildlife underpasses beneath tracks.

Notable Mammal Species

Habitat Loss

7.19.245 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 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 and retained marshy grassland as a result of the proposed road. 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.

7.19.246 As discussed under 'Habitats' in paragraphs 7.19.49 to 7.19.53 there will be small-scale habitat creation within the Washery including species rich grassland, as well as enhancements of retained habitats, namely marshy grassland. Embankments of the test track will provide establishing acid grassland habitat, will also provide a large extent of suitable habitat for notable mammals within the local area. Across the site SuDs and landscaping will also provide additional habitats. Newly created habitats, providing they meet the specific species-requirements, are likely to be rapidly utilised by notable mammals present within the Site and adjoining habitats, and become even more favourable in the long term if subject to management.

7.19.247 Furthermore retained habitats within the Washery, which will be enhanced as part of the GCRE project and retained habitats within the Nant Helen Site, which will be enhanced as part of the Nant Helen Complementary Earthworks, will continue to provide suitable habitats for notable mammals within the local area.

7.19.248 As such any habitat loss is not considered to have a significant impact on notable mammals.

7.19.249 Additional mitigation measures are detailed in Sections 7.21 and 7.22 which will ensure there will be no significant effects on notable mammals as a result of the proposals. Section 7.25 details the specific requirements of long term management and monitoring of retained and newly created habitats. Additionally Section 7.23 describes how further measures can be implemented to provide enhancements to habitats for notable mammals.

Habitat Fragmentation / Severance

7.19.250 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.

7.19.251 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 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.

7.19.252 As such adverse effects on populations of notable mammal species from habitat fragmentation are not considered to be significant.

Habitat Disturbance / Degradation

7.19.253 Habitats important for notable mammals may also be adversely affected if construction / operation activities where to damage / degrade habitats.

7.19.254 Aquatic habitats will be particularly sensitive to changes in water quality, which could occur during construction or operation. Some habitats may also be more sensitive to changes in air quality, particularly effects of nitrogen deposition. In addition it is possible that habitats for notable mammals could by physically disturbed for example by machinery, during construction and potentially during operation.

7.19.255 As discussed above under 'Habitats' in paragraphs 7.19.62 to 7.19.71, when considering embedded mitigation, physical disturbance to habitats will be avoided and there are limited residual effects of air quality or water quality, including potential effects to water quality within the area of the washery and also temporary effects to sensitive habitats as a result of nitrogen deposition. However additional mitigation measures have been recommended to ensure habitats are protected from changes in water and or air quality.

7.19.256 Adverse effects from habitat degradation / disturbance are likely to be of low magnitude, and not significant to local notable mammal populations.

7.19.257 Mitigation measures to address the habitat degradation / disturbance are detailed in Sections 7.21 and 7.22. Monitoring of habitats is also recommended in Section 7.25.

7.19.258 It is considered that with the implementation of this additional mitigation, there should be no residual significant effect on notable mammal populations as a result of habitat disturbance / degradation.

Harm / Mortality

7.19.259 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. Embedded mitigation comprising covering open excavations and limiting vehicle traffic to low speeds as detailed in Section 7.16, will avoid harm / mortality of notable mammls during construction.

7.19.260 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 construction and operation. Although effects on mammals have not been well-studied[19] 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, and to a lesser extent undulates and insectivorous mammals (including West European hedgehog)[25]. Notable mammals species have been recorded in low numbers within the Site. 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

7.19.261 Adverse effects on notable mammal populations as a result of harm / mortality are considered to to of low magnitude, and not significant

7.19.262 Mitigation measures to address the harm / mortality of notable mammal species, and ensure compliance with UK legislation are detailed in Sections 7.21 and 7.22.

Invasive species

7.19.263 The site is known to support Japanese knotweed, montbretia, rhododendron and cotoneaster species. These plants are listed under Schedule 9 plants of the Wildlife and Countryside Act 1981 (as amended) and The Invasive Alien Species (Enforcement and Permitting) Order 2019, and which make it is an offence to spread them from the site. Mitigation measures are required to ensure compliance with UK legislation. These are detailed in Sections 7.21 and 7.22.

7.20 Potential effects due to Climate Change

7.20.1 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.

[25] Van der Grift, E. A. (1999). Mammals and railroads: Impacts and management implications. *Lutra, 42*, 77–98.

7.20.2 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.

7.20.3 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.

7.20.4 Mitigation measures to address the climate change impacts are detailed in Sections 7.21 and 7.22. Mitigation will include management and monitoring to control INNS within the Site.

7.21 Construction Mitigation

7.21.1 Embedded mitigation measures to be implemented during construction are detailed in Section 7.16.

7.21.2 The following additional mitigation measures will be implemented prior to or during the Construction Phase.

7.21.3 All additional mitigation measures will be incorporated into the CEMP and EPP.

Site Clearance / Construction

Habitats and Protected Sites

- A review of the final design will be undertaken prior to submission of reserved matters, specifically relating to factors likely to affect air quality such as levels of diesel emissions, train speed / frequency of use and annual hours of operation in order to determine the requirement for updating the existing air quality assessment. Should an update of the air quality assessment still find that there are likely significant effects (or if the possibility for significant effects is not ruled out) on ecological receptors including nearby SSSIs, SINCs and ancient woodland, due to nitrogen deposition being >1% of the lower critical load for the habitats they support, additional mitigation measures will be provided to protect all affected ecological receptors. Based on the

existing worst case scenario which has been modelled it is assumed that mitigation would be acceptable to address the likely temporary effects for 5 years of diesel emissions. Mitigation measures are likely to comprise specific habitat management including grazing and woodland management within areas of affected SINC grasslands, SSSI bog/grassland habitats and ancient woodland. Additional management may be required within Gorsllwyn also, which is already grazed by livestock, depending on the extent/frequency of grazing. In addition specific vegetation/habitat monitoring would be required until lower diesel or zero emission trains are used (i.e. after 5 years or at whatever point this occcurs), and at least 5 years afterwards to confirm whether there have been adverse effects on ecological receptors in vicinity of the train operation. Management of these areas including the Gorsllwyn SSSI will be within ownership of the applicant.

- 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.
- The LPA will be consulted regarding impacts on SINCs, which are considered likely to be affected by the Project, namely Onllwyn Coal Washery and Dyffryn Cellwen and Gorsllywn Meadow.
- The EPP as detailed in Section 7.16 will be prepared, and will:
    - Detail mitigation measures required during construction to protect important ecological receptors that are being retained on or adjacent to the Site, and which may be subject to incidental damage. This will include notable habitats immediately adjacent to the works, including those which occur within SINCs, such as marshy grassland, species rich grassland, waterbodies, river corridor and heathland in the Washery, and retained and newly created habitats within the Nant Helen Site such as marshy grassland, species rich grassland, woodland and waterbodies. This will be implemented through the use of measures such as Heras fencing and buffer zones. Trees, hedgerow and woodland will be treated in accordance with BS5837 (2005).
    - Detail temporary construction works including access and working compounds, ensuring that no equipment, machinery will be brought into the retained habitats areas, or stored under retained tree canopies, and ground levels will not be altered within any of the demarcated zones of protection.
    - Detail the translocation of notable vascular plants where habitats are to be lost, and new habitats are available for them to re-establish.
    - Detail elements of working which will need to be overseen by a SQE.

- Detail the treatment of the realigned tributary to ensure it provides naturalistic features of an equivalent or greater value to that of the existing watercourse, and provide connecting habitat for otter and other wildlife.
- Detail the specific species mitigation to be implemented, as detailed below.

Protected and Notable Species

- Pre-construction surveys are anticipated to be required for badger and otter, where suitable habitat occurs within 50 m of the construction works.
- Where there is suitable habitat within the vicinity for Schedule 1 nesting birds, such as common crossbill or barn owl, pre-consutruction checks should also be undertaken within an appropriate distance from the works. Survey areas will depend on the species, and will need to be confirmed by the LPA ecologist.
- 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 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. An indicative location for reptile translocation, immediately west of the Site within marshy grassland is shown in Figure 7.9. This area currently supports a mosaic of acid grassland and marshy grassland. Although this area was not surveyed as part of the reptile surveys, the Phase 1 Habitat survey shows that this area supports similar habitats to those where common lizard were found. To increase the area's carrying capacity for reptiles, it will be subject to short term enhancements in the form of the creation of a number of reptile refugia (six locations are shown in Figure 7.9) which will be suitable for common lizard and slow worm.
- 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 (eyebright spp) which occur in the Washery grasslands.
- Where there is a delay to site clearance / construction, and more than 18 months 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.

7.22 Post Construction / Operation

7.22.1 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.

7.22.2 The following mitigation measures will be incorporated in to the scheme design to reduce the scale of effects during the operational phase:

Sites

- Should an updated air quality assessment determine the likely significant impacts on sensitive ecological receptors (or not be able to rule out such potential), namely: Gorsllywn SSSI, discussions should take place with NRW regarding mitigation within the SSSI including the potential changes to grazing.

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.

- The plan comprises those habitats proposed for habitat retention within the Washery including acid and marshy grassland, in addition newly created habitats including new SuDS and landscaping which will also provide value to ecology within the Site. Additionally, the Figure shows areas of small scale habitat creation using existing coillery substrates within the Site to create habitat for species rich grassland, for establishment by heathland and lichen / fungi communities.
- 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.
- The plan also includes habitats which will be created within the Nant Helen site. This includes new SuDS and landscaping, and creation of species rich acid grassland on track embankments which will allow for the establishment heathland, lichen and fungi habitats.
- 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).
- 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.
- Should an updated air quality assessment determine the likely significant impacts on SINCs within the Washery, discussions should take place with NRW and the LPA regarding mitigation within the SSSI including the potential changes to grazing regimes or whether the proposed grazing is sufficient.
- 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 providing SuDS, 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 / susbtrate 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 scub / trees enchroachment on sensitive habitats such as marshy grassland and short ruderal grassland.
- 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 grassland.
- Sustainable Drainage Systems (SuDS) which forms part of the Sites embedded Mitigation. 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 will also create diverse wetland habitats for example through the use of a range of native wetland plants in swales and rain gardens.
- 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.
- Additionally, retained conifer and mixed woodland within the site will be enhanced through the gradual removal of conifer species and replacement with broadleaved tree species, to increase light levels and species diversity.

- 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 (where relevant). 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. 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 25 years. A programme detailing all management prescriptions for the first 25 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 Wales[26] 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 1.8 m. 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 details indicative locations, which will be confirmed at the reserved matters stage of the application, along with details of the culvert design (including technical drawings) 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.

[26] Arup (2020) A40 Redstone Cross Environmental Statement. Welsh Government.

- 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 schemes[26] in Wales and detailed in best practice guidance[27,28,] 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 Wales. 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.
- A lighting design and associated plan will be produced in accordance with Bat Conservation Trust's (BCT) 'Bats and Lighting' publication[29], 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 guidance[30]. A suitable location will be provided as part of the reserved matters application, further to discussions with the local bird groups, Wildlife Trust and LPA ecologists to identify a suitable location and agreement being obtained with the landowner.

[27] 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.
[28] 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.
[29] http://www.bats.org.uk/data/files/bats_and_lighting_in_the_uk__final_version_version_3_may_09.pdf
[30] https://www.barnowltrust.org.uk/barn-owl-nestbox/

- At least ten house sparrow nest boxes will be provided in the area of the washery as mitigation for the loss of nesting opportunities within the washery buildings.
- 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.

7.23 Enhancements

7.23.1 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 11 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

7.23.2 Retained and newly created habitats within the Washery and Nant Helen site (as shown in Figure 7.9) will be enhanced through long-term management. In addition to mitigating / compensating for habitat loss across the site, 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.

7.23.3 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

7.23.4 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. An indicative location is shown in Figure 7.9 on land which is within ownership of the applicant.

7.23.5 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. Indicative locations are shown in Figure 7.9 on land which is within ownership of the applicant.

7.23.6 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 and culverts. Similar to bat boxes, these should be of woodcrete construction, such as Schwegler models, which are more durable and require minimal maintenance. Indicative locations are shown in Figure 7.9 on land which is within ownership of the applicant.

7.23.7 At least 15 artificial reptile refugia, which provide shelter to hibernating and active reptiles, will be created within the Site. 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. Indicative locations are shown in Figure 7.9 on land which is within ownership of the applicant.

7.24 Ecosystem Resilience

7.24.1 A separate assessment of ecosystem resilience has been undertaken, which considers the existing ecosystem resilience of the Future Baseline and how likely this is to change as a result of the implementation of the scheme.

7.24.2 The assessment considers the key attributes of resilience; diversity, extent, condition and connectivity, for each broad ecosysystem type.

7.24.3 Table 7.20 in Appendix 7V, shows the resilience assessment along with an indication of how the scheme will change this resilience (increase + / decrease -).

7.24.4 There are no decreases in resilience as a result of the scheme. The resilience of the majority of the broad ecosystems, including grassland, woodland and wetland, are likely to increase as a result of the increase extent as a result of habitat creation and increase in condition as a result of favourable long term management. Positive changes in ecosystem resilience are subject to habitats being protected and enhanced, and newly created in accordance with the EPP and EMMP, and long term monitoring will also be essential to ensure changes are favourable.

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[31,32,33].
- 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.
- Should an updated air quality assessment determine the likely significant impacts (or if significant effects cannot be ruled out) on sensitive ecological receptors, namely: Gorsllywn

[31] JNCC, 2010. Handbook for Phase 1 habitat survey – a technique for environmental audit (2010) 2016.
[32] Jerram, R. & Drewitt, A. (1998). Assessing vegetation condition in the English uplands. Peterborough: English Nature Research Reports, No. 264.
[33] JNCC (2009). Common Standards Monitoring Guidance for Upland habitats, Version July 2009.

SSSI, Gorsllwyn meadows and Onnllwyn coal washery SINCs, and areas of ancient woodland within the vicinity of track (as identified in the air quality assessment; chapter 14), the following will also be required:

1. Vegetation monitoring will be used to support an assessment of whether air quality impacts are contributing to changes in the habitats present. The monitoring proposals should be reviewed with the LPAs and NRW to agree the aims, objectives and techniques to be used; and

2. Air quality should also be monitored including measuring the concentrations of pollutants in the atmosphere at the location of sensitive ecological receptors. As above, the monitoring proposals should be reviewed with the LPA and NRW to agree the aims, objectives and techniques to be used.

- Monitoring results will be reported through a Steering Group, led by the site owner in partnership with NPTCBC and PCC, 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 7.19 (detailed in Appendix 7U) provides a summary of the evaluation of impacts, with and without mitigation.

7.26.2 Providing the measures as detailed in Section 7.21, 7.22 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 majority 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, badger and invertebrates, it is unlikely to remove the collision risk completely. However, providing wildlife crossings are included in the design at suitable locations, 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 7.23) 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 11, 2021), Chapter 6: Distinctive and Natural Places (section 6.1; Historic Environment);
- *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's[1] 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:

- CIfA[2] *Code of Conduct*.
- Cadw[3] *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.
- Cadw[4] *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'.
- Cadw[5] *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
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	A WSI was submitted to GGAT for approval. See further discussion in Table 8-2.

approach is appropriate, and we look forward to agreeing the methodology. See Appendix 4.	
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. 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. 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. 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.	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. Noted.
CADW (PCC & NPT) – Having carefully considered the information provided with this request, consider that further information is required. 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.	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.

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 11, 2021). See Appendix 7.	Noted and updated.
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 l 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.	
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.	Noted
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.	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.
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.	Consultation (and scheduled monument consent) have been discussed separately with Cadw.
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.	This is addressed in the LVIA chapter (Chapter 9)
It is advised that the Archaeological Trusts be contacted in respect of the Historic Environment Records on the site.	HER data was obtained from both CPAT and GGAT HERs to inform the baseline.

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/advicesupport/ placemaking/heritage-impact-assessment/setting-historic-assets.	The Cadw guidance on setting has informed the methodology used in this assessment.
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. 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.	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.
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.	Noted
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.	An assessment has been made regarding impacts resulting from changes to the settings of all scheduled monuments within 5km buffered from the site boundary.

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	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. 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. 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.	Planning Policy Wales reference corrected. 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.
CPAT	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. 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. 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.	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. This has been supplied.
Cadw	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.	

	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).	This has informed the assessment of setting contained in this chapter.

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 value[7] 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 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, 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 mutli-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 as, although there would be additional structures visible in views along the monument, the adverse impact to the setting would not be increased. This is because the impact to the setting arises from the visual separation of the east and western parts of the monument rather than from the appearance of the proposed scheme. 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, so the use of the earthworks for a rail testing loop would not, as an addition to the base case, be an

adverse impact. 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 breath 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 11

9.3.10 The following paragraphs have been highlighted as they are of particular relevance to proposed development.

6.0.1 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.

6.3.20 and **6.3.21** outline the importance of LANDMAP as a resource in the decision-making process.

6.3.12 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

2015-2020[2] 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 GLVIA3[6]

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.
‘’In light of NRW advice, you may wish to provide additional viewpoints as follows: - 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
- 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. 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.''.	
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.	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.
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. BBNPA would concur with this advice. Reference should be made to the SPG – Obtrusive Lighting and Light Pollution dated 27.03.2015.	A night-time assessment has been undertaken and is included as a separate appendix to this report (Appendix 9E). The current assessment is limited due to the level of development of the lighting design. The assessment makes recommendations to be taken forward to detailed design when a full lighting assessment will likely be produced.
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.	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. (*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)

Scoping opinion clause	Response
Noted the absence of any viewpoint on the A4221 / Inter Valley Road and within Coelbren.	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. A representative viewpoint from Coelbren has been included in this report.

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.	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. A representative viewpoint from Coelbren has been included in this report.
Brecon Beacons National Park Authority, Neath Port Talbot Council and Powys County Council.	Draft Landscape Character Area boundaries and visual receptor locations were sent to stakeholders for comment outside of the scoping process. Comments were provided by stakeholders within the scoping opinion.	Additional viewpoints were visited and where deemed appropriate included within the report.

Table 9-3: Response to representations from stakeholders on PAC submission

Stakeholder	Comment	Response
NRW	**Landscape - Visual effects** 'There would be significant adverse visual effects on receptors at eight viewpoints within the park for a considerable time period (during the four-year construction period and continuing for up to 15 years	Noted.

	after completion). Beyond 15 years significant adverse effects would remain at two viewpoints. The woodland planting proposed should integrate much of the development into the surrounding landscape within the 15-year period. However, some of the rail infrastructure and engineered features (overhead lines and cuttings) will remain noticeable as permanent features in the views and continue to have an adverse effect on the scenic quality of views and the sense of tranquillity & remoteness.' 'There is potential for light pollution and impact on the National Park's Dark Skies.' A light pollution/dark skies assessment is required to be undertaken and used to influence the final lighting scheme.	A night-time assessment has been undertaken and is included as a separate appendix to this report (Appendix 9E). The current assessment is limited due to the level of development of the lighting design. The assessment makes recommendations to be taken forward to detailed design when a full lighting assessment will likely be produced.
NRW	**Mitigation** 'Whilst some additional native tree and shrub planning …. may help to reduce the visual impact of the buildings, it would not be possible to reduce the adverse effects of the rail infrastructure that has been identified in the Landscape Visual and Impact Assessment (LVIA).' 'We believe there is benefit in investigating the inclusion of Green Infrastructure in the design of the buildings at the washery and advise this should be completed alongside a colour assessment to reduce the long-term effects of the development on the BBNP.' *Requirement 1 - Plans: All plans associated with this development are amended in line with the established principles of habitat mitigation/enhancements agreed under consented application 20/0738/FUL.*	Noted. The inclusion of green infrastructure including green/brown roofs has been identified as an opportunity within this chapter and the potential reduction of landscape and visual effects as a result is recognised, though it does not form part of the proposed scheme that has been assessed. Habitat mitigation and enhancement plans have been updated to align with the consented application. In some cases, reductions in landscape and visual effects at year 15 rely upon mitigation planting that was developed as part of the previously consented application (*20/0738/FUL)*, this has been

		added and clearly identified on Figure 9.14.
Brecon Beacons National Park Authority	The Brecon Beacons National Park Authority currently has very significant concern that the proposal will have adverse impacts on one of the National Park's statutory purposes. Key issues raised relate to landscape and visual impacts: 1. Night-time assessment – 'The LVIA currently omits a night-time assessment. This assessment is required in order to understand the full impact on the National Park and the near-by Dark Sky Reserve.' 2. Visual effects – 'The Environmental Statement outlines that there would be residual effects to 4 visual receptors following the establishment of mitigation planting at year 15. Viewpoints 2, 3 and 9 having moderate adverse beyond the 15 years and viewpoint 14 having a major adverse impact. Three out of four of these viewpoints are from within the National Park. On this basis the National Park Authority still has very significant concern with the proposal and requires further planting mitigation to be incorporated in areas around the northern and eastern areas of the Washery site and also use of other means to integrate the development into the landscape to be detailed (e.g. use of green or brown roofs etc).' 3. Landscape effects: 'The Environmental Statement outlines moderate adverse effects on the landscape during construction and during the operation landscape impacts are moderate adverse with the impact of the mitigation planting taking at year 15 changing two out of three landscape character areas to have minor adverse landscape impacts. The National Park Authority maintains significant concern with the proposal's	1. A night-time assessment has been undertaken and is included as a separate appendix to this report. The current assessment is limited due to the level of development of the lighting design. The assessment makes recommendations to be taken forward to detailed design when a full lighting assessment can be produced. 2. Landscape mitigation planting has been limited around the washery site to promote habitat continuity between grassland and the SSSI to the north. The inclusion of green infrastructure including green/brown roofs has been identified as an opportunity within this chapter and the potential reduction of landscape and visual effects as a result is recognised, though it does not form part of the proposed scheme that has been assessed. The existing washery site forms part of the baseline condition and changes in scale of development have been identified and form part of the assessment. 3. Noted.

	impact on the special qualities of the National Park.' 4. Effective management and monitoring of mitigation planting: 'the basis of much of the landscape and visual conclusions outlined in the Environmental Statement are on assumption that the proposed mitigation planting establishes itself as expected in the 15-year period. It is also noted that some of the specific detail on the planting is stated 'to be developed at detailed design stage' and there is also a planning condition attached to the earthworks permission requiring further detail too. The National Park Authority has outlined reservations regarding the adequacy/effectiveness of this mitigation measures in reality (see previous comments on the earthworks application) and has outlined above, the need for additional mitigation around the Washery site in particular. The National Park requests careful consideration to: • 'the mechanism to ensure the long-term management and maintenance of this planting' • 'an appropriate mechanism for the effective monitoring of landscape and visual effects in the future'. It is the National Park Authority's view that effective monitoring may require (more numerous time interval) photomontages in the Environmental Statement to enable effective comparisons/ monitoring to be undertaken in the future (and interventions to be made is required).'	4. Management and monitoring processes will be outlined within subsequent stages. It is therefore recommended that this be revisited and form part of the management and monitoring plan once further detail about planting is developed. This chapter currently assumes established planting at Year 15.
NPT	During consultee meetings held on 27/10/20 and 08/02/21 it was suggested that additional information (sections) would help demonstrate how the proposed development sits within the landscape at this location.	Sections through the sidings with indicative sight lines have been produced to demonstrate the proposed development at this location (see Figure 9.17). 'Appendix F - Visual Impact of Southern Sidings' provides supporting written narrative to the sections.
N/A	During consultee meetings held on 27/10/20 and 08/02/21 it was suggested that the LVIA should provide further information detailing how the landscape mitigation proposals would be developed and the processes/requirements for	'Appendix G – Landscape Strategy for Reserved Matters' outlines the recommended contents of a landscape strategy.

	establishment, monitoring and management of proposals. It was suggested that the contents of a 'Landscape Strategy' which would provide this information should be outlined within the LVIA.	

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 Assessment[7]
- Neath Port Talbot LANDMAP Landscape Assessment[8]

[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*

- Landscape and Seascape – Supplementary Planning Guidance[9]
- LANDMAP[10]

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.

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

[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]

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.
- 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.

Assumptions

Construction

9.6.2 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.

9.6.3 It is assumed that there will be no night-time working during the construction phase. Working hours would be 08:00-18:00 Monday to Friday and 8:00 – 13:00 on a Saturday.

9.6.4 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.

9.6.5 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

9.6.6 It is assumed that the rail testing facility will be in 24hour use. (see night-time assessment limitation).

9.6.7 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.

9.6.8 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 susceptibility[11] 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 9-4: 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

[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
Dulais Valley LCA	Valley landform. River Dulais. Enclosed pastoral land with treed field boundaries. A4109. Neath and Brecon Railway. Crynant.	High
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

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
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
Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	Open character. Common Land. Panoramic views. Grazed landcover. Gwrhyd Welsh Independent Church.	High
Nant Helen Reclaimed Uplands LCA	Past mining activity. Open character. Established marsh and grassland landcover. Newly restored marsh, acid grassland and enclosed pasture. Tramroad at Ystradgynlais Scheduled Monument.	Low
Slopes of Cefn Gwrhyd & Cwm Egel LCA	Grazed pasture. Field boundaries formed by hedgerows and stone walls. Scattered farmsteads. Remoteness and tranquillity. SSSIs. Ancient Semi-Natural Woodland.	Medium
Swansea Valley LCA	Meandering River Tawe. Deciduous woodland. Mosaic of pasture fields.	Medium

Landscape Character Area	Future Baseline Key Features / Characteristics	Value
Swansea Valley Settlements LCA	Linear settlements of Ystalyfera, Gurnos, Ystradgynlais, Penrhos, Cwm-twrch Isaf, Cwmgiedd and Glan-rhyd. Transport corridors of A4067, A4068 and B4599. Enclosed, relatively high density urban character. Historic relics of the industrial history of the area such as Swansea Canal that is now used for recreation.	Medium
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 Ystradfellte 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 charter 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 proposed development 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 proposed development 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 2018-2023[1].

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	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: 45dB***		60dB

*free-field external noise levels
**from BS8233 2014 Table 4
***from BS8233 1999 Table 5 and ProPG

Reduction in noise level from windows

10.3.3 The reduction in noise levels from outside to inside a typical bedroom vary depending on whether windows are open and, if so, how open they are.

10.3.4 The report *Institute of Acoustics & Association of Noise Consultants' Acoustics, Ventilation & Overheating Residential Design Guide 2020* provides typical outdoor-to-indoor corrections for different window

opening configurations[2]. One is for a fully opened window with a correction of 10dB(A) and one is for a partially open window, with a correction of 15dB(A). The two configurations are shown in the picture below:



Picture 1: Two window opening configurations. The configuration on the right is assumed in the assessment.

10.3.5 For the purposes of this assessment, the partially open window has been used, on the assumption that windows are on average unlikely to be opened wider than this at night-time, which is the most sensitive time period for the assessment.

10.3.6 The criteria for the construction noise assessment are included in Appendix 10B.

10.4 Responses to consultation

10.4.1 The following responses were received during the consultation process. These are listed are provided in **Table 10.2**, along with a response from the scheme:

Table 10.2: Consultation responses relating to noise

Concern	Response
Concern expressed about the noise generated – during construction and operation.	The Environmental Impact Assessment contains a comprehensive noise impact assessment which assesses noise (and vibration) during both construction and operational phases of the project, identifies impacts of significance and the mitigation for dealing with them. For construction, contractors will be bound to operate under a code of good practice known as the Construction Environmental Management Plan. Best Practicable Means will be used to minimise noise from construction

[2] 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.pdf

Concern	Response
	activities, including limits on working hours near to sensitive communities. For the operation of the facility, noise mitigation has been included in the scheme including noise barriers to the north, east and south of the test circuits.
Is the proposed track a 'squeal track'?	We are not proposing a squeal track. Measures will be taken to minimise the occurrence of any possible 'squealing' noise (also known as curving noise) from the facility.
Suggestions that construction phase should not be started until the land has been put back, the remedial earthworks finished, and the sound sensor survey has been carried out.	There is a natural sequence to the implementation of the proposal as outlined in the submissions, which sees the land restored alongside the implementation of the complementary earthworks proposals which together ready the sites for the GCRE development. Also, there will be a duty on the contractors building the scheme to use Best Practicable Means to minimise construction noise, regardless of the sound survey results.
Mitigation queries and soil barrier suggested to prevent noise during operation. Query as to whether some villagers would be compensated with double glazing to address noise impacts.	The noise and vibration assessments contained within the Environmental Impact Assessment propose a number of embedded and other mitigation to address noise, including noise barriers and soil earth 'bunds' which act as noise barriers. The assessments demonstrate that these measures would successfully mitigate noise such that compensation and/or off-site measures are not required.
Hours of operation	
Concern about the potential impact of 24/7 operation – in particular continuous noise and impact on residents and environment.	The ability to operate 24/7 will not mean that the facility will in fact operate 24/7. The Environmental Impact Assessment presents a set of operational assumptions in the early chapters which present a picture of how it is envisaged the facility will operate including hours and days of operation. Those assumptions have fed into the impact assessments such as for noise.
Suggestion that the facility should operate for the same hours and the opencast mining operation.	There is a need to tailor the operational requirements to the proposed facility as it is responding to the marker and operational needs of a different market sector.
Environmental issues	
Air pollution / dust.	These are both assessed in depth in the Environmental Impact Assessment both for the construction and operational phases of development.
Vibration.	Vibration fades away very quickly with distance. Due to the distances of dwellings from the facility, there will be no vibration effects from the facility.

10.4.2 This chapter also responds to issues raised by the Local Authorities during the engagement process as follows:

Further detail on mitigation provision, including justification from both noise and visual perspectives. This is dealt with the inclusion of an additional section of the report (section 10.7) and by the inclusion of noise levels both with and without noise fence barriers included in the scheme (

- **Table 10.5**).
- A better explanation of how the assessment assumptions around train flows are averages and that actual usage would vary during a year: this is covered in paragraph 10.6.4.
- Context of the numbers of train events which would take place on the circuits vs the much greater numbers of road traffic passbys on the local A roads: this is covered in paragraph 10.10.6.

10.5 Calculation methodology

Construction noise

10.5.1 The outline assessment of effects from construction on noise sensitive receptors was carried out using the ABC method from Annex E of BS 5228-1. The full details are contained in Appendix 10C.

Operational noise from the test tracks

10.5.2 The dominant noise from the rolling stock test track and the infrastructure test track will be from trains running at speeds of greater than 40km/h. The relevant calculation method is Calculation of Rail Noise 1996 and this has been used to predict train noise to sensitive receptors using the noise prediction software package SoundPLAN.

10.5.3 Noise prediction packages such as SoundPLAN are used when there are complicated noise sources which need to be assessed. SoundPLAN is capable of performing calculations under several different calculation methodologies including Calculation of Rail Noise 1996 and ISO 9613-2.

Washery: calculation methodology

10.5.4 The calculations for the noise sources at the washery were carried out using the methodology set out in ISO 9613-2. Sound powers were established for the various sources (slow-moving trains, maintenance shed, train wash) based on measurements from other similar projects, and the calculation of noise propagation to nearby receptors carried out with the implementation of ISO 9613-2 in the noise modelling software package SoundPLAN (see paragraph 10.5.3 for more detail about SoundPLAN).

10.6 Noise assessment: scheme operation

10.6.1 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

10.6.2 The rolling stock test track will be used to test trains at speeds of up to 110mph.

10.6.3 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.

10.6.4 Reasonable worst-case assumptions have been developed for the purposes of the assessment, in the form of average usage for daytime, evenings and night-times. To be clear, the use of the test tracks is likely to vary over the year.

10.6.5 The assumptions 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

10.6.6 The number of laps of the circuits these assumptions equate to is set out in Appendix C, along with other assumptions for the calculations.

10.6.7 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 – noise mitigation has been

included in the design. This mitigation is described in detail in section 10.7.

Infrastructure test track

10.6.8 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.

10.6.9 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.

10.6.10 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'.

10.6.11 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

10.6.12 The number of laps of the circuits these assumptions equate to is set out in Appendix C, along with other assumptions for the calculations.

10.6.13 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.

10.6.14 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. This mitigation is described in detail in section 10.7.

Washery facility

10.6.15 The facility on the site of the old washery will include a maintenance shed, a train wash, a train decommissioning facility and railway sidings.

10.6.16 The washery facility will see only a small fraction of the number of movements and 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, but occasionally at night - between the sidings, maintenance shed, train wash and the test tracks.

10.6.17 Noise sources would consist of trains moving at low speeds (around 5mph) around the facility, noise breakout from the maintenance shed and decommissioning facility and noise from the train wash. All of these noise sources have been included in the assessment.

10.6.18 The assumptions for the various noise sources in the washery are shown in figure 10.5.

10.6.19 Along with the descriptions of activities given below, information on the noise source levels assumed in the assessment are given in Appendix C in Table 3.

10.6.20 A summary of the envisaged washery activities is included below in table 10.3:

Table 10.3: Summary of washery activities assumed in the noise assessment

Activity	Daytime (0700-1900)	Evening (1900-2300)	Night-time (2300-0700)
Slow-moving trains	Yes: 20 sets of movements	Yes: 4 sets of movements	Yes: 1 sets of movements.
Maintenance shed	Yes, with doors assumed open	Yes, with doors shut	Yes, with doors shut
Train Wash	Yes, assumed on 10% of the time	No	No
Decommissioning facility	Yes, activity assumed for 10% of the time	No	No

Slow-moving trains

10.6.21 To assess possible noise effects from trains moving about the washery, a set of typical envisaged train movements has been defined in consultation with project railway engineers. These movements, all assumed to take place at a speed of 5mph, are as follows:

- A train moving from eastern sidings backing out to the western sidings then 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

10.6.22 As a reasonable worst-case assumption, in the noise assessment 20 sets of the above movements have been assumed to occur during the daytime; 4 sets during the evening and 1 set during the night-time.

10.6.23 The above assumptions cover the reasonable worst-case for train movements both from those trains at the depot for testing and for trains which are at the facility for medium or long-term storage.

10.6.24 It is anticipated that the vast majority of train movements within the facility during the night-time will be electric-powered. However, occasionally a diesel-hauled train may deliver a train to the facility – or collect one - during the night. This would not, however, materially affect the predicted noise levels.

10.6.25 All train movements at night-time in the washery area would be powered with electric (non-diesel) traction – either by the trains themselves, or though the use of an electric shunter.

10.6.26 For the maintenance shed, maintenance activities have been assumed to be active continuously for the purposes of the assessment, creating an internal reverberant sound pressure level of 70dB(A) within the shed. The assessment assumes the shed doors would be open throughout the daytime as a reasonable worst-case assumption: however, they will be closed for much of this time in reality. When the shed doors are open during the day, an air curtain has been assumed to be active on the shed doors which has a noise level of 80dB(A) at 1m. During the night-time, maintenance has been assumed to continue with but with the shed doors closed and the air curtains off.

10.6.27 If decommissioning of trains is carried out on site then this would consist of the dismantling of trains to retain components which could then be re-used. The outdoor dismantling works would be carried out on the apron to the north of the maintenance sheds: this would consist of the use of hand-held power tools and the occasional use of a crane and would occur during daytime only. Some further dismantling works may occur inside the maintenance sheds themselves and would be no more noisy than routine maintenance works. No scrapping, crushing or shredding operations would take place on the site as form part of the decommissioning works.

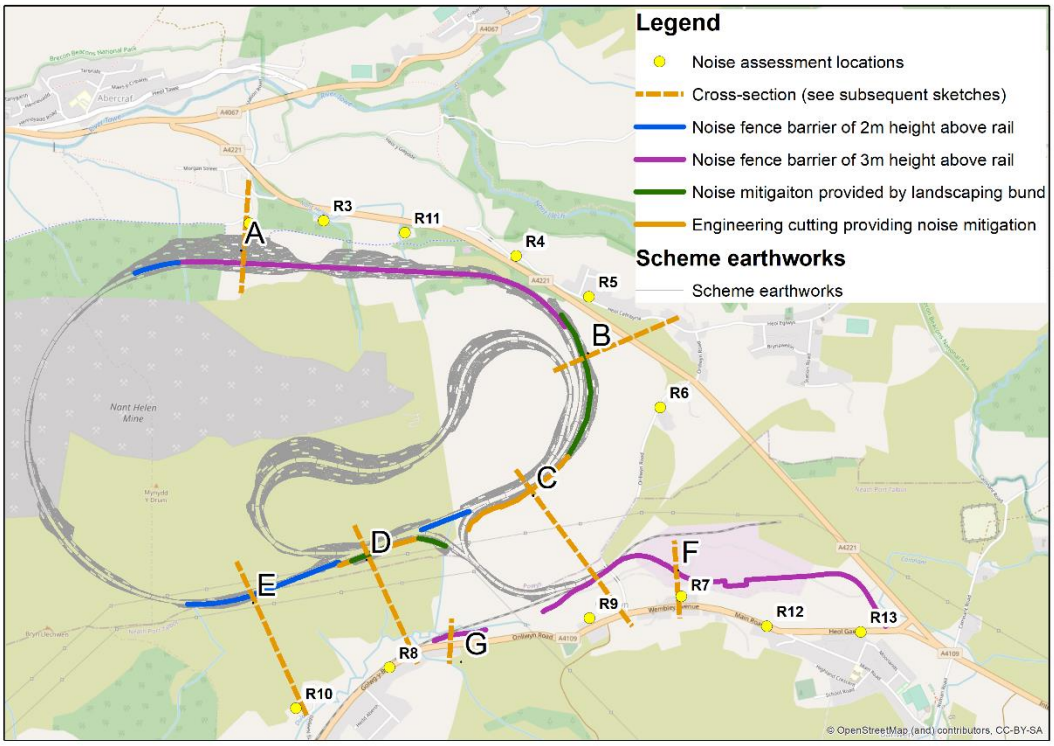
10.6.28 Outdoor decommissioning/train dismantling activities would not take place during evening or night-time.

10.6.29 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.

10.6.30 Noise from the train wash has also been included in the predictions. It has been assumed that the wash will be in use for 10% of the time during the daytime but inactive during the evenings and night-times.

10.7 Mitigation provision and context

10.7.1 The scheme has been split into six areas (A-F) to communicate the rationale behind the mitigation design, as shown in the sketch below:



10.7.2 The context behind the mitigation for each area is set out in the following section.

Mitigation principles

10.7.3 The general approach to mitigation design is to minimise the environmental impacts of the scheme as far as reasonably practicable, and to do this from a multi-disciplinary point of view. This means that consideration of noise, visual, ecology and cultural heritage impacts have all been taken into account and a holistic set of mitigation proposals is presented as part of this application. The detail of the mitigation may alter at the detailed design stage, but the principle of 'not environmentally worse than' will be maintained to ensure that no new worse environmental effects result from this.

Area-specific mitigation context

10.7.4 Note that a figure showing all of the cross-sections included in this section is included as Figure 14.4.

Area A

10.7.5 This section of the scheme faces the national park to the north. The noise mitigation included in the scheme is a 3m noise fence barrier placed close to the rolling stock test track.

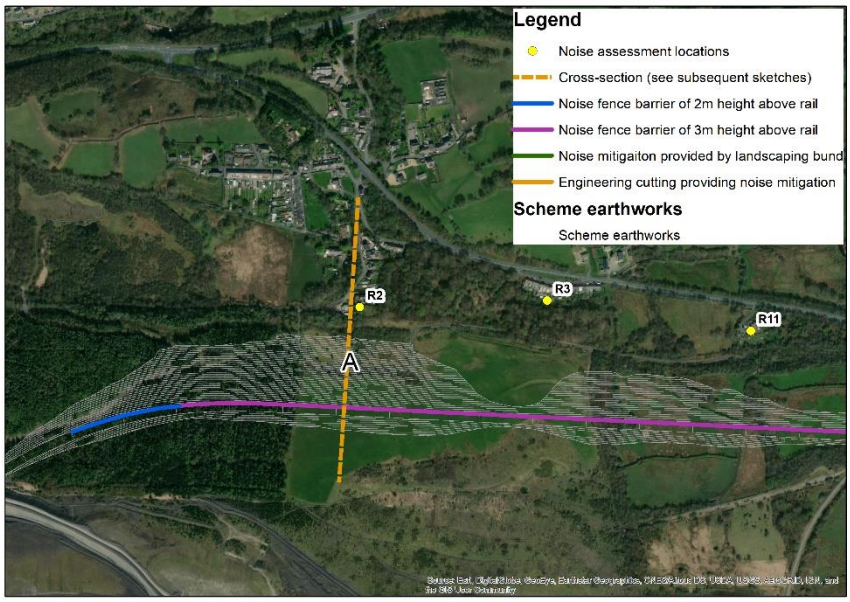
10.7.6 Landscape bunding has not been used in the location because this would have increased the land-take of the scheme to the north by

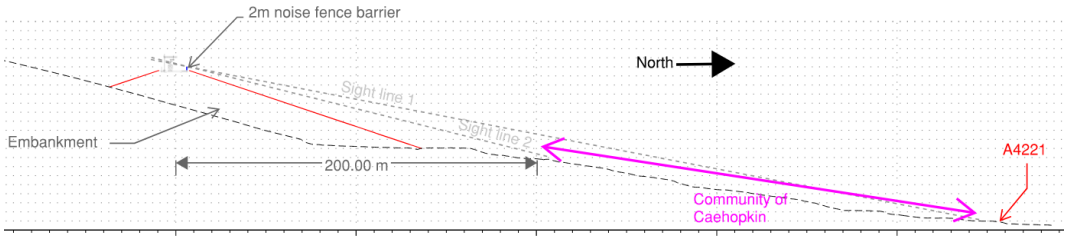
many tens of metres where the boundary is already close to residential properties.

10.7.7 The noise fence barriers will be opaque and solid, with a timber outer finish. They will provide visual mitigation by shielding some of the scheme infrastructure, including blocking the glare of the train headlights which would otherwise produce potential visual impacts during the hours of darkness.

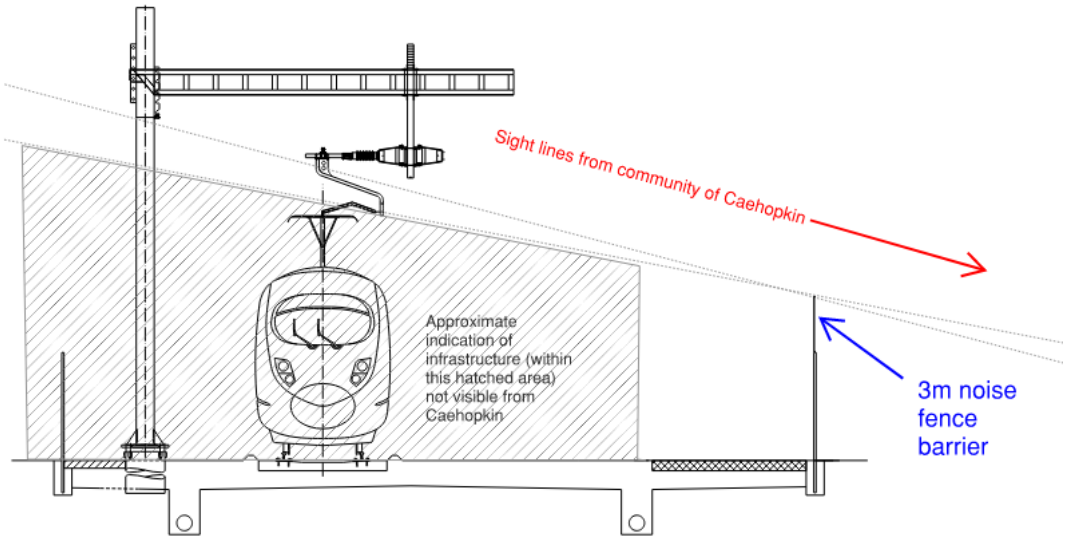
10.7.8 The embankment slopes will be planted with woodland, which will further decrease visual impacts of the scheme as the trees mature.

10.7.9 Two cross-section sketches are shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines (that is, not taking account of the visual mitigation provided by planting).





Cross-section along the dashed orange line shown in the sketch above. To scale. Note that the dots represent a 5m grid



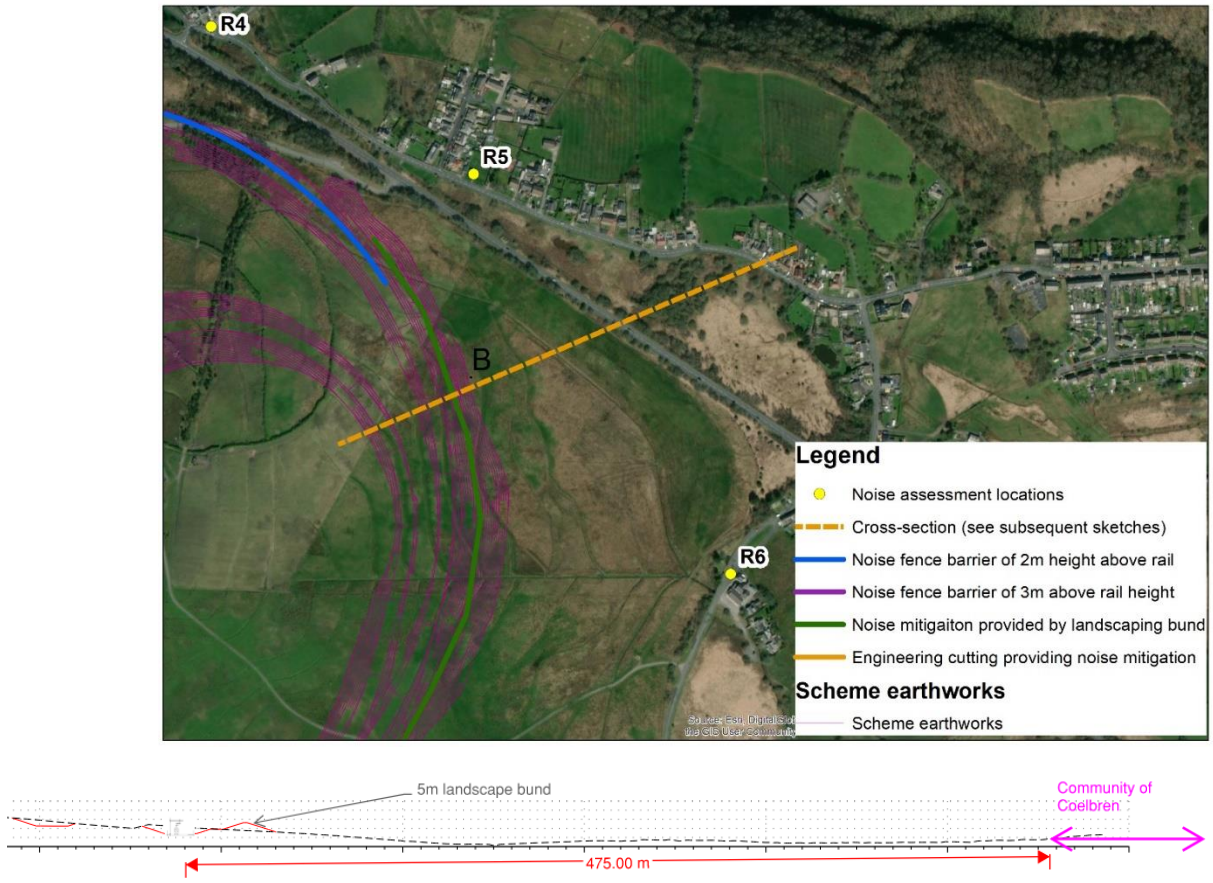
10.7.10 Initially a 2m noise barrier was included in the design to the north of the circuits. During the process of engagement with the local authorities, this was increased to 3m. This increase gives an improvement of 1-2dB(A) to the magnitude of noise mitigation (relative to a 2m noise barrier) for the receptors north of the circuit (receptors R2, R3, R4 and R11 in the noise assessment).

Area B

10.7.11 This section of the scheme faces the community of Coelbren to the east. The noise mitigation included in the scheme is a 5m landscape bund placed to the east of the rolling stock test track. A bund was chosen in this area due to the space available and the suitability of the landform to accommodate the bund.

10.7.12 The bund also provides visual mitigation by visually screening the test tracks.

10.7.13 A cross-section sketch is shown below of the mitigation at this location in the context of the nearest community.

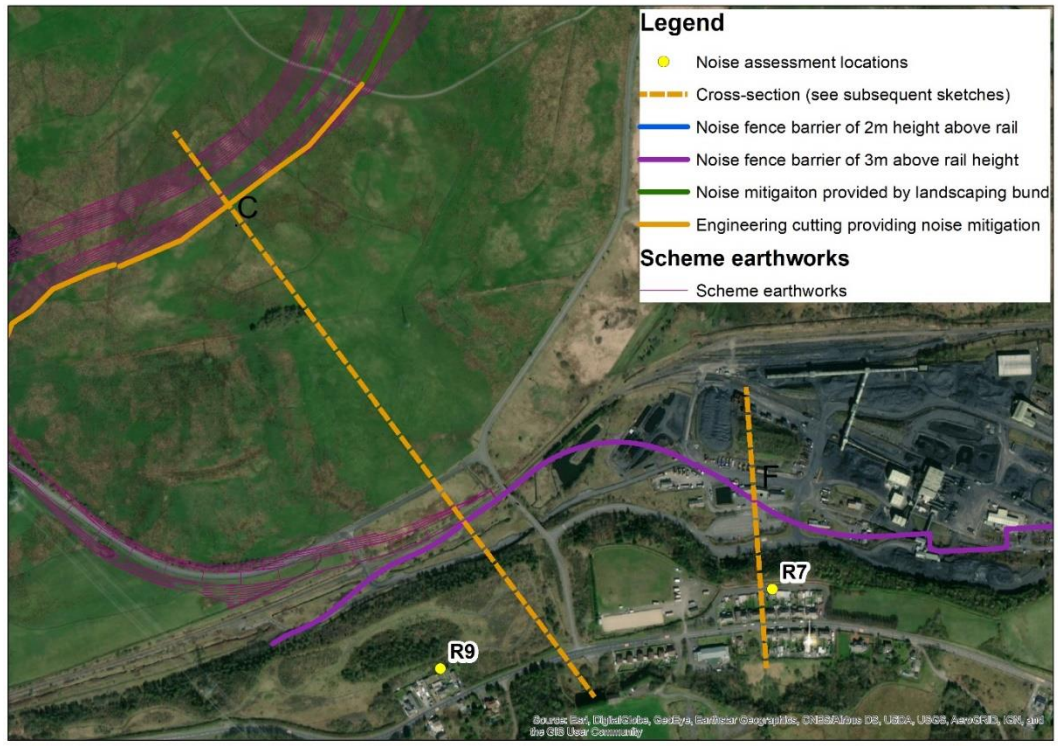


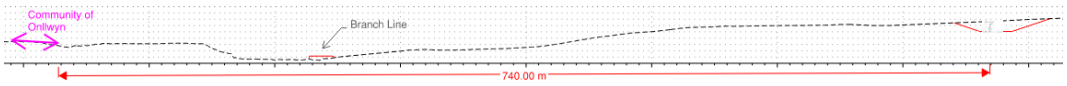
Cross-section along the dashed orange line shown in the sketch above. To scale. Note that the dots represent a 5m grid

Area C

10.7.14 This section of the scheme faces the community of Onllwyn to the south. The engineering cuttings in which the test tracks sit provide the noise mitigation by acting as a noise barrier.

10.7.15 A cross-section sketch is shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines (that is, not taking account of the visual mitigation provided by planting).





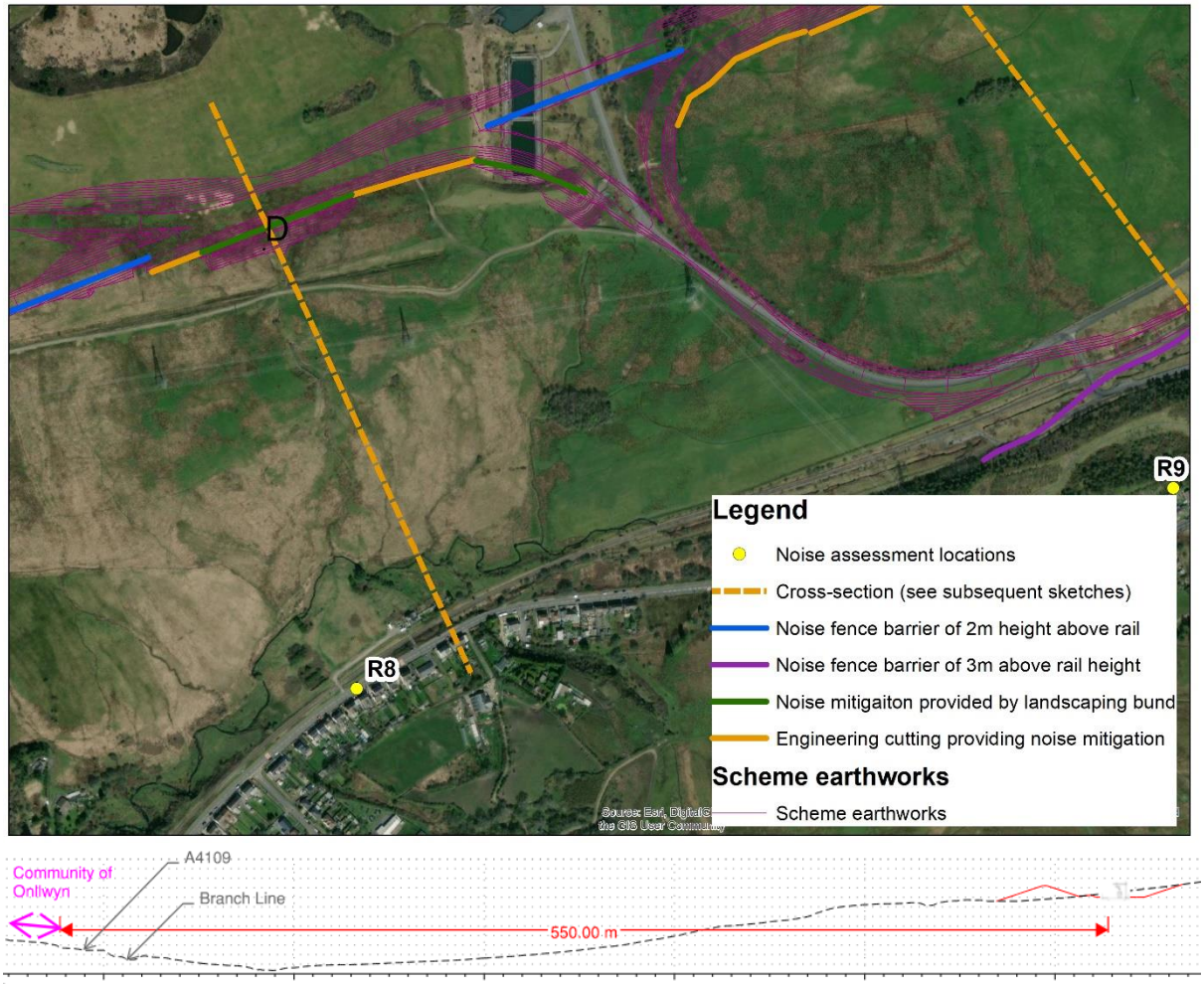
Cross-section along the dashed orange line (close to R9) shown in the sketch above. To scale. Note that the dots represent a 5m grid

Area D

10.7.16 This section of the scheme faces the community of Onllwyn to the south. The shallow engineering cuttings in which the test tracks sit have been enhanced with additional landscape bunds to provide noise mitigation by acting as a noise barrier.

10.7.17 Care has been taken in this area in the earthworks and bunding design so not to impinge near the Scheduled Ancient Monument.

10.7.18 A cross-section sketch is shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines.

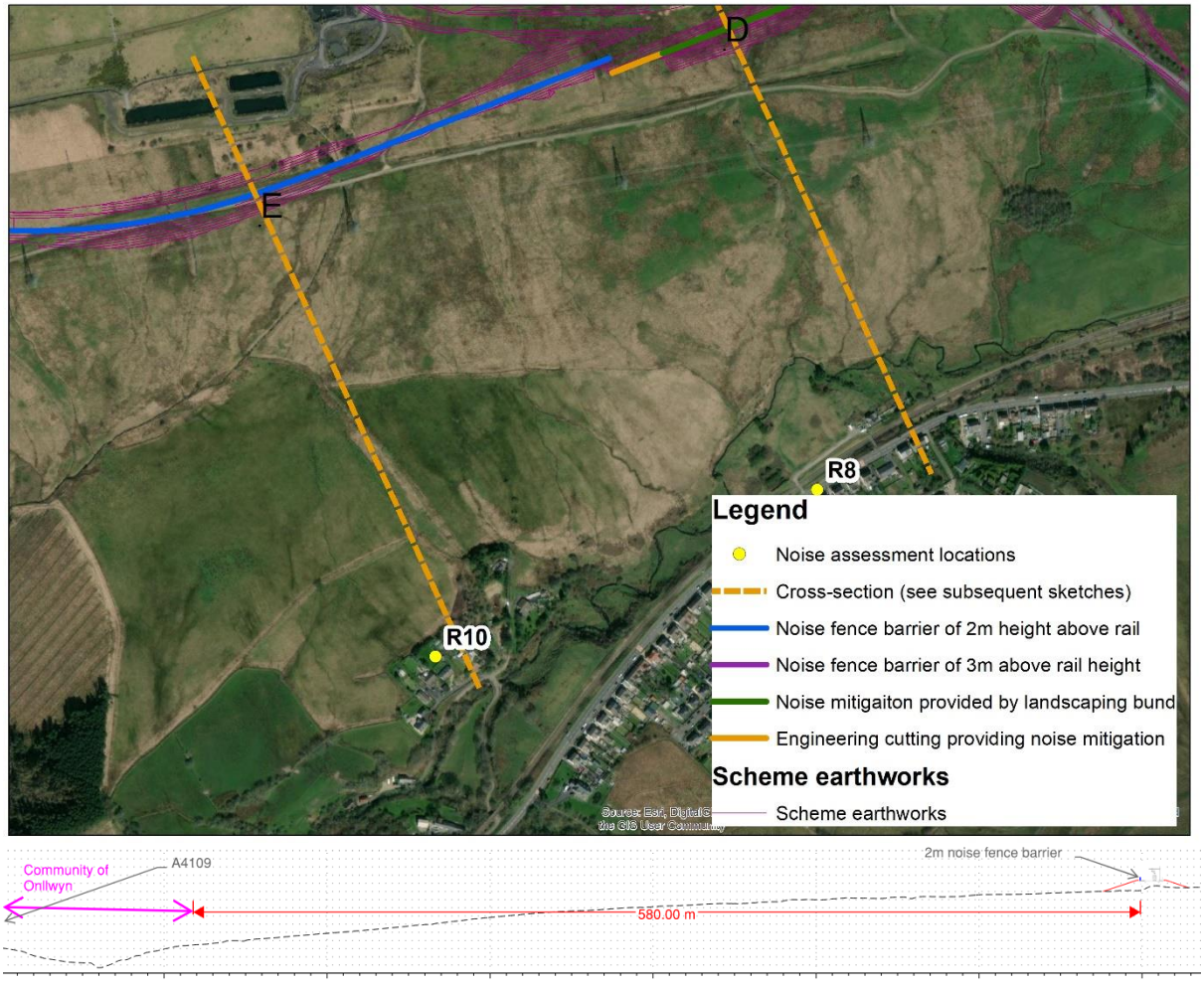


Cross-section along the dashed orange line shown in the sketch above. To scale. Note that the dots represent a 5m grid

Area E

10.7.19 This section of the scheme faces the community of Onllwyn to the south. Due to the close proximity to the Scheduled Ancient Monument, a noise fence barrier provides the noise mitigation instead of a landscape bund.

10.7.20 A cross-section sketch is shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines.



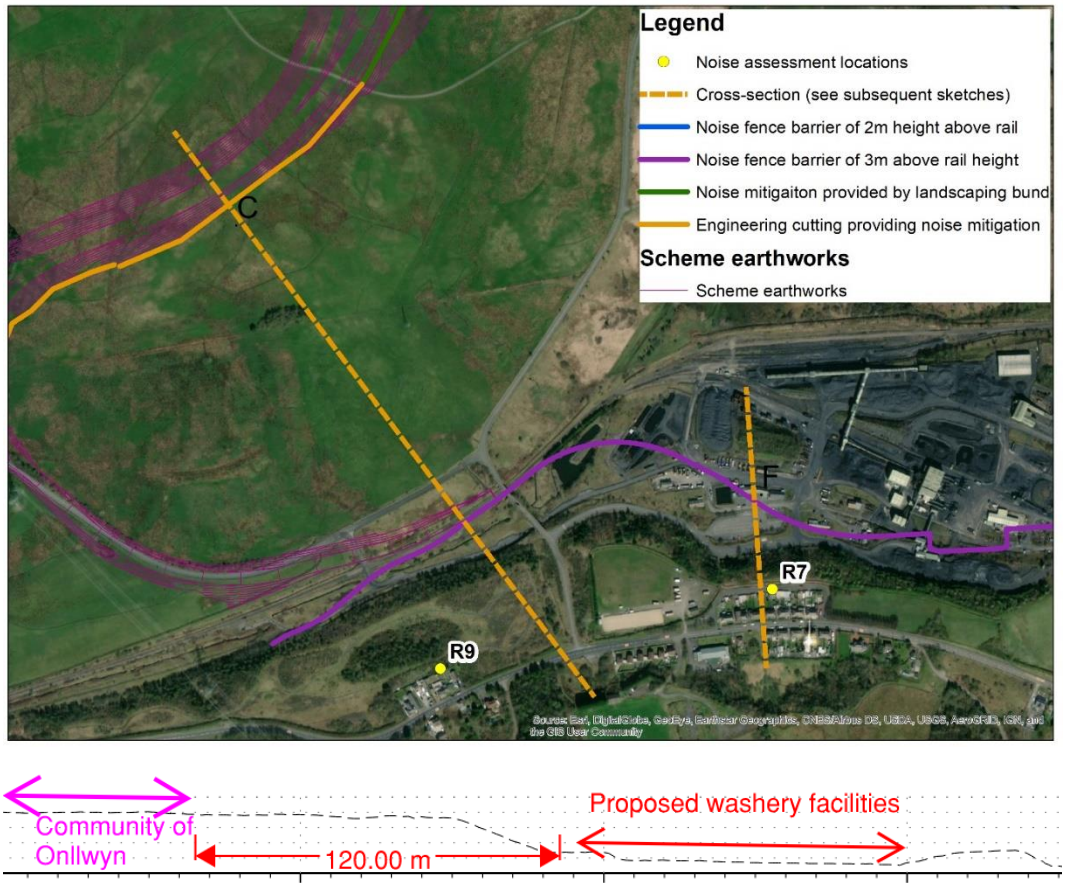
Cross-section along the dashed orange line shown in the sketch above. To scale. Note that the dots represent a 5m grid

Area F

10.7.21 This section of the scheme faces the community of Onllwyn to the south. The washery facilities will be screened from view of the nearby community by the natural landform and the existing planting.

10.7.22 A noise barrier will be provided alongside the facility to minimise noise to communities.

10.7.23 A cross-section sketch is shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines (without planting).



Sketch showing cross-section F (near receptor R7). To scale. Note that the dots represent a 5m grid

Area G

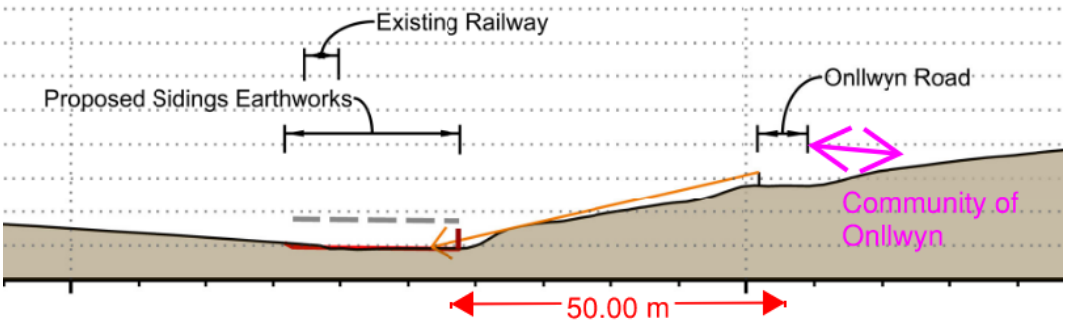
10.7.24 This section of the scheme features some railway sidings which would be used for medium or long-term storage of trains. faces the community of Onllwyn to the south. The washery facilities will be screened from view of the nearby community by the natural landform and the existing planting.

10.7.25 A noise barrier will be provided alongside the facility to minimise noise to communities.

10.7.26 A cross-section sketch of cross-section ‘G’ is shown below of the mitigation at this location in the context of the nearest community. They show the worst-case visual sight-lines (without planting).

10.7.27 Note that further detailed cross-sections of this area are included in Figure 9.17 in the landscape and visual impact assessment.





Cross-section along the dashed orange line 'G' shown in the sketch above. To scale. Note that the dots represent a 5m grid

10.8 Combined noise predictions and assessment

10.8.1 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 10.5 and shown in Figures 10.1 to 10.3.

10.8.2 Existing (baseline) noise levels are shown in Table 10.4. A comparison of levels with and without noise fence barriers is provided intable 10.5, in which any exceedances of the criteria set out in Table 10.1 are highlighted in red.

Table 10.4: Existing noise levels at sensitive receptors

Receptor (See Fig 10.1)	Existing noise levels based on noise survey			
	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	46	41	38	55
R2	46	41	38	55
R3	46	41	38	55
R4	51	42	43	61
R5	51	42	43	61
R6	56	56	34	62
R7	49	51	44	67
R8	48	47	33	59
R9	49	51	44	67
R10	48	47	33	59
R11	46	41	38	55
R12	49	51	44	67
R13	49	51	44	67
R14	56	56	34	62

Table 10.5: Scheme noise levels with and without noise fence barriers

Receptor (See Fig 10.1)	Total overall predicted scheme noise level, $L_{Aeq,T}$ without noise fence barriers				Exceedances of criteria without noise fence barriers?	Mitigation area (see section 10.7)	Reduction in LAeq noise levels due to noise fence barriers	Total overall predicted scheme noise level, $L_{Aeq,T}$ with noise fence barriers				Exceedances of criteria with noise fence barriers?
	Daytime $L_{Aeq,T}$ 0700-1900	Evening $L_{Aeq,T}$ 1900-2300	Night-time $L_{Aeq,T}$ 2300-0700	$L_{Amax,F}$				Daytime $L_{Aeq,T}$ 0700-1900	Evening $L_{Aeq,T}$ 1900-2300	Night-time $L_{Aeq,T}$ 2300-0700	$L_{Amax,F}$	
R1	29	29	26	56	No	to the west	0	29	29	26	56	No
R2	48	48	45	68	Yes	A	-7	41	41	37	58	No
R3	47	47	44	68	Yes	A	-7	40	40	37	58	No
R4	49	49	46	69	Yes	A	-8	41	41	38	59	No
R5	43	43	39	67	Yes	B	-1	42	42	39	57	No
R6	39	37	34	57	No	B	0	39	38	35	54	No
R7	48	35	31	49	No	F	-3	45	33	29	49	No
R8	42	42	38	53	No	D	-5	37	37	33	53	No
R9	42	38	34	50	No	C	-2	40	36	31	50	No
R10	43	43	40	58	No	E	-7	36	36	33	53	No
R11	50	50	46	69	Yes	A	-9	41	41	38	59	No
R12	37	22	21	48	No	F	-2	35	22	18	48	No
R13	34	27	23	47	No	F	-1	33	27	23	47	No
R14	43	37	32	57	No	C	-1	42	35	31	57	No

10.9 BS4142 assessment results

10.9.1 An assessment of night-time noise at the washery has been carried out under British Standard 4142[3]. A breakdown of noise from the different noise sources at the washery is presented below in Table 10.6:

Table 10.6: BS4142 assessment of the washery

Receptor	Scheme noise levels: $L_{Aeq,1900\text{-}2300}$ (Evening (Eve)); $L_{Aeq,2300\text{-}0700}$ (Night)								Baseline levels (LA90,10mins)		Rating level (total scheme noise level + 3dB(A))*		BS4142 Assessment (Rating level over background)	
	Slow-moving trains		Train wash		Maintenance shed		Total Washery noise							
	Eve	Night	Eve	Night	Eve	Night	Eve	Night	Evening	Night	Evening	Night	Evening	Night
R6	20	14	Inactive	Inactive	-11	-11	20	14	28	24	23	17	-5	-7
R7	28	22			1	1	28	22	26	26	31	25	5	-1
R8	19	13			-18	-18	19	14	32	29	22	17	-10	-12
R9	30	24			-9	-9	30	24	26	26	33	27	7	1
R12	15	9			-5	-5	15	10	26	26	18	13	-8	-13
R13	19	13			0	0	19	14	26	26	22	17	-4	-9
R14	29	23			0	0	29	23	28	24	32	26	4	2

*A correction of +3 is applied based on the advice set out in section 9.2 of BS4142: "*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied*"

[3] BS4142 2014: *Methods for rating and assessing industrial and commercial sound*

10.10 Results & Conclusions

10.10.1 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.

10.10.2 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.

10.10.3 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 spaces[4].

10.10.4 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.

10.10.5 The assessment has also considered maximum noise levels from the trains which would be tested on the rolling stock test track. At all 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.

Scheme in context with existing road traffic

10.10.6 When the rolling stock test track is in use five days out of seven, trains on test will complete an average of ~200 laps of the circuit over the daytime and evening combined. For comparison, the A4221 – an A road with national speed limits and no noise barriers, which is much closer to most of the communities to the north of the circuit than the test track will be - has a daily flow of ~3800 road vehicles.

BS4142 assessment results

10.10.7 The BS4142 assessment results have been presented for evening and night-time periods. During these periods, the background noise levels – that is, between passbys of cars on the local roads – are relatively low.

10.10.8 The 4142 assessment include all sources of noise from the washery. At night-time, the loudest source of noise from the washery will be the occasional slow-moving trains moving around the washery at 5mph.

[4] Guidelines for community noise, World Health Organization, Birgitta Berglund et al https://www.who.int/docstore/peh/noise/Comnoise-1.pdf

The only other source of noise at night-time - the maintenance building – will be much quieter.

10.10.9 BS4142 sets out that a rating level over background difference of +5 is likely to be an indication of adverse impact and +10 an indication of significant adverse impact.

10.10.10 On this basis, adverse impacts would be indicated during the evening at receptors R7 and R9 (due to differences of +5 and +7 being predicted respectively).

10.10.11 During the night-time, no adverse effects are identified.

10.10.12 Overall, no significant effects have been identified from the BS4142 assessment.

Fixed plant on site buildings

10.10.13 Information is not currently available about any fixed plant which may be installed on buildings onsite, such as the maintenance shed and/or the control building/offices.

10.10.14 When such information becomes available (during detailed design), the BS4142 assessment will be updated to include this additional fixed plant and design measures (such as the placement of equipment and attenuators) included as necessary to ensure no likely significant effects occur.

Summary of likely significant effects

10.10.15 No likely significant effects from noise are predicted during the construction or operation of the scheme.

10.11 Construction noise assessment

10.11.1 An assessment of construction noise impacts has been carried out and is reported in Appendix 10C.

10.11.2 In summary, no likely significant effects due to construction noise are expected at any receptors during the construction period.

10.11.3 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 (see Figure 10.1), whilst the existing buildings on the washery site are being demolished.

10.11.4 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.

10.11.5 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).

10.12 Vibration

10.12.1 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.

10.12.2 No likely significant vibration effects are predicted due to either construction or operation of the facility.

10.13 Traffic associated with the scheme

Road traffic

10.13.1 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.

10.13.2 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.

10.13.3 The details of the analysis of road traffic is contained in Appendix 10C.

Rail traffic

10.13.4 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.

10.13.5 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.

10.13.6 During the operation of the facility, trains arriving at the facility for test may arrive along the branch line, hauled by a diesel locomotive.

10.13.7 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

10.13.8 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.

10.13.9 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 pollution[1], working on or near water[2] and for managing water on land[3];
- CIRIA[4] 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-ppgs-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 Viewer[7]
- 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/virtualdirectory/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=4ef6ea25c5984c939636714dbfce25f3

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 **Table 11.2** 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 < 1m3/s but >0.001m3/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 ≤0.001m3/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 >0.001m3/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 ≤0.001m3/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 < 1m3/s but >0.001m3/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 ≤0.001m3/s
River Pyrddin	South eastern area of study area	None	Very High	WFD classification shown in RBMP Q95 < 1m3/s but >0.001m3/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 ≤0.001m3/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 EnviroInsight[10] 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 Plants[12]. 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 Map[15], 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

<u>Surface Water Quality</u>

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 incept 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 Llech 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 Llech	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 Llech	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 Llech	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 This 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	The opening of the 4.5km test track, largely for testing infrastructure and some stabling facilities, in 2023.
Phase Two	The addition of the 6.9km test track primarily for testing rolling stock in 2024.
Phase Three	The addition of expanded stabling facilities and research facilities in 2025.

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 outline Construction Environmental Management Plan (CEMP) (Appendix 3A).

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 **The Countryside and Rights of Way Act 2000** gives the public right of access to registered common land and land mapped as 'open country'.

12.3.5 A total of 115.7 hectares (ha) within the development boundary is designated Common Land known as Mynydd-y-Drum (reference: BCL78), a further area to the north of the site known as Land at Abercrave Station (BCL136) is also designated Common Land.

12.3.6 Both Powys County Council (PCC) and Neath Port Talbot County Borough Council (NPTCBC) 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, legal orders must be made by the relevant Local Authority.

12.3.7 There are several designated PRoW within the development boundary that will require diversion and this is presented in detail later in this Chapter. This sets the principle of the change required to accommodate the scheme, however the detail of any diversion or new routes would be formally agreed through the above orders process led by PCC and NPTCBC, outside of the outline planning process (subject to consent).

Policy context

National Policy

12.3.8 Planning Policy Wales (PPW) Edition 11 sets out the land use planning policies of the Welsh Government. The relevant sections of PPW11 to the socio-economic assessment include:

- Strategic and Spatial Choices;
- Active and Social Places;
- Productive and Enterprising Places;
- Distinctive and Natural Places.

12.3.9 In relation to Economic Development, paragraph 5.4.2 states that *'economic land uses include the traditional employment land uses*

[1] http://www.legislation.gov.uk/ukpga/2006/26/contents/2014-01-09

(offices, research and development, industry and warehousing), as well as uses such as retail, tourism, and public services.

12.3.10 In relation to the rural economy, paragraph 5.6.7 sets out that: *'businesses in rural areas are essential to sustain and improve rural communities.'*

12.3.11 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 diverse economy. Here development should be sympathetic in nature and scale to the local environment.'*

12.3.12 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.'*

12.3.13 Technical Advice Note (TAN) 23: Economic Development builds on the broad definition of economic development set out within PPW11 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.'

12.3.14 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

12.3.15 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.

12.3.16 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
Neath Port Talbot Local Development Plan		
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.
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, T04/3 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.
Powys Local Development Plan		

Policy	Summary	Considerations
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.
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.
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.	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.
The scoping report confirms that the proposed development is sited on Common Land known as Mynydd-Y-Drum.	The Common Land status of the site has been acknowledged within the baseline and is addressed under 'land use' within the assessment of effects.

Consultation

12.4.5 Consultation has been undertaken with the Public Rights of Way Officers in each respective Local Authority during the preparation a of this Chapter and through the statutory pre-application consultation process on the proposed development.

12.4.6 In addition, the local community has had the opportunity to comment on the assessment as part of the pre-application consultation process and their comments are addressed within this Chapter in terms of the proposed development's impact on jobs and the local economy, and impact on PRoW and recreational routes.

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 Nomis[2]);
- Visit Wales statistics;
- Agricultural Land Classification (ALC) information[3];
- 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;
- NRW Open Country Mapping and Registered Common Land Mapping[4];
- 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

[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.
[3] Available on the Lle Geo-Portal, an open source catalogue of environmental data developed by Welsh Government and Natural Resources Wales.
[4] Available on the Lle Geo-Portal

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 ES 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.

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	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. 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.
Medium	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. 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.
Low	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. 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.

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 receptors[5]. 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.

[5] 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).

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 individuals[6], 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.

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

[6] 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 12.6: 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 GCRE and the subsequent addendum document[7] 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.

[7] Arup (2020) Welsh Government Global Centre of Rail Excellence Outline Business Case

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 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 persons[8].

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 142,900[9].

12.7.11 Population projections estimate that this trend is expected to continue over the next 10 years[10] as shown in the graph below.

[8] ONS Census (2011) KS101EW – Usual Resident Population
[9] Annual Population Survey (2019)
[10] 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]

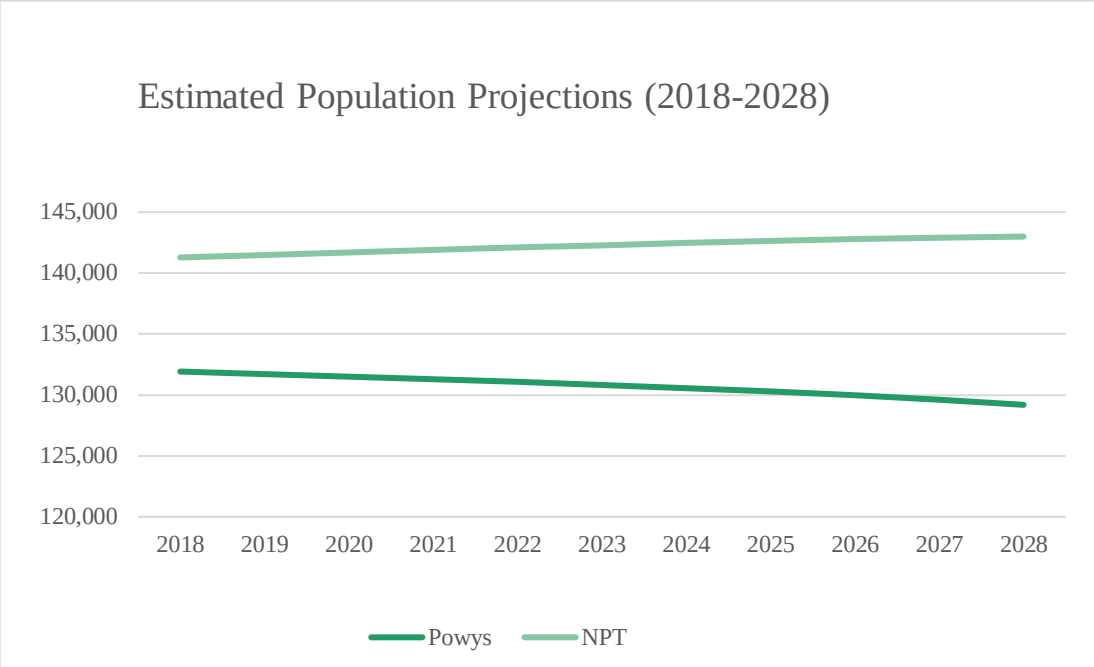


Figure 12.1 Estimated Population Projections by Local Authority and Year (2018-2028)

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%[11].

[11]ONS Census (2011) - KS501EW – Qualifications and Students

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.

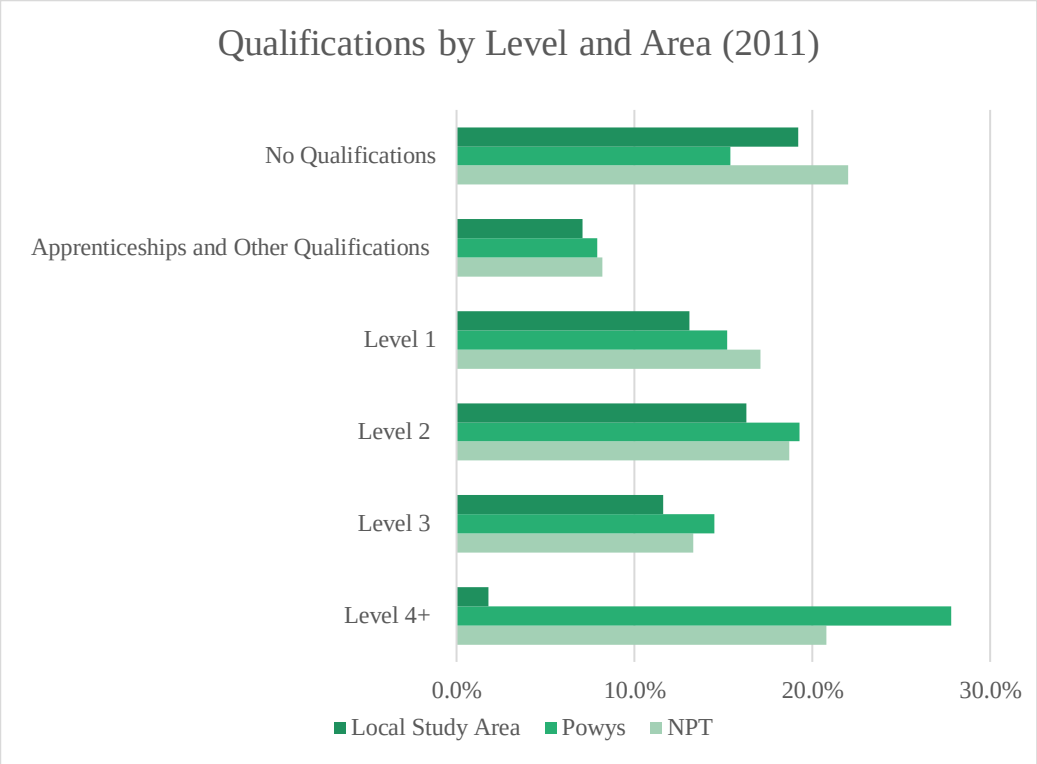


Figure 12.2 Level of Qualification in Local Study area and Local Authority Area (Source: Census 2011)

Deprivation

12.7.16 Statistics on deprivation have been found using the Welsh Index of Multiple Deprivation (WIMD) 2019[12].

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,

ations and Students
019) WIMD – available online at: https://wimd.gov.wales/geography/la/W06000023?lang=en#&min=0&max=10&domain=overall [date accessed: 02.01.20]

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.

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 Wales[13].

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 72.5% of those aged 16-64 are economically active with an employment rate of 72.7%. These figures fall just below the Welsh figures of 76.2% and 73.3% 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, 79.8% are economically active, with the overall employment rate standing at 75.7[14].

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 below[15].

[13] ONS Census (2011) QS601EW - Economic activity
[14] ONS (2020) Annual Population Survey, Estimate 12 months to September. Available online at: https://www.nomisweb.co.uk/query/construct/components/date.asp?menuopt=13&subcomp= [date accessed: 24.02.20]
[15] 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.

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 sector, employing a total of 19.1% of the county's population[16]. 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.

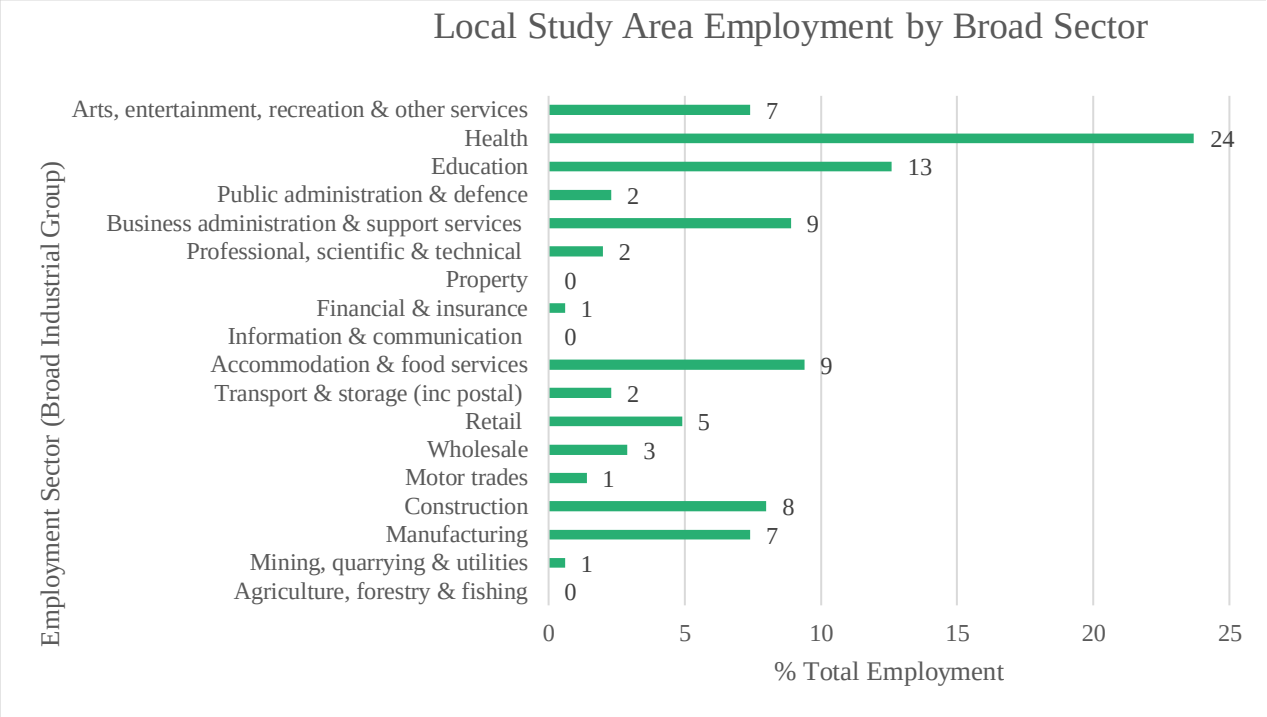


Figure 12.3 Local Study Area Employment by Broad Sector (Source: BRES 2018)

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.

[16] 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]

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.

Table 12.8: Businesses Receptors in Local Study Area

Settlement	Business Name
Onllwyn	• Banwen News • Dyffryn Pharmacy • Café Sarn Helen
Abercrave	• The Rheolau Arms • Rotafix Building Materials • The Hub: Café, Shop, Post Office • The Copper Beech Inn • Abercrave Inn
Coelbren	• Prices Arms • Kellie's Craft Supplies • Coelbren Welfare Hall Tea Rooms
Seven Sisters	• Nitelite Security Services • Seven Sisters Post Office • Call in Coffee Shop & Fish Bar • Costcutter • Seven Sisters Sawmill
Ystradgynlais	• TLT Supermarket • Cambrian Gallery Antiques
Caer-Lan/Caerbont	• 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	• Nitelite Security Services • Seven Sisters Post Office • South Wales Reptile Supplies • Call in Coffee Shop & Fish Bar • Coelbren Post Office • Costcutter • Seven Sisters Sawmill
Nant-Y-Cafn	• Garden City Garage • Dulais Valley Quads • Valley Autocare
Crynant	• 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	• Family Fare General Store • Cilefrew Post Office • Kaye's Kreations Florist • Coco Loco Salon • Neath Coachbuilders • Cilfrew Fish Bar
Aberdulais	• 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.

12.7.33 It is also recognised that there are agricultural related businesses operating within the local study area and the wider study area. The effect of the proposed development on these individuals/businesses has been taken into consideration through the assessment of impacts on business and residential receptors presented from section 12.10 onwards.

Land Use

Local Study Area

12.7.34 The area within the development boundary is currently in use as an opencast coal mining site known as the 'Nant Helen Surface Mine'. The coal mined at the site is processed at the adjacent Onllwyn Washery 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.

12.7.35 Celtic Energy has recently secured planning permission (Refs: 19/1899/REM, P2020/0362 and 20/0738/FUL) for the restoration of the site and a complementary earthworks scheme, known as the Nant Helen Complementary Restoration Earthworks. It is understood these restoration works are planned for 2021.

12.7.36 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. In the NPT LDP, a very small proportion of the site falls within land designated as a 'Settlement Protection Zone' which serves to protect settlements against the extent of surface coal mining operations. The washery site is identified as a freight facility, safeguarded under Policy TR4/4. Policy TR4/4 specifically seeks to protect the rail connection and sidings.

12.7.37 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).

12.7.38 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 Act[17].

12.7.39 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 land[18]. There is a designated SSSI to the east of the site in Coelbren.

Wider Study Area

12.7.40 In addition to the development boundary, the proposed development would also utilise the existing railway line to facilitate deliveries etc.

[17] UK Government (2020) https://www.gov.uk/government/collections/common-land-guidance
[18] 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]

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.

12.7.41 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.

12.7.42 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.

12.7.43 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 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).

12.7.44 The wider study area is located entirely with the boundary of the Neath Port Talbot local authority area.

12.7.45 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).

Tourism & Recreation

12.7.46 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 Museum[19] in Crynant, located adjacent to the existing rail line.

12.7.47 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'[20] and is particularly popular with those seeking to appreciate the natural landscape at sites such 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.

[19] https://www.npt.gov.uk/1655
[20] Visit NPT (2020) http://www.visitnpt.co.uk/1806 [date accessed: 13.01.20]

12.7.48 The Dulais Valley has also become known for its opportunities for adventure sports and outdoor pursuits for example quad biking, archery and clay pigeon shooting[21]. 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.

12.7.49 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).

12.7.50 Specific accommodation providers and specific information regarding recreational routes within the study area is provided below.

Accommodation Businesses

Local Study Area

12.7.51 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.

[21] For example see: http://www.dulaisvalley-quads.co.uk/ and http://www.crynant-shooting-ground.co.uk/

Settlement	Accommodation Name	Description
	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.
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.

12.7.52 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

12.7.53 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.

12.7.54 Given that no work is proposed 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

12.7.55 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

12.7.56 In NPT there is a total of 777.3km of PRoW access comprised of footpaths, bridleways, BOATs[22]. In Powys, there is over 9,250 km of public rights of way [23]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.

[22] 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]
[23] 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
	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.
	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.

Local Authority Area	PRoW Reference	Description
	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.
	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.

12.7.57 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 Caehopkin[24]. This is shown on Figure 12.3.

12.7.58 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.

12.7.1 The sensitivity of the individual PRoWs included within the above table is presented within the assessment of effects.

12.7.2 It is understood that the value individuals assign to PRoW and recreational routes will vary and is subjective. Notwithstanding this, the assessment of potential effects on the ProW network has been undertaken in accordance with the methodology presented in section in 12.5, with sensitivity assigned as per table 12.4.

12.7.3 This section presents the assessment of potential socio-economic effects during both construction and operation. The assessment

[24] See: https://osmaps.ordnancesurvey.co.uk/52.71819,-1.65624,8

considers potential effects within the local study area and the wider study area.

Wider Study Area

12.7.4 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.

12.7.5 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.	Gated crossing point across railway line with signage. 
21/17/1 and 21/18/1	Shorter PRoW extending south/south east from New Road, Cilfrew.	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. 
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.	

PRoW Reference	Description	
25/1.D.Hi/1	Bridleway extending east/west from Brynawel in Crynant, links into another bridleway, 25/11.D.Lo/2	
25/MO.ANC19/1	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.	Manual gated crossing point over the railway line. 
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.	
28/16.D.Hi/1	Footpath extending north from bridleway 25/9.D.Hi/12 towards Seven Sisters. After the railway path extends west towards Dulais Road. Footpath crosses railway to the south of Seven Sisters.	Manual gated crossing, on day of site visit gate chained open. 
28/18.D.Hi/1	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.	
28/19.D.Hi/1	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.	
28/31.D.Hi/3	Footpath extending north/south, running parallel to railway line linking to footpath 28/31.D.Hi/1 in Seven Sisters.	

PRoW Reference	Description	
28/31.D.Hi/1	Footpath running from Seven Sister RFC to Martyn's Avenue.	Footpath passes underneath railway line viaduct and as such no crossing in situ. 
28/29.D.Hi/1	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.	
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	

12.7.6 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.

12.7.7 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

12.11 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 by the end of 2025.

12.11.4 Estimates included within the OBC suggest that depending on the phase of the project, between 53-163 net direct jobs could be created during construction.

12.11.5 It is expected that approximately 53 net direct construction jobs would be created during Phase 1 of the works, rising to 163 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 miles[25]. In the context of the proposed development a 22-mile buffer taken from the development boundary would include workers living in: Brecon and Llandovery 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 (approx. 16-33 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 Guidance[26]. 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

[25] 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

[26] 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

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 night[27] which would be spent on accommodation within 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.

[27] BATJIC (2019) Constitution and Working Rule Agreement 2019/2020, https://www.fmb.org.uk/media/44309/constitution-and-working-rule-agreement-2019-2020.pdf

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.

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 by the appointed contractor 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 CEMP.

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 diverted and/or 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. located outside the proposed development boundary.

12.11.46 It should be noted that the changes to the PRoW network are being developed by NPTCBC and PCC within a Public Rights of Way Management Strategy that is separate to the planning application process. This will set out in detail proposed changes to the PRoW that would be affected by the proposed development and how these would be managed to minimise disruption to the network.

12.11.47 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 by Neath Port Talbot Council and Powys County Council, separate to the outline planning application for GCRE. There will be an opportunity to respond to consultation on these proposed works at later date.

12.11.48 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.	Low	Minor deviation likely to be implemented as part of future baseline. 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.	Low	Footpath likely to be permanently diverted and would aim to retain north/south movements.	Negligible	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 likely to be 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 likely to be 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.	Low	Routes would be likely to be permanently diverted. Diversion would aim to achieve same level of connectivity as existing and therefore 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.	Low	Route would likely be diverted as part of future baseline which would be permanent. This may result in longer north east-south east movements being required from Caehopkin to Onllwyn.	Minor	Minor Adverse
7	Short footpath extending north from footpath 49 to site boundary.	Medium	Footpath likely to be permanently diverted following minor deviations as part of the future baseline.	Minor	Minor Adverse

PRoW Ref.	Descriptor	Sensitivity	Proposed Mitigation	Magnitude	Significance of Effects
			It is considered that diversion would maintain existing level of connectivity.		
11	Short section of footpath linking bridleway number 76 and footpath 18 at the north of the development boundary.	Medium	Route would be permanently diverted. It is considered that diversion would maintain existing level of connectivity.	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 diverted. It is considered that diversion would seek to maintain existing level of connectivity.	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 diverted. It is considered that diversion would seek to maintain existing level of connectivity.	Minor	Minor Adverse
31/33.D.Hi/2	Short section of footpath extending north/south along the eastern washery boundary.	Medium	Route is likely to be diverted. It is considered that diversion would seek to maintain existing level of connectivity.	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

12.11.49 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.

12.11.50 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.

12.11.51 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.

12.11.52 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 the transient nature of the users and the temporary nature of construction, it is considered that any effect would be very short term, minor in magnitude and would not be significant.

12.11.53 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.

12.11.54 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

12.11.55 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.

12.11.56 The construction of the proposed development would result in the permanent loss of a proportion of this Common Land at Mynydd-y-Drum. The sensitivity of the existing Common Land is considered to be high.

12.11.57 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 affected areas 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.

12.11.58 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.

12.11.59 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 141 (during phase 1) and 298 (phase 3) direct and indirect net jobs could be created at GCRE.

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 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 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 due to the more coherent and joined up network that is likely to result from the changes. 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 PRoW 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 includes 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 presented in the Transport Assessment to be secured through CTMP.	Minor Adverse
	Construction traffic and access implications (Local Study Area)	Local businesses	Indirect	Low	Minor	Traffic mitigation measures presented in the Transport Assessment to be secured through 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	Traffic mitigation measures presented in the Transport Assessment to be secured through CTMP.	Minor Adverse

Construction & Operation	Permanent diversions 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	Minor	Diversions and new routes provided in order to mitigate the impact.	Minor Adverse
	Permanent diversions to recreational routes (Local Study Area)	PRoW reference: 19, 31/15.D.Hi/1	Direct	Low	Negligible	Diversions and new routes provided in order to mitigate the impact.	Negligible
	Visual effects from recreational routes in close proximity to the development boundary.	Land Use	Indirect	Low	Negligible	Visual effects from PRoW should be balanced against wider benefits of the Proposed Development. Consideration should also be paid to site's existing use as coal mine.	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 and indirect local employment associated with the proposed development 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 (2021)[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, 2021. Available at: https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

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 capital[2];
- 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	A substantial change to a health determinant, with two or more of the following characteristics: • assessed as 'major' by relevant environmental topics (where applicable[3]); • 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	A moderate change to a health determinant, with two or more of the following characteristics: • assessed as 'moderate' by relevant environmental topics (where applicable[3]);

[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.

	• 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	A minor change to a health determinant, with two or more of the following characteristics: • assessed as 'minor' by relevant environmental topics (where applicable[3]); • 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

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 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 132,447[4]. 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 ethnicity[5].

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

	WIMD – overall deprivation		**WIMD – health deprivation**	
LSOA	**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

[1]Where 1 is most deprived and 1909 is the least deprived

[2]Where 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 average[7]. 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% nationally[8]. 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 Wales[9].

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 population[11].

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] [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 alterative 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 provides. 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 alterative 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 like 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 The 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 PRoW 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 dust, 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 (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2).

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

National objectives

14.3.2 The current Air Quality Strategy for England, Scotland, Wales and Northern Ireland[1] 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.

Air Quality Standards and Limit Values

14.3.3 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.

14.3.4 The air quality Limit Values (LV) 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	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 (99.8th percentile)
Fine Particulate Matter (PM_{10})(a)	Annual mean	40µg/m^3

[1]Defra et al 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland

	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year (90.4th percentile)
Very Fine Particulate Matter ($PM_{2.5}$)(a)	Annual mean	25µg/m^3
Protection of vegetation		
Oxides of Nitrogen (NO_x)	Annual mean	30µg/m^3
(a) The Air Quality Standards (Wales) Regulations 2010, No. 1433		

14.3.5 The United Nations Economic Commission for Europe (UNECE) and the World Health Organisation (WHO) have set a critical level for NOx (30µg/m^3), for the protection of vegetation. Therefore, the statutory nature conservation agency's (Natural Resources Wales, NRW) policy is to apply the 30µg/m^3 criterion as a benchmark, on a precautionary basis, in internationally designated conservation sites and in Sites of Special Scientific Interest (SSSI).

14.3.6 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

14.3.7 The Act[2] 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.

14.3.8 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 11, December 2021

14.3.9 The 11th edition of Planning Policy Wales[3] (PPW11) was published in February 2021. It sets out land-use and planning policy for Wales. The

[2] Wellbeing of Future Generations (Wales) Act 2015
[3] Welsh Government (2021) Planning Policy Wales Edition 11 (PPW11)

new planning policy incorporates principles derived from the Well-being of Future Generations (Wales) Act 2015.

14.3.10 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 PPW11 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.

Local planning policy

Neath Port Talbot County Borough Council Local Development Plan

14.3.11 Neath Port Talbot County Borough Council (NPTCBC) adopted their Local Development Plan (LDP)[4] 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 due 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

14.3.12 This guidance[5] 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

[4] Neath Port Talbot County Borough Council Local Development Plan 2011-2026
[5] Pollution (Supplementary Planning Guidance) 2016

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

14.3.13 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;
- To ensure air quality throughout the Council Borough is better than the standards required by 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)

14.3.14 The Powys County Council (PCC) Local Development Plan (LDP)[6] 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.*

Guidance

Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction

14.3.15 The IAQM provide guidance to development consultants and environmental health officers (EHO) on how to assess air quality

[6] Powys Local Development Plan 2011-2026

impacts from construction. The IAQM document[7] 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.

Local Air Quality Management Policy and Technical Guidance

14.3.16 The 2016 policy note from Defra, LAQM.PG(16)[8], 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.

14.3.17 The LAQM Technical Guidance 16 (LAQM TG(16))[9] 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

14.3.18 The 2017 Land-Use Planning & Development Control guidance document[10] 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.

14.3.19 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.

[7] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1)
[8] Defra (2016) Local Air Quality Management Policy Guidance. PG(16)
[9] Defra (2016) Local Air Quality Management Technical Guidance.TG(16)
[10] EPUK/IAQM, (2017) Land-Use Planning & Development Control: Planning for Air Quality

IAQM A guide to the assessment of air quality impacts on designated nature conservation sites

14.3.20 The IAQM provide guidance[11] on how to assess ecological impacts on designated nature conservation sites. It provides a structure for working with professional ecologists in order to reach a determination of the impacts of air quality on designated sites. It however does not specifically provide guidance on the assessment of rail emissions.

[11] IAQM (2020) A guide to the assessment of air quality impacts on designated nature conservation sites version 1.1

14.4 Scoping and consultation

Scoping

14.4.1 This chapter has been scoped to include:

- Effects on human and ecological receptors due to the generation of construction dust during the construction phase; and
- Effects on ecological receptors during operation of the proposed development.

14.4.2 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
From: Neath Port Talbot – Air Quality Officer	
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.	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 14.5.
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.	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.
From: Powys County Council – Environmental Health Officer Confirmation they are satisfied with the proposed assessments in respect of air quality.	N/A
From: Powys County Council- Planning and Highways Consultant A zone of influence has been identified as being up to 200m in the biodiversity chapter due to air quality impacts during construction works.	200m usually refers to the area beyond roads that will be assessed for changes in air pollutant concentrations due to changes in traffic emissions.
From: Natural Resources Wales – Development Planning Advisor 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 security impacts on the nature conservation resource, landscape and public access.	The impacts of the construction, operation and decommissioning of the proposed development on air quality will be considered.

Consultation

14.4.3 Further comments have been received through the Pre-application Consultation (PAC) process. This is summarised in Table 14-3.

Table 14-3: Response to representations from stakeholders on the air quality assessment

Stakeholder	Comment	Response
Powys County Council and Neath Port Talbot - Environmental Health Officers	Agreement that the assessment of rail impacts on human receptors can be screened out based on guidance outlined in LAQM TG(16).	No assessment of rail emission impacts on human receptors has been undertaken.
Powys County Council, Neath Port Talbot and NRW – Biodiversity Officers	Provided that during construction the outline Construction Environmental Management Plan (CEMP) includes monitoring that allows for identification of and timely response to nuisance dust deposition levels (200mg/m^2/day) it is considered there would be no significant impact on protected sites. Dust level deposition of 500mg/m^2/day or over is considered damaging to Gorsllwyn Onllwyn SSSI. Agreement that traffic changes are unlikely to trigger any screening thresholds relevant for the assessment of air quality. Advise that impacts from rail emissions on designated habitats should be assessed to determine whether there is a change of more than 1% of the critical load at designated habitats.	Mitigation measures would include monitoring of dust levels. Proposed mitigation is outlined in section 14.10. An assessment of nitrogen deposition on nearby designated habitats has been carried out to determine whether there is change of more than 1% of the relevant critical load. The assessment is in section 14.5 and results are in 14.9.

14.5 Methodology

Overview

14.5.1 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.

14.5.2 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

14.5.3 Existing or baseline air quality refers to the concentration of pollutants of interest for this assessment NO_2, PM_{10} 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.

14.5.4 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 Report[12];
- Powys County Council Air Quality Progress Report[13]
- Defra Local Air Quality Management website[14];
- UK Air Information Resource website[15]; and
- Natural Resources Wales (NRW) register on industrial installations[16].

[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]

14.5.5 The review included the local authority air quality monitoring data for recent years (2014-2019) and local background pollutant concentrations.

Methodology for construction dust assessment

14.5.6 Construction dust effects have been assessed using the qualitative approach described in IAQM guidance[7], 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).

14.5.7 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 PM_{10} exposure.

14.5.8 The methodology accounts for the scale at which the above effects are likely to be generated (classed as small, medium or large). The distance of the closest human and ecological receptors and background PM_{10} 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.

Methodology for Operational Assessment

14.5.9 There is potential for emissions to air from both road and rail operations associated with the proposed development.

Screening of traffic emissions

14.5.10 The EPUK/IAQM screening criteria[10] 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.

14.5.11 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.

14.5.12 When the traffic data provided is considered against the above criteria, that road emissions can be scoped out if considered alone. However, as there will also be emissions from rail sources, road emissions are considered in conjunction with rail emissions to understand the potential cumulative impact on sensitive receptors.

Screening of rail emissions

14.5.13 LAQM TG(16)[9] provides guidance on when an assessment of rail emissions is appropriate with regards to human health. There are two scenarios considered as potentially causing exceedances:

- Stationary locomotives: 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 SO_2 objective; and
- Moving locomotives: Rail lines that are identified with heavy traffic of diesel passenger trains, relevant exposure within 30m of moving locomotives and background NO_2 concentrations above 25 $\mu g/m^3$ could potentially cause an exceedance of the annual mean NO_2 objective.

14.5.14 There is no relevant exposure within 15m of the rail for the SO_2 objective or NO_2 background concentrations above 25$\mu g/m^3$ therefore an assessment of the impacts of rail emissions on air quality relevant to human health has been screened out.

14.5.15 There is no screening criteria or guidance for assessing the impacts of rail emissions on designated ecological habitats. Due to the close proximity of several designated habitats including the Gorsllwyn Onllwyn SSSI to the proposed development the potential impacts of emissions from rail on air quality for designated habitats has been assessed.

Methodology for the Assessment of rail emissions

14.5.16 Three distinct track layout features are proposed with the facility, namely:

- The rolling stock test track;
- The infrastructure test track; and,
- The sidings and facilities in and around the old washery site (the washery).

14.5.17 For the purposes of assessing air quality during its operation, only two of the three features will include diesel trains operating on them (and therefore emissions), namely: the rolling stock test track and the sidings area (washery).

14.5.18 As a result, only these two features have been considered and assessed in this assessment. The infrastructure test track will not feature diesel trains and therefore has not been included in the operational air quality assessment.

14.5.19 Further features are described in detail in the project description in Chapter 3.

Rolling stock test track

14.5.20 The rolling stock test track will be used to test trains at speeds of up to 110mph (with an average of 70mph) and is expected to be operational 24 hours per day for 252 days of the year. The proposed train fleet use is also expected to consist of 70% electric-powered, 20% hydrogen-powered and 10% diesel-powered for the first 5 years. Thereafter, trains are 75% electric and 25% hydrogen-powered.

14.5.21 For the purposes of the air quality assessment, diesel train-use on the rolling stock test track is assumed to operate 25 days per year.

Infrastructure test track

14.5.22 The high tonnage infrastructure test track would be used to test railway infrastructure at speeds of up to 40mph.

14.5.23 Infrastructure testing is expected to be operational 24 hours per day for 105 days of the year. Trains are expected to be 100% electric powered for the duration of the 60-year appraisal period, and therefore this track has not been considered in the assessment for emissions to air.

Washery facility

14.5.24 The facility on the site of the old washery will include a maintenance shed, train wash and railway sidings. 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.

14.5.25 Diesel emissions are likely to consist of shunting trains moving at very low speeds (around 5mph) around the facility and the train wash. It is assumed that there are up to four movements per day.

14.5.26 For the purposes of the air quality assessment and potential impact to sensitive receptors, it is assumed that the train movements consist of:

14.5.27 A train from eastern sidings backing out to the western sidings then moving through the train wash to the eastern headshunt and back.

Rail emission calculations

14.5.28 Estimates for the number of diesel powered rail movements for the rolling stock test loop and washery facility were provided by the rail design team as outlined in sections 14.5.20 to 14.5.27. The estimates were used to calculate total annual distances travelled by diesel locomotives on the rolling stock test loop and washery facility.

14.5.29 Estimates of rail movements were combined with emission factors from the Strategic Rail Authority report on rail and road emissions modelling[17] to calculate rail emission rates for use in the dispersion model.

14.5.30 The Inter-city IC125 emission rates were chosen for the diesel locomotive movements on the rolling stock test track, as in the absence of detailed information on the diesel train type being used at the proposed development, these are the highest emission factors and therefore add to a conservative assessment of impacts. Shunting train emissions factors were used solely for the washery areas.

14.5.31 Rail emission factors and calculated emission rates used in the assessment are shown in Table 14-4.

Table 14-4: Rail emission factors and rates

Modelling source	Train type	NOx Emission factor*	NOx Emission rate (g/km/s)
Rolling stock test facility	IC125	194.8 g/km	0.0611
Washery facility	Shunting class	12.6 g/kWh	0.0479
*Emission factor from the Strategic Rail Authority report on Rail and road emissions[17].			

14.5.32 The modelled sources used in the model are shown in Figure 14.1.

14.5.33 Only emissions for NOx have been calculated as is it considered to be the pollutant of greatest concern. Emissions of SO_2 have not been included as due to the low sulphur content present in diesel fuel, the

[17] Strategic Rail Authority 2001. Rail and road emission model.

impacts from SO_2 emissions with such short operating frequency, as well as the spatial and temporal variation, are considered to be negligible.

Dispersion model setup

14.5.34 This section details the inputs and set-up for the operational traffic dispersion modelling using ADMS-Roads version 5.0.

Sensitive human receptors

14.5.35 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 130m from the operational test track and therefore an assessment of air quality impacts on human receptors has been screened out as discussed in section 14.5.14.

Sensitive ecological receptors

14.5.36 The proposed development is located near Nant Lech and Gorsllyywn Onllywyn SSSIs. Nant Lech SSSI is located more than 200m from the operational test track. Gorsllyywn Onllywyn SSSI is located approximately 100m from the stabling track.

14.5.37 There are also six Sites of Importance for Nature Conservation (SINCs) within 200m of the operational test track. These sites are Intervalley Road Banwen, Adjacent to Gors Llwyn, Onllwyn Coal Washery, Dyffryn Cellwen and Gorsllwyn Meadows.

14.5.38 To the north of the proposed development, there are also large areas of Ancient Woodland (AW) comprising ancient semi natural woodland and plantation on an ancient woodland site.

14.5.39 The Coedydd Nedd a Mellte Special Area of Conservation (SAC) is located approximately 3km south-east of the operational test track and therefore has not been assessed further in this chapter, as it is unlikely to be affected by emissions to air from the proposed development.

14.5.40 These ecological habitats are shown in Figure 14.2 and the modelled receptors are shown in Figure 14.3. Details of the ecological habitats are in Table14- 5 and Table 14-6.

Table14- 5: Designated habitats

Habitat name	Designation	Habitat	Critical load kg N/ha/yr	Total N deposition kg N/ha/yr
Intervalley Road,Banwen	SINC	Purple Moorgrass and rush pastures	10-15	17.8*
Site adjacent to Gors Llwyn	SINC	Purple moor-grass and rush pastures	10-15	17.8*
Onllywyn coal washery	SINC	Marshy grassland	10-15	17.8*
Dyffryn Cellwen	SINC	Purple moor-grass and rush pastures	10-15	17.8*
Gorsllwyn Meadows	SINC	Purple moor-grass and rush pastures	10-15	17.8*
Ancient semi natural woodland	Ancient woodland	Broadleaved, mixed and yew woodland	10-20	17.8*
Plantation on ancient woodland site	Ancient woodland	Broadleaved, mixed and yew woodland, coniferous woodland	5-15	17.8*
Gorsllwyn Onllwyn	SSSI	Raised bog-blanket bog	5-10	17.8
*Assumed value based on location derived data in absence of site-specific data.				

Table 14-6: Ecological receptors

Receptor ID	X	Y	Habitat name
AW1	281619	211792	Plantation on Ancient Woodland Site
AW2	281768	211885	Plantation on Ancient Woodland Site
AW3	281921	211914	Plantation on Ancient Woodland Site
AW4	282495	212108	Ancient Semi Natural Woodland
AW5	282838	212062	Ancient Semi Natural Woodland
AW6	283235	212056	Ancient Semi Natural Woodland
AW7	283656	212054	Ancient Semi Natural Woodland
AW8	283229	211779	Ancient Semi Natural Woodland
E1	284717	210723	Gorsllwyn Meadows
E2	284849	210636	Onllwyn Coal Washery
E3	285099	210524	Onllwyn Coal Washery
E4	285229	210611	Onllwyn Coal Washery
E5	285087	210353	Dyffryn Cellwen
E6	285503	210211	Intervalleey Road, Banwen
E7	285575	210299	SINC adjacent to Gorsllwyn
T0	285366	210493	Gorsllwyn Onllwyn
T10	285374	210500	Gorsllwyn Onllwyn
T20	285380	210506	Gorsllwyn Onllwyn

Receptor ID	X	Y	Habitat name
T50	285403	210527	Gorsllwyn Onllwyn
T100	285440	210561	Gorsllwyn Onllwyn
T150	285477	210595	Gorsllwyn Onllwyn
T200	285514	210629	Gorsllwyn Onllwyn

Local air quality modelling

14.5.41 The inputs to the modelling process included:

- Traffic data;
- Rail movements;
- Receptor locations;
- Meteorological data; and
- Background concentrations.

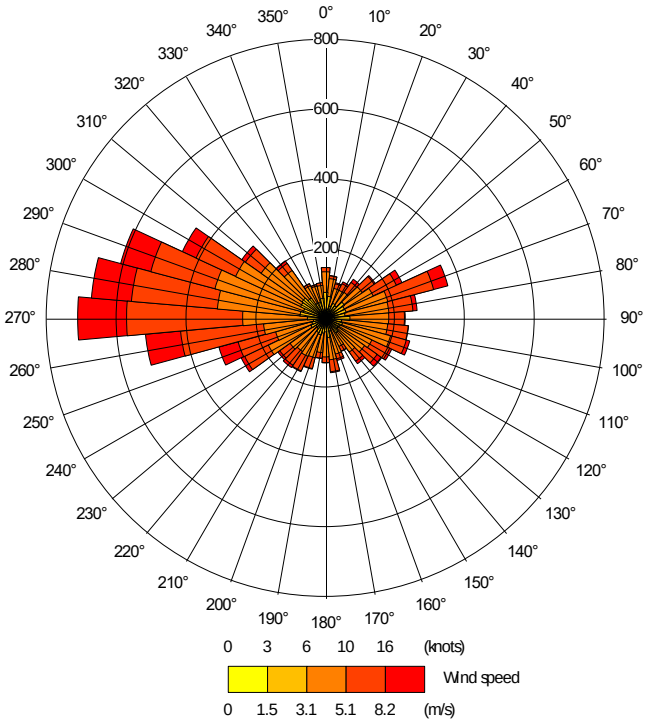
Meteorological data

14.5.42 The meteorological data used in this assessment were measured at Rhoose airport meteorological station. The data was collected over the period 1st January 2019 to 31st December 2019 (inclusive). Rhoose airport is located approximately 50km south east of the proposed development. This meteorological site was chosen due to its proximity to the proposed development.

14.5.43 Most dispersion models of roads do not use meteorological data if modelling calm wind conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. Defra's LAQM.TG16 guidance[9] recommends that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably 90%.

14.5.44 Hourly sequential observation data was used. The dataset includes 8,653 lines of usable hourly data, out of a total of 8,760 lines of data. This corresponds to 98.8% of the year. This is above the 90% threshold, so meets the requirements of the Defra guidance and is adequate for dispersion modelling. shows the windrose for Rhoose airport. It can be seen that the predominant wind direction is westerly in the wind rose Diagram 14.1.

Diagram 14-1: Windrose for Rhoose airport, 2019



Other parameters

14.5.45 The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Typical surface roughness values range from 0.0001m (for water or sandy deserts) to 1.5 (for cities, forests and industrial areas). In this assessment, a value of 0.25m has been selected for the dispersion site and this value is described in ADMS representing a surface roughness of "agricultural areas" which is appropriate for the mixed terrain around the proposed development. For the meteorological site, a surface roughness value of 0.02m was used to represent the surrounding area.

14.5.46 The minimum Monin-Obukhov length is a model parameter which describes the extent to which the urban heat island effect limits stable atmospheric conditions. A Monin-Obukhov length of 10m has been used in this dispersion modelling study for the local study area, which is described as representative of "Small towns<50,000". The same Monin-Obukhov length was used for the meteorological station site.

NOx to NO_2 conversion

14.5.47 The dispersion model predicts NOx concentrations which comprise nitric oxide (NO) and nitrogen dioxide (NO_2). NOx is emitted from combustion processes, primarily as NO with a small percentage of NO_2. The emitted NO reacts with oxidants in the air (mainly ozone) to form NO_2. NO_2 is associated with effects on human health. The air

quality standards for the protection of human health are based on NO_2 rather than total NOx or NO. A suitable NOx: NO_2 conversion has been applied to the modelled NOx concentrations in order to determine the impact of the NOx emissions on ambient concentrations of NO_2.

14.5.48 LAQM.TG16 details an approach for calculating the conversion of NOx to NO_2. This approach takes into account the difference between ambient NOx concentrations with and without the proposed development, the concentration of ozone and the different proportions of primary NO_2 emissions in different years. This approach is available as a spreadsheet calculator, with the most up-to-date version being version 8.1, released in August 2020[18].

Model verification

14.5.49 Model verification refers to the comparison of modelled and measured pollutant concentrations at the same locations to determine the performance of the model. Verification is often carried out on the process concentration from road emissions.

14.5.50 There is no local monitoring in the vicinity of the proposed development, therefore verification of modelling results was not carried out.

Assessment of significance

14.5.51 For the assessment of impacts and significance at sensitive human receptors, the approach described in the EPUK/IAQM guidance[10] has been used (Table 14-7). This is considered to be best practice for undertaking air quality assessments.

14.5.52 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 14-1).

Table 14-7: 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

[18] Defra NOx to NO_2 calculator (version 8.1), https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Predicted concentration relative to air quality standard	% Change in concentrations relative to air quality standard			
	1%	2-5%	6-10%	> 10%
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.**				

14.5.53 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.

14.5.54 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.

14.5.55 With regards to impact on ecological receptors, the IAQM guidance[10] recommends that concentrations of oxides of nitrogen (NOx) are used as the main basis for evaluating the potential for significant effects. An increase in annual mean NOx concentration of more than 0.3µg/m³ cannot be dismissed as imperceptible. If the increase is not imperceptible at an ecological site, and the NOx critical level (30µg/m³) is exceeded, then changes in nutrient nitrogen deposition should be calculated to assist the evaluation of significance.

14.5.56 Where changes in nitrogen deposition are more than 1% of a habitat's critical load this information should be passed to an ecologist to evaluate whether there is a significant effect.

14.6 Assumed construction practices

14.6.1 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.

14.6.2 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.

14.7 Limitations and assumptions

Limitations

14.7.1 Air quality dispersion modelling has inherent limitations and areas of uncertainty, as below:

- Traffic data used in the model;
- Traffic emissions data;
- Simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere;
- Background concentrations; and
- Meteorological data.

Assumptions

14.7.2 The following assumptions have been made in undertaking this assessment:

- The speeds for the modelled road network were based on the designated speed limits; modelled road speeds were reduced to 20kph for all junctions and roundabouts (to represent congested conditions following the LAQM TG(16) guidance).
- All calculated diesel rail emissions assumed the train type was IC125 for the rail test track and shunting class for the washery area. IC125 had the highest emission rates available in the Strategic Rail Authority model which allowed for a pessimistic emission rate to be used in the modelling process in the absence of more detailed information about the types of trains using the site.

14.8 Baseline environment

Baseline ambient air quality refers to the concentrations of pollutants of interest for this NO_2, PM_{10} 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

14.8.1 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(1), A(2), Part B processes or Medium Combustion Plant, regulated through the Pollution Prevention and Control (PPC) system[19,20]. 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.

14.8.2 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.

14.8.3 A review of the industrial sites database under Environmental Permitting Regulation does not identify existing installations within 2km[21].

14.8.4 The impact of industrial processes is assumed to be included in the background monitoring and Defra background concentrations.

Road traffic

14.8.5 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 NO_2, PM_{10} and $PM_{2.5}$.

[19] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)
[20] The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390
[21] Natural Resources Wales. Environmental Permitting Regulations – Industrial Sites. http://lle.gov.wales/catalogue/item/EnvironmentalPermittingRegulationsIndustrialSites/?lang=en

Rail traffic

14.8.6 A single track branch line exists connecting the existing Celtic Energy facility to Swansea. This is estimated to be used once per day and is considered to have a negligible contribution to air pollution in the study area.

Local authority air quality monitoring

14.8.7 NPTCBC and PCC undertake air quality monitoring using automatic monitors and passive diffusion tubes in their respective administrative regions. No automatic or diffusion tube monitoring sites are within 2km of the proposed development.

14.8.8 PCC have not declared any AQMAs in the local authority area.

14.8.9 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.

14.8.10 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 PM_{10} air quality objective.

14.8.11 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

14.8.12 Defra publishes background pollutant mapping[22] 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 14-8.

14.8.13 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. These concentrations are all well below the relevant air quality objective levels for each pollutant and it is considered unlikely the proposed development will exceed the air quality objectives.

[22] Defra, Background Pollutant Mapping, https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017

Table 14-8: Defra estimated background pollutant concentrations for the proposed development grid squares

Local authority	OS grid square		2019 concentrations (µg/m^3)				2020 concentrations (µg/m^3)			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	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

14.9 Assessment of effects

Assessment of effects from construction

Construction traffic

14.9.1 Traffic data for the assessment was screened using the criteria for roads not located within an AQMA set out in section 14.5.11. The changes in traffic flows due to the proposed development during the construction phase are shown in Table 14-9. 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.

14.9.2 The impact of construction traffic on sensitive human and ecological receptors is considered to be negligible.

Table 14-9: 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

14.9.3 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 for this development would be limited to foundations for the new rail infrastructure and buildings.

Sensitive receptors

14.9.4 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.

14.9.5 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

14.9.6 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 14-10.

14.9.7 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 14-10: 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

14.9.8 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 red line boundary, this is considered to have low sensitivity to dust.

14.9.9 As such, the area's sensitivity to dust soiling has been classified as *high* in accordance with the IAQM guidance[7]. The construction dust distance buffers are shown in Figure 14.4.

14.9.10 The average Defra background PM_{10} concentrations for the grid squares where the proposed development is located (Table 14-8Table 14-8) all fall below the 24µg/m^3 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.

14.9.11 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.

14.9.12 There are also several areas of AWs within 20m of the site boundary. The sensitivity of these AWs to ecological impacts is considered to be medium.

14.9.13 There are six low-sensitivity ecological receptors known as SINCs (see section 14.5 for details) within 50m of the site boundary. Low-sensitivity receptors are defined locations with a local designation where the features may be affected by dust deposition.

14.9.14 As such, the area's sensitivity to ecological impacts has been classified as *medium* considered worse-case in accordance with the IAQM guidance.

Risk of impacts

14.9.15 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 14-11).

14.9.16 Specific mitigation to minimize risk of dust soiling and human health impacts of the proposed development is described in section 14.10. Overall, *low risk* mitigation will be considered for the proposed development with *medium risk* demolition specific measures.

Table 14-11 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

14.9.17 Traffic data for the assessment were screened using the criteria for roads not located within an AQMA set out in section 14.5.11. The changes in traffic flows due to the proposed development during the operational phase are shown in Table 14-12. There is no change in traffic speeds. A detailed assessment of operational traffic emission impacts on human health can be screened out as none of the screening criteria are met as a result of the operational traffic from GCRE.

14.9.18 The impact of operational traffic on sensitive human receptors in isolation is considered to be negligible and therefore not significant.

14.9.19 For cumulative purposes emissions from traffic were calculated to inform the assessment of rail emissions on designated sensitive receptors.

Table 14-12: Traffic data summary

Scenario	Additional LDV due to the proposed development	Additional HDV due to the proposed development	Screened in/out
Operation (opening year 2026)			
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 – Human impacts

14.9.20 Screening criteria for impacts of rail emissions on human health are outlined in sections 14.5.13 and 14.5.15.

14.9.21 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 would 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 NO_2 concentrations are 3.6 - 4.0 µg/m^3 across the proposed development area.

14.9.22 There are no human receptors within 15m of the stabling tracks where locomotives will be stationary.

14.9.23 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. An assessment of train emissions at human receptors has not been undertaken.

Operational rail – Impacts on designated ecological sites

14.9.24 Following consultation with the local planning authorities and NRW, an assessment of potential rail impacts on designated habitats was carried out. In order to capture all potential pollutant sources, the assessment has also included cumulative emissions from the local road network.

14.9.25 The nitrogen deposition in the baseline year and modelled opening year and the magnitude of change between Do-Minimum and Do-Something scenarios for ecological receptors are in Table 14-13.

14.9.26 The maximum increase in nutrient deposition as a result of the proposed development in 2026 is predicted to be 0.6kg N/ha/year at receptor AW3. At this location, as a percentage of the lower critical load for the relevant habitat (5kg N/ha/yr), there is a 12.8% increase in nitrogen deposition. This receptor point is located 22m north of the proposed test track.

14.9.27 There are no reductions in nitrogen deposition anticipated as a result of the proposed development.

14.9.28 Increases in nitrogen deposition are predicted to be above 1% of the lower critical load at the following habitats (highlighted in bold in Table 14-13):

- All assessed ancient woodlands;
- Gorsllwyn Meadows and Onnllwyn coal washery SINCs; and
- Gorsllwyn Onllwyn SSSI.

14.9.29 It should be noted that the modelling of train emissions has been undertaken assuming the use of highly conservative emissions data, in the absence of more detailed site-specific train fleet and emissions data. For example, the NOx emissions data for the IC125 locomotive selected for use in the assessment provide the highest emissions of any locomotive presented in the SRA[17] reference source. The emissions are nearly 50% greater than the second highest emitting locomotive

provided in this source. Should further operational emissions data therefore become available, this assessment and conclusions could be revisited.

14.9.30 It should also be noted that the design for the proposed development is that diesel trains will operate for a period of five years, after which zero emission trains will be used. The assessment therefore does not reflect a permanent increase in emissions at these locations.

14.9.31 These predicted changes at receptors are also not necessarily considered to be significant; rather they cannot be considered to be insignificant at this stage without ecological evaluation by a biodiversity specialist. Further discussion of the impacts of the proposed development on nitrogen deposition at these locations, focussing on the specific habitat types in the receptor locations, is included in the biodiversity chapter (ES chapter 7).

Table 14-13: Nitrogen deposition results

Receptor ID	**Lower critical load**	**Nitrogen deposition (kg N/ha/yr)**					
		Baseline	**2026 DM**	**2026 DS**	**Change**	**Change %**	**Change as a % of critical load**
AW1	5	19.0	17.6	17.8	0.2	1.3	**4.5**
AW2	5	19.0	17.6	17.8	0.3	1.5	**5.3**
AW3	5	19.0	17.6	18.2	0.6	3.6	**12.8**
AW4	10	19.1	17.5	17.6	0.1	0.6	**1.1**
AW5	10	19.1	17.5	17.7	0.1	0.7	**1.3**
AW6	10	19.1	17.6	17.7	0.1	0.7	**1.2**
AW7	10	19.1	17.6	17.7	0.1	0.5	**1.0**
AW8	10	19.0	17.6	17.8	0.2	1.3	**2.3**
E1	10	18.4	17.7	17.8	0.2	0.9	**1.6**
E2	10	18.4	17.7	17.8	0.1	0.7	**1.3**
E3	10	18.4	17.7	17.8	0.2	0.9	**1.6**
E4	10	18.5	17.7	17.8	0.1	0.3	0.6
E5	10	18.4	17.7	17.8	0.1	0.5	0.9
E6	10	17.9	17.7	17.8	0.1	0.3	0.6
E7	10	18.5	17.7	17.8	0.1	0.4	0.6
T0	5	18.8	17.8	17.9	0.1	0.6	**2.1**
T10	5	18.5	17.7	17.8	0.1	0.4	**1.6**
T20	5	18.6	17.7	17.8	0.1	0.5	**1.8**
T50	5	18.5	17.7	17.7	0.1	0.3	**1.2**
T100	5	18.5	17.7	17.7	0.0	0.2	0.8

Receptor ID	Lower critical load	Nitrogen deposition (kg N/ha/yr)					
		Baseline	2026 DM	2026 DS	Change	Change %	Change as a % of critical load
T150	5	18.4	17.7	17.7	0.0	0.2	0.7
T200	5	18.4	17.7	17.7	0.0	0.1	0.5

14.10 Mitigation and enhancement

Mitigation of effects from construction

14.10.1 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 PM_{10} 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 actives 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 a 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

14.10.2 The impact from operation on designated ecological sites is considered to be temporary for the period it takes to switch all locomotives to zero emission engines. This period is currently estimated to be within five years of the proposed development opening.

14.10.3 During this period, low emission diesel locomotives should be chosen when none of the electric or hydrogen locomotives are available.

14.11 Residual effects

Residual effects from construction

14.11.1 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

14.11.2 The impact from operation on air quality for human health is considered to be negligible.

14.11.3 The impacts on designated ecological habitats are considered to be temporary. Once all trains using the test facility have switched to zero emission locomotives no operational residual effects are anticipated.

14.12 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 14.10 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 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 the ES.

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, lightening, 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 adaption 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 polices 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 quantification[1]

15.5.2 In order to adequately capture direct and indirect emissions associated with the proposed development, a lifecycle approach is adopted. Lifecycle phases are outlined in Figure 15.2 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.

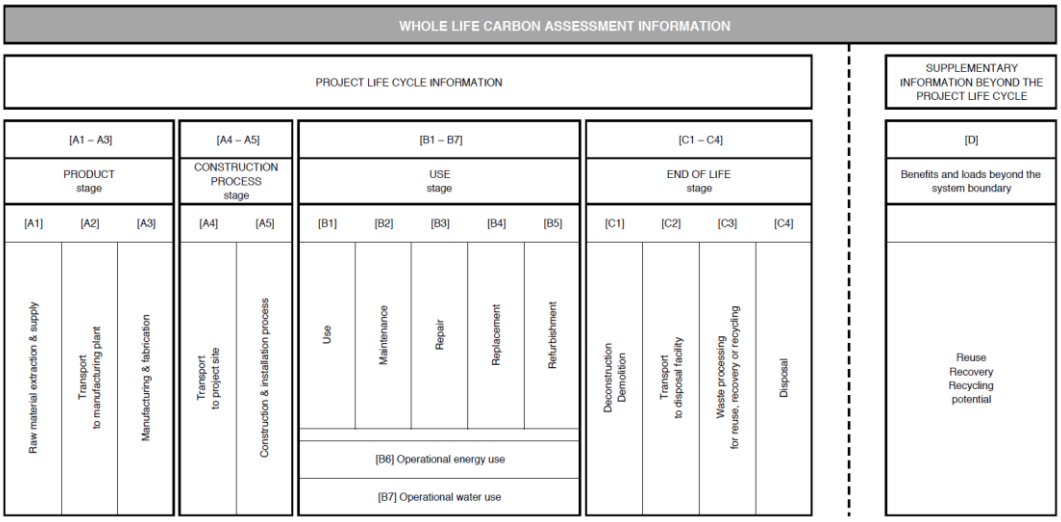


Figure 15.2 Lifecycle stages for a whole life carbon assessment as per EN 15978[2]

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.

[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]
[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]

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.

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	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. Emissions calculated over the 60-year design life using projected emissions intensity of the electricity grid. An allowance for maintenance and refurbishment has been included based on asset life expectancies.	Arup professional experience BEIS (2019) Green Book supplementary guidance: Table 1 Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal
Transport emissions	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.	BEIS (2019) Green Book supplementary guidance: Table 1 Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal
Rolling Stock and Infrastructure Testing	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. Hydrogen powered vehicle emissions are zero over the 60-year design life. 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. An allowance for maintenance and refurbishment has been included based on asset life expectancies.	ORR data portal Available at: https://dataportal.orr.gov.uk/ Rail Industry Decarbonisation Taskforce (2019) Final Report to the Minster for Rail Available at: https://www.rssb.co.uk/en/Research-and-Technology/Sustainability/Decarbonisation/Decarbonisation-our-final-report-to-the-Rail-Minister BEIS (2019) Green Book supplementary guidance: Table 1 Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

	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 significance[4] 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.

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

<table>
<tr><th>Emissions source</th><th>Assumptions</th></tr>
<tr><td></td><td>The benchmarks for embodied carbon in buildings are based on collated life cycle assessment data for the production stage emissions (refer to Figure 15.2). 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.
Further detail of the benchmarks used to calculate the emissions and the emissions breakdown per asset are included in Appendix 15A: GHG Assessment.</td></tr>
<tr><td>Access and ancillary civils</td><td>The car parks and walkways (ancillary civils) are assumed to be constructed as per the elements detailed below:
<table>
<tr><td>Type</td><td>Element for the ICE database</td></tr>
<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>
</table>
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.</td></tr>
<tr><td>Plant</td><td>Plant working hours are assumed to be 85 hours per week. Construction duration estimates for plant machinery is recorded in Chapter 3.</td></tr>
<tr><td>Transport</td><td>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.
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.</td></tr>
<tr><td colspan="2">Operation</td></tr>
<tr><td>Buildings</td><td>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.
The ratios for embodied emissions from the phases ‘to practical completion’ and ‘in operation’ are as summarised below:
<table>
<tr><th>Building type</th><th>Carbon emissions to practical completion</th><th>Carbon emissions in operation</th><th>Ratio</th></tr>
<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>Residential[5]</td><td>51%</td><td>31%</td><td>61%</td></tr>
</table></td></tr>
<tr><td>Access and ancillary civils</td><td>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.</td></tr>
<tr><td>Transport emissions</td><td>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</td></tr>
</table>

[5] Residential benchmark included for staff accommodation building

<table>
<tr><th>Emissions source</th><th>Assumptions</th></tr>
<tr><td></td><td>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.</td></tr>
<tr><td>Rolling Stock Testing</td><td>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.
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.
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.</td></tr>
<tr><td>Infrastructure Testing</td><td>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.
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.</td></tr>
<tr><td colspan="2">Maintenance and refurbishment</td></tr>
<tr><td>Buildings</td><td>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.
The ratios for embodied emissions from the phases ‘to practical completion’ and ‘in use’ are as summarised below:
<table>
<tr><th>Building type</th><th>Carbon emissions to practical completion</th><th>Carbon emissions in use</th><th>Ratio</th></tr>
<tr><td>Office</td><td>35%</td><td>32%</td><td>91%</td></tr>
<tr><td>Warehouse</td><td>47%</td><td>29%</td><td>62%</td></tr>
<tr><td>Residential[5]</td><td>51%</td><td>18%</td><td>35%</td></tr>
</table>
</td></tr>
</table>

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 CO_2 emissions by emission sources[6]

Emissions source	Emissions over appraisal period (tCO_2e)
Construction	
Rail testing infrastructure	30,400
Buildings	23,400
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

[6] Note that numbers are rounded to nearest hundred.

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 $ktCO_2e$ 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 $ktCO_2e$[7] 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 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.

[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]

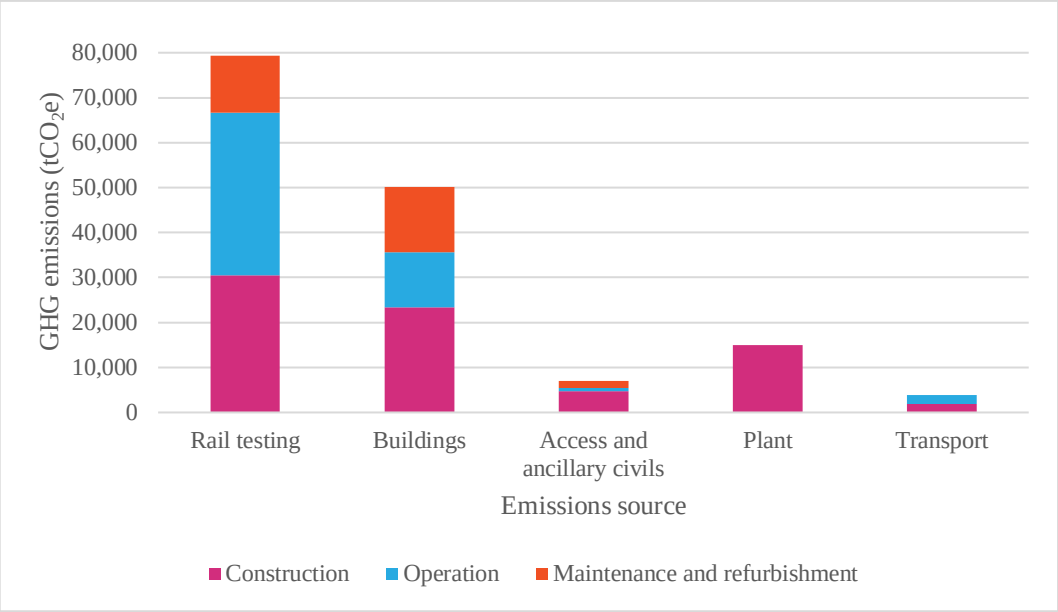


Figure 15.3 Total CO_2 emissions by emission sources

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 CO_2 emissions by emission sources in opening year of operation[6,6]

Emissions source	**Annual emissions in opening year, 2023 (tCO_2e/year)**
Operation	
Buildings	N/A[10]
Access and ancillary civils	100
Transport	13

[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.

Emissions source	Annual emissions in opening year, 2023 (tCO_2e/year)
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:

- 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 power[11]) 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

[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]

- 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 vegetation[12].

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 likelihood and consequences; and the evaluation of significance. These are shown in Table 15.6 and 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

[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.

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.

15.6.3 For the CCR assessment, the timeframe for the risk assessment has been selected to align with the start and end of the operational life.

15.6.4 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

15.6.5 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

15.6.6 Any risk equal to or above “medium” is considered significant.

Limitations and assumptions

15.6.7 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 UKCP[13];

[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]

- 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).

15.6.8 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

15.6.9 The future baseline environment for the CCR assessment include consideration of:

- Current climate conditions; and
- Projected future climate conditions.

15.6.10 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.

15.6.11 This section presents future projected climate conditions for the area encompassing the proposed scheme for the 2020s and 2080s[14]. 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.

15.6.12 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 change[15]; and
- The changes in extreme weather events were obtained using UKCP18 regional projections.

15.6.13 Climate change projections for a range of meteorological parameters are presented for different probability levels within the Representative

[14] The time periods for climate projections are selected based on the lifespan and stages of the proposed development
[15] Met Office, "UK Climate Projections (UKCP) - Met Office," 2018. [Online]. Available: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index.

Concentration Pathway 8.5 (RCP8.5)[16] high emission scenario for the near-term and long-term future time periods. Table 15.9 and Table 15.10 present 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.

15.6.14 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.

15.6.15 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.

15.6.16 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.

15.6.17 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.

15.6.18 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.

[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)		
			10th percentile	50th percentile	90th percentile	10th percentile	50th percentile	90th 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

15.6.19 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

15.6.20 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 deficiencies[19] 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

15.6.21 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.

15.6.22 Additionally, due to the uncertainties involved in adapting to future climate change, an adaptive pathway approach[20] 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