



CELTIC ENERGY LIMITED

NANT HELEN COMPLEMENTARY
RESTORATION EARTHWORKS

ENVIRONMENTAL STATEMENT
MAY 2020

ARUP



Celtic Energy Ltd
**Nant Helen Complementary
Restoration Earthworks**

Environmental Assessment

Issue | 4 May 2020



This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271968

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1 What is the Nant Helen Complementary Restoration Earthworks?

Celtic Energy Ltd currently operate Nant Helen open cast coal mine which covers the western end of the project site. The company will cease extraction operations in 2021 at which point they will be required to restore the land in accordance with regulatory requirements and agreements that are in place with Powys County Council (PCC).

The restoration scheme will form the basis for this project known as 'Nant Helen Complementary Restoration Earthworks' which combined with the restoration scheme would create a flexible and adaptable area of land that could be used for a variety of uses including agriculture, nature conservation, leisure, tourism and industrial, research and development/business uses. The site boundary is shown in Figure 1.

The planning application is being made by Celtic Energy Ltd. As the site crosses the local authority boundary between Powys and Neath Port Talbot, the application is being submitted to both Local Authorities who will be working together to determine it.

The Environmental Statement (ES) is submitted to accompany the planning application. It describes the environmental effects of the proposed project, assessed in accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. This document is the Non-Technical Summary (NTS) of the ES, providing an overview of the proposals and summarising the assessment outcomes.

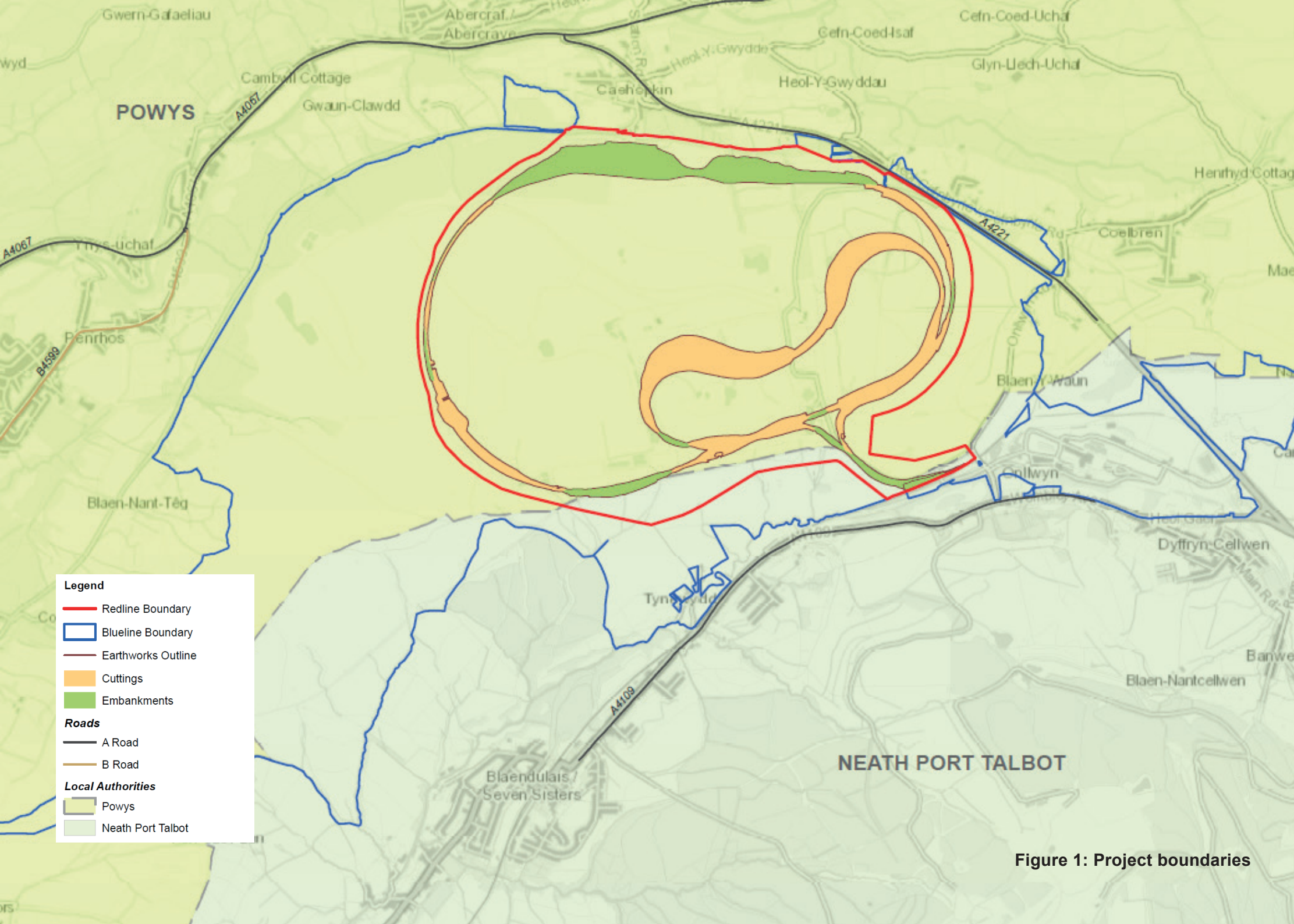


Figure 1: Project boundaries

2 What is being proposed?

The proposed project is to include earthworks and drainage works associated with the revised landform which covers an area of approximately 179 hectares and is located within the Dulais Valley. Nearby settlements include Onllwyn, Seven Sisters, Ystradgynlais, Caehopkin, Abercrave and Coelbren. The earthworks include a combination of cutting and embankments to create the loop form illustrated in Figure 2.

The earthworks have been designed to create a bridleway/footpath for walking, cycling and horse riding. The Brecon Beacons National Park (BBNP) is located immediately north of the site and the proposal is intended to possibly help reduce visitor pressure on the National Park by providing alternative areas of interest for these types of activities.

The possible industrial uses include the Welsh Government's proposed rail testing, research and development and storage facility, called the Global Centre of Rail Excellence (GCRE). The planning application for GCRE could be submitted later this year, following a final round of rail industry appraisal/evaluation.

The required profile for the GCRE would already have been created by the Nant Helen Complementary Restoration Earthworks, thereby avoiding the need for further extensive earthmoving.

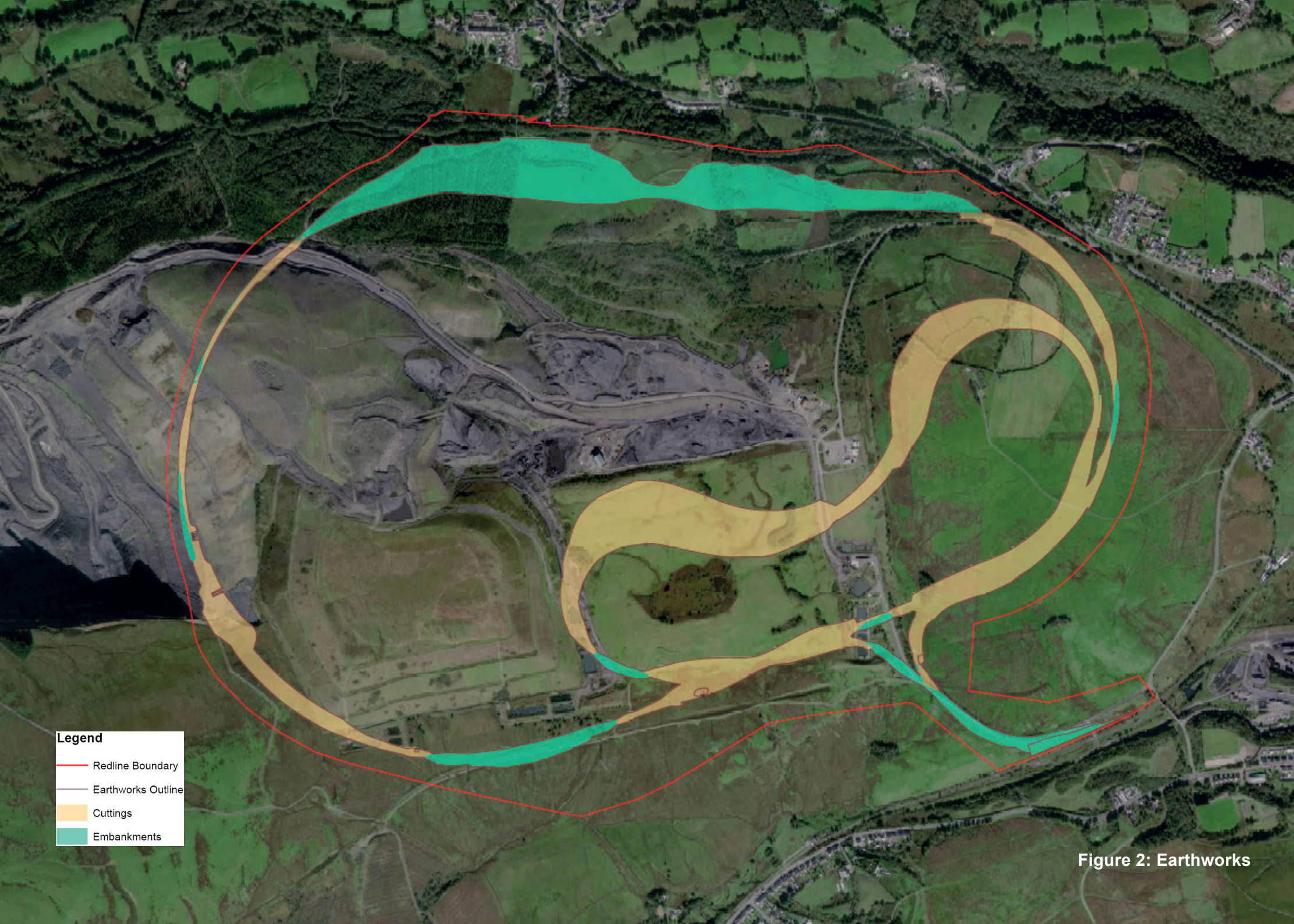


Figure 2: Earthworks

3 How have the plans evolved?

The proposed earthworks reconcile parcels of land that comprise the present day and wider past extent of coaling operations at Nant Helen Surface Mine. To all intents and purposes this includes land associated with the site's western extent that will be restored at the end of current coaling operations; and land associated with the site's eastern extent that has already been restored.

Coaling operations on the eastern and western extents of the site were subject to separate planning permissions, and therefore separate red line boundaries. Subsequently, a planning application which takes in the entire extent of land subject to coaling operations over the history of Nant Helen Surface Mine has been identified as the most efficient way to deliver the proposed earthworks, which would reconcile land that has been restored in the past with land that will be restored in the future.

In this context specifically, the proposed earthworks have been developed to complement the forthcoming revised strategy for restoring land on the western extent of the site. The combined restoration and earthworks plans are shown in Figure 3.

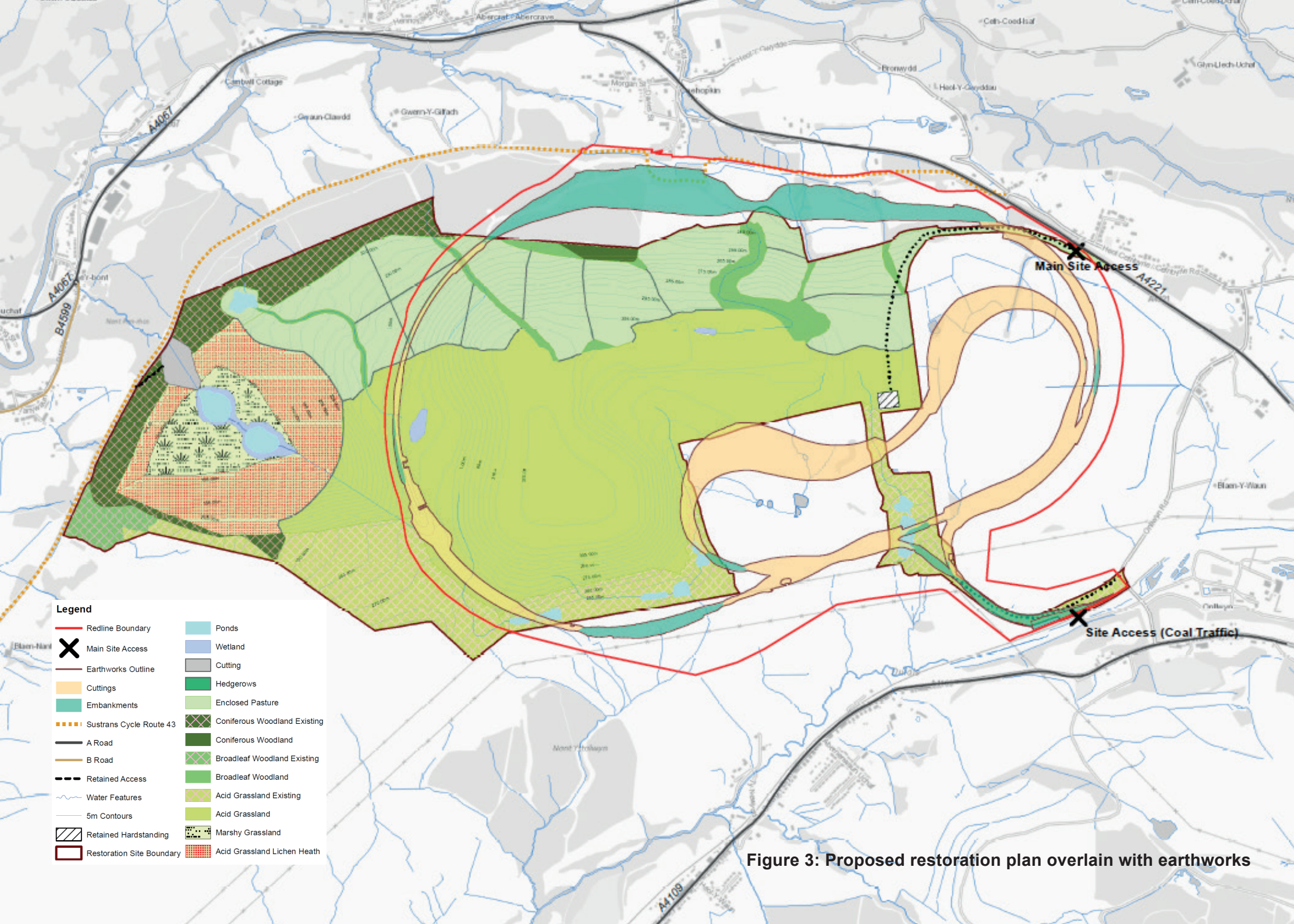


Figure 3: Proposed restoration plan overlain with earthworks

4 How would the Restoration Earthworks be undertaken?

The Nant Helen earthworks involves a combination of cutting and embankments to create the loop forms illustrated in Figure 2. The materials would all originate from within the existing Celtic Energy Nant Helen open cast mining site boundary and involves the following volumes of material:

- Cut - 3,255,000m³ (this also includes an allowance for attenuation pond construction); and
- Fill – 1,765,000m³

The works would be completed over a period of 73 weeks (17 months) and would include the following activities:

Activity	Description	Week
Site preparation	Ecological preparation works, vegetation clearance on the southern embankment, protection of services on the site, fencing and temporary drainage works along the southern embankment	1 - 10
Creation of cuttings	The western cuttings would be done first, followed by cut and fill to the southern section	2 - 21
Temporary drainage works	Temporary drainage works for the duration of construction would be implemented on the eastern section	22 - 35
Excavation	Excavation of cutting for the inner earthworks loop	38 - 67
Embankments	Construction of east northern embankment followed by the west northern embankment	39 - 67
Drainage works	Creation of the permanent drainage works required for the site	60 - 69
Soiling and seeding	Soiling and seeding across the site for stabilisation and landscaping on different sections as they gent finished sequentially	41 - 73

Working hours

In general, works would be carried out over 16 hours a day which reflects the existing site operation times for the opencast mine.

Reduced working hours would be implemented for works related to the Northern Embankment because of the close proximity of this area of the site to residential receptors which are likely to be more sensitive to noise. Works on the Northern Embankment would be restricted to 10 hours a day (between 8am-6pm).

Construction plant movements

Depending on which area of the site was being worked the restoration earthworks would result in a range of plant being used which would include a variety of excavators, bulldozers, dumptrucks, rollers and motor graders.



Abbreviations

AOD	Above Ordnance Datum
BBNP	Brecon Beacons National Park
BGS	British Geological Survey
CAMS	Catchment Abstraction Management Strategy
CEMP	Construction Environmental Management Plan
CIfA	Chartered Institute for Archaeologists
CPAT	Clywd Powys Archaeological Trust
DBA	Desk Based Assessment
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
ES	Environmental Statement
GCRE	Global Centre of Rail Excellence
GGAT	Glamorgan-Gwent Gwent Archaeological Trust
GPP	Guidance for Pollution Prevention
HER	Historic Environment Record
HEWRAT	Highways England Water Risk Assessment Tool
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
JNCC	Joint Nature Conservation Committee
LCA	Landscape Character Area
LDP	Local Development Plan
LVIA	Landscape and Visual Impact Assessment
NPTCBC	Neath Port Talbot County Borough Council
NPPF	National Planning Policy Framework
NRW	Natural Resources Wales
NTS	Non-Technical Summary
PCC	Powys County Council
PPG	Pollution Prevention Guidelines

PPW	Planning Policy Wales
PRoW	Public Rights of Way
RCAHMW	The Royal Commission on the Ancient and Historical Monuments of Wales
RIGS	Regionally Important Geological and Geomorphological Sites
RBD	River Basin District
RBMP	River Basin Management Plan
SLA	Special Landscape Areas
SMC	Scheduled Monument Consent
SSSI	Site of Special Scientific Interest
SPZ	Source Protection Zone
TAN	Technical Advice Note
UXO	Unexploded Ordnance
VP	Viewpoint
WFD	Water Framework Directive
WG	Welsh Government
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1.1 This Environmental Statement (ES) has been prepared to support the full planning application submitted to Powys County Council (PCC) and Neath Port Talbot County Borough Council (NPTCBC) for the following development:

1.1.2 *‘Construction of complementary restoration earthworks to create 2 looped landform platforms (part in cutting and part on embankment) with associated drainage infrastructure and areas of landscaping and habitat creation to create a flexible and adaptable area of land that could be used for a variety of uses including agriculture, nature conservation, leisure, tourism and industrial, research and development/business uses (potentially including a proposed rail testing, research and development and storage facility) on land at Nant Helen Surface Mine, Onllwyn’*

1.2 Proposed development

1.2.1 The proposed restoration earthworks, referred to as Nant Helen Complimentary Restoration Earthworks, are to include the following:

- Earthworks to include cutting and embankment; and
- Drainage works associated with the revised landform.

1.2.2 For the purposes of this ES, the elements of these Nant Helen Complimentary Restoration Earthworks are referred to as ‘the Project’.

1.3 Site location

1.3.1 The planning application site boundary is shown on Figure 1.1 and covers an area of approximately 416ha.

1.3.2 The Project site is within the Dulais Valley located within Powys and Neath Port Talbot, with the Brecon Beacons National Park Authority boundary immediately to the north. Nearby settlements include Onllwyn, Seven Sisters, Ystradgynlais, Caehopkin, Abercrave or Coelbren. The site is predominantly brownfield land that has been heavily worked by open cast mining. Much of the site has been revegetated.

1.4 Project context

1.4.1 The proposed site is currently being mined by Celtic Energy, who will cease extraction operations in 2021, at which point Celtic Energy will be required to restore the land in accordance with regulatory requirements and agreements with PCC. This includes s106 planning obligations and planning conditions that need to be discharged.

- 1.4.2** Celtic Energy has submitted a revised restoration strategy for approval (under Section 73 application under the Town and Country Planning Act 1990) which would change the existing approved restoration scheme (for planning application ref 18/1070/REM). The purpose of the variation is to allow for a *‘flexible and adaptable landform for a variety of uses on restoration including agriculture, nature conservation, leisure, tourism and some industrial uses’*¹.
- 1.4.3** Following discussions with PCC and NPTCBC both authorities have expressed a desire along with Celtic Energy to look at regeneration projects for the area that will create long term, sustainable jobs. Whilst not within the Brecon Beacons National Park (BBNP), due to its proximity the area has been identified as having the potential for a variety of uses. It is the intention of this project to complement the revised restoration proposal submitted by Celtic Energy in October 2019. Figure 1.2 overlays the Complementary Earthworks proposals with the Celtic Energy Restoration Strategy.
- 1.4.4** The revised restoration proposal looks to provide a flexible landform that can be used or adapted for a diverse set of future uses. This could range from the traditional agriculture, woodland and nature conservation uses, to amenity, leisure and tourism uses (including the potential for future tourist accommodation to add to the existing offering within the BBNP) that would be designed to help take visitor pressure off the BBNP.
- 1.4.5** Other uses of the site could also include industrial after uses such as the Welsh Government’s (WG) proposal to develop a rail testing and storage facility, known as the Global Centre of Rail Excellence (GCRE) at this site together with the adjacent Onllwyn Washery. It is anticipated that a planning application for the GCRE will be submitted early next year subject to confirmation of its feasibility.
- 1.4.6** The justification for designing the proposed earthworks in this way is that the landform would not only make an ideal bridleway / footpath for walking, cycling and horse riding, but should planning permission be awarded for the GCRE, then the required profile for this would already have been created, thereby avoiding the need for further extensive earthmoving should GCRE gain planning permission.
- 1.4.7** If desired, the earthworks programme required to create the profile for the GCRE could be accelerated. By accelerating this part of the programme the financial and environmental impacts of the GCRE project could be reduced by:
- utilising existing, onsite resources;

¹ Celtic Energy s73 application for variation of condition 45 of planning application 18/1070/REM – further addendum to original environmental statement and supporting information submitted under planning reference 18/1070/REM including revised LVIA.

- reducing heavy plant vehicle movements into, and out of the site, thereby reducing impact on the local road network;
- avoiding double handling of materials and therefore reduction in additional cost;
- aligning the earthworks programme with other restoration earthworks, therefore reducing the time period of construction activity on site;
- taking advantage of the opportunity for the GCRE earlier and contributing to the positive viability and deliverability;
- increasing the viability of future tourist developments such as hotels which would be supported by the GCRE temporary workforce both during and after construction; and
- more sustainable use of existing resources (including natural, human and mechanical) to allow for the full restoration of the site to be delivered without further disturbance in the event of future development.

1.5 Environmental impact statement structure

1.5.1 This ES contains the environmental information that is required by the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. It comprises a number of elements:

- Non-technical summary (NTS) – a NTS summarises, in non-technical language, the findings of the EIA. The NTS is provided independently and also included within the main ES (Volume I);
- Environmental Impact Statement (Volume I): Main Report – Volume I of the ES (this volume) which includes the topic assessments (chapters 4 – 15);
- Environmental Statement (Volume II): Appendices – Volume II includes the technical reports that accompany the ES technical assessments;
- Environmental Statement (Volume III): Figures – Volume III includes figures referenced within this ES (unless included within the text).

1.6 Application documents

1.6.1 The ES is being submitted to PCC/NPTCBC for determination as part of the outline planning application. Other documents submitted in support of the application include:

- Application forms and ownership certificates;

- Pre-Application Consultation Report;
- Drawing package;
- Planning Statement; and
- Drainage Strategy.

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 project, 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 has a number of required key characteristics, including that it is:
- **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, the planning application has been scoped to accord with the requirements associated with major development as prescribed by the regulations.
- 2.2.2** The need to undertake an Environmental Impact Assessment is prescribed under the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017, hereafter referred to as the EIA Regulations.
- 2.2.3** The Nant Helen project is not Schedule I development. It also does not fit neatly within the definitions of Schedule II. However, as the earthworks have an area of works that exceeds 1 hectare and, based on the size of the project, the sensitivity of the local environment and the

potential to result in significant environmental effects, it is considered to be Schedule II development as defined by the EIA Regulations.

2.2.4 Schedule 4 of the EIA Regulations set out what information needs to be included within the ES. This is outlined in **Table 2.1** below together with details of where this information is located within this ES.

Table 2.1 Schedule 4 information requirements

Schedule 4 requirement	Where assessed/included in this ES
A description of the development	Chapter 3
An outline of the reasonable alternatives studied (for example in terms of development design, technology, location, size and scale) and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Chapter 3
A description of the existing environment (baseline) along with an outline of the likely evolution thereof without implementation of the development	Chapters 4-11
A description of the aspects of the environment likely to be significantly affected by the development, including, population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Chapters 4-11– some topics have been scoped out of the assessment. This is discussed in Section 2.4
A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.	Chapters 4-11
A description of the forecasting methods or evidence used to identify and assess the effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Chapter 4-11
A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements. A description of the extent to which this is achieved should also be included.	Chapters 4-11
A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned.	Section 2.4
A non-technical summary	Provided with this ES and as a

	separate document
A reference list detailing the sources used for the descriptions and assessments included in the environmental statement	References included within each chapter of the ES, as required.

2.3 Guidance

2.3.1 This ES has been prepared in accordance with best practice guidance including:

- Welsh Office Circular 11/99 Environmental Impact Assessment;
- 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 hold the IEMA EIA 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.

2.4 EIA Scoping

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 the proposed development.

2.4.2 No formal scoping report was submitted for the planning authority for this Project (i.e. to PCC and NPTCBC), but an internal scoping exercise was undertaken identifying a number of topics that could be scoped out of the full EIA due to the judgement that no significant impacts would result from the Project in these areas. Table 2.2 summarises the scope of the EIA. The assessment reports of the topics which have been scoped in are set out in Chapter 4-11 of this ES.

Table 2.2 Scope of EIA

Assessment topic	Summary of scope
Socio-economics	Scoped out , except for consideration of Public Rights of Way (PRoW) and issues related to common land and rights of access.
Noise and vibration	The likely significant effects from construction works associated with the Project (excavation of cuttings and construction of embankments) have been assessed. The predicted noise levels without mitigation at all receptors bar

Assessment topic	Summary of scope
	Receptor 1 (dwellings in the south of Caehopkin adjacent to the quarry site) would not result in significant effects. Without mitigation in place, construction noise impacts would occur at dwellings represented by Receptor 1: mitigation in the form of a 5m screen on the perimeter of the site would control noise levels to these dwellings and prevent a significant effect. Scope out - except for at Receptor 1.
Air quality	Scoped out. The nearest sensitive receptors are located approximately 500m away from proposed dust generating activities. In human health terms, background annual PM₁₀ concentrations are low (9-10ug/m³). There is a very low risk that air quality objectives will be exceeded by the proposed activities provided that good practice measures are followed. An assessment of mineral dust impacts on human health receptors is screened out. The mineral type at the proposed site is soft rock according to the British Geological Survey. Due to the nearest sensitive receptors being more than 500m away from the proposed dust generating activities and the low background annual PM₁₀ concentration it is considered that, in accordance to the IAQM mineral dust guidance (IAQM 2016, Guidance on the Assessment of Mineral Dust Impacts for Planning), a detailed disamenity dust impact assessment is not required.
Traffic and Transport	Scoped out. No materials will be transported to the site for the earthworks therefore there would be no impact on the local or regional road network or railways.
Hydrogeology and flooding	Scoped in
Ground conditions	Scoped in
Biodiversity	Scoped in
Cultural heritage	Scoped in
LVIA	Scoped in
Health and wellbeing	Scoped out. The earthworks are not considered likely to result in any population health and wellbeing effects.

Assessment topic	Summary of scope
Climate change	Scoped out. The earthworks are not considered to contribute significantly to greenhouse gas emissions and the Project is not considered to be vulnerable to climate change.
Major accidents and disasters	Scoped out. The Earthworks are not considered in themselves likely to give rise to major accident or disaster effects upon environmental receptors.
Cumulative effects	Scoped in
Decommissioning	Scoped out. Decommissioning effects are scoped out of the EIA as once in place it is anticipated that the earthworks would remain in perpetuity.

2.5 Consultation

2.5.1 Whilst there was no formal EIA scoping with statutory consultees, consultation was carried out throughout the assessment process with relevant consultees. This included consultation with the following:

- Neath Port Talbot Highways Authority (includes Drainage)
- Powys Highways Authority
- Natural Resources Wales (NRW) - South West Wales
- Cadw, Welsh Government
- The Health and Safety Executive
- The Glamorgan Gwent Archaeological Trust
- The Coal Authority

2.5.2 The ES has been prepared and updated based on the consultation responses received, both prior to, and following the statutory pre-application consultation period. This was undertaken from 18 February to 16 March 2020 in line with the requirements of the Planning (Wales) Act 2016. The deadline for responses to the consultation was later extended to 25 March 2020 at the request of one of the statutory consultees.

2.5.3 Public consultation was carried out during through the formal pre-application consultation. A total of six phone call and emails were received during the consultation from Community consultees, residents and neighbouring landowners consultation which have been addressed. Please refer to the Pre-application Consultation Report

which has been submitted in support of the planning application for more details and outcomes related to the consultation process.

2.6 Assessment methodology

2.6.1 Once the scope of the EIA had been established, individual environmental topics were subject to survey and investigation to establish the baseline conditions that exist before the Project proceeds. This was followed by assessment to identify and predict the significance of the likely environmental impacts of the proposed Project. 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.

2.6.2 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 Project on the existing baseline and any mitigation that may be possible;
- Assessment of the final Project design and evaluation of the significance of any residual and cumulative effects; and
- Compilation of the relevant ES chapter.

2.6.3 Many of the environmental effects are relevant to more than one topic area and therefore, attention has been paid to the interrelationship between them. For example, the biodiversity assessment, has received input from the water resources and air quality assessments.

2.6.4 In general, the ES assessment chapters have followed the same general format set out below, although there is variation between topics:

- **Introduction** - presents the potential scope of assessment and sets the general scene for the topic;
- **Approach and methodology** – a description of the methods used to establish the baseline conditions, identify the likely effects of the proposed development and the assessment of their significance. Details of any consultation are generally included in this section;
- **Assessment criteria and assignment of significance** - a description of the approach taken to identify the magnitude of

an impact, the sensitivity of a receptor and how these combine to result in an assigned significance;

- **Assessment limitations** – a description of any limitations experienced during assessment;
- **Assumptions** – a description of any assumptions that have been made within the assessment;
- **Baseline environment** – a description of the current state and circumstances of the receptors and changes that might reasonably be expected to occur over the project lifetime or during periods considered in the assessment if the proposed Project was not implemented;
- **Design mitigation** – mitigation that has been included within the design of the Earthworks;
- **Potential effects of the proposed project** – this is an assessment of the significant environmental effects of the Project as set out in Chapter 3: Proposed Development. Effects are considered for the earthworks themselves in addition to any effects that would occur due to the ongoing presence of the earthworks;
- **Prevention and mitigation** – measures that would be implemented to avoid, reduce, control, manage or compensate for potential significant effects. Enhancement measures are also set out, if relevant;
- **Survey and monitoring** – Where relevant, recommendations for any surveys or monitoring that should be undertaken during earthwork operations; and
- **Residual effects** – an assessment of the significance of the effects likely to arise as a result of the Project following implementation of any mitigation measures.

2.7 Baseline

2.7.1 Celtic Energy's restoration plan² (and accompanying ground model) has been used as the basis for the Nant Helen Complementary Restoration Earthworks model, planning boundary and ongoing drainage strategy work.

2.7.2 However, for the purpose of the EIA, the existing (i.e. pre-restoration) conditions have been used as the baseline because the restoration will not have commenced before the Earthworks proposed in this application have begun and the Project boundary extends beyond the restoration site boundary.

² The restoration plan refers to the revised restoration strategy which has been submitted (November 2019) for approval (under Section 73 application under the Town and Country Planning Act 1990) which would change the existing approved restoration scheme (for planning application ref 18/1070/REM).

2.7.3 The exception to this is the landscape assessment which uses the restored site levels as the baseline to allow for the fact that the site is currently predominantly an open cast mine which has a planning condition requiring restoration of the site. Likewise, the biodiversity assessment also considers the restored landscape baseline where appropriate. For example, there are some areas of habitat proposed within the Restoration Plans which would be lost due to the Earthworks. This is therefore taken account of within the assessment by using the future restored baseline to identify potential impacts.

2.8 Identification and significance of effects

2.8.1 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 Project; 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.

2.8.2 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 Project is likely to cause the affected receptors.

2.8.3 In broad terms, significance is defined to be a function of:

- Resource value/receptor sensitivity;
- Magnitude of effect (either adverse or beneficial); and
- Temporal scale (temporary or permanent)

2.8.4 Each topic chapter defines what criteria have been used to establish resource value/sensitivity and magnitude of effect.

Temporal scale

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

- Short term: Up to 1 year;
- Medium term: 1-7 years; and
- Long term: greater than 7 years.

Significance scales

2.8.6 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.

2.8.7 Within each assessment topic, where effects have been classified as being of **moderate and/or major significance** (either beneficial or detrimental), the effect is considered significant in EIA terms.

2.9 Assumptions and limitations

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

3 Project description

3.1.1 A full planning application has been submitted for Nant Helen Complementary Restoration Earthworks (the Project). A description of the Project is set out below along with the characteristics of the construction phase. The description provided here is the basis upon which the EIA has been undertaken.

3.2 Complementary restoration earthworks

3.2.1 The restoration earthworks include a combination of cutting and embankments to create the loop form illustrated in Figure 1.1. The materials for the earthworks would all originate from within the existing Celtic Energy Nant Helen open cast mining site boundary and represent the following volumes:

- Cut – 3,255,000m³ (this also includes an allowance for attenuation pond construction); and
- Fill – 1,765,000m³

Earthworks modelling

3.2.2 The earthworks modelling has been based on Celtic Energy's restored site levels, i.e. the revised restoration strategy submitted under Section 73 of the Town and Country Planning Act 1990, which seeks to change the existing approved restoration scheme under planning application reference 18/1070/REM. The baseline for the

Vehicle movements and programme

3.2.3 The cut excavation will likely be carried out using a combination of machinery, each achieving approximately half of the cut excavation (i.e. 1,627,500m³). Table 3.1 sets out the potential number of vehicle movements across the site based on these estimations:

Table 3.1 Estimated vehicle movements within the site

Machinery	Load rate (approx.)	Machinery used with	Carrying Capacity	Loads per hour	Total number of loads	Total hours
PC2000	600m ³ /hr	Cat 777 dump trucks	52m ³	600/52 = 11.5	1,627,500/52 = 31,298 loads	31,298/11.5 = 2,721
Hitachi EX1200	560m ³ /hr	40 tonne Articulated Dump Trucks (ADT's)	17m ³	560/17 = 32.9	1,627,500/17 = 95,735 loads	95,735/32.9 = 2,909

- 3.2.4** With the exception of the Northern Embankment, works would be carried out over 16 hours a day, 7 days a week (which is the existing site operation times for the opencast mine). Due to the closer proximity of the northern embankment to residential receptors, works on this area would be based on a 55-hour working week (0700hrs-1800hours Monday to Friday and 0800hrs-1300hrs on Saturdays).
- 3.2.5** It is assumed that the Complementary Restoration Earthworks would take place at the same time as the works needed to return some of the overburden back into the void on the site (part of the restoration requirements includes the reduction in height of the overburden mound that currently exists to the east of the existing void). Together with the required site preparation works (ecological, archaeological and drainage works), this would result in a combined works programme of approximately 73 weeks with approximately 300-600 vehicle movements a day.
- 3.2.6** An outline draft programme for the Complementary Restoration Earthworks is set out in Appendix A.
- 3.2.7** Table 3.2 identifies which plant will be required on the site for the activities identified. Those marked with * are already present on the site.

Table 3.2 Plant requirements on site during complementary restoration earthworks

Site activity	Plant requirements
Ecological Preparatory Works	1 No 20 Tonne Excavator, 2 No 5 tonne Dumper, 2 No 7.5 Tonne Mini Digger
Vegetation Clearance	2 No 20 Tonne Excavator, 1 No Forestry Forwarder, 2 No Cat D6 Bulldozer, 4 No 30 Tonne Articulated Dumptrucks
Fencing Works	1 Self propelled Post Knocker, 2 No Agricultural Tractor & Trailer
Temporary Drainage Works	No additional requirement*
Protection of Archaeological Features	No additional requirement
Protection of Services	No additional requirement
Soil Stripping Operations	1 No Cat D6 Bulldozer, 2 No 45 tonne Articulated Dumptrucks
Excavation of Cutting for Inner Track	5 No 45 Tonne Articulated Dumptruck, 1 No Motor Grader **
Construction of Northern Embankment - Main Track	1 No Cat D9 Bulldozer, 1 No Cat D8 Bulldozer, 2 No Sit on Rollers
Construction of False Eastern Embankment - Main Track	No additional requirement
Construction of Southern Embankment / Cutting -Main Track	1 No Cat D9 Bulldozer
Construction of Western Embankment / Cutting	No additional requirement
Landscaping of Surplus material from Cutting	No additional requirement

Site activity	Plant requirements
Permanent Drainage Works	No additional requirement
Soiling of Embankments	No additional requirement
Planting and Seeding of Embankments	2 No Tractor and Trailer
* No additional requirement means that these are already on site operating on the open cast mine **Note: Hitachi 1200 and Komatsu 2000 Excavator together with 5 No 100 tonne dumptrucks already on site for use in mining activities	

Stormwater Drainage Strategy

- 3.2.8** A stormwater drainage strategy has been prepared for the Earthworks which will identify how water falling on the site during rainfall events will be managed and mitigated to attenuate flows.

Access

- 3.2.9** Existing access onto the site for personnel would be via the A4109, into Celtic Energy owned land. Machinery used for earthworks will also be brought to the site along this route.

Landscaping

- 3.2.10** At this stage the earthworks landscaping would be limited to planting and seeding of the embankments. A landscape strategy would be developed once the future use of the earthworks has been confirmed.

Lighting

During earthworks lighting will be required during winter months to facilitate safe working. On completion no lighting is currently anticipated.

4 Public Rights of Way/Common Land

4.1 Introduction

- 4.1.1** This assessment considers the potential effects that the Project would have on the Public Rights of Way (PRoW) that cross or are adjacent to the Project site, and on the registered common land that falls within the redline (Mynydd-y-Drum). Consideration is given to both the existing baseline across the site and to the future restored baseline of the site, which is committed and is set out in the Restoration Plan submitted by Celtic Energy.

4.2 Review of proposed development

- 4.2.1** The earthworks seek to provide a flexible landform that can be used or adapted for a diverse set of future uses which could include amenity and leisure such as walking, cycling and horse-riding. This would provide opportunities for enhancing the PRoW network in the area.
- 4.2.2** The Celtic Energy restoration scheme includes reinstating Commoners' rights across the Common.

4.3 Legislation, policy context and guidance

Legislation

- 4.3.1** The Countryside Rights of Way Act 2000 makes provisions for the public to access the countryside. It includes measures to improve public access to the open countryside and registered common land. The Act is split into three parts:
- Part I: Access
 - Part II: Rights of way
 - Part III: Nature conservation
- 4.3.2** The Commons Act 2006 makes provisions for the protection and management of common land. Where works are proposed on common land consent must be sought from Planning Inspectorate Wales.

Policy context

National policy

- 4.3.3** Planning Policy Wales (PPW) Edition 10 recognises the importance of Public Rights of Way as both tourism assets and also in contributing to green infrastructure provision. In turn, the potential benefits of

green infrastructure are also recognised, including the potential well-being benefits of this infrastructure.

- 4.3.4** Paragraph 6.3.17 of PPW considers Common Land and recognises it as a finite resource that should not be developed unnecessarily.
- 4.3.5** Technical Advice Note 16 (TAN16): sport, recreation and open space. This TAN provides guidance on the role of the planning system in making provision for sport and recreational facilities and informal open spaces as well as existing facilities and open spaces in rural Wales.
- 4.3.6** WG Strategy for Sport and Active Recreation: “Climbing Higher” - This is a strategy which sets out means of encouraging the Welsh population to participate more in sport and active recreation. Improving access to the countryside and coast is a key part of how this would be achieved.

Local policy

- 4.3.7** The Local Development Plan for Powys (Adopted LDP 2011-2026), identifies PRowS as important recreational assets which need to be considered within any development proposals. Policy DM13 stipulates that the PRow network should be enhanced and integrated into development proposals or appropriate mitigation measures should be put in place where necessary.
- 4.3.8** The Local Development Plan for Neath Port Talbot (adopted LDP 2011-2026) recognises the importance of open space and access to recreation space with Policy SP2 identifying the need to maintain and promote access to a range of accessible leisure and recreational facilities throughout the County. This includes consideration of PRow.

4.4 Consultation

- 4.4.1** Powys County Council have been consulted in relation to PRow that cross and are connected to the site as well as in relation to Common land. Information obtained includes definitive maps of PRow, Commoner registers and legal agreements across the site in relation to both PRow and Common Land. There are no PRow across the site that are within Neath Port Talbot.
- 4.4.2** PCC have also been consulted in relation to the PRow and Common Land strategy that is being put in place to manage these assets during both construction and once the earthworks are completed.

4.5 Methodology

Overview

- 4.5.1** There is no standard methodology for assessing the impact of effects from a development on PRow, however assessment guidance from DMRB related to population and human health (LA112¹) includes consideration of walkers, cyclists and horse riders as part of the assessment on effects on land use and accessibility in relation to road schemes. This methodology has been applied to this assessment with professional judgement used where necessary throughout.
- 4.5.2** Powys County Council are taking the lead on the development of a strategy for dealing with issues related to the Common Land. However, the majority of these issues, and the need for a management strategy would be most relevant should the GCRE project be granted planning permission.

Methodology for establishing baseline conditions

- 4.5.3** The study area includes the Project boundary in addition to a 500m area surrounding the boundary. All PRow within this study area have been identified using the PRow definitive map of Powys and Neath Port Talbot.
- 4.5.4** Due to the operation of the mine at Nant Helen, the majority of these PRow which cross the site have been suspended or diverted for the duration of coaling. These have been confirmed through review of existing project documentation for Nant Helen mine works and the associated restoration scheme, in addition to consultation with Powys.
- 4.5.5** The frequency of use of the PRow has been estimated qualitatively based the surrounding settlements and through consultation with Powys.

Assessment methodology

- 4.5.6** The assessment of effects is based on consideration of the sensitivity of the PRow/Common land and the magnitude of change which have been defined following the criteria set out in Table 4.1 and Table 4.2 respectively. These are based on DMRB assessment guidance (LA112) and have been adapted to include consideration of Common Land.

¹ DMRB, 2019. Sustainability and Environmental Appraisal, LA112, Population and Human Health

Table 4.1 Receptor value/sensitivity

	Definition of sensitivity
High	Land or assets 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 regional or 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 or Common Land.
Medium	Land or assets 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 footpath or bridleway; irreversible effects on Grades 2 and 3a BMV agricultural land, residential properties, business premises of tourism facilities where they are situated in the works area.
Low	Land or assets 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 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.

Table 4.2 Magnitude of impact

	Definition of magnitude
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.
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.
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.
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.

4.5.7 The assessment of effects during construction will be based on the current baseline of the site because the works would be done alongside those required for the restoration scheme at which time, no PROW would have been reinstated.

4.5.8 The assessment of effects on completion of the Complimentary Earthworks will be based on the future baseline which is that which

has been agreed following restoration of the site, i.e. a site across which PRoW have been reinstated, as required through planning obligations by Celtic Energy.

Significance Criteria

- 4.5.9** Based on the combined consideration of receptor sensitivity and impact magnitude the significance of effect is determined. Table 4.3 sets out the approach that is taken.

Table 4.3 Significance of effect based on impact magnitude and receptor value

		Magnitude of impact (change)			
		Negligible	Minor	Moderate	Major
Receptor value (Sensitivity)	High	Minor	Moderate	Major	Severe
	Medium	Minor	Minor	Moderate	Major
	Low	Negligible	Minor	Minor	Moderate

4.6 Limitations and assumptions

- 4.6.1** The baseline has been assumed to be the restored site which has had the PRoW and Common land rights restored, as shown on Figure 4.1.
- 4.6.2** No user surveys have been carried out on any of the PRoW and it is not possible for the majority of them that cross the site as they are currently suspended for the duration of mining works. An assumption has therefore needed to be made regarding their likely usage, based on the routes, proximity to settlements and/or other areas of interest.
- 4.6.3** The restoration earthworks aim to create a form that is versatile and could be used or adapted for a diverse set of future uses. As set out in the project description in Chapter 1, this could range from the traditional agriculture, woodland and nature conservation uses, to amenity, leisure and tourism uses that would be designed to help take visitor pressure off the Brecon Beacons National Park.
- 4.6.4** If the earthworks were to be used for amenity, leisure and tourism, PRoW could be created across the site, in particular using the earthworks as amenity features. However, at this stage, the end use is not confirmed and therefore no assumption has been made regarding this potential provision.

4.7 Baseline Environment

4.7.1 Based on the definitive map, there are a number of PRow that cross the site, and which would be impacted by the Complementary Restoration Earthworks. These are shown on Figure 4.1 and are listed in Table 4.4.

4.7.2 However, this is not the existing baseline on the site, but rather the future baseline once the approved restoration plan for the site has been delivered. For clarity therefore, Table 4.4 also gives an indication of which PRow have been suspended or temporarily closed for the duration of coaling, and therefore represents the current (2019) situation across the site. A value has also been assigned to each of the PRow in their existing and future state.

4.7.3 For the purpose of the assessment of construction effects, the existing baseline will be considered because the earthworks would be done alongside the restoration works (i.e. before the PRow have been reinstated). For the purpose of the on-completion effects, it is against the restored site which effects will be considered, i.e. with the PRow restored as dictated by the definitive map because this is what is currently anticipated and agreed through planning conditions of the Nant Helen open cast mine.

4.7.4 Appendix 4A includes the suspension order and mapping which was applied for by Celtic Energy under Section 15 of the Opencast Coal Act, 1958 to suspend some routes and to provide alternative routes. These have been in place since 1997. The map provides visual clarity of which PRow have been suspended or temporarily closed.

Table 4.4 PRow affected by the project, current status and value (2019) predicted future value.

PRow	2019 status	Receptor value (sensitivity) of current baseline - 2019	Receptor value (sensitivity) of future baseline
Footpath 40	Suspended for the majority of the length where it crosses the Nant Helen site.	Low value based on current suspended status with no use.	Medium value due to being close to communities that can be used for recreation, but alternative routes are available.
Bridleway 45 (which becomes bridleway 66)	Open except for a short section which crosses the access route to the south of Nant Helen site which has been suspended.	Low value as one section is suspended for use disconnecting it from the wider network.	Low value as route does not offer a meaningful route even when not suspended in parts

PRoW	2019 status	Receptor value (sensitivity) of current baseline - 2019	Receptor value (sensitivity) of future baseline
Footpath 19	Mostly suspended	Low value as the majority of it has been suspended except for one short section at the south of its length. Whilst it connects into Footpath 11 to the south, the northern end ends abruptly.	Medium value as it offers a route north-south across Mynydd-y-Drum. However, it possibly wouldn't be used very frequently as it doesn't connect communities.
Footpath 50 (which becomes footpath 90)	Mostly suspended	Low value based on current suspended status with no use.	Medium value as it offers a route east - west across Mynydd-y-Drum. However, it possibly wouldn't be used very frequently as it doesn't connect communities
Footpath 11	Part of the footpath that extends for 215m from a point 230m south-east of Gwern Gyrlais Farmstead near Penrhos to a point 445 m south-east of that Farmstead is suspended. The rest of the footpath which extends past Bryn Llechwen is open. An alternative Right of Way No.1 (1997) provided for the section that was suspended.	Medium value. Whilst part of the route was suspended, an alternative was provided which maintains connection around the site to Penrhos	Medium value as it offers a connection from Penrhos to Tynewydd.
Footpath 17	A portion of this PRoW which crosses the Nant Helen site is temporarily closed	Low value due to its current status with no use.	Low value due to its likely low usage and alternative routes being available.
Footpath 52	Temporarily closed	Low value due to its current status with no use.	Medium value as it links two other PRoW (11 with 49). Likely to have low usage.

PRoW	2019 status	Receptor value (sensitivity) of current baseline - 2019	Receptor value (sensitivity) of future baseline
Footpath 76	Temporarily closed	Low value due to its current status with no use.	Medium value as it links three other PRoW (11, 7 and 52).
Footpath 49	Suspended and temporarily closed	Low value due to its current status with no use.	Medium value as it offers a link across the site from Onllwyn to Caehopkin.
Footpath 7	Temporarily closed	Low value due to its current status with no use.	Medium value as it is the only route crossing the site at this point, but there are alternative routes available

4.7.5 Alternative rights of way were created under the Suspension of Public Rights of Way Order 1997 which are still in place today. These are shown in the Figure within Appendix 4A, but in summary include:

- Alternative Right of Way No.1 (1997) – this starts at the disused railway line at a point 350m south-south east of little London, extends south west for a distance of 560m, then along the track parallel to the former railway line for a further 480m and then turning eastwards for a distance of 200m before joining footpath No.11 at a point approximately 300m east of Hendre-ladis. This is to replace the sections of Footpaths 11 and 40 which would be lost.
- Alternative Right of Way No.2 (1997) – this starts at the disused railway line at a point approximately 234m south-south-west of Gwern-y-Gilfach Farmstead, extends southwest for a distance of approximately 720m to make an end-on connection with Alternative Way No.1 at a point approximately 350m south-south-east of little London.

4.7.6 The sensitivity of these Alternative Rights of Way is considered to be high based on their inclusion within Sustrans cycle route 43 (part of the National Cycle Route) which runs between Swansea and Caehopkin (shown on Figure 4.1) and which is reasonably well used. These alternative routes would remain in place and accessible during both construction and no completion.

4.7.7 Mynydd-y-Drum common covers much of the site and wider locality and is registered common land with several registered commoners with grazing rights. Some of these commoners have signed legal agreements with Celtic Energy for the temporary suspension of

grazing rights for the duration Nant Helen Surface Mine's coaling operation.

4.8 Assessment of effects

Assessment of effects from construction

4.8.1 During the earthworks the following impacts have been identified for the PRow:

Footpath 40

4.8.2 No change from existing suspension.

Bridleway 45 (which becomes bridleway 66)

4.8.3 A further section of this bridleway would need to be suspended representing a moderate magnitude of change and resulting in a route that would not be meaningful. Combined with its low value, the significance of this adverse impact is **minor**.

Footpath 19

4.8.4 The majority of this route has been suspended for the mine works. The remaining section where it meets Footpath 10 would need to be suspended representing a minor magnitude of change due to the short section of PRow being removed that currently doesn't lead to any destination or provide a link to another PRow. Combined with its low value, the significance of this impact is **minor**.

Footpath 50 (which becomes footpath 90)

4.8.5 No change from existing suspension.

Footpath 11

4.8.6 No change from existing suspension.

Footpath 17

4.8.7 No change from existing suspension.

Footpath 52

4.8.8 No change from existing suspension.

Footpath 76

4.8.9 No change from existing suspension.

Footpath 49

- 4.8.10 No change from existing suspension and temporary closure.

Footpath 7

- 4.8.11 No change from existing temporary closure.

Alternative Way 1 and Alternative Way 2

- 4.8.12 No change from existing.

Common land

- 4.8.13 During the earthworks the Common Land rights will continue to be suspended under the same legal agreements that are in place for the mining works. As the earthworks will be carried out prior to the completion on the restoration of the site, there will be no additional impacts on Common Land than those currently experienced.

Assessment of effects on completion

- 4.8.14 On completion of the earthworks, the resulting impacts will depend on what the earth form is ultimately used for. For example, impacts will be very different should the earthworks be used for the GCRE project than if the earthworks were used as a recreational resource.
- 4.8.15 As it is not yet confirmed what the earthworks will ultimately be used for, this assessment considers the earthworks in isolation and has assessed impacts based on no further engineering works taking place. Should GCRE move forward, that project and the accompanying EIA will consider the effects on PRow and Common land associated with those works and operational impacts.
- 4.8.16 With this in mind, an assumption is made that on completion of the earthworks (and restoration of the site), the PRow will be restored as closely as possible to the routes as shown on the definite map. This will not be possible in all instances due to the new cuttings and embankments created by the earthworks, therefore some deviations will need to be agreed with Powys County Council. An overview of what these deviations are likely to be is set out below:

Footpath 40

- 4.8.17 A slight deviation is likely to be required where the footpath comes close to a section of cutting on the east of the site. This change would be of minor magnitude which combined with its medium future value, would result in an adverse impact of **minor** significance.

Bridleway 45 (which becomes bridleway 66)

- 4.8.18** The bridleway would need to be rerouted to avoid the embankments and a small section of cutting. This would potentially result in a long deviation of moderate magnitude which combined with its low future value would result in an adverse impact of **minor** significance.

Footpath 19

- 4.8.19** Once reinstated, this footpath would need to be diverted where it meets the embankment to its south. It would be possible to route the footpath over the embankment, but to avoid prohibitive steepness, a longer, less direct route would be required to achieve this. This would result in the footpath becoming steep in this section which is considered to be an adverse impact of minor magnitude. Combined with the medium future value would result in an adverse impact of **minor** significance.

Footpath 50 (which becomes footpath 90)

- 4.8.20** This footpath will be reinstated as part of the restoration works and the earthworks will not directly impact this route. However, they will affect the connectivity of footpath 50 to Footpaths 49 and 7. It is considered that this is a minor magnitude adverse impact, which combined with the medium future value would result in an adverse impact of **minor** significance.

Footpath 11

- 4.8.21** This footpath would likely require diverting to avoid the embankment to the north of the site. An obvious option for this includes diversion onto Sustrans Route 43 where it would go on to connect to the west with Footpath 17. This change is considered to be of minor adverse magnitude which combined with the medium future value would result in an adverse impact of **minor** significance.

Footpath 17

- 4.8.22** This footpath would likely need to be diverted to avoid the embankment in the north of the site. An obvious option for this includes diversion onto Sustrans Route 43 where it currently meets it south of Gwaun-Clawdd. Moving east it would then continue along Route 43. This change is considered to be of moderate magnitude due to the proposed length of the footpath that would be diverted. Combined with the future low value of the route, this would result in an adverse impact of **minor** significance.

Footpath 52

- 4.8.23** Part of this route crosses the embankment to the north of the site. Due to the steep incline of the embankment, this would likely need to be diverted over the embankment to reduce the steepness of the route. This adverse change to that shown on the definitive map would be of minor magnitude. Combined with a future medium value, this would result in an adverse impact of **minor** significance.

Footpath 76

- 4.8.24** This route crosses the embankment to the north of the site. Due to the steep incline of the embankment, this would likely need to be diverted over the embankment to reduce its steepness. This adverse change to that shown on the definitive map would be of minor magnitude. Combined with a future medium value, this would result in an adverse impact of **minor** significance.

Footpath 49

- 4.8.25** This route would need to be diverted to avoid the area of cutting half way along the route. An option for the diversion includes diverting along the cutting to meet with Footpath 7 to the north of the site. This would substantially reduce the connectivity northwest-southeast across the site (between Onllwyn and Caehopkin) resulting in a change of moderate magnitude. Combined with a future medium value, this would result in an adverse impact of **moderate** significance. It is not considered to be of large significance due to the likely low usage of the route.

Footpath 7

- 4.8.26** This footpath would need diverting in two places. To the north it would likely be diverted over the embankment to reduce the steepness of the route. Half way along this route it would cross a large section of cutting. It would therefore need diverting to avoid the cutting, most likely south-eastwards, to join with Footpath 49. This change is considered to be of moderate adverse magnitude which combined with a future medium value would result in an adverse impact of **moderate** significance.

Alternative Way 1 and Alternative Way 2

- 4.8.27** It is anticipated that these routes would be extinguished and the original routes that these replaced reinstated. As these actually follow the Sustrans route 43, in reality access will still remain and people will still be able to use this path, even though it would no longer be an official PRow on the definitive map.

Common land

- 4.8.28** A Common Land Strategy is currently being developed by Powys County Council and Neath Port Talbot County Borough Council. This will set out the proposed approach for managing any changes that will arise as a result of changed access to the common on completion of the earthworks. Details of this strategy are currently being developed; there will be consultation with affected Commoners and at this stage it is not known what the impacts of this will be. However, as a formal legal process must be followed, an assumption is made that all Commoners will be appropriately and fairly dealt with for any changes to grazing and access to the common, in accordance with good practice and regulation.

4.9 Mitigation and enhancement

- 4.9.1** In this section, describe the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

Mitigation of effects from construction

- 4.9.2** During construction there are likely to be very minimal direct adverse impacts on PRow which are unlikely to affect people's enjoyment of the wider PRow network. No mitigation measures are therefore considered necessary.

Mitigation of effects on completion

- 4.9.3** On completion of the earthworks, the PRow will have been reinstated as close to the definitive map as possible. However, due to the new terrain the steepness of some of the PRow which cross the embankments will have been altered, and in some cases will need to be modified to avoid excessive inclines. This will not alter the overall routing but is likely to make some of the paths longer as they are modified to zig-zag up and down the embankments to reduce steepness. This modification could be considered to be part of the design mitigation and no further mitigation would be necessary.
- 4.9.4** No further mitigation has been identified for on completion impacts.

5 Water Environment

5.1 Introduction

5.1.1 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, level and flow;
- Terrestrial ecosystems that are dependent on groundwater; and
- Flood risk to and resulting from the project.

5.1.2 Impacts associated with groundwater levels and flows and groundwater dependent terrestrial ecosystems (GWDTE) will be addressed in Chapter 10 - Ground Conditions.

5.1.3 The chapter provides an overview of the proposed development in relation to the water environment and details the relevant legislation. The chapter subsequently describes the baseline conditions of the existing water environment in the study area and the methodology used to assess potential impacts during construction and on completion of the proposed development, before presenting the results of those assessments and mitigation or monitoring deemed necessary.

5.2 Review of proposed development

5.2.1 The proposed development comprises earthworks of cuttings and embankments as shown in Figure 1.1.

5.2.2 In order to deliver the earthworks there will be works over, and changes to, existing watercourse. The elements of the proposed development that have the potential to impact the water environment include:

- Introduction of new culverts to tributaries and drainage ditches;
- Introduction of cascading features;
- Diversions to watercourses on site; and
- Removal or relocation of ponds.

5.3 Planning policy context and guidance

5.3.1 Planning policy and guidance relevant to the water environment and associated with the proposed development is listed below. This guidance has been used when undertaking this assessment.

European planning policy

5.3.2 The following European planning policy is relevant to the assessment:

Water Framework Directive

5.3.3 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.

Groundwater Directive

5.3.4 A daughter directive of the WFD, the Groundwater Directive establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater.

Floods Directive

5.3.5 The Floods Directive requires Member States to assess if all watercourses and coastlines are at risk from flooding, to map the flood extent and assets and people at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

Priority Substances Directive

5.3.6 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

5.3.7 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.

National planning policy

5.3.8 The following national planning policy is relevant to the assessment:

Environmental Protection Act 1990

5.3.9 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

- 5.3.10** 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 Resources Act 1991

- 5.3.11** The Water Resources Act 1991 (as amended) sets out the responsibilities of the Environment Agency (EA) in relation to water pollution, resource management, flood defence, fisheries, and navigation.

Flood and Water Management Act 2010

- 5.3.12** 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

- 5.3.13** 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

- 5.3.14** 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.

National Planning Policy Framework (NPPF) 2019

- 5.3.15** 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.

Local planning policy

Neath Port Talbot County Borough Council Local Development Plan (2011-2026)

5.3.16 Within the Neath Port Talbot 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)

5.3.17 Within the Powys 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 standards and guidance

5.3.18 The assessment has been carried out in accordance with 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.

5.3.19 This assessment also draws on other guidance including:

- Planning Inspectorate Advice Note 18 ('Water Framework Directive'). This guidance is specifically for DCO projects; however, it benefits from being recognised by regulators and details the relationship between WFD legislation and EIA's. The WFD Screening Assessment provided in Appendix 5A has been produced following this guidance.
- Planning Policy Statement 15 (Revised): Planning and Flood Risk.

5.3.20 Due reference has been made to GOV.UK guidance for preventing pollution¹, working on or near water² and for managing water on land³.

5.3.21 CIRIA⁴ guidance used for the assessment includes:

- Control of Water Pollution from Construction Sites – Guide to Good Practice (SP156);
- Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (C532);

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].

- Remedial processes for contaminated land - principles and practice (C549);
- Environmental good practice on site (C692); and
- Groundwater control: design and practice (second edition) (C750).

5.4 Methodology

Methodology for establishing baseline conditions

- 5.4.1** The water environment baseline data for the study area has been obtained from a combination of desktop study and walkover survey.
- 5.4.2** The following information sources have been used to complete the baseline assessment:
- NRW ‘Water Watch Wales’⁵;
 - Ordnance Survey (OS) Open Data;
 - Nant Helen Remainder Environmental Statement (2011);
 - Nant Helen Environmental Statement Addendum (2016);
 - Lle Development Advice Map; and
 - BGS GeoIndex.
- 5.4.3** A site visit was undertaken by a geomorphologist on 28th November 2018. The visual inspection during a site visit is an appropriate method to inform this level of assessment.
- 5.4.4** The study area has been selected based on a source – pathway – receptor approach. For direct effects on surface waters, the study area will include the geographical extent of the full scope of works 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.
- 5.4.5** The baseline describes the existing condition of surface water bodies within the study area. Criteria from LA 113 have been used to assess the attributes and indicators of quality associated with surface water bodies, this assessment has been used to define the baseline. The criteria are shown in **Table 5.1** and have been adapted from LA 113: Table 3.69.
- 5.4.6** Criteria from LA 113 have been used to assess the importance of surface water features, this assessment has been used to define the baseline. The criteria are shown in **Table 5.2** and have been adapted from LA 113: Table 3.70.

⁵ <http://waterwatchwales.naturalresourceswales.gov.uk/en/> (last accessed 17/07/2019)

**Table 5.1: Surface water features, their attributes and indicators of quality
(adapted from LA 113)**

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 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
Floodplain	Conveyance of flood flows	Presence of floodplain; Flood flows.	Developed area within extent of floodplain

Feature	Attribute/Service	Indicator of quality	Possible measure
			affected; as determined from hydraulic modelling Flood risk Mean annual flood
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
	Biodiversity	Presence of groundwater supported wetlands.	Changes to groundwater recharge, levels or flows Status or classification of wetland including GWDTE under WFD

**Table 5.2: Criteria for estimating the importance of environmental attributes
(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 $Q95 \geq 1.0$ 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 SPZ1 Flood risk: Essential infrastructure or highly vulnerable development
High	Attribute has a high quality and rarity on local scale	Surface water: Watercourse having a WFD classification shown in a RBMP and $Q95 < 1.0$ m³/s. Species protected under EC or UK legislation Ecology and Nature Conservation. Groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE SPZ2 Flood risk: More vulnerable development
Medium	Attribute has a medium quality and rarity on local scale	Surface water: Watercourses not having a WFD classification shown in a RBMP and $Q95 > 0.001$ m³/s. Groundwater: Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3 Flood risk: Less vulnerable development
Low	Attribute has a low quality and rarity on local scale	Surface water: Watercourses not having a WFD classification shown in a RBMP and $Q95 \leq 0.001$ m³/s. Groundwater: Unproductive strata Flood risk: Water compatible development

Assessment methodology

5.4.7 The LA 113 is specifically designed for assessing the impacts of roads or bridge construction on the water environment and whilst sections of the methodology (e.g. HEWRAT) are not applicable to the proposed development the methodology is widely used for all types of scheme and benefits from being recognised by regulators.

5.4.8 LA 113 provides a standard methodology for the assessment of each topic area and has four key steps:

- Step 1 – Identification of water features within the study area. Water features are assessed against criteria defining quality and importance/value/sensitivity, as stated above. **Table 5.1** sets out the attributes used to define the quality of water feature considered in defining the baseline. An assessment of the importance/value/sensitivity of each of these receptors is then undertaken using the criteria set out in **Table 5.2**;
- Step 2 – Identification of potential impacts to the water features identified in Step 1, from construction and/or operation. Under the WFD, an impact is defined as causing a deterioration in the status of a waterbody or preventing a water body from reaching ‘Good’ status in the future;
- Step 3 – Assessment of the potential magnitude of any construction or operation impacts on the receptor, based on the criteria in LA 113, summarised in **Table 5.3** below; and
- Step 4 – Assessment of the overall significance of any effects to receptors due to impacts, using the significance matrix provided in **Table 5.4**. This identifies the magnitude of impact on the top and receptor sensitivity on the side. The significance of impact is identified where the two meet within the matrix. This assessment considers a ‘Very Large’, ‘Large’ and ‘Moderate’ significance of effect as significant. Slight and neutral significance of effect is considered not significant. These definitions, along with professional judgement have been used within assessment. Where any significant effects are determined, mitigations measures are proposed.

Table 5.3: Criteria for estimating the magnitude of an impact (adapted from LA 113: Table 3.71)

Importance	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

Table 5.4: Significance matrix (adapted from DMRB LA 104: Table 3.8.1)

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
	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

Construction Phase – assessment methodology

5.4.9 The assessment of construction impacts follows the guidance set out in LA 113, which recommends that construction impacts are considered using a source – pathway – receptor approach.

5.4.10 Potential impacts include:

- **Potential surface water impacts:** impacts to surface water quality from sediment run-off, spillage or discharges resulting from construction activities. Activities with potential to cause contamination of surface water from made ground will be covered in Chapter 6 - Ground Conditions.
- **Hydro-morphological impacts:** working in or near watercourses or mobilising sediment in runoff, potentially modifying flow processes and sediment movement.
- **Groundwater:** construction activities may release pollutants to groundwater or open up new pathways to groundwater. Activities with potential to cause contamination of groundwater from made ground will be covered in Chapter 6 – Ground Conditions.
- **Potential flooding impacts:** activities such as the removal of topsoil during construction.

5.4.11 Where measures to reduce construction impacts are considered standard practice, they are described in the Outline Construction Environmental Management Plan (CEMP). Additional measures to those that are typically used are detailed in Section 5.10, following the assessment of impacts.

On completion – assessment methodology

- 5.4.12** The assessment of the potential impacts on completion of the earthworks follows the principles outlined in LA 113 but does not utilise the quantitative assessment methods that are specific to highway runoff (e.g. HEWRAT). Qualitative assessments have been preferred due to the limited perceived risk of potential impacts as a result of the activities likely on completion of the earthworks.
- 5.4.13** At present the final use of the earthworks has not been determined. Therefore, hydromorphological impacts have only been assessed as it is considered on completion the use will not have an impact on surface water quality, groundwater quality or flood risk. Should other uses of the site come forward, the assessment will need to be revised to consider additional potential impacts.

Hydro-morphology

- 5.4.14** A qualitative assessment of potential impacts on the hydro-morphology of the affected watercourses was undertaken based on a fluvial geomorphologist's understanding of the potential for impacts to the watercourse flow dynamics and sediment transport processes and the subsequent effects that this might have on the ecological potential of the water body.

5.5 Limitations and assumptions

Limitations

- 5.5.1** The accuracy of the baseline condition described in the assessment is dependent on the accuracy of data available from the sources listed in Section 5.4.3.
- 5.5.2** The drainage design is currently at an outline stage and will be finalised later in the design process.
- 5.5.3** Ground investigations have not been undertaken and the assessment has been based on a desk top study.

Assumptions

- 5.5.4** For the assessment of construction impacts, where construction methods and sequencing are not available, industry standard construction practices are assumed.
- 5.5.5** In line with the restoration strategy, it is assumed that the earthworks will be landscaped.

5.6 Baseline Environment

5.6.1 This section sets out existing conditions and identifies potential receptors, describing sensitivity or value according to the methodology.

Surface Water

5.6.2 The following surface water features have been identified in the study area and are shown in Figure 5.1:

- a) The **River Nant Llech** (headwaters to confluence with Tawe - GB110059032240) is located to the north east of the study area and, at its closest point, 300m 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).
- b) There are multiple **unnamed tributaries of the River Nant Llech** that flow north-eastwards from the eastern portion of the proposed development.
- c) The **River Dulais** (headwaters to confluence with River Neath - GB110058032430) is located to the south of the proposed development and, at its closest point, is 230m from the proposed development.
- d) There are multiple **unnamed tributaries of the River Dulais** that flow southwards from the southern portion of the proposed development.
- e) The **River Tawe** (conf with Giedd to confluence with Twrch - GB110059032180) is located to the north of the proposed development and, at its closest point, is 580m from the proposed development.
- f) 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.
- g) There are 62 **ponds** located within the study area. The majority of these ponds are within the opencast mine site and are artificial. These features are part of ongoing mine water treatment or redundant features related to operational mining activities. Many of these are in limited connectivity with the wider drainage network.
- h) There are **numerous drainage ditches** located within the study area which are expected to have resulted from the mining activities. The ditches shown in Figure 5.1 are indicative and may have changed through the ongoing mine works on site.

5.6.3 As part of the mining operations, discharges to the River Tawe are controlled. Groundwater and runoff enter a pit sump where it is moved

to primary and secondary settlement areas in order to remove suspended solids. Following settlement, the water is checked for compliance and then discharged to the River Tawe via a pond and a stream. The discharges are monitored independently by NRW under the Surface Mines Discharge Consents.

5.6.4 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. Flow data for these watercourses, and their tributaries, is not available.

5.6.5 Surface watercourses identified within the study area which have been considered in the assessment are listed and assigned values in Table 5.6.

Relevant Future Baseline

5.6.6 As part of the restoration plan for Nant Helen, associated with the decommissioning of the mine, there will be changes to the existing surface water features. The changes are detailed below:

- Six watercourses will be restored across the site;
- Introduction of two wetlands;
- Introduction of attenuation ponds that will discharge to watercourses at greenfield run off rates or below greenfield run off rates;
- Removal of ponds associated with mine workings; and
- Removal of drainage ditches associated with mine workings.

The future baseline will form part of the assessment as it is redundant to assess existing surface water features that will be removed as part of the restoration scheme. The restoration plan with the existing surface water features is shown in Figure 1.2.

WFD Status

5.6.7 The study area includes three 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); and
- Swansea Carboniferous Coal Measures (GB41002G201000).

5.6.8 The current status of each of these WFD water bodies (surface water and groundwater) is summarised in Table 5.5.

5.6.9

As stated above, the study area contains 62 ponds. The ponds are generally man-made and associated with the mine workings with several ponds in the southern area of the site part of which form part of the mine water treatment system. The ponds within the study area vary in size from approximately 50m² to 4,200m². Through the restoration plan, the majority of ponds will be removed, the ponds that will be retained are shown in Figure 1.2.

Table 5.5: 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)	Swansea Carboniferous Coal Measures
ID	GB110059032250	GB110058032360	GB110059032240	GB41002G201000
Type of Waterbody	River	River	River	Groundwater
Area (km/km ²)	3.97	16.06	5.94	758
HMWB/AWB	Not heavily modified or artificial	Not heavily modified or artificial	Not heavily modified or artificial	N/A
Overall Status	Good	Good	Good	Poor
Objective	N/A	N/A	N/A	Objective not assigned as no known technical solution available
Chemical Status	Good	Good	Good	Poor
Ecological Status (River) / Quantitative Status (Groundwater)	Good	Good	Good	Good
Driver of failure to achieve 'Good' status	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.
Reasons for not achieving 'Good' status	N/A	N/A	N/A	Point source pollution is defined as causing the poor

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)	Swansea Carboniferous Coal Measures
				Chemical status. Point source pollution is thought to have resulted from mining activities.
Other (including Mitigation Measures)	N/A	N/A	N/A	No known technical solution available.

Groundwater Quality

- 5.6.10** 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.
- 5.6.11** To accommodate open cast mining activities, active dewatering is necessary. 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 increased groundwater levels to those currently present and potentially flooding of the void present in the western site area.
- 5.6.12** National Resources Wales have classified the underlying bedrock geology as being a Secondary A Aquifer⁶. There are no Source Protection Zones within 1km of the proposed development.
- 5.6.13** The groundwater levels and flows and groundwater dependent terrestrial ecosystems are detailed within Chapter 10 - Ground Conditions.

Flood Risk

- 5.6.14** Under TAN15, as shown in Lle Development Advice Map⁷, all of the study area is within Zone A which is defined as ‘Considered to be at little or no risk of fluvial or tidal/coastal flooding’. Areas within Zone C2 and Zone B are predominantly localised to the immediate areas surrounding the major watercourses although Zone B extends into the southern part of the village of Ystradgynlais.
- 5.6.15** Information on surface water flooding risk from NRW indicates that the site is not at risk of flooding, with the exception of a small area in the centre of the site. However, as the mine workings impact the topography of the site and the active working areas change frequently, there is the potential for the risk of surface water flooding dataset to be outdated.

Designated Sites

- 5.6.16** There are two Sites of Special Scientific Interest (SSSI) partially located within the 1000m study area: Gorsllwyn and Nant Llech.

⁶ British Geological Society. Available at: <<http://mapapps2.bgs.ac.uk/geoindex/home.html>>

⁷ 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>>

- 5.6.17** The Gorsllwyn is located approximately 870m to the south east of the proposed development and is designated due to its raised mire.
- 5.6.18** 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 Plants⁸. Potential ecological impacts to the protected site is addressed in Chapter 7 – Biodiversity.
- 5.6.19** The Gorsllwyn has not been considered within the assessment as it is not considered to be hydrologically connected to the site.

Environmental Value of Surface Water Features

- 5.6.20** Table 5.6 details the surface water features to be assessed and ascribes them a value for the assessment. Refer to Figure 5.1 for their location.

⁸ 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>

Table 5.6: Summary of water features within study area

Label	Location relative to proposed development	Description	Proposed development elements	Value	Value rational
Surface Water					
River Nant Llech	Located to the north east of the proposed development, approximately 300m from the proposed development at its closest point	The River Nant Llech is approximately 4km long, the headwaters are located approximately 2km to the north east of Coelbren. The river flows in a north westerly direction through the study area	No modification, outside of the red line boundary	Very High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s Section of the river located within SSSI
Unnamed tributaries of the River Nant Llech	Located to the north east of the proposed development, approximately 170m from the proposed development at its closest point	The unnamed tributaries of the River Nant Llech are located north and south of the river and vary from approximately 50m to 380m in length within the study area	No modification, outside of the red line boundary	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s
River Dulais	Located to the south of the proposed development, approximately 230m, from the proposed development at its closest point	The River Dulais is approximately 16km long, the headwaters are located within the study area. The river flows in a south westerly direction through the study area	No modification, outside of the red line boundary	High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s
Unnamed tributaries of the River Dulais	Located to the south of the proposed development, some of the tributaries extend into the proposed development	The unnamed tributaries of the River Dulais are located north and south of the river and extend into the site boundary. The tributaries within the study area vary from approximately 100m to 1,500m in length	Approximately 4 culverts across 4 tributaries of the River Dulais	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s

Label	Location relative to proposed development	Description	Proposed development elements	Value	Value rational
River Tawe	Located to the north of the proposed development, approximately 580m from the proposed development at its closest point	The River Tawe is approximately 6km long, the headwaters are located approximately 6km north of Penwyllt. The river flows in a westerly direction through the study area.	No modifications, outside of the red line boundary	High	WFD classification shown in RBMP Q95 < 1m ³ /s but >0.001m ³ /s
Unnamed tributaries of the River Tawe (and named tributary Nant Helen)	Located to the north of the development, several tributaries abut the proposed development	The unnamed tributaries of the River Tawe are located to the south of the river in the study area. The tributaries within the study area vary from approximately 360m to 770m in length	Approximately 5 culverts across 5 tributaries of the River Tawe	Medium	Drains with no WFD classification shown in RBMP Q95 expected to be ≤0.001m ³ /s
Ponds	There are 11 ponds within the study area, the majority of ponds are located within the site boundary	The majority of ponds within the study area are man made, resulting from previous mine workings or the associated restoration plan	Some ponds are expected to be removed, modified or relocated	Low	Majority are man made ponds. Some ponds are considered to have ecological value due to plant and invertebrate species present but the majority are of low ecological value
Drainage ditches	There are numerous drainage ditches throughout the study area and within the site boundary	Artificial channels installed for land drainage related to the restoration plan.	Drainage ditches will be retained on site and culverted where required	Low	Majority of drainage ditches are a result of the restoration plan following the decommission of the mine
Groundwater					

Label	Location relative to proposed development	Description	Proposed development elements	Value	Value rational
Swansea Carboniferous Coal Measures WFD groundwater body	Entire site is encompassed within the groundwater body	Groundwater body is approximately 760km ²	Cuttings	Medium	Secondary A Aquifer Not in a Source Protection Zone

5.7 Embedded mitigation

5.7.1 The Construction Environmental Management Plan (CEMP) will be adhered to, to ensure industry standard practice working methods and mitigation measures set out in the Environment Agency's Pollution Prevention Guidelines (PPGs) (withdrawn) and Guidance for Pollution Prevention (GPPs) are implemented. This will include details of the management of water and sediment across both sites and provisions to minimise the likelihood of run-off, provide containment of spillage and capture or treat wastewaters where necessary. These mitigations are intended to prevent impacts upon surface water or groundwater quality. An outline CEMP is included as Appendix 5B.

5.8 Design mitigation

5.8.1 There are several measures built into the proposed development which seek to minimise the impact on the water environment. These measures include:

- Attenuation features will be installed as part of the drainage design to collect surface water run-off, the features will be restricted to discharge at greenfield run off rate or to a lower discharge rate as specified for the restoration scheme; and
- Maintaining vegetation adjacent to the streams within the redline boundary is necessary.

5.9 Assessment of effects

5.9.1 Construction projects have the potential to intersect a number of surface and groundwater features and create pollution sources or pathways that are not present under existing conditions.

5.9.2 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.

Assessment of effects from construction

5.9.3 This section presents the assessment of potential effects to the water environment resulting from the construction of the proposed development. The significance of potential effects is based on a combination of the potential for pollution and the sensitivity of the receptor.

5.9.4 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 and groundwater dependent terrestrial ecosystems have also been assessed in Chapter 6 – Ground Conditions.

- 5.9.5 The potential effects associated with ecology have been assessed within Chapter 7 – Biodiversity.

Surface Water Quality

- 5.9.6 The most likely sources of surface water impacts are:

- a) Disturbance of silt/soil generating surface runoff with high sediment concentrations (mobilised suspended solids);
- b) 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 impacts on fish; and
- c) Dewatering discharges containing high levels of suspended solids.

- 5.9.7 The risk of pollution impacts is heightened during periods when vegetation has been removed and exposed soil is present, such as during initial site preparation. Risks of surface water pollution impacts are also greater during works in close vicinity to surface watercourses or ponds on site. Without control measures, the risk of runoff from exposed soil would remain until vegetation is established, which would take generally one growing season.

- 5.9.8 The magnitude of these impacts would be Major Adverse and short term in timeframe. However, as outlined in Section 5.7, when considering measures outlined in the CEMP as inherent mitigation, the magnitude of impact will reduce to Negligible.

- 5.9.9 All tributaries of the River Tawe, River Dulais and River Nant Llech have the potential to receive run-off from the site, the significance of effect on water quality would be **Neutral or Slight adverse**. The drainage ditches and ponds on site also have the potential to receive run-off, the significance of effect on water quality is **Neutral or Slight adverse**. The effects on each respective surface water feature are not considered significant and so no mitigation measures additional to the embedded mitigation and standard practice construction site management are required.

Hydromorphology

- 5.9.10 The most likely sources of hydrological impacts relate to the direct physical modifications to surface water features including:

- a) culverts to tributaries of the River Tawe and River Dulais and drainage ditches;
- b) cascading features associated with the culverts;
- c) diversions to drainage ditches on site; and
- d) removal or relocation of ponds and drainage ditches. The modifications are detailed in the Drainage Strategy that has been submitted in support of the planning application.

5.9.11 The modifications to culverts, cascading features and diversions will require in-channel working that have the potential to cause bank failure, erosion or scouring and modification of geomorphological features. As a result, there is the potential for the washing of sediment into tributaries and drainage ditches, causing siltation with the tributary or drainage bed. Clogging of tributaries or ditches by silt will reduce in-stream habitat quality. The effects of siltation could be medium term, as high flows are required to remobilise the silt and flush it downstream.

5.9.12 It is considered that standard practice mitigation measures and working practices incorporated into the CEMP are suitable to minimise risk to the hydromorphology of River Tawe and River Dulais tributaries and drainage ditches on site.

5.9.13 The magnitude of the hydromorphological impact on the River Tawe and River Dulais tributaries and drainage ditches during construction is Negligible. The significance of effect on the tributaries is therefore considered to be ***Slight adverse*** and the significance of effect on the drainage ditches is considered to be ***Neutral or Slight adverse***. The effects on each respective surface water feature are not considered significant and so no mitigation measures additional to those embedded within the scheme design and standard practice construction site management are required.

5.9.14 The impact of the proposed development on WFD quality elements has been considered in a standalone WFD compliance assessment. The WFD Screening Assessment can be found in Appendix 5A.

Groundwater Quality

5.9.15 Sources of potential pollutants to groundwater 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 movement of earth and excavation causing creation of new pathways, direct infiltration at source or in the case of spillages, infiltration from the surface water features during periods of low flow.

5.9.16 Embedded mitigation measures included within the CEMP will significantly reduce potential impacts. When incorporating the embedded mitigation, the potential magnitude of the risk of

contamination is Negligible. When combined with the classification of medium importance, the significance of effect is **Neutral or Slight adverse**.

Flood Risk

- 5.9.17** The site is classified as being at low risk of flooding. Areas at risk of fluvial flooding are localised to the areas adjacent to the River Tawe, River Nant Llech and River Dulais, outside of the site boundary. Although the earthworks will involve changes to ground levels, it is not considered that this will present a flood risk to the proposed development as the site is not within an area deemed as high flood risk.
- 5.9.18** Site run-off has the potential to exacerbate the risk of flooding at the River Tawe, River Nant Llech and River Dulais, however, site run-off will be captured within the attenuation features and discharged at greenfield run-off rates, or to a lower discharge rate as specified for particular catchments as part of the restoration scheme.
- 5.9.19** Dewatering was required for the mine workings but will cease following closure of the mine in 2021. The impact of ending dewatering of the site has been accounted for in the restoration plan and it is therefore considered that the ending of dewatering activities does not present a flood risk.
- 5.9.20** As part of the construction process, the appointed contractors will take account of baseline flood risk to inform emergency evacuation plans and placement of materials and equipment to mitigate against the risk of flooding. Given the embedded mitigation measures, the magnitude of impact is considered to represent **No Change**. When combined with the River Tawe and River Dulais classification of High and Nant Llech classification of Very High, the significance of effect is considered to be **Neutral**. The effect is not considered to be significant and additional mitigation measures are not required.

Assessment of effects on completion of earthworks

- 5.9.21** This section considers the potential effects on the water environment on completion of the earthworks. Similar to the assessment for the construction phase, the significance of effects would depend on a combination of the potential for pollution as well as the sensitivity of the receptor.
- 5.9.22** The assessment of effects on completion of earthworks only considers the impact on hydromorphology through physical modifications to surface water features. The completion of the earthworks is not considered to have an impact on surface water quality, groundwater quality or flood risk.

Hydromorphology

- 5.9.23** As stated in 5.9.10 above direct physical modifications to surface water features include:
- a) culverts to tributaries of the River Tawe and River Dulais and drainage ditches;
 - b) cascading features associated with the culverts;
 - c) diversions to drainage ditches on site; and
 - d) removal or relocation of ponds and drainage ditches, as detailed in the Drainage Strategy.
- 5.9.24** New culverts would remove natural channel bed and banks, and inhibit floodplain connectivity. If designed inappropriately, culverts can cause local scour, prohibit fish passage and impair downstream transport of sediment.
- 5.9.25** The diversion of drainage ditches on site has the potential to take flow away from existing ponds and watercourses which could impact habitats. Most of the ditches and watercourses on site show evidence of modification by human activity and none of the waterbodies within the site as a whole are natural. However, one of the water treatment ponds exhibits rare vegetation and another contains reeds making it a suitable habitat for breeding birds. For further details on the impact of the removal of the ponds on ecology, see Chapter 7 – Biodiversity.
- 5.9.26** The removal and relocation of ponds is not considered to impact groundwater as the ponds are thought to be part of the surface water drainage system across the site. However, as identified above, one pond contains a rare vegetation species, and another contains reeds making it suitable for breeding birds.
- 5.9.27** There will be no direct hydromorphological impacts on the named WFD waterbodies within the vicinity of the proposed development.
- 5.9.28** The magnitude of impact on the River Tawe and River Dulais tributaries and drainage ditches through the introduction of new culverts is considered to be Moderate Adverse. The significance of effect is on the tributaries is **Moderate adverse**, and mitigation measures are detailed in Section 5.10. The significance of effect on the drainage ditches is **Slight adverse** and not considered significant.
- 5.9.29** The magnitude of impact on drainage ditches through diversion to drainage ditches is considered to be Moderate Adverse. The significance of effect is therefore **Slight adverse** and not considered significant.
- 5.9.30** The magnitude of impact on removal and relocation of ponds is considered to be Major Adverse. The significance of effect is therefore **Slight or Moderate adverse**. Mitigation measures are detailed in Section 5.10.

5.10 Mitigation and enhancement

- 5.10.1 The following mitigation measures are required to protect water quality and the water environment are to be included above and alongside the mitigation included in the initial design (detailed in Section 5.8).

Mitigation of effects from construction

- 5.10.2 As no significant effects are anticipated to arise during the construction phase, no additional mitigation measures are required.

Mitigation of effects from operation

- 5.10.3 This section identifies mitigation measures where adverse effects on completion of the proposed scheme were identified. The mitigation relates primarily to hydromorphological impacts.

Culvert Design

- 5.10.4 The assessment identified potential **Moderate adverse** impacts on the River Tawe and River Dulais tributaries and **Slight adverse** impact on the drainage ditches as a result of the introduction of culverts. It is considered that these impacts can be negated through good design. Therefore, the design of any new or extended culverts should ensure that:
- a) The base of the culvert is set >150mm below the existing bed of the watercourse. This will help to retain habitat connectivity either side of the culvert and promote continued sediment transport downstream;
 - b) Culvert gradients are such that flow velocities within the culvert are minimised to aid fish passage; and
 - c) Any scour protection at the inlet or outlet uses bioengineering methods wherever practicable to maximise habitat potential.
- 5.10.5 The design and construction supervision of mitigation measures will be led by a qualified geomorphologist.

Relocation of Ponds

- 5.10.6 The assessment identified that several ponds have ecological value and hence the significance of impact associated with their removal was **Slight or Moderate adverse**.
- 5.10.7 To offset for the loss of habitat, ponds with similar habitat characteristics should be created elsewhere on the site. Further information is detailed in Chapter 7 – Biodiversity.

5.11 Residual effects

5.11.1 With additional mitigation measures in place, the table in Section 5.12 summarises the residual effects of the proposed development.

Residual effects from construction

5.11.2 Mitigation measures were not required for construction therefore the residual effects remain equal to those identified during the assessment.

Residual effects from operation

5.11.3 On completion of the Earthworks effects related only to hydromorphology, specifically, the effects resulting from the introduction of new culverts and the relocation of ponds.

5.11.4 Measures to mitigate the impacts of the introduction of new culverts comprise good practice culvert design to ensure physical modifications retain natural processes and habitat area where possible. The magnitude of effect at locations where culverts are proposed is reduced to:

- Tributaries of River Tawe and River Dulais – **Minor**
- Drainage ditches – **Minor**

5.11.5 The resulting significance of effect is reduced to:

- Tributaries of River Tawe and River Dulais – **Slight**
- Drainage ditches – **Neutral or Slight**

5.11.6 Measures to mitigate the impacts of the loss of ponds comprise relocation and reinstatement of ecological assets. The measures will reduce the magnitude of effect to Moderate. The significance of effect is reduced to **Slight Adverse**.

5.12 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)
Construction							
Surface water quality impacts from construction activities	Tributaries of River Tawe, River Dulais and River Nant Llech Drainage ditches Ponds	Medium (tributaries) Low (ditches) Low (pond)	Negligible	Neutral or Slight (tributaries) Neutral or Slight (ditches) Neutral or Slight (pond)	No further mitigation required	No further mitigation required	Neutral or Slight (tributaries) Neutral or Slight (ditches) Neutral or Slight (pond)
Hydromorphological impacts from in-channel workings	Tributaries of River Tawe and River Dulais Drainage ditches	Medium (tributaries) Low (ditches)	Negligible	Neutral or Slight (tributaries) Neutral or Slight (ditches)	No further mitigation required	No further mitigation required	Neutral or Slight (tributaries) Neutral or slight (ditches)
Groundwater quality impacts from construction activities	Swansea Carboniferous Coal Measures Groundwater Body	Medium	Negligible	Neutral or Slight	No further mitigation required	No further mitigation required	Neutral or slight

Flood risk impacts as a result of construction activities	River Tawe, River Nant Llech and River Dulais	High (Tawe, Dulais) Very High (Nant Llech)	No change	Neutral	No further mitigation required	No further mitigation required	Neutral
On completion							
Hydromorphological impacts from new culverts	River Tawe and River Dulais tributaries Drainage ditches	Medium (tributaries) Low (ditches)	Moderate Adverse	Moderate (tributaries) Slight (ditches)	Culvert design	Minor (tributaries) Minor (ditches)	Slight (tributaries) Neutral or slight (ditches)
Hydromorphological impacts from diversion to drainage ditches	Drainage ditches	Low	Moderate Adverse	Slight	No further mitigation required	No further mitigation required	Slight
Hydromorphological impacts from removal or relocation of ponds	Ponds	Low	Major Adverse	Slight or Moderate	Relocation and reprovision of ecological assets	Minor	Slight

6 Ground Conditions

6.1.1 This chapter considers the baseline conditions present in the area of the proposed Nant Helen Complementary Restoration Earthworks (the Project) and identifies the potential effects that the construction and use may have on ground conditions focusing on geology and impact of land contamination on soils and controlled waters.

6.1.2 The potential effects on hydrology from other aspects of the scheme development including drainage are covered in Chapter 5: Hydrology and Flooding.

6.2 Introduction

6.2.1 The Ground Conditions chapter sets out the legislative context specific to the assessment of ground conditions. It then presents baseline conditions within the Project. This includes the presentation of geological, hydrological and hydrogeological setting, underlying ground conditions, site history including details on legacy of opencast and deep mineworkings, and 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.

6.2.2 The chapter includes the following appendix:

- Appendix 6.A – Global Centre of Railway Excellence Desk Study

6.3 Review of proposed development

6.3.1 The proposed Nant Helen Complementary Restoration Earthworks, as detailed in Section 3, would include construction of a landform that could be used for a number of purposes. This would include embankments and cuttings which would involve significant movement of materials within the proposed redline boundary area. It is proposed that the embankments will largely be constructed using materials present on site associated with the current mining activities and with materials excavated to create the cuttings. No foundations works such as piling are required for the proposed works.

6.3.2 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 scheme. 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 scheme. This will determine suitability for reuse criteria.

6.3.3 The final finish of the embankment and cut surfaces will be undertaken in accordance with landscaping proposals provided as part

of the wider restoration plans. These will include grass seeding to vegetate the restored areas.

6.4 Legislation, policy context and guidance

6.4.1 Legislation and policies specifically related to the assessment of ground conditions focusing on geology and land contamination are described below.

Legislation

6.4.2 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).

6.4.3 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;
- Contaminated Land (Wales) (Amendment) Regulations 2012;
- Environment Act 1995; and
- Environmental Permitting Regulations 2016 (as amended).

6.4.4 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).

6.4.5 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.

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

6.4.7 A list of additional legislation and guidance 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 in 2018 and 2019), which amend the Environmental Permitting (England and Wales) Regulations SI 2010/675. 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 Groundwater (Water Framework Directive) (Wales) Direction 2016;
- The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009; and
- Flood and Water Management Act 2010.

Policy context

National and Regional Policy

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

- UNESCO Global Geoparks;
- Regionally Important Geological and Geomorphological Sites (RIGS); and

- Sites of Special Scientific Interest (SSSIs).

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

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

Local Planning Policy

6.4.11 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:

- Demonstration how geodiversity is protected and enhanced.
- The Water Framework Directive objectives are met including achievement of Water Quality Standards.
- 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’
- Ensure protection of public health and safety.

6.4.12 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

6.4.13

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 by the end of 2019 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;
- BS10175:2011 + A1 2013: Code of Practice for Investigation of Potentially Contaminated Sites⁶;
- Groundwater protection guidance⁷, including the Environment Agency’s approach to groundwater protection⁸;
- CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice⁹;

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.

⁶ BS10175:2011+A1 2013 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 17 June 2019].

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 17 June 2019].

⁹ Contaminated Land Risk Assessment, A guide to good practice (C552), Construction Industry Research and Information Association (CIRIA), 2001

- CIRIA 681: Unexploded ordnance (UXO) A guide for the construction industry¹⁰;
- CIRIA 733: Asbestos in soil and made ground: a guide to understanding and managing risks¹¹;
- CIRIA 765: Asbestos in soil and made ground: good practice site guide¹²;
- Definition of Waste: Development Industry Code of Practice¹³ 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. Refer to Chapter 16: Material Assets for more details;
- Eurocode 7 (BS EN 1997-1¹⁴ & EN 1997-2¹⁵) 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.

6.5 Consultation

6.5.1 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. At the time of writing no scoping opinion from consultees has been received.

6.6 Methodology

Overview

6.6.1 The methodology for the geology and land contamination 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 Nant Helen Complementary Restoration Earthworks.

¹⁰ Unexploded ordnance (UXO) A guide for the construction industry (C681), Construction Industry Research and Information Association (CIRIA), 2009

¹¹ Asbestos in soil and made ground: a guide to understanding and managing risks (C733), Construction Industry Research and Information Association (CIRIA), 2014

¹² Asbestos in soil and made ground: good practice site guide (C765), Construction Industry Research and Information Association (CIRIA), 2017

¹³ 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.

¹⁴ BS EN 1997-1: 2004 and Amendment 1: 2013: Eurocode 7 Geotechnical Design. General Rules British Standards Institution, 2013.

¹⁵ BS EN 1997-2: 2007 UK National Annex to Eurocode 7 Geotechnical Design. Ground Investigation and Testing, British Standards Institution, 2007.

Methodology for establishing baseline conditions

6.6.2 The identification of baseline method will include:

- 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.

6.6.3 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, one of the considered development options. This is presented in Appendix 6A of the ES.

6.6.4 The baseline conditions presented in this chapter specifically pertain to the Nant Helen Complementary Restoration Earthworks application.

Study Area

6.6.5 The study area that has been used for this assessment includes an area extending up to 250m away from the boundary of the proposed Nant Helen Complementary Restoration Earthworks 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 Nant Helen Complementary Restoration Earthworks area, for instance via groundwater than this has been included.

6.6.6 The study area of 1km allowing to identify sensitive controlled water receptors, for example source protection zones or water abstraction points, to any potential contamination originating within the Nant Helen Complementary Restoration Earthworks area has been applied.

6.6.7 The geology study area has been determined on the basis of the regional geology of the area, however it is considered that the proposed Nant Helen Enabling Works would have an impact on geology only within the footprint of the scheme.

Assessment methodology

- 6.6.8** 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' by end of 2019. This will involve preparation of a Conceptual Site Model for the baseline conditions, which will form the basis for preliminary followed by generic and, if required, detailed risk assessments.
- 6.6.9** The impacts and effects on the geology/geomorphology and land contamination arising from construction of the Nant Helen Complementary Restoration Earthworks 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.
- 6.6.10** Assessment of the likely impact on the geology/geomorphology and land contamination arising from the operation of the Project will be undertaken by review of baseline conditions in the context of the final end use.
- 6.6.11** 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

- 6.6.12** 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 6.1 and the magnitude of impact in accordance with Table 6.2.
- 6.6.13** 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 6.3.

Table 6.1 – 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:

Value (sensitivity)	Typical Descriptors
	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: 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.

Value (sensitivity)	Typical Descriptors
Negligible	Geology: Of little local geological/geomorphological interest. Land Contamination: Receptor with low importance and rarity.

Table 6.2 – 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) 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)

Magnitude of Impact	Typical Criteria Descriptors
	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.

6.6.14 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.

6.6.15 In accordance with the EIA Regulations, the level of significance that merits further consideration / mitigation are generally those where the significance of the effect is 'moderate' negative or greater.

Table 6.3 – 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

6.7 Limitations and assumptions

Limitations

- 6.7.1** Limited intrusive ground investigations have been undertaken within the proposed Nant Helen Complementary Restoration Earthworks area. No chemical testing on soils has been undertaken.
- 6.7.2** Desk study review has identified the presence of mine workings within the Project area. These may require treatment depending on the final land use. The scope and design of the treatment works has not yet been developed and this would be developed based on results of future intrusive ground investigations. On confirmation of the treatment requirements, appropriate mitigation would be applied as required.
- 6.7.3** 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 may be required to inform geotechnical design of the proposed scheme.

Assumptions

- 6.7.4** 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. It is assumed that measures would include groundwater management during excavations and management of dust generation.
- 6.7.5** It is assumed that chemical testing of made ground 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.

- 6.7.6** It is assumed that only materials considered suitable for use within the proposed development will be imported and used within the construction of the proposed development.
- 6.7.7** It is assumed that materials constituting on-going sources of contamination will be removed/remediated as part of the scheme construction in line with current legislation.
- 6.7.8** 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.
- 6.7.9** 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.
- 6.7.10** Notwithstanding the limitations and assumption, sufficient information has been available for the completion of the assessment of geology and land contamination issues.

6.8 Baseline Environment

- 6.8.1** 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.
- 6.8.2** The centre of the site is located at approximate National Grid Reference SN 82135 11212, 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 scheme area respectively.

Topography

- 6.8.3** The boundary of the site sits at approximately 250m AOD with the land generally rising inwards towards the centre of the site. The central portion of the site sits at around 295m AOD. Site topography is shown on Figure 6.1.
- 6.8.4** 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 centrally within 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.

6.8.5 The active Nant Helen Extension opencast site is typically 150m lower than the site surface level in that area 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 portion of the site.

6.8.6 It is understood that 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.

Published Geology

6.8.7 The geology beneath the site has been interpreted through a review of published geological sources. These sources include the BGS 1:10,560 geological mapping¹⁶, the BGS 1:50,000 geological mapping¹⁷ and the BGS GeoIndex online viewer¹⁸. Refer to Figure 6.2 and 6.3 throughout.

6.8.8 In addition to the geological mapping sources reviewed, two 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 1904¹⁹ and the second in 1988²⁰.

Made Ground

6.8.9 A large region of artificial ground is shown to be present in the north of the 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).

6.8.10 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 Nant Helen Complementary Restoration Earthworks area, refer to Figure 6.5.

¹⁶ British Geological Survey (BGS), Geological Survey of Great Britain (England and Wales), 1:10,560 scale geological map, SN 81 SW, 1979

¹⁷ 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

¹⁸ British Geological Survey (BGS), Geoindex online viewer (online), <http://mapapps2.bgs.ac.uk/geoindex/home.html> , Date accessed 20/11/2019

¹⁹ 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

²⁰ 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

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.

- 6.8.11** 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.

Drift (Superficial Deposits)

- 6.8.12** 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. 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)”.

- 6.8.13** 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.

- 6.8.14** 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, these may have been retained beneath the storage area in line with historical practices.

Solid (Bedrock)

- 6.8.15** 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.

- 6.8.16** 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.

- 6.8.17** From review of dip angles presented on the 1:10,560 geological mapping, the solid geology is anticipated to dip in a west south-west direction and angles ranging between 5° and 15°. Various localised syncline and anticline features are shown to be present beneath the site and as a result dip angles vary accordingly in these locations.

Linear Features

- 6.8.18** 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 situated approximately 200m to the east of the site. The geological memoir from 1904 suggests that the fault has a downthrow of “*forty yards*” (~36.6m) to the west.
- 6.8.19** 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.
- 6.8.20** 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.
- 6.8.21** 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.
- 6.8.22** 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

- 6.8.23** There are no statutory designated areas specifically of geological interest present within the proposed site boundary. However, as identified from review of Lle Welsh Government Sites of Special Scientific Interest (SSSI) data sets²¹, the Nant Llech SSSI is located approximately 110m to the north of the site as shown on Figure 6.4.

²¹ 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

- 6.8.24** 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.
- 6.8.25** As highlighted on the Joint Nature Conservation Committee (JNCC) website²², 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.
- 6.8.26** There are no ‘Regionally Important Geological and Geomorphological Sites’ (RIGS) within a 1km radius of the site.

Geomorphology

- 6.8.27** The site encroaches on three Geological Landscape Areas, as shown on Figure 6.4. These have been identified through review of Natural Resources Wales LANDMAP²³. The three Geological Landscape Areas include:
- Ystradgynlais – Upland valley slope (Outstanding)
 - Seven Sisters – Upland plateau (Moderate)
 - Banwen – Mountain and Upland Valley (High)
- 6.8.28** The Ystradgynlais 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.
- 6.8.29** 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.
- 6.8.30** The Banwen area has been evaluated to be of ‘High’ value on account of the glacial drift deposits which covered extensively opencast coal measures. The high valuation is based on both the research value and the educational value of the area.

²² 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

²³ Natural Resources Wales (NRW), Interactive Maps, LANDMAP (online), <https://landmap-maps.naturalresources.wales/>, Date accessed 20/11/2019

Ground Conditions

- 6.8.31** The anticipated ground conditions beneath the site have been interpreted through review of 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.
- 6.8.32** 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.
- 6.8.33** 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.
- 6.8.34** Natural superficial deposits of peat and glacial till were encountered beneath the southern portion of the site. Detailed descriptions of the material encountered within these boreholes was not provided. The boreholes have been reviewed in order to ascertain information regarding the thicknesses and stratigraphic order of the materials encountered.
- 6.8.35** Peat deposits up to 1.6m thick were encountered. The glacial till material encountered had a thickness range between 1.0m and 3.1m.
- 6.8.36** The depth to rockhead vary 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.
- 6.8.37** 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 weathered head of the bedrock was recovered as highly weathered fragments of mudstone and sandstone within a clay matrix.

Site History

- 6.8.38** Historical Ordnance Survey (OS) mapping sets (1876 - 2019)²⁴, 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.
- 6.8.39** 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.
- 6.8.40** 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.
- 6.8.41** 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.
- 6.8.42** 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”²⁵. The tramroad was constructed circa 1827 and fell into disuse at some point prior to 1876. The location is shown on Figure 6.6.
- 6.8.43** 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 shown 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,

²⁴ Groundsure, Historical Mapping set, Report ref.: GS-6396071, 14/10/2019

²⁵ 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

a portion of the main line remains to the current day and links the Onllwyn Washery site to Neath.

Coal Mining

Coal outcrops

- 6.8.44** 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.
- 6.8.45** 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.
- 6.8.46** 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.
- 6.8.47** 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.
- 6.8.48** 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.

Mine Entries

- 6.8.49** Based on review of the Coal Authority online viewer²⁶ a total of 64No. mine entries have been identified to be present within the outer boundary 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.
- 6.8.50** 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

²⁶ The Coal Authority, Interactive viewer, Coal mining data (online), <https://mapapps2.bgs.ac.uk/coalauthority/home.html> , Date accessed 20/11/2019

outcrops in the south east of the site. These are indicative of ‘bell pitting’ coal extraction methods.

Underground mine workings

- 6.8.51** A total of eight collieries have been identified to have worked the seams beneath study area through various drift and seam entries.
- 6.8.52** The Abercrave, International and Gwaunclawdd collieries were located along the lower northern slopes of Mynydd Drum and through review of the Welsh Coal Mines website²⁷ 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.
- 6.8.53** 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).
- 6.8.54** 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.
- 6.8.55** 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.

Opencast mine working

- 6.8.56** 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.

²⁷ Welsh Coal Mines, Collieries, Brecon (online), <http://welshcoalmines.co.uk/Photo.htm> , Date accessed 20/11/2019

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

Hydrology

- 6.8.58** The site overlaps with three principal river catchments; the Tawe catchment, the Dulais catchment and the Pyrddin catchment. Refer to the Flooding and Hydrogeology Chapter 5 for details.
- 6.8.59** 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.
- 6.8.60** 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.
- 6.8.61** The southern half of the site sits within the Dulais catchment. The River Dulais flows roughly from east northeast to west southwest. 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.
- 6.8.62** 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.
- 6.8.63** 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 to the south 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.

- 6.8.64** 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

- 6.8.65** The information presented below has been based on review of the BGS 1:125,000 Hydrogeological Map of South Wales²⁸.
- 6.8.66** 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.
- 6.8.67** 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.

Aquifer Designations

- 6.8.68** The aquifer designations have been determined through review of the Groundsure EnviroInsight²⁹ report purchased for the site.
- 6.8.69** The glacial till deposits shown to be present in the southern and western portion of the site are designated as ‘Secondary Aquifer’. 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.
- 6.8.70** The deposits of peat shown to be present within the site are designated as ‘unproductive strata’.
- 6.8.71** 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

²⁸ 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

²⁹ Groundsure, EnviroInsight report, Report ref.: GS-6396069, 14/10/2019

permeable layers capable of supporting water supplies at a local rather than strategic scale.

From review of the Groundsure EnviroInsight report purchased for the desk study of the wider site 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.

Groundwater Levels

- 6.8.72** The groundwater levels beneath the site have been interpreted through review of documents provided by Celtic Energy.
- 6.8.73** Extensive exploratory drilling was undertaken by British Coal in the late 1990s in the location of the Nant Helen Extension opencast. These boreholes do not sit beneath the site itself and pertain to the land immediately to the west of the western site boundary. 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 at approximately 128m AOD beneath the easternmost extent of the Nant Helen Extension opencast site and dropped to approximately 100m AOD at the westernmost extent of the Nant Helen Extension opencast site. Based on current LiDAR elevation data, the levels above put groundwater at between ~50m bgl (west) and ~170m bgl (east); the disparity in these levels is due to the existing Nant Helen Extension void in the west and the overburden storage area to the east.
- 6.8.74** These levels are somewhat corroborated by two piezometers which were installed within two of the boreholes progressed as part of the investigation by British Coal. These piezometers indicate that the groundwater level sits between 109.04m AOD and 98.75m AOD.
- 6.8.75** It should be noted that no indication of the groundwater level beneath the main body of the site could be interpreted from the information received. 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.
- 6.8.76** Other borehole logs, held by the British Geological Survey, pertaining to an area to the southeast of the site indicate shallower groundwater strikes within the superficial and artificial material present in this region. These 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 site.

Unexploded Ordnance

- 6.8.77** 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.
- 6.8.78** 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.
- 6.8.79** 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.
- 6.8.80** 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.
- 6.8.81** Based on the preliminary UXO risk assessment detailed above, the risk of UXO encounter beneath the site is considered negligible.

Land Contamination

- 6.8.82** 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)

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

Made Ground

- 6.8.84** 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.

6.8.85 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.

6.8.86 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.

Rail/tram Lines

6.8.87 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.

Fuel Tanks

6.8.88 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

6.8.89 From review of the Groundsure EnviroInsight report, a single pollution incident has been identified to have occurred within the site boundary.

6.8.90 The pollution incident occurred in 2013 and was located within the southern half 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).

6.8.91 Landfill Sites

6.8.92 No landfill sites have been identified within the Study Area. However, from review of the Groundsure EnviroInsight report, the following historic landfills are located within 1km of the site boundary:

Table 6.4 – Historical Landfill sites – NRW Dataset

Name	Direction and distance from site	Type of Waste Accepted	Year of Closure
Moorside Villas	473m (NW)	Commercial Household	1974
Cowlbren	612m (N)	Unknown	Unknown

6.8.93 As neither of these landfills impact the site directly, the risk of encountering potential contamination associated with these two locations within the scheme area is considered to be negligible.

Receptors (Baseline)

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

6.8.95 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.

6.8.96 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)

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

6.8.98 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

6.8.99 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)

6.8.100 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.

6.8.101 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.

6.8.102 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.

6.8.103 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.

6.8.104 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.

6.9 Design mitigation

- 6.9.1 The geotechnical design of the Nant Helen Enabling Works would ensure slope stability of the ground, cuttings and embankments adequate for the selected development option. The design would also consider ground hazards associated with historical mineworkings and subsidence due to potential change in groundwater conditions. This would include a detailed mining and hydrogeological impact assessment, and potentially treatment of shallow mine workings.
- 6.9.2 Materials reuse will be managed via the wider restoration scheme leading to overall betterment of the site conditions.
- 6.9.3 An Outline Construction Environmental Management Plan has been prepared, which sets out general requirements with respect to health and safety, minimum requirements of an Action Plan to deal with unexpected contamination, management of construction related waters and provision of an environmental monitoring. This will be further developed as the design progresses.
- 6.9.4 A number assumptions have been made with respect implementing legislation and good practice during construction as detailed in Section 6.7, which constitute design mitigation. These include appropriate health and safety, materials management and pollution prevention systems applied during the works.

6.10 Assessment of effects

Assessment of effects from construction - Geology and geomorphology

- 6.10.1 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.
- 6.10.2 Considering the historical exploitation of the open cast area, the features characterising these non-statutory designated sites would have been removed and replaced by mine spoil and overburden materials. 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

- 6.10.3** Baseline conditions review indicated that groundwater level is may be 50m below ground level, therefore the Project 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. Should mineworkings treatment be required any impacts on hydrogeology would be assessed through detailed studies as stated in Section 6.9 on design mitigation.
- 6.10.4** 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 no change to hydrogeological value with a **neutral** significance of effect.

Assessment of effects from construction - Land contamination

- 6.10.5** The construction works would introduce new pollution linkages into the baseline conceptual site model. The revised conceptual site model is detailed below.
- 6.10.6** 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)

- 6.10.7** The potential baseline sources of contamination identified in relation to the study area are presented in Section 6.8 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.
 - Groundwater removed as a result of dewatering of cuttings.

Potential Receptors (construction)

- 6.10.8** Potential baseline receptors to the identified sources of potential contamination within the study area are presented in relevant sections in Section 6.8 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)

6.10.9 The preliminary potential baseline pathways between identified sources of contamination and receptors are presented in Section 6.8 Baseline Environment, Land Contamination . The construction works would introduce the following additional pathways:

- Direct discharge of groundwater removed from ground as a result of dewatering operations.
- Direct exposure to soils or groundwater, such as ingestion, dermal contact and/or inhalation of vapours, during excavation works.
- Surface run-off where made ground is exposed during excavation works.

Plausible Pollution Linkages (construction)

6.10.10 Construction workers, same as workers of the opencast mine in the baseline scenario, have the potential to be directly exposed to soils and dust from exposed made ground materials. Providing that health and safety measures are in place in accordance with current legislation and good practice, as assumed in Section 6.7, is unlikely to pose a risk to construction workers. There is however an increased risk due to encountering unexpected contamination.

6.10.11 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.

6.10.12 The proposed Nant Helen Complementary Restoration Earthworks will result in dust generation, which may migrate towards the residents of nearby settlements. Dust would be generated from the same materials as those handled during the opencast operation and therefore there is unlikely to be a significant change to baseline conditions.

6.10.13 Breaking the ground, moving materials within the study area, temporary storage, may result in contaminants mobilisation due to increased exposure to rainfall and consequent increased rate of contaminants leaching into the underlying groundwater or surface run-off into watercourses.

6.10.14 During the earthworks there may be a need to dewater the excavations. The removed water could be discharged to the wider site drainage or ground, and potentially impact the receiving controlled water receptors. As stated in Section 6.7, it is assumed that such discharge will not have detrimental impact on the receiving water quality.

- 6.10.15** 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**. The construction works are likely to have a **neutral** significance of impact on nearby residents due to no change in the pollution linkage or exposure scenario.
- 6.10.16** The site is located within a very sensitive setting with respect to controlled waters, with surface water receptors being assigned high value and groundwater – medium, as detailed in the Water Environment chapter. The magnitude of impact is considered to be negligible on account of the environmental monitoring being in place and a requirement to set out an Action Plan as per Outline CEMP, 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.

Assessment of effects on completion

Assessment of effects on completion - Geology and geomorphology

- 6.10.1** It is considered that the proposed Nant Helen Complementary Restoration Earthworks scheme 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 on completion - Hydrogeology

- 6.10.2** Baseline conditions review indicated that groundwater level is may be 50m below ground level, therefore the Project 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.
- 6.10.3** 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 no change to hydrogeological value with a **neutral** significance of effect.

Assessment of effects on completion - Land contamination

6.10.4 The operation of the proposed scheme would introduce new pollution linkages into the baseline conceptual site model. The revised conceptual site model is detailed below.

6.10.5 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 (on completion)

6.10.6 The potential baseline sources of contamination identified in relation to the study area are presented in Section 6.8 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 scheme. Materials impacted by significant contamination would have been removed or remediated.

Potential Receptors (on completion)

6.10.7 Potential baseline receptors to the identified sources of potential contamination within the study area are presented in Section 6.8 Baseline Environment, Land Contamination. On completion this would introduce the following additional receptors:

- End users of the scheme such as adults and children i.e. cyclists, walkers for the recreational end-use scenario, and railway testing facilities workers for the testing facility end use scenario
- Maintenance workers: Minimal maintenance is likely to be required for the recreational end-use scenario. Railway testing facilities is likely to involve more regular maintenance regime. It has been assumed that the maintenance workers include adults and also apprentices aged 16 and above.

Potential Pathways (on completion)

6.10.8 The preliminary potential baseline pathways between identified sources of contamination and receptors are presented in Section 6.8 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 scheme users and maintenance workers (e.g. where vegetation maintenance is required) may still come to dermal contact with

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

- Inhalation of gases would be unlikely due to lack of confined spaces or structures.
- Inhalation of volatile hydrocarbon contaminants will no longer be viable due to the removal of significant contamination.
- No exposure to groundwater is likely as part of normal operation or maintenance works.
- Introduction of vegetation on sloped surfaces will significantly reduce rainwater infiltration and therefore the rate of contaminant leaching into the underlying groundwater would be reduced.
- Groundwater regime may alter when the opencast mining activities cease due to deactivation of dewatering. Groundwater is still likely to drain via a network of historical adits but may discharge directly into the surface water receptors.

Plausible Pollution Linkages (on completion)

- 6.10.9** Depending on the final use of the proposed landform, end scheme users and maintenance workers are likely to be exposed to soils via dermal contact and to a lesser extent via inhalation or ingestion of soil dust. Providing that health and safety measures are in place in accordance with current legislation and good practice, as assumed in Section 6.7, is unlikely to pose a risk to maintenance workers.
- 6.10.10** Significant dust generation and off-site migration is unlikely to be a viable pathway on completion, significantly reducing the exposure of residents of nearby villages. This would present a beneficial impact in relation to baseline conditions.
- 6.10.11** If encountered during the earthworks, significant contamination is likely to have been removed and therefore have a beneficial impact on underlying groundwater. Vegetation introduced at the finished level would reduce rainwater effective infiltration and leachate generation and migration towards the controlled water receptors. This would have a beneficial impact.
- 6.10.12** Considering the high sensitivity of the end site user as a receptor (child user of the recreational end use) and medium sensitivity of the testing track facilities workers, based on exposure scenario, with 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** in both cases. On completion there is likely to be a **moderate beneficial** significance of effect on nearby residents due to reduction in soil dust generation in comparison with the baseline scenario, also in a context of the wider restoration works.
- 6.10.13** The site is located within a very sensitive setting with respect to controlled waters, with surface water receptors being assigned high

value and groundwater – medium, as detailed in the Flooding and Hydrology chapter. 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 Nant Helen Complementary Restoration Earthworks are 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 subject to the measures presented within the Outline CEMP being adhered to.

6.11.3 Should mineworking treatment be required within the proposed footprint of the scheme, then the design of the treatment and its extent will be undertaken as part of the engineering design. It may introduce further risks depending on the proposed treatment. On confirmation of the treatment requirements, appropriate mitigation will be applied as necessary.

6.11.4 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 scheme. This will determine suitability for reuse criteria.

Mitigation of effects on completion

6.11.5 The proposed Nant Helen Complementary Restoration Earthworks are likely to result in neutral 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 scheme may have temporary moderate negative effect on the water environment and therefore mitigation measures have been identified. 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 however at levels not causing pollution.

Residual effects on completion

- 6.12.3** The proposed Nant Helen Complementary Restoration Earthworks are 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 of embankments and cuttings	Geology and geomorphology	Negligible	No change	Neutral	n/a	n/a	Neutral	n/a
	Hydrogeology	Medium	No change	Neutral	n/a	n/a	Neutral	n/a
Unexpected contamination during construction	Construction workers	Low	Minor	Slight adverse	n/a	n/a	Slight adverse	n/a
	Controlled waters	High	Negligible	Slight adverse	n/a	n/a	Slight adverse	n/a
Mobilisation of contaminants during earthworks	Controlled waters	High (surface water) Medium (groundwater)	Negligible	Slight adverse	plan/a	n/a	Slight adverse	n/a
On completion	Geology and geomorphology	Negligible	No change	Neutral	n/a	n/a	Neutral	n/a
	Hydrogeology	Medium	No change	Neutral	n/a	n/a	Neutral	n/a
Exposure to made ground containing contaminants	End users of the scheme	High	Negligible	Neutral	n/a	n/a	Neutral	n/a
Reduction in exposure to dust	Residents of nearby villages	High	Moderate	Moderate positive	n/a	n/a	Moderate positive	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
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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. The project boundary is considered in this assessment as the footprint of the development i.e. earthworks (as shown in Figure 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. The 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 ES, since it is anticipated that the earthworks would remain in perpetuity, and therefore will not be considered in this Chapter of the ES.
- 7.1.4** This Chapter has been informed by the baseline ecology survey data, reports and associated drawings included in Appendices A-M, 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 Project involves the construction of earthworks, including cutting and embankments works, and associated drainage works.
- 7.2.2** The following are considered key issues that will be considered in detail within the ecology chapter of the ES:
- The presence of statutory and non-statutory designated sites which could be indirectly affected during construction and on completion.

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

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

7.2.3 As detailed in Section 2.7 of this ES, the baseline for this project, will incorporate details of the restoration of the site which is a planning condition of the existing mining works, where any restoration is likely to have commenced, and or, be in operation at the time of the earthworks, or post earthworks. Therefore, the future baseline of the site has been considered in the assessment of impacts on ecological receptors both during construction and operation. The restoration plan referred to throughout this ES (shown in Figure 1.2) has recently been revised and submitted to the relevant planning authorities but not yet approved; however there is a resolution to grant permission at the time of writing this document.

7.3 Legislation, policy context and guidance

Legislation

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

Conservation of Habitats and Species Regulations 2017 (as amended)

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

7.3.3 European Sites comprise:

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

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

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

1. "A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which:
 - (a) is likely to have a significant effect on a European site or European marine site (either alone or in combination with other plans or projects), and
 - (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".

7.3.5 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.

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

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

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

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

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

7.3.7 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.

7.3.8 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.

7.3.9 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

7.3.10 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)

7.3.11 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.

7.3.12 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.

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

7.3.14 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.

7.3.15 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.

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

7.3.17 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.

7.3.18 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.

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

7.3.19 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

- 7.3.20 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.

Hedgerow Regulations 1997

- 7.3.21 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.

The Environment (Wales) Act 2016

- 7.3.22 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.

Wild Mammals (Protection) Act 1996

- 7.3.23 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.

Policy Context

- 7.3.24 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:

- 7.3.25 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.

- 7.3.26 Mitigation and/or compensation measures will need to be agreed where adverse effects are unavoidable.
- 7.3.27 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”.
- 7.3.28 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.”
- 7.3.29 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.”
- 7.3.30 The Powys County Borough Council (PCBC) LDP includes a number of policies relating to nature conservation, in particular:
- 7.3.31 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”.
- 7.3.32 “Development proposals which would impact on the following natural environment assets will only be permitted where they do not unacceptably adversely affect:
1. The important site designations, habitats and species afforded the highest levels of protection through European legislation including:
 - A. European Sites (SAC, SPA and Ramsar).
 - I. Development proposals likely to have a significant effect on a European site, when considered alone or in combination

with other proposals or plans, will only be permitted where it can be demonstrated that:

- a) The proposal is directly connected with or necessary for the protection, enhancement and positive management of the site for conservation purposes; or
 - b) The proposal will not adversely affect the integrity of the site.
- II. Where it cannot be demonstrated that development proposals would not adversely affect the integrity of the site and there is no satisfactory alternative solution, permission will be refused unless:
- a) There are imperative reasons of over-riding public interest; and
 - b) Appropriate compensatory measures are secured.
- B. European Protected Species afforded strict protection by the Conservation of Habitats and Species Regulations 2017 (Habitats Directive Annex IV Species)."

7.3.33

"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.”

7.3.34

“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.”

7.3.35

“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

7.3.36

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

7.3.37

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.”

7.3.38 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.”

7.3.39 4.2.49 “Protected species are a material planning consideration. The way in which protected species are considered in the planning process is detailed in TAN 518. The LDP does not repeat this guidance on how to deal with protected species and in this instance relies upon national guidance.”

Planning Policy Wales (PPW)

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

7.3.41 PPW 10 sets out that “planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means that development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity” (para 6.4.5). This policy and subsequent policies in Chapter 6 of PPW 10 respond to the Section 6 Duty of the Environment (Wales) Act 2016.

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

United Kingdom Biodiversity Action Plan (UK BAP)

7.3.43 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

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

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.

7.3.44 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)

7.3.45 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.’

7.3.46 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

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

Neath Port Talbot Biodiversity Action Plan

7.3.48 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

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

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

7.3.49 A range of guidance documents are available for biodiversity, but the principal assessment sources include:

- Guidelines for Ecological Impact Assessment in the UK and Ireland, Versions 1.1 (CIEEM, 2019)¹.

7.3.50 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 A-M).

7.4 Study Area

7.4.1 The Study Area used for all ecological baseline reports encompasses the majority of land within the Nant Helen open cast operational site, and the area surrounding and adjacent to this Site

7.4.2 The development footprint for the project, is shown in Figure 1.1. 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 A scoping report has not been submitted, due to the short timeframe available for submitting the ES. Consultation has taken place with PCC and NPTCBC, and NRW as in Section 7.6 below on the scope and timing of ecological surveys, required for the Project.

7.5.2 A formal scoping opinion has been received the proposed application for a rail testing and storage facility, known as the Global Centre of Rail Excellence (GCRE) (application numbers P2019/5455 (NPTCBC) and PCBC 18/1619/SC (PCBC)). Comments are detailed below in Table 7-1 along with the response to address these comments. This Scheme is considered to be relevant to the Project, since it is within the same Site.

Table 7.1: Formal scoping opinion for the proposed application for GCRE.

Scoping opinion clause	Comment	Response
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 Mellt 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-of-national-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 ZoI of 200m of the	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 Influence 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 Enhancement measures are detailed for all ecological receptors within this Chapter including LBAP and S7 species and habitats.

Scoping opinion clause	Comment	Response
	development boundary and in relation to water resources a ZoI of 500m has been identified - as both of these are linked to condition of biodiversity features then it is 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 from Welsh Government to Wales LPA Heads of Planning dated 23rd October 2019 which states that 'where biodiversity enhancement is not proposed as part of an application, significant weight will be given to its absence, and unless other significant material considerations indicate otherwise it will be necessary to refuse permission.'	
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 SINC are available from SEWBReC and the criteria are available from the Wales Biodiversity Partnership website. • No mention of an assessment of ecosystem resilience (Section 2 Environment (Wales) Act 2016) is included, it is recommended that an assessment is undertaken to ensure the aspects of ecosystem resilience are able to be appropriately considered in line with the Act; this shall particularly consider: (a) diversity between and within ecosystems; (b) the connections between and within ecosystems; (c) the scale of ecosystems;	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.

Scoping opinion clause	Comment	Response
	(d) the condition of ecosystems (including their structure and functioning); (e) the adaptability of ecosystems. • Also, an assessment of impacts upon bird habitat (Section 9a Conservation of Habitats and Species Regulations 2010 as amended); should be included. It is welcomed that up to date surveys are being undertaken to ensure appropriate data is available to inform this assessment. • In relation to the significance criteria to be used for the assessment please note the NPT LDP policy requirements and the requirements of the Environment (Wales) Act 2016 in relation to what the LPA needs to consider as part of planning submission. For example all S7 habitats/SINCs/LBAP habitats and species impacted by the scheme will require mitigation as well as protected species and designated sites. These should not be ruled out too early in the assessment process on the basis of criteria applied.	
NRW	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.	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 restoration works (recently revised submission) in the assessment of impacts. 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

Scoping opinion clause	Comment	Response
	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 requirements for a licence and set out how the works will satisfy the three requirements as set out in the Conservation of Habitats and Species Regulations 2017. 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.	existing ecological reports and interrogation of online sources, to identify potential ecological receptors. The presence of marsh fritillary has been considered in this Chapter and the enhancement of potential habitat discussed, and required within the forthcoming Habitat management plan. 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 is considered in Sections 7.20, 7.21, 7.24 and Appendix 7Q.

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 to by Celtic Energy to inform the 2011 EIA (for the Site's restoration) would be required to be updated for the Project. This included previous species surveys with negative results, due to the mobile nature of these species and presence of suitable habitat. In addition, they confirmed that an arboreal mammal survey would be required due to the presence of red squirrel (*Sciurus vulgaris*) 3 km from the Site.
- 7.6.2** The NPTCBC Ecologist was also consulted regarding the LBAP habitats and both the NPTCBC and PCBC Ecologists were consulted on the local SINC 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 planning inspectorate stated, in a meeting with the Arup project team on the 15th November 2018, that all protected species/habitat surveys would need to be undertaken prior to submission of the EIA application.
- 7.6.4** 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.
Planning Inspectorate	Requested that all the ecology baseline surveys were undertaken prior to the submission of the Project's EIA application.	The above surveys have been completed between November 2018 and November 2019.

7.7 Methodology

Overview

- 7.7.1 The assessment presented within this Chapter is undertaken in accordance with the guidance for ecological assessment provided by the Chartered Institute of Ecology and Environmental Management (CIEEM)¹.
- 7.7.2 The assessment considers the potential impacts on statutory and non-statutory nature conservation sites, habitats and species of conservation importance. The methodology for establishing baseline conditions is set out in the following sections along with the methods for evaluating receptors and assessing impacts.

7.8 Sources of Baseline Data

Table 7.3: Sources of baseline information including timing and survey effort. Further details on methods and results can be found in the Baseline Ecological Appraisal in Appendices A-M.

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

⁷ Environmental Statement (2011), Celtic Energy.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ecological Feature	Date	Summary of method	Survey boundary
		All Wintering bird surveys were carried out by a team of two surveyors, with at least one experienced in undertaking ornithological survey work and able to identify birds by calls and songs, as well as visually. Further details are provided in the Wintering bird report in Appendix 7H.	
Riparian mammal (otter and water vole) survey	Three surveys undertaken of suitable waterbodies in spring, summer and autumn 2019 (between May and September 2019)	The otter/water vole field survey involved surveying all waterbodies (25 ponds and nine streams/ditches) present within the Study Area that had been identified during the Phase 1 habitat survey³¹ or Ordnance Survey data. Three otter/water vole surveys (spring, summer and autumn) were completed of each of these waterbodies between May and September 2019 (inclusive). Due to the cross-over in habitat requirements and survey methodology both species were surveyed for at the same time. The water vole survey was completed in accordance with the standard survey guidelines²⁴²⁵ The survey comprised walking the ditch banks to search for signs of water vole presence, including but not limited to burrows, latrines, footprints, feeding remains and sightings of animals. The otter survey was conducted in line with relevant survey guidance²⁶. This involved accessing the watercourse and walking in-channel (where possible), to search for evidence of otter presence such as resting places, spraints, food remains, prints, slides and holts. Camera traps (Minox DTC 650) were installed at four locations within the Study Area to provide additional data on usage of identified features, or where a complete survey of waterbodies/courses was difficult (due to dense vegetation). The images obtained were checked for otter and water vole. Further details are provided in the Riparian mammal report in Appendix 7I.	The Study Area as defined in 7.4
Bat roost survey (buildings/structures and trees)	Preliminary roost assessment survey undertaken in June and July 2019. Emergence and re-entry surveys undertaken between July and September 2019.	All trees, buildings and structures within the Study Area were assessed for their suitability to support roosting bats as well as checking for signs of bats (such as dead specimens, droppings, urine splashes, fur oil -staining and/or squeaking noises by bat squeaking noises) in accordance with published guidance²⁷, in summer 2019. Potential roost features in either trees, buildings or structures were categorised as being of high, moderate or low suitability for use by bats in accordance with the Bats: Good Practice Survey Guidelines²⁴. Trees, buildings and structures with potential roosting features were subject to further assessment. Trees were subject to aerial inspections by bat licensed tree climbers, to inspect these features more closely. Buildings and structures were subject to nocturnal surveys i.e. either a dawn re-entry survey or a dusk	The Study Area as defined in 7.4.

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

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

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

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

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

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

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

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

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

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

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

7.9 Evaluation of Receptors and Assessment of Impacts

Zone of Impact for Ecological Features

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

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

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

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

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

7.10 Determining Value

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

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

Importance of ecological feature	Criteria
International and European	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. 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 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.

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

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

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

7.11 Valuing Habitat and Species

7.11.1 In accordance with the CIEEM guidelines¹, in assigning a level of value to each habitat or species considered in the assessment, it is necessary to consider its distribution and status, including a consideration of trends based on available historic records. Rarity is an important consideration because of its relationship with threat and vulnerability although since some species are inherently rare, it is necessary to consider rarity in the context of status. A habitat or species that is rare or declining should be assigned a greater level of importance than one that is rare but known to have a stable distribution or population.

7.11.2 Those ecological features which have been identified as being of sufficient value to be material to decision-making (e.g. those considered to be of 'Local' importance or above), and which it is considered could experience significant effects as a result of the proposed development (i.e. effects that could adversely affect the integrity of the habitat or the favourable conservation status of a species' local population), have been classified as 'Important Ecological Features' (IEF) (as outlined in CIEEM Guidelines), and thus will be considered in the detailed assessment. Other ecological features (i.e. those which are of less than 'Local' importance will be scoped out, and not subject to any further assessment within this document).

7.11.3 In accordance with the CIEEM Guidelines, where there is the potential for a breach of legislation in relation to protected species (regardless of their value), those species are also considered as IEF.

7.11.4 Following identification and valuation of the IEF, it is then necessary to investigate potential impacts on those features in order to understand how they might be affected by the proposed development.

7.11.5 Predicting and Characterising Ecological Impacts

7.11.6 In accordance with CIEEM guidelines, when describing impacts reference is made to the following:

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

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

7.12 Significance Criteria

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

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

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

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

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

7.13 Limitations and Assumptions

Limitations

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

Assumptions

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

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

7.14 Baseline Conditions

Designated Sites

Statutory Designations

- 7.14.1 Fourteen statutory designated sites were identified within 5 km of the Site. They comprised two Special Area of Conservation (SAC) within 15 km, and 12 Sites of Special Scientific Interest (SSSI), one of which is also designated as a National Nature Reserve (NNR), within 5 km. They are detailed in Table 7.6 and 7.7 below and shown in Figures 7.2 and 7.3.

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

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Coedydd Nedd a Mellte	SAC	Annex I habitats that are a primary reason for selection of this site include Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles. Coedydd Nedd a Mellte is a very large and diverse example of old sessile oak wood in south Wales. The woods extend along a series of deeply incised valleys and ravines, and contain complex mosaics of sessile oak <i>Quercus petraea</i> woodland, ash <i>Fraxinus excelsior</i> woodland (some of which is referable to Annex I type 9180 <i>Tilio-Acerion</i> forests of slopes, screes and ravines), and transitions to lowland woodland types. The whole site is biologically rich, with many woodland plant communities represented and rich bryophyte and lichen assemblages. Notable higher plant species include wood fescue <i>Festuca altissima</i> and the ferns <i>Dryopteris aemula</i>, <i>Hymenophyllum tunbrigense</i> and <i>Asplenium viride</i>.	4.2 km south-east
Cwm Cadlan	SAC	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caeruleae</i>) for which this is considered to be one of the best areas in the United Kingdom. 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.	10.4 km to the east (closest compartment)

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

Site Name	Designation	Features	Approximate Distance and Orientation from Site
Nant Llech	SSSI	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 (<i>Podabrus alpinus</i>) 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 (<i>Carum verticillatum</i>), meadow thistle (<i>Cirsium dissectum</i>) and sharp-flowered rush (<i>Juncus acutiflorus</i>). These plants form a clearly defined community of extremely limited distribution in Europe, occurring only along the southern Atlantic seaboard.	800 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 (<i>Trollius europaeus</i>), meadow thistle, whorled caraway and marsh arrowgrass (<i>Triglochin palustris</i>). Notable species in the eastern field include greater butterfly-orchid (<i>Platanthera chlorantha</i>), saw-wort (<i>Serratula tinctoria</i>), dyer's greenweed (<i>Genista tinctoria</i>) and petty whin (<i>G. anglica</i>). Over 100 species of flowering plants and ferns having been recorded. The area also supports invertebrates, especially butterflies.	2 km 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 (<i>Nardus stricta</i>), heath rush (<i>Juncus squarrosus</i>), deergrass (<i>Scirpus cespitosus</i>) and sheep's-fescue (<i>Festuca ovina</i>). This changes into grass heath communities of brown bent (<i>Agrostis canina</i>), red fescue (<i>Festuca rubra</i>), lousewort (<i>Pedicularis sylvatica</i>) and heath spotted-orchid (<i>Dactylorhiza maculata</i> spp. <i>ericetorum</i>), which in turn grade into purple moor-grass/sedge associations.	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 (<i>Eriophorum angustifolium</i>). Other species include bog pimpernel (<i>Anagallis tenella</i>), round-leaved sundew (<i>Drosera rotundifolia</i>), few-flowered spike-rush (<i>Eleocharis quinqueflora</i>), common butter-wort (<i>Pinguicula vulgaris</i>) and devil's-bit scabious (<i>Succisa pratensis</i>). Additional interest is provided by stands of alder (<i>Alnus glutinosa</i>) and by ditches which support species such as hemp-agrimony (<i>Eupatorium cannabinum</i>), bogbean (<i>Menyanthes trifoliata</i>), bog pondweed (<i>Potamogeton polygonifolius</i>) and the locally uncommon fern (<i>Osmunda regalis</i>).	
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 <i>Calluna vulgaris</i> and bilberry <i>Vaccinium myrtillus</i>. The north and east facing cliffs of Bannau Sir Gaer and Bannau Brycheiniog support an interesting arctic-alpine flora, with such species as northern bedstraw (<i>Galium boreale</i>), dwarf willow (<i>Salix herbacea</i>), lesser meadow-rue (<i>Thalictrum minus</i>) and roseroot (<i>Sedum rosea</i>), together with a rich moss and liverwort flora.	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 (<i>Convallaria majalis</i>), soft-leaved sedge (<i>C. montana</i>), mountain melick (<i>Melica nutans</i>), lesser meadow-rue (<i>Thalictrum minus</i>) and the nationally rare hairy greenweed (<i>Genista pilosa</i>). These areas of sheltered, deep heather provide suitable habitat for nightjar (<i>Caprimulgus europaeus</i>), offering probably one of the last breeding localities in Brecknock for this summer-visiting bird. Also present within the site are a number of peat-bottomed pools with a well-developed upland dragonfly and damselfly population.	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 (<i>Carex pulicaris</i>), carnation sedge (<i>C. panicea</i>) and tawny sedge (<i>C. hostiana</i>).	
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.	4.3 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

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

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

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

Habitats

Desk Study

Local Biodiversity Record Centre Search

- 7.14.3 Other notable habitats within 1 km were returned in the desk study records from BIS. The only notable habitats within the site, are areas of ancient woodland, shown in Figure 7.4.
- 7.14.4 There were 57 areas of ancient woodland within 1 km, one of which is within the Project/Site boundary (as shown in Figure 7.4). A site investigation (Appendix 7Q, Volume 2) confirms that the PAWS has been misrecorded as the AWS has been surface mined and backfilled with overburden shales. There are a number of other areas of recorded ancient woodland which occur within the wider Study Area, but which would not be affected by the Project.
- 7.14.5 Numerous records of notable vascular plants were returned by BIS within the search area. These included: small-flowered sticky eyebright (*Euphrasia officinalis subsp. anglica*), bluebell (*Hyacinthoides non-scripta*), globeflower (*Trollius europaeus*) and eyebright (*Euphrasia officinalis subsp. pratensis*). None of these were within the site boundary however.
- 7.14.6 Numerous records of notable bryophytes and lichen plants were returned by BIS within the search area, but not recorded within the Site. These included: the Witches' Whiskers lichen (*Usnea florida*), and lichens (*Parmotrema perlatum*, *Usnea articulate*, *Pachyphiale carneola*, *Pannaria conoplea*, *Parmeliella triptophylla*, *Phyllopsora rosei*, *Sticta canariensis (dufourii)*, *S. fuliginosa* and *S. limbata*), scarce turf moss (*Rhytidiadelphus subpinnatus*) and the varnished hook-moss (*Hamatocaulis vernicosus*).
- Review of existing ecology reports (associated with the Celtic Energy 2011 ES)**
- 7.14.7 Habitats recorded on Site during previous Extended Phase 1 Habitat surveys (undertaken to inform Celtic Energy's 2011 ES) included plantation woodland, broadleaved woodland, hedgerows, scrub, acid marshy/grassland, mire, ephemeral/short perennial, watercourses and standing water.
- 7.14.8 An Extended Phase 1 Habitat survey of the Site in 2016¹³ did not record any significant changes to habitats present on Site, except for fluctuating water levels within water bodies and the extension of the surface mine.
- 7.14.9 Grassland vegetation and areas dominated by purple moor grass (*Molinia caerulea*) were subject to NVC surveys in 2010, to inform the 2011 ES⁷. Five NVC community types were present within the Site:

M3 - *Eriophorum angustifolium* bog pool community, U4b - *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland; *Holcus lanatus* – *Trifolium repens* sub-community, U5d - *Nardus stricta* – *Galium saxatile* grassland; *Calluna vulgaris* – *Danthonia decumbens* sub-community, U5 - *Nardus stricta* – *Galium saxatile* grassland and M25 - *Molinia caerulea* – *Potentilla erecta* mire.

7.14.10 The bryophyte and lichen survey¹⁵ undertaken in 2012 did not identify any specially protected species, but the reasonably diverse flora present would qualify as being of ‘high conservation interest’ under the assessment criteria detailed in a report by Miller *et al.* (2007) for the then Countryside Council for Wales³⁷. Notable species identified included: *Sphagnum denticulatum*, *S. inundatum*, *Stereocaulon dactylophyllum*, *Arthrorhaphis grisea*, *Cladonia cervicornis* ssp. *verticillata*, *Cladonia macrophylla*, *Cladonia ramulosa*, *Hypotrachyna afrorevoluta* and *Syzygospora physciacearum*.

7.14.11 Restored grassland areas on Site (area immediately east of the overburden mound) were subject to NVC surveys again in 2013¹⁴. NVC communities that best fit the vegetation communities present on site included: MG 6b - *Lolium perenne*-*Cynosurus cristatus* grassland, *Anthoxanthum odoratum* subcommunity and U1e *Festuca ovina*-*Agrostis capillaris*-*Rumex acetosella* grassland, *Galium saxatile*-*Potentilla erecta* sub-community.

7.14.12 The Addendum to the OES Condition 45 (of the planning application 18/1070/REM)¹⁶ describes habitats within part of the Site (comprising the overburden mound and areas immediately to the west and east), and how their nature conservation value has increased since surveys undertaken in 2010, to inform the 2011 ES. It states that ‘the overburden mound has developed an area of higher conservation interest and one that has several Section 42 Priority habitat types³⁸. These now encompass the upper third tier and its top, and the western and eastern slopes of the overburden mound, as well as the lower two south facing tiers. Juxtaposed with the western slopes of the overburden mound there is 29 ha of undisturbed land within the Site and which has been placed under management during the Site operations. This land comprises both acid grassland and mire communities which is similar to those developed on the mound and which are too listed as Section 42 habitats of conservation importance. Furthermore, the 2012 survey of the 42 ha of restored land to the east of the mound identified it also to be of high importance, also listed as Section 42 habitats, and for its Nationally rare and scarce lichen flora. Hence together, the undisturbed land, the overburden mound and the

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

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

restored land currently provide a 120ha continuum of mosaics of highly (Section 42) important nature conservation habitats.’

Field surveys

Extended Phase 1 Habitat Survey

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

Broadleaved woodland – semi-natural

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

Broadleaved woodland – plantation

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

Coniferous woodland – plantation

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

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

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

Mixed woodland – plantation

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

Scrub – dense/continuous

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

Scrub – scattered

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

Coniferous parkland/scattered trees

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

Coniferous woodland – recently felled

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

Acid grassland – semi-improved

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

Improved grassland

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

Marsh/marshy grassland

- 7.14.25 Large areas of the site comprised grasslands dominated by rushes. Species present included hard rush (*Juncus inflexus*), soft rush (*Juncus effusus*), yarrow (*Achillea millefolium*), meadowsweet (*Filipendula ulmaria*), cock's foot (*Dactyla glomeratus*), valerian (*Valeriana* sp.),

common sorrel (*Rumex acetosa*), ribwort plantain (*Plantago lanceolata*), vetch species (*Vicia* spp.), Yorkshire fog (*Holcus lanatus*) and teasel (*Dipsacus fullonum*). Some areas of this habitat were dominated by purple moor grass. These grasslands were often heavily grazed by sheep, cattle and horses.

Poor semi-improved grassland

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

Bracken – scattered

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

Dry dwarf shrub heath – acid

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

Wet dwarf shrub heath

- 7.14.29 The area that was restored from previous mining activities in the centre of the site comprised an area of wet heath. Common heather and cross-leaved heather (*Erica tetralix*) were present, along with purple moor grass and sphagnum mosses (*Sphagnum* spp.).

Dry heath/acid grassland

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

Acid/neutral flush

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

Fen – basin mire

- 7.14.32 A fen was present within the restored mining area, likely to be fed by the flush within the same field. Common cotton-grass (*Eriophorum*

angustifolium) and common club-rush were present (*Schoenoplectus lacustris*).

- 7.14.33 Deep peat also occurs at this location, which was translocated (from the Mynydd Du peat deposit) as part of a previous habitat restoration project undertaken by Celtic Energy ^{46 54}.

Swamp

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

Standing water

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

Running water

- 7.14.36 Various drains and streams were present throughout the Site. These were typically up to 1 m wide with beds formed of rocks. The River Dulais flows east to west outside the southern boundary of the site.

Acid/neutral natural inland cliff

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

Quarry

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

Spoil

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

Amenity grassland

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

Ephemeral/short perennial

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

Intact hedge – species-poor

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

Species-poor intact hedge with fence

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

Defunct hedge – species-poor

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

Fence

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

Fence with trees

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

Dry ditch

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

Earth bank

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

Buildings

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

Bare ground

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

Gravel/hard standing

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

Tarmac surface

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

NVC surveys

Field Study

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

Table 7.9: NVC survey results.

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

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

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
Semi-improved acid grassland	Many extensive examples, especially on well-drained slopes associated with former mining activity. Including some areas with high densities of ant-hills.	A high proportion of the heavily grazed, short grassland on the site is best classified as semi-improved acid grassland. Most is grazed by sheep and cattle. One of the features of the older semi-improved grassland is the abundance of ant-hills. For the purposes of this study the ‘ant-hill grassland’ was sampled separately from the other semi-improved acid grassland, because of its very distinct appearance. This fits the NVC community U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland. Other semi-improved acid grassland is present that also has a closed sward but does not support the same frequency of ant-hills. Some of this is of relatively recent origin (the large spoil heap known as the overburden mound where Q30 and 37 were recorded is only about 30 years old). Some appears to be on natural clay soil rather than coal spoil, and with a high proportion of sweet vernal-grass (<i>Anthoxanthum odoratum</i>), red fescue and crested dog’s-tail (<i>Cynosurus cristatus</i>) is close to MG5 semi-improved neutral grassland (e.g. Q69, 79 and 80, Figure 6). Much of the semi-improved grassland has patchy rushes (especially soft rush), and some is transitional with damp grassland (e.g. Q35, which has a high frequency of purple moor-grass and has affinity with M25 mire, Figure 6). A few areas with more prominent Mat Grass resemble U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland. However, the majority of this close-sward acid grassland still broadly conforms to the NVC community U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland.	U4/U5	-
Sparse grassland on coal spoil and washery sidings	Many variations on U1 grassland. There is a full spectrum of cover and diversity from almost bare spoil to very high diversity vegetation which includes locally uncommon species.	Much of the Study Area supports sparse vegetation on recently disturbed coal spoil. The flora supports a high proportion of annual and low-growing ruderal species, as well as early colonists more typical of heath and grassland vegetation, and seedlings of trees and scrub. Bryophytes and lichens are also locally prominent. The flora supports many species indicative of acid soils, but there are many base-loving species too. This mix is typical of coal spoil and results in a very variable, flower-rich and often high diversity flora.	Unclassified	Small cudweed (<i>Filago minima</i>), viviparous fescue (<i>Festuca vivipara</i>), brown sedge (<i>Carex brunnescens</i>), and eye bright (<i>Euphrasia arctica</i> ssp <i>borealis</i>)

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		In Phase 1 habitat classification this would usually be classified as ‘ephemeral/short perennial vegetation’, although it is often not freely draining as the shale in the coal spoil breaks down into clays. It is not easy to define in terms of the NVC, probably because of the wide variation in the range of species that co-exist on the coal spoil and the presence of so many base-loving plants. The closest matches are probably U1 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Rumex acetosella</i> grassland community (Quadrats 38 and 72, Figure 6, are good examples of a typical U1 flora on coal spoil), but much of the spoil flora bears little resemblance to U1 and is probably best left unclassified.		
Dry heath / Dry heath and acid mosaic	The Study Area supports very few examples of heath with >25% cover by dwarf shrub species that would qualify as the S7 habitat ‘upland heathland’. The largest area is in the restoration area in the centre of the site, which supports H1 heath. Heath is mostly only present as mosaic component amongst acid grassland on former colliery slopes.	Heath is a feature of several areas on older coal spoil, especially where it has not been limited by grazing or shaded by scrub. The largest stands of heath are in the centre of the site which supports a mix of dry heath, wet heath and marshy grassland. Dry heath is also found on steeper slopes of coal spoil, often forming a mosaic with acid grassland (e.g. in Quadrats 40, 60 and 73, Figure 6). Most stands of dry heath are dominated by common Heather and readily conform to the published NVC community H1 <i>Calluna vulgaris</i> – <i>Festuca ovina</i> heath.	H1	-
Wet heath/ marshy grassland mosaic	Only a few small examples present, and mostly M25 mire, grading into other habitat mosaics. All that were seen support a good range of species.	Wet heath is not a common feature within the site, and where it occurs it is generally a fragmentary form within a mosaic of marshy grassland and mire vegetation. The examples sampled are all dominated by purple moor-grass, and the shrubs are a relatively minor element. In terms of the NVC this type of vegetation is best classified as M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire (possibly close to the M25a <i>Erica tetralix</i> sub-community).	M25	-
Sphagnum-rich bog vegetation	Only a few small areas are present, but they all support uncommon plants and all occur in association with other diverse marshy grassland and heath.	Several wet areas with Cotton-grasses and <i>Sphagnum</i> mosses are present around the margins of the restored coal workings, typically only in small quantity and/ or filling ditches. The peaty substratum supports a number of species typical of upland peat bogs, including Common Cotton-grass, Hare’s-tail Cotton-grass, Star Sedge, White Sedge, Round-leaved Sundew and a good number of Sphagnum species, locally with	M6	Royal fern.

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		standing water and Bog Pondweed in wetter parts. A young plant of Royal Fern was also found in this habitat. Only two quadrats were collected from this vegetation. Quadrat 48 is from a bog pool and Quadrat 42 is from a ditch. Both are probably forms of the published NVC community M6 <i>Carex echinata</i> - <i>Sphagnum fallax</i>/ <i>S.denticulatum</i> mire. Only two quadrats were collected from this vegetation. Quadrat 48 is from a bog pool and Quadrat 42 (Figure 6) is from a ditch. Both are probably forms of the published NVC community M6 <i>Carex echinata</i> - <i>Sphagnum fallax</i>/ <i>S.denticulatum</i> mire.		
Marshy grassland	Several relatively large areas are present that are dominated by Purple Moor-grass (M25 mire) and rush pasture (M23 mire). The most diverse would qualify as the S7 habitat 'Purple Moor-grass and rush pastures'. An extensive area of diverse, minerotrophic M23/M24 marshy grassland is present in wet fields with coal spoil north of the washery. A high proportion of marshy grassland on recently restored farmland is species poor MG10 rush pasture with negligible value.		M25 (species poor – where ungrazed), M23, M22, U4, MG10	In species rich areas - the flower-rich sward includes a number of locally uncommon species, such as marsh lousewort (<i>Pedicularis palustris</i>) and brookweed.
Flush vegetation	Several small M23 flushes are present; mostly at the margins of the grazed upland areas. They support a	There are several areas of flush vegetation on gently sloping ground at the lower edges of the site, particularly at the south and west margins. In most cases the flushes are very small and the vegetation is not very different from other rush-dominated marshy grassland. The plant community probably conforms most closely	M23	Several locally uncommon species were found in association with

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
	diverse sward with locally uncommon plant species.	to the NVC category M23 <i>Juncus effusus/ acutiflorus</i> – <i>Galium palustre</i> mire. However, the flushes tend to be relatively diverse examples of this. An area of seepage from coal spoil at the washery (Q114) appears to fit more closely with sand dune slack vegetation but this is probably just an anomaly of the unusual man-made nature of the habitat. Several locally uncommon species were found in association with flushes, including ivy-leaved bellflower (<i>Wahlenbergia hederacea</i>), whorled caraway and bog pimpernel (although no quadrats included the ivy-leaved bellflower).		flushes, including ivy-leaved bellflower, whorled caraway and bog pimpernel (although no quadrats included the ivy-leaved bellflower).
Swamp	Several areas of swamp vegetation are present, but they are mostly too small to qualify as priority habitat. Only one small area of S4 reedbed is present, but this is relatively small and species-poor.	Dense stands of tall emergent plants forming swamp vegetation tend to be very localised within the site, and they are mostly low diversity plant communities. greater tussock-sedge (<i>Carex paniculate</i>) forms one rather uniform stand beside a small stream, and this has been sampled in Quadrat 15, Figure 6. Tall sedge (<i>Carex appressa</i>), common reed and reed canary-grass (<i>Phalaris arundinacea</i>) are patchily dominant in parts of the wet grassland north of the washery, and a stand of lesser pond-sedge (<i>Carex acutiformis</i>) has been sampled to represent this (Q105). Bulrush was also present as small stands in several ponds (this was not sampled because it generally exists in deeper water as single-species stands). There is also a small common reed reedbed near the centre of the site. NVC classification for these very low-diversity swamp communities in this case is straightforward; the greater tussock-sedge swamp is S3 <i>Carex paniculata</i> swamp, the lesser pond-sedge stand is S7 <i>Carex acutiformis</i> swamp, the bulrush stands are S12 <i>Typha latifolia</i> swamp, and the reedbed is S4 <i>Phragmites australis</i> swamp. Common Reed was generally present as a single-species stand in the reedbed, but a list of associated species was obtained from the whole reed bed as a target Note (TN7), Figure 6.	S3, S7, S12 and S4	-
Ponds	There is an extensive network of ponds within the site. They are of man-made origin but support a variety of vegetation types, including several locally rare plant	The Study Area supports a high density of ponds; many of these are relatively recent in origin, created for silt control, attenuating high flows and providing water for the mine operations. Some ponds are still very functional, with steep sides and little vegetation, but others are less intensively maintained and support a fringe of wetland plants. These typically include common spike-rush, soft rush, sharp-flowered rush, bulbous rush (<i>Juncus bulbosus</i>), lesser spearwort (<i>Ranunculus flammula</i>) and	Affinities with M23, S19, M29, M6 and OV35 and A24.	Floating bur-reed, lesser bulrush, and spiked water-milfoil (<i>Eleocharis palustris</i>).

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
	species such as floating bur-reed (<i>Sparganium angustifolium</i>).	<i>Sphagnum</i> mosses. Some of the older ponds have a well-developed submerged plant community. The acidic, silty water from the coal spoil that feeds the ponds allows species typically associated with upland pools to grow, such as bog pondweed, cotton-grasses, star-sedge and the locally rare floating bur-reed. It is difficult to place the pond communities in terms of the NVC as any more than a rough approximation, particularly as each pond had a slightly different character, and elements of several different communities might be present in any pond. The fringing vegetation often has strong elements of M23 <i>Juncus effusus/ acutiflorus</i> – <i>Galium palustre</i> mire, which is similar to much of the nearby marshy grassland. Ponds fringed by common spike rush could be considered to support a narrow band of S19 <i>Eleocharis palustris</i> swamp. The boggy margins of some ponds have some similarities with M29 <i>Hypericum elodes</i> – <i>Potamogeton polygonifolius</i> soakway vegetation (although there was no sign of marsh St. John's-wort (<i>Hypericum elodes</i>)), M6 <i>Carex echinata</i> – <i>Sphagnum denticulatum</i> mire, and the OV35 <i>Lythrum portula</i> – <i>Ranunculus flammula</i> community. The aquatic plants could feasibly be described as a species-poor version of the A24 <i>Juncus bulbosus</i> community.		
Ditches	There are a range of ditch types within the site. Most are small with a limited wetland flora. Several larger ones support a more diverse flora.	There are numerous shallow ditches within the Study Area, but many of them appear to be almost dry most of the time and only support a species-poor rush-dominated flora. A few of the deeper, wetter ditches have a greater proportion of wetland plants, such as bulrush, water mint <i>Mentha aquatica</i>) and common spike rush, and the flora resembles that of the pond margins. In most cases the ditches support variations of the NVC community M23 <i>Juncus effusus/ acutiflorus</i> – <i>Galium palustre</i> mire. Some ditches support a high proportion of bulrush or common spike-rush and are closer to S12 <i>Typha latifolia</i> swamp and S19 <i>Eleocharis palustris</i> swamp respectively. Some ditches which are subject to disturbance or regular management, such as around the washery, support open vegetation communities resembling the OV28 <i>Agrostis stolonifera</i> – <i>Ranunculus repens</i> community. The ditches with greatest botanical conservation significance tend to be those that are permanently wet. Some these support a high proportion of mosses (e.g. Q42, described under <i>Sphagnum</i>-rich bog vegetation, Figure 6). Some have a very high proportion of sedges and flowering herbs (e.g. TN20, which has a diverse flora	Variation of M23, S12, S19, and Ov28	-

Vegetation type	Summary of vegetation community descriptions	Detailed habitat description	NVC category (most closely aligned)	Notable vascular plants
		including common sedge, star sedge, remote sedge (<i>Carex remota</i>), common yellow sedge (<i>C. demissa</i>) and white sedge (Figure 6).		

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

Fungi

Desk study

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

Field Study

- 7.14.56 Various wax cap mushrooms were identified on Site during the Extended Phase 1 habitat survey (TN45, TN46, TN47 & TN48, Figure 5). They were not identified to species level.
- 7.14.57 The fungi survey undertaken in 2019, identified 80 fungi species within the Study Area (and therefore not all these records were within the Site boundary). Areas 3 and 10, as shown in Figure 7.7 (and detailed within the fungi survey report, Appendix 7C, Volume 2), support the highest number and diversity of fungi, which occur on coal spoil. None of the fungi recorded during the survey are Section 7 species. However, several species, infrequently recorded in Wales including *H. substragulata* (areas 1, 3 and 6), *H. phaecooccinea* (areas 3, 7 and 8) and *H. lacmus* (areas 2, 7 and 9). It is acknowledged in the report that fungi are generally under recorded and therefore it is difficult to determine whether these less frequently recorded species are rare or just under recorded.

Invertebrates

Desk study

- 7.14.58 Numerous records of notable invertebrates were returned by BIS within the search area. These included: broom moth (*Ceramica pisi*), dark barred twin-spot carpet moth (*Xanthorhoe ferrugata*), small phoenix (*Ecliptopera silaceata*), small heath (*Coenonympha pamphilus*), knot grass (*Acronicta rumicis*), dot moth (*Melanchra persicariae*), rosy minor moth (*Litoligia literosa*), rosy rustic moth (*Hydraecia micacea*), sawfly moth (*Cirrhia icteritia*), ear moth (*Amphipoea oculatea*), oak hook-tip moth (*Drepana binaria*), oblique carpet moth (*Orthonama vittata*), autumnal rustic moth (*Eugnorisma glareosa*), hedge rustic moth (*Tholera cespitis*), grayling butterfly (*Hipparchia semele*), double dart moth (*Graphiphora augur*), blood-

vein moth (*Timandra comae*), buff ermine moth (*Spilosoma lutea*), garden tiger moth (*Arctia caja*), shoulder striped wainscot moth (*Leucania comma*), small square moth (*Diarsia rubi*), white ermine moth (*Spilosoma lubricipeda*), centre barred sallow (*Atethmia centrago*), dusky brocade moth (*Mniotype adusta*), ghost moth (*Hepialus humuli*), small pearl-bordered fritillary butterfly (*Boloria selene*), small blue butterfly (*Cupido minimus*), wall, brindled beauty moth (*Lasiommata megera*), cinnabar moth (*Tyria jacobaeae*), narrow bordered bee hawk-moth (*Hemaris fuciformis*) and dingy skipper butterfly (*Erynnis tages*).

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

Field Study

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

Fish

- 7.14.61 BIS returned two records of notable fish species within the search area: Atlantic salmon (*Salmo salar*) at 600 m and European bullhead (*Cottus gobio*) at 2 km from the Site boundary.
- 7.14.62 Waterbodies such as man-made lagoon and bog pools, may support common fish species such as stickleback (*Gasterosteus aculeatus*).
- 7.14.63 There are numerous streams and ditches within, and adjacent to, the Site. These are narrow and shallow, and not well connected through the Site and as such are not considered to provide suitable habitat for any notable fish species including Atlantic salmon and bullhead.

Amphibians

Desk study

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

Field Study

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

Reptiles

Desk study

- 7.14.69 BIS returned records of reptiles within the search area including common lizard (*Zootoca vivipara*) at 700 m, grass snake (*Natrix helvetica*) at 1 km and slow worm (*Anguis fragilis*) at 2 km from the Site boundary.

- 7.14.70 Previous reptile surveys undertaken for Celtic Energy's 2011 ES recorded low numbers of common lizard and slow worm.

Field Study

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

Birds (Breeding and Wintering)

Desk study

- 7.14.73 Bird records within the area provided by BIS within the Site boundary included cuckoo (*Cuculus canorus*), house sparrow (*Passer domesticus*), kestrel (*Falco tinnunculus*), lesser black-backed gull (*Larus fuscus*), red kite (*Milvus milvus*) and starling (*Sturnus vulgaris*). Records outside of the Site boundary but within the 2 km search area included hawfinch (*Coccothraustes coccothraustes*), dunnock (*Prunella modularis*), merlin (*Falco columbarius*), mistle thrush (*Turdus viscivorus*), bullfinch (*Pyrrhula pyrrhula*), common crossbill (*Loxia curvirostra*), skylark (*Alauda arvensis*), woodcock (*Scolopax rusticola*), grasshopper warbler (*Locustella naevia*), barn owl (*Tyto alba*), curlew (*Numenius arquata*), linnet (*Linaria cannabina*), mallard (*Anas platyrhynchos*), snipe (*Gallinago gallinago*), song thrush (*Turdus philomelos*), brambling (*Fringilla montifringilla*), fieldfare (*Turdus pilaris*), lapwing (*Vanellus vanellus*), redwing (*Turdus iliacus*), reed bunting (*Emberiza schoeniclus*), peregrine (*Falco peregrinus*), lesser redpoll (*Acanthis cabaret*), hen harrier (*Circus cyaneus*), jack snipe (*Lymnocyrtus minimus*), water rail (*Rallus aquaticus*), hobby (*Falco subbuteo*), honey buzzard (*Pernis apivorus*), goshawk, tree pipit (*Anthus trivialis*), nightjar (*Caprimulgus europaeus*), osprey (*Pandion haliaetus*) and short-eared owl (*Asio flammeus*).
- 7.14.74 Previous breeding bird surveys undertaken for Celtic Energy's 2011 ES recorded no nesting honey buzzards were recorded on or adjacent to the Site. Neither goshawk nor peregrine were recorded but three old buzzard (*Buteo buteo*) nests were found. Tawny owl (*Strix aluco*) were heard during bat surveys. Twenty-one species were recorded as breeding/possibly breeding within, and adjacent to, the Site. Six of these species were Section 7 species under the Environment (Wales) Act 2016 (at the time Section 42 species, published under the Natural

Environment Act (NERC) 2006) and five species were red listed on the Birds of Conservation Concern 3 (BoCC). No crepuscular species were recorded.

- 7.14.75 Previous wintering bird surveys undertaken for Celtic Energy's 2011 ES recorded common crossbill, which are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Five species listed as Section 7 species under the Environment (Wales) Act 2016 (at the time Section 42 species, published under the NERC 2006 were recorded, four of which were also red listed on BoCC 3.

Field Study

- 7.14.76 There are woodlands, hedgerows and scrub on Site that provide suitable nesting opportunities for birds. The opencast mine may also provide nesting opportunities for species such as peregrine. The wet grasslands on site may provide suitable habitat for wintering bird species.
- 7.14.77 During the Extended Phase 1 survey, a peregrine was seen flying just south of the mine (TN28, Figure 5). Skylark and cuckoo were also heard on Site (TN29, Figure 5). A snipe (*Gallinago gallinago*) was seen on top the spoil from the mine and a lapwing was heard here (TN30, Figure 5). During bat transect surveys, nightjars have been heard and seen in recently felled woodland just outside the southern boundary of the Site (TN31, Figure 5).

Breeding Birds

- 7.14.78 Breeding bird surveys undertaken in 2019 (and detailed in Appendix 7G, Volume 2), recorded the following species: greater Canada goose (*Branta canadensis*), mallard, common buzzard, lapwing, curlew, woodpigeon (*Columba palumbus*), Eurasian collared dove (*Streptopelia decaocto*), cuckoo, nightjar, great spotted woodpecker (*Dendrocopos major*), jay (*Garrulus glandarius*), magpie (*Pica pica*), jackdaw (*Corvus monedula*), carrion crow (*Corvus corone*), goldcrest (*Regulus regulus*), blue tit (*Cyanistes caeruleus*), great tit (*Parus major*), coal tit (*Periparus ater*), skylark, long-tailed tit (*Aegithalos caudatus*), chiffchaff (*Phylloscopus collybita*), willow warbler (*Phylloscopus trochilus*), blackcap, garden warbler (*Sylvia borin*), whitethroat (*Sylvia communis*), grasshopper warbler, sedge warbler (*Scrocephalus schoenobaenus*), wren (*Troglodytes troglodytes*), starling, blackbird, song thrush, mistle thrush (*Turdus viscivorus*), robin (*Erithacus rubecula*), redstart (*Phoenicurus phoenicurus*), stonechat, northern wheatear (*Oenanthe oenanthe*), dunnoek, house sparrow, pied wagtail (*Motacilla alba*), grey wagtail, tree pipit, meadow pipit (*Anthus pratensis*), chaffinch, bullfinch, linnet, lesser redpoll (*Carduelis cabaret*), goldfinch (*Carduelis carduelis*), siskin (*Spinus spinus*), yellowhammer (*Emberiza citrinella*) and reed bunting.

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

Wintering Birds

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

Otter

Desk study

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

Field Study

- 7.14.83 There are numerous watercourses on site, which may provide suitable commuting and foraging opportunities for otter. The woodlands and scrub on site may also provide suitable terrestrial habitat for this species.
- 7.14.84 During the field survey, an otter spraint and a mammal pathway were identified in a stream bed outside of the site boundary, to the north-west of the site (TN27, Figure 5).
- 7.14.85 Riparian mammal surveys undertaken in 2019 (and detailed in Appendix 7I, Volume 2) identified a number of otter spraints along the Afon Dulais, therefore outside of the Site boundary. No natal dens or couches were identified within the Site, although a potential couch was identified south-west of the Site, along the Afon Dulais. It is possible, due to the large territories of otter, that they may occur within the site whilst foraging or commuting, although due to the exposed nature of the site, current levels of disturbance, lack of well stocked fish ponds, this is considered likely to be infrequent.

Water Vole

Desk study

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

Field Study

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

Bats (Roosting and Commuting/Foraging)

Desk study

- 7.14.89 Bats records within the area provided by BIS within the search area included roost and foraging records between 300 m and 2 km for the following species: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), unidentified species, Daubenton's bat (*Myotis daubentonii*), noctule bat (*Nyctalus noctula*), brown long-eared bat (*Plecotus auratus*), Myotis bat, Nathusius' pipistrelle (*P. nathusii*), Natterer's bat (*Myotis nattereri*) and lesser horseshoe bat (*Rhinolophus hipposideros*).
- 7.14.90 Previous surveys undertaken for Celtic Energy's 2011 ES recorded a single pipistrelle roost in a tree (which was removed as part of the Site's mining activities). In addition, bat boxes installed in woodland (at NGR SN80427 10771, SN 8403 10775 and SN80288 10812) as part of mitigation in association with the 2011 EIA, supported single pipistrelle bats in two boxes in 2015, and three boxes in 2016.
- 7.14.91 Previous transect and static surveys undertaken for Celtic Energy's 2011 ES recorded seven bat species foraging and or commuting including: common pipistrelle, soprano pipistrelle, Nathusius pipistrelle, brown long-eared, noctule, serotine (*Eptesicus serotinus*) and Leisler's (*N. leislerii*). The most frequently recorded species were pipistrelles.

Field Study

Bat roosts (Tree, buildings and structures)

- 7.14.92 Various trees were identified during the field survey as having potential roosting features (TN16, TN17, TN18, TN19, TN20 & TN21, Figure 5). Additionally, three trees with bat boxes were recorded in woodland in the west of the Site (TN22, TN23 & TN24, Figure 5). A road bridge (TN25, Figure 5) and railway bridge (TN26, Figure 5) are present just outside of the Site boundary to the south-east of that Site that may also provide roosting opportunities for bats.
- 7.14.93 Bat roost surveys undertaken in 2019 (and detailed in Appendix 7J, Volume 2) recorded no roosts within any trees/buildings within the Study Area; however, 12 trees retained low-moderate roost potential following the tree climbing assessment (as shown in Figure 8). A potential *Pipistrellus* sp. and Natterers bat roost was identified within an old tunnel during the bat roost surveys, as well as during the 2019 transect surveys at NGR SN80138 09411.

Bat Foraging and Commuting

- 7.14.94 The Extended Phase 1 habitat survey identified suitable habitat for foraging/commuting bats: woodlands, hedgerows, and waterbodies.
- 7.14.95 During transect surveys soprano and common pipistrelle were by far the most abundantly logged species, with records from each transect, in addition noctule and *Myotis* species were recorded (bat activity report, Appendix 7P, Volume 2).
- 7.14.96 A minimum of eight bat species were recorded during static monitoring recorded (bat activity report, Appendix 7P, Volume 2), of these, common and soprano pipistrelle were by far the most commonly recorded, comprising 96.78% of all bat calls recorded (common pipistrelle - 49.36%, soprano pipistrelle - 45.97% and pipistrelle species (common or soprano) - 1.37%). *Myotis* sp. (3,824 calls representing 2.73% of all bat calls recorded) and Noctule (522 calls representing 0.37% of all bat calls recorded) were the next most commonly recorded species/species group. Of those species identified to species-level, serotine (two passes, static monitoring locations 1 and 8) and greater horseshoe bat (an Annex II species), (five passes, static monitoring locations 3, 7, 9 and 16) provided the fewest records (bat activity report, Appendix 7P, Volume 2)).
- 7.14.97 During static monitoring, bat activity levels increased through spring to peak in May and July (no data for June) before tailing off in the autumn, quite considerably in October. Such a pattern is typical, but the large drop in bat activity in October, when bats are still active, would suggest that the Site is a 'summer' (maternity period) feeding area predominantly.

- 7.14.98** Bat activity levels (and activity by rarer species: greater horseshoe and serotine) were highest at lower elevations and/or when near to optimal foraging habitat (e.g. woodland/water), and lowest at higher elevations and/or near to busier roads (as opposed to access tracks around the site).
- 7.14.99** During transect surveys, a likely bat roost was noted at the Orange transect (Grid Reference SN80138 09411) (as detailed above under 'Bat roosts') where common and soprano pipistrelle bats are considered likely to have emerged during the June and September surveys. This likely roost consists of an old stone tunnel approximately 20 m long, and open at both ends. A Natterer's bat roost was also recorded here during inspections of buildings and structures, and is also detailed within the bat roost survey report (Appendix 7J, Volume 2).

Badger

Desk study

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

Field Study

- 7.14.102** The Site contains large areas of woodland and grasslands that offer suitable habitat for badger sett building, commuting and foraging.
- 7.14.103** During the Extended Phase 1 Habitat survey, two badger outlier setts were recorded in the east of the Site (TN3 and TN4, Figure 7.5). Badger latrines were identified in the grassland to the west of the site (TN5, Figure 5) and in the conifer plantation north of the site (TN6 & TN7, Figure 5). A badger footprint was found in the mud to the north of the site (TN8, Figure 7.5) and pathways and snuffle holes were also recorded (TN9, TN10 & TN11, Figure 7.5). Additionally, during a bat transect survey, a badger was seen crossing the site (TN12, Figure 7.5).
- 7.14.104** During the fungi survey, badger activity was recorded across the Site in the form of an outlier sett (TN13, Figure 7.5), badger hair (TN14, Figure 7.5) and foraging activity and footprints (TN15, Figure 7.5).
- 7.14.105** Badger surveys undertaken in 2019 within the Study Area (detailed in the badger survey report in Appendix 7K, Volume 2), recorded setts within the Site boundary. This included a three hole and five-hole subsidiary sett (TN3, Figure 7.5 - recorded during the Extended Phase 1 habitat survey). None of the sett entrances had any signs of currently being used by badger, but a latrine was recorded in close proximity. An outlier sett, badger latrine and signs of digging by badger were

also recorded in woodland outside of the Site boundary, over 2 km to the south-west.

Hazel Dormouse

Desk study

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

Field Study

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

Other Notable Mammal Species

Desk study

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

Field Study

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

Invasive Non-native Species

Desk Study

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

Field Study

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

7.15 Evaluation of Receptors

- 7.15.1 This section evaluates the nature conservation importance of the habitats and species present in the vicinity of the scheme in terms of their importance in an international, national, regional, county and local context.

Designated Sites

- 7.15.2 Coedydd Nedd a Mellte SAC and Blaen cynon SAC are considered to be of **International value** due to their designated status.
- 7.15.3 The 12 SSSIs (Nant llech, Gors Llwyn Onllwyn, Caeau Ton-y-Fildre, Waun Ton-y-Spyddaden Rhos Hen-Glyn-Isaf, Mynydd Du, Ogof Ffynnon Ddu, Ogof Ffynnon Ddu - Pant Mawr, Nant y Rhos, Craig y Rhiwarth, Dyffrynoedd Nedd a Mellte a Moel Penderyn and Caeau Nant y Llechau), are considered to be of **National value** due to their designated status.
- 7.15.4 The five SINC's (Gorsllwyn Meadows, Aberhenwaun Uchaf, Onllwyn Coal Washery, Dyffryn Cellwen and Land behind Marigold Place) are considered to be of County value due to recognition in the relevant Local Planning Authority LDP.
- 7.15.5 There is one area of recorded ancient woodland⁴⁰ within the Project boundary. The area within the project boundary, recorded as PAWS, is

⁴⁰ in accordance with the Ancient Woodland Inventory: <https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en>

known to be plantation on backfilled material following mining and extending over an area of previously ancient woodland; rather than as implied, the plantation replacing semi-natural woodland on the in situ woodland soils (see supporting technical note in Appendix 7Q, Volume 2). As such it is not PAWS.

Habitats

- 7.15.6** A large range of habitats occur within, and adjacent to, the Site including: Semi-improved acid grassland, quarry, bracken, marshy grassland. Dry heathland and acid grassland mosaic (including areas of unimproved acid grassland), improved grassland, short/ephemeral vegetation, dry heathland, poor semi-improved grassland, fen-mire, flushes, wet heathland, scrub, semi-natural broad-leaved woodland (including ancient woodland), mixed, conifer and broadleaved plantation, hedgerows (species poor), streams, standing water, swamp, dry and wet ditches. In addition, there are areas of quarry, bare ground, coal spoil, buildings, fences and areas of gravel and tarmac.
- 7.15.7** A summary of the habitat evaluation in terms of nature conservation significance is provided in Table 7.13 in Appendix 7N. Many of these habitats including semi-natural broadleaved woodland, heathland (dry and wet), fen/mire, swamp and many of the ponds are considered to qualify as Priority habitats within the 'UK Post-2010 Biodiversity Framework' Biodiversity Action Plan (UKBAP), in addition to being Section 7 habitats.
- 7.15.8** A number of these habitats are also considered to qualify the site as a SINC, in accordance with published guidelines⁴¹. These include those habitats above (i.e. UK BAP and Section 7 habitats) in addition to heath, acid grassland mosaic (where unimproved grassland) and flushes (which are not listed above as UKBAP/Section 7 habitats).
- 7.15.9** Qualifying SINC habitats include habitats restored further to previous mining activities i.e. the overburden mound and area to the east which support acid grassland, marshy grassland, fen-mire and heathland. These are also rich in fungi, lichen and bryophytes.
- 7.15.10** Previous surveys undertaken as part of the Celtic Energy 2011 ES, also support this conclusion, and note particularly the high value of the overburden mound (for nature conservation), and habitats immediately west and east, which comprise acid grassland, marshy grassland, heathland and mire. The addendum to OES Condition 45¹⁶ report also states this area supports Section 7 habitats, and meets the criteria for SINC designation.

⁴¹ South Wales Wildlife Sites Partnership (2004) *Guidelines for the Selection of Wildlife Sites in South Wales*. Gwent Wildlife Trust.

- 7.15.11 In addition, conifer plantation habitat are considered to qualify as a SINC, due to the presence of notable vascular plant species (Common wintergreen). This is also a LBAP habitat within the Powys LBAP.
- 7.15.12 Other habitats listed within Powys LBAP and which occur in proximity to the Site include: Broadleaved woodland ('Oak woodland'), scrub ('Scrub and fridd'), marshy grassland ('Rhos pasture'), heathland ('Upland and lowland heathland'), streams ('Rivers and streams'). Mire/fen habitat could be classified as the Powys LBAP habitat 'mesotrophic waters'.
- 7.15.13 A presence of other notable plants, also contributes, to those habitats, which alone, are considered to qualify as UK BAP/Section 7 habitats, at last where these plants occur (although it is noted that the NVC survey only sampled key areas within the site, and these notable species may occur elsewhere). These include ponds which supported spiked water milfoil, floating bur-reed and lesser bulrush; and mire, which supported royal fern (in addition to the presence of common wintergreen in conifer plantation as mentioned above).
- 7.15.14 Examples of UK BAP/Section 7, SINC and LBAP habitats are however relatively small in extent or species poor examples. Of these habitats for example marshy grassland occurs across the site but is species poor due to agricultural improvement and unsympathetic grazing regimes; the only species-rich examples of this habitat occur to the east of the Site in the washery.
- 7.15.15 There are still good quality examples of habitats of conservation significance importance, and which is reflected by the presence of notable plant species (and fungi, and invertebrates which is discussed later under 'Species'), and the high number of different habitats which occur together, albeit some of lower habitat quality, indicates that the Site (excluding areas subject to disturbances from current mining activities) would qualify as SINC under the 'Mosaic habitat' criteria. As such, it is considered that the Site is of **County value** for its habitats. Although, it is noted that some habitats particularly areas of quarry, bare ground, coal spoil, buildings, fences and areas of gravel and tarmac would be of less than local value if considered separately.

Species

Fungi

- 7.15.16 There are several areas within and adjacent to the site, which support a high diversity of fungi species. This includes three areas which are considered to qualify as SINC habitat, based on the number of different species, and occurrence of rare species (in accordance with published guidance⁴¹). The best examples of fungi habitat, which were surveyed, occur in grassland on coal spoil.

- 7.15.17** It is considered that similar habitats elsewhere on site such as the restored grassland on a large area of coal spoil in the south west corner of the Site, are likely to support similar diversity and rare species. Similarly, to those recorded, it is likely the distribution of fungi may be localised to key areas, and not spread throughout the Site.
- 7.15.18** Due to the known presence of SINC habitats, and the presence of habitats likely to be of conservation importance for fungi, being present within the Site boundary, the Site is considered to be of **County value** for fungi.

Invertebrates

- 7.15.19** The Site supports notable invertebrates including species listed in the Red data book (identified as Nationally scarce including NT, Nb, N, NT⁴² categories), and as species of principal importance for conservation in Wales (i.e. Section 7 species) (S7). In accordance with published guidance
- 7.15.20** These include scarce blue-tailed damselfly (NT), a water beetle (*Helochares punctatus*) (NS), a rove beetle (*Hadrognathus longipalpis*) (pNs), weevils: *Anthonomus brunnipennis* (Nb), *Pelenomus waltoni* (Nb) and *Magdalis carbonaria* (Nb), dingy skipper (S7), double line moth (Nb), a money spider (*Walckenaeria kochi*), money spiders: *Erigonella ignobilis* (NS) and *Agyneta olivacea* (NS), triangle hammock-spider (S7/NS).
- 7.15.21** The majority of these species were recorded in small numbers in one or a few of the sampling areas within the Site. Dingy skipper was recorded in higher numbers, and across the Site in open, ruderal vegetation and is considered to be an important population of this butterfly.
- 7.15.22** The adjacent washery site supported a number of other notable invertebrates including the small blue, grayling and small pearl bordered butterfly. All are S7 species.
- 7.15.23** Key habitats within the site of importance for these notable invertebrates are areas of mesotrophic mire and fen, species rich short ruderal vegetation, acidic grassland and or heathland, acidic bog and

⁴² **NT** - IUCN UK Red List, Near Threatened. A taxon is Near Threatened when it has been evaluated against the IUCN criteria and does not currently qualify for Critically Endangered, Endangered or Vulnerable status, but is close to qualifying, or is likely to do so soon; **Nb** – Nationally Scarce Category B. Taxa thought to occur in between 30 and 100 10 km squares of the National Grid; **NS** – Nationally Scarce. In more recent second status reviews, the Na and Nb sub-divisions have been subsumed into a single category covering species occurring in 16 to 100 10km squares of the National Grid. Unlike the previous ‘N’ category, which covered the same range, the amalgamation does not necessarily result from inadequate information on the British distribution; **pNS** – Provisional Nationally Scarce. The rove beetles *Hadrognathus longipalpis* and *Zyras collaris* will almost certainly be accorded Nationally Scarce status in the forthcoming Review of this group, but they have no formal conservation status currently.

pools, streams, wood edges and dead wood, all of which occur within and adjacent to the Site.

- 7.15.24 Due to the presence of a diverse range of invertebrate species of high conservation value, including UK red data book and S7 species, the Site is considered to qualify as a SINC, at least where the above habitats occur.
- 7.15.25 The Site is assessed as being of **County value**, due to the presence of a high proportion of habitats which support a diverse invertebrate fauna including species of high conservation status.

Amphibians

- 7.15.26 There are areas suitable for common amphibians to breed within the site, in addition to a number of permanent and temporary water bodies. The site is known to support common toad, common frog, common and or smooth newt, which have been found in terrestrial habitat during reptile surveys. Common toad are a Section 7 species.
- 7.15.27 The Site is assessed as being of **Local value** to amphibian populations.

Reptiles

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

Birds

Breeding Birds

- 7.15.31 Surveys recorded an assemblage of breeding birds typically associated with the habitat surveyed. Of these species ten are included on the BoCCW 3 Red list, 12 on the BoCCW 3 Amber list with 14 being Section 7 species. One species (Common Crossbill) that is included on Schedule 1 of the Wildlife and Country 1981 (as amended) bred within the Study Area.
- 7.15.32 In addition, three of these species are listed as 'Primary' species, and ten as 'Contributory' species in published guidance⁴¹, and therefore the site would qualify as SINC based on the presence of these species.

- 7.15.33 One species, the nightjar (a BoCCW 3 Amber list, S7 and SINC ‘Contributory’ species) was recorded in cleared plantation woodland, south-west of the Site.
- 7.15.34 No territories of Goshawk or Honey-buzzard were present within the Study Area or relevant buffers. A number of observations of Red Kite occurred during the survey period, although no evidence of breeding within the Study Area was noted.
- 7.15.35 On the current survey information to date, the site is assessed as being of **County value** for breeding birds.
- 7.15.36 All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs. Some rarer species (those listed under Schedule 1 of the Act) are afforded additional protection from disturbance when breeding. Barn owl is included on Schedule 1.

Wintering birds

- 7.15.37 The habitats present within the site have the potential to support breeding birds, which are listed as Section 7 species.
- 7.15.38 Overall, the assemblage of birds recorded is typical of habitats in upland areas of this part of Wales. No particularly rare species or large aggregations of species of conservation concern were recorded. Of the total of 34 species was recorded, three are included on the Birds BoCCW3 Red list, 12 are included on the BoCCW3 Amber list with seven being included on S7 of the Environment (Wales) Act 2016.
- 7.15.39 In addition, seven of these species are listed as ‘contributory’ species in published guidance⁴¹, and therefore the site would qualify as SINC based on the presence of these species.
- 7.15.40 On the current survey information to date, the site is assessed as being of **Local value** for wintering birds.

Badger

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

Otter

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

Bats (Roosts and Commuting/Foraging)

Bat Roosts

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

Bat Activity (Commuting and Foraging)

- 7.15.50 The site is used by foraging and commuting bats, with the most common species being pipistrelle bats (common and soprano species), followed by noctule and myotis species. In addition serotine (two passes), and greater horseshoe bats (five passes) were recorded.

- 7.15.51 The most commonly occurring species are common and widespread within Wales and the UK. Serotine and greater horseshoe, are rarer species in Wales however and greater horseshoe bats are also critically endangered in Europe.
- 7.15.52 On the current survey information to date, the site is assessed as being of **County value** for foraging/commuting bats, largely due to the presence of serotine and greater horseshoe bats, although it is acknowledged that this species are present infrequently and in lower numbers.
- 7.15.53 All bat species are protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended). Eight of the UK's bat species are listed as Section 7 species.

Other Notable Mammal Species

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

Invasive Species

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

7.16 Assessment of Effects

- 7.16.1 Potential impacts of the Project on biodiversity present (as detailed in the Ecological Baseline Section) are likely to occur in a number of ways both during construction and operation.
- 7.16.2 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, surface run-off and pollution events, disturbance to species, species mortality through vegetation clearance/vehicle collisions. 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.
- 7.16.3 Impacts are anticipated to existing habitats within the site, providing the restoration scheme has not commenced at the time of the Project commencing (which is considered very likely). In this situation and based on the recently revised restoration plan (Figure 1.2), the construction of earthworks within the Site will however remove habitats, proposed for retention as part of the restoration scheme (the 'future baseline'); and this is therefore considered within the impact assessment, in particular when considering effects of habitat loss and severance.
- 7.16.4 A scheme wide summary of the main potential impacts is provided below.

Habitat Loss

- 7.16.5 Earthworks will result in habitat loss, where cuttings and embankments are constructed. In addition, temporary works such as construction compounds and access may require habitat loss.
- 7.16.6 Habitat loss will directly affect notable habitats, protected and notable species known to occur within, and adjacent to, the Site. Indirect effects to species may also occur such as reduced breeding and foraging success, as result of reduced habitat availability, and which may lead to extinction where populations are small and or isolated. Habitat loss is not anticipated to directly or indirectly affect any protected sites in the wider area.
- 7.16.7 The revised restoration scheme (Figure 1.2) includes the creation of new habitats within parts of the Site including acid grassland, enclosed pasture and broadleaved woodland. As such, these areas of the Site will be re-established as acid grassland (once the restoration scheme commences).
- 7.16.8 The restoration scheme (Figure 1.2) also details the retention of existing habitats namely acid grassland and waterbodies (as shown on

the restoration plan), as well as purple moor grassland and heathland (shown on the Phase 1 plan) within the Site boundary. These habitats will be lost during construction for the Project.

- 7.16.9 The earthworks are anticipated to be left in perpetuity, and for the purposes of this assessment the future use of areas within the Site is unknown. Therefore, no operational effects are anticipated, and it is considered that areas left undisturbed will naturally re-vegetate over time. It is acknowledged, however; that some habitats such as woodland, and grassland with diverse fungi communities, will take significantly more time to establish. In addition to this, some habitats such as ancient woodland, are considered irreplaceable i.e. cannot be recreated (best practice advice also supported by National planning policy).
- 7.16.10 Habitat loss of both the current baseline, and future baseline will be mitigated for through the creation of new habitat on and off-Site. It may be possible to create temporary habitats during construction, which also facilitate movement of species around the site, until permanent habitats are created. Management and monitoring of any created habitats will be crucial to ensuring their establishment, and long-term success.

Habitat Severance/Fragmentation

- 7.16.11 The Project layout comprises a smaller loop, with a larger loop surrounding this, and access from the south. Existing habitats within the Site will therefore be severed and fragmented.
- 7.16.12 This will particularly affect water dependant habitats where hydrological connections are severed therefore reducing/stopping the flow of water into these habitats.
- 7.16.13 Severance 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.
- 7.16.14 Impacts from severance/fragmentation of habitats will be more significant where habitats provide key corridors for mobile species: to move around the Site, and the wider area, whilst commuting/foraging, migrating, and or dispersing to find new territories. For example, hedgerows, woodland, tree corridors, watercourses, and other wetland features such as ponds may provide corridors for foraging/commuting by bats, otter, badger, reptiles, amphibians, and breeding/wintering/migrant birds.
- 7.16.15 As discussed above, parts of the Site outside of the restoration scheme will naturally re-vegetate, although habitats providing wildlife corridors are likely to take longer to establish. Habitats providing

wildlife corridors will be created within parts of the Site, within the restoration scheme. Other parts of the Site, where it is proposed to retain habitats during the sites' restoration, will be lost including ponds which currently provide connectivity for notable amphibians.

- 7.16.16 Habitat severance effects can be reduced by the sensitive timing of construction works. The creation of habitat within available areas of the Site, will need to incorporate key habitats which provide corridors for the movement of species, known to occur within the Site, and be connected to existing wildlife corridors adjacent to the Site. As described above, it may be possible to create temporary habitats during construction, which also facilitate movement of species around the site, until permanent habitats are created.

Habitat Damage/Disturbance

- 7.16.17 Habitats adjacent to the Site, or hydrologically connected i.e. aquatic habitats, are sensitive to effects from 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.
- 7.16.18 Changes in air quality can affect ecological receptors i.e. sensitive species. Habitats and vegetation are also sensitive to increases in nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃), which can be absorbed directly (The relevant assessment benchmark for pollutant concentrations 'in the air' is referred to as a critical level) or indirectly i.e. through deposition, which affects the soil pH or causes nutrient enrichment of the soil. In addition, construction works may generate dust from the earthworks and or the use of access roads for vehicular movements. It is anticipated that there would no significant change in air quality as a result of emissions or dust, from the existing baseline for the Site, which is currently subject to mining and associated activities such as regular vehicle traffic.
- 7.16.19 Habitats within/adjacent to areas of construction works may be damaged through the spread of invasive, non-native species (INNS) from locations within the Site, and which would reduce the quality of any habitats where INNS newly establish. Furthermore, legal offences would result from any INNS being spread from the Site.
- 7.16.20 Any habitat damage may indirectly affect species, if this habitat becomes unavailable for foraging/commuting etc, and or directly if any species are harmed by pollution events.
- 7.16.21 No habitat disturbance is anticipated during operation since the Site will be left in perpetuity, and likely to naturally re-vegetate over time.
- 7.16.22 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, together with measures such as the use of Heras 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

- 7.16.23 Construction activities (including associated activities such as site clearance), may result in effects such as noise, vibration and lighting, and which may significantly impact sensitive species such as bats, otter, breeding/wintering birds etc. Disturbance from lighting, noise and vibrations are particularly significant to bats, which may abandon roosts, 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.
- 7.16.24 Vibration effects have been scoped out of the Project ES (due to anticipated levels being no greater than existing levels associated with current mining activities). It is considered that impacts from these effects with regard to ecological receptors i.e. sensitive species, need to be assessed within this Chapter, since any vibration effects associated with the earthworks will be separate to those associated with current mining activities on the Site; occurring in different locations within the Site and having different impacts.
- 7.16.25 Task lighting is anticipated to be required during winter months only. There will be no lighting required on completion. 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).
- 7.16.26 Disturbance effects on completion are not anticipated since the Site will be left in perpetuity.

Species Mortality/Harm

- 7.16.27 Harm/mortality can occur to species as a result of construction activities including any site clearance activities. There is an increased risk to less mobile species, and or species that have young or which are in hibernation.
- 7.16.28 Entrapment to species, for example in any open excavations particularly if left overnight, during periods of the year when certain species are more active, may result in harm/injury to mobile species.
- 7.16.29 Harm/mortality is not considered likely to occur during operation since the Site will be left in perpetuity.

7.17 Assessment of Impacts and Significance

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

7.17.2 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.

7.17.3 On this basis, the following receptors have been taken forward for detailed assessment:

- Statutory Designated Sites – Three SACs: Coedydd Nedd a Mellte, Cwm Cadlan, and Blaen Cynon, 12 SSSIs: Nant llech, Gors Llwyn Onllwyn, Caeau Ton-y-Fildre, Waun Ton-y-Spyddaden Rhos Hen-Glyn-Isaf, Mynydd Du, Ogof Ffynnon Ddu, Ogof Ffynnon Ddu - Pant Mawr, Nant y Rhos, Craig y Rhiwarth, Dyffrynoedd Nedd a Mellte a Moel Penderyn and Caeau Nant y Llechau.
- Non-statutory Designated Sites - five SINCs: Gorsllwyn Meadows, Aberhenwaun Uchaf, Onllwyn Coal Washery, Dyffryn Cellwen and Land behind Marigold Place.
- Mosaic of habitats (qualifying the site as a SINC) –namely semi-improved acid grassland, quarry, bracken, marshy grassland. Dry heathland and acid grassland mosaic (including areas of unimproved acid grassland), improved grassland, short/ephemeral vegetation, dry heathland, species-poor semi-improved grassland, fen-mire, flushes, wet heathland, scrub, semi-natural broad-leaved woodland (including ancient woodland), mixed, conifer and broadleaved plantation, hedgerows (species-poor), streams, standing water, swamp, dry and wet ditches.
- Protected and Notable species including:
 - Fungi;
 - Invertebrates;
 - Amphibians;
 - Reptiles;
 - Breeding birds;
 - Wintering birds;
 - Badger;
 - Otter;
 - Roosting bats;
 - Commuting/foraging bats;
 - Notable mammals; and

- Invasive species.

7.17.4 In generic terms, the potential ecological impacts of the construction and operation of the scheme may be categorised as follows:

- Habitat loss during construction and operation;
- Habitat severance during construction and operation;
- Habitat disturbance/degradation (including impacts on water quantity or quality) during construction and operation;
- Disturbance/displacement to fauna (e.g. visual impact, noise and lighting) during construction and operation; and
- Mortality/injury to fauna during construction (e.g. direct impacts during vegetation clearance, trapping within excavations, collisions with site vehicles/plant).

7.18 Assessment of Construction Impacts

Designated Sites

7.18.1 A draft Statement to Inform a Habitats Regulations Assessment has been prepared and will be submitted to PCBC and NPTCBC alongside this ES. Likely effects on European sites (together with Nationally and locally designated sites) are discussed below.

Habitat Loss and Disturbance

7.18.2 Potential effects could occur to nearby SACs during construction. Coedydd Nedd a Mellte SAC's closest compartment is 4.3 km from the proposed works. Cwm Cadlan is also 9.5 km from the proposed works. impacts to European Sites are also detailed within the separate Habitat Regulation Assessment included in Appendix 7R, Volume 2.

7.18.3 Coedydd Nedd a Mellte SAC is designated for its important woodland and Cwm Cadlan SAC is designated for its Molinia meadows and alkaline fen habitat. Potential effects on these SACs are limited to [1] water quality effects: pollutants (fuel, chemical spills, dust and vehicle emissions) or high sediment load in surface water runoff from construction areas; and [2] air quality effects: increases in levels of nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃). The SACs are not hydrologically connected to the Project area, and therefore there is no pathway for effects from changes in water quality. Due to the distance/spatial separation of the SACs from the proposed works it is considered that any changes in air quality would not result in any effects.

7.18.4 The closest compartment of Blaen Cynon is located 10.4 km from the Site. It is designated for its population of marsh fritillary; a species which exists in metapopulations and are known to range up to 15 km from its primary habitat³³. Marsh fritillary are also known to be

present in the Wildlife Trust Nature Reserve west of the Site (approximately 1.5 km). Although purple moor grass, the habitat used by this species, is present within and adjacent to the Site, invertebrate surveys found no evidence of marsh fritillary using habitats within the Site. In addition, surveys assessed the purple moor grass present as being largely unsuitable for this species (due to being in poor condition as a result of agricultural improvement and overgrazing and having little or no growth of the food plant). Therefore, it is considered unlikely that any metapopulations of marsh fritillary, associated with either the Wildlife Trust Reserve or Blaen Cynon SAC, would occur within the Site. Furthermore, although there would be a loss of purple moor grass within the Site, this would be small proportion of what is available within the wider area.

7.18.5 The Nant llech SSSI is hydrologically connected to the Site. As such there is the potential for SSSI habitats to be adversely affected by pollution events and or surface run-off which a high sediment load. Any adverse effect on the SSSI would be of significance at a National level, due to its designated status. Effects would however be temporary, and reversible. Pollution control measures as detailed in Section 7.20, 7.21, 7.22 and 7.23, will avoid such adverse effects, and comply with UK legislation.

7.18.6 No direct or indirect effects on any of the others SSSIs are anticipated. The closest sites are: the Gors Llwyn, Onllwyn SSSI, located approximately 800 m east of the Site. The SSSI is separated from the Site by the A422 and has no hydrological connections. Due to spatial separation and absence of hydrological connections, no effects are considered likely to this, and any of the other SSSIs within 5 km.

7.18.7 There are also five SINCs within 2 km of the Site, with the closest being approximately 200 m east. Any effects would be of significance at a County level, should they occur. As for the Gors Llwyn, Onllwyn SSSIs, there is significant spatial and physical separation of the Site from these SINCs, and as such no effects (either direct or indirect) are considered likely.

7.18.8 There are a number of areas of ancient woodland, within 1 km of the Site. There is one area of recorded ancient woodland⁴³ within the Project boundary As previously discussed in Section 7.15.5 and the separate technical note (Appendix 7Q, 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. As such effects of habitat loss, fragmentation and disturbance are discussed in habitats/conifer plantation below.

⁴³ in accordance with the Ancient Woodland Inventory: <https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en>

Habitats

Habitat loss

- 7.18.9** Construction and associated Site clearance will result in loss of existing habitats within the Site boundary, which are of conservation significance and support notable vascular plant species including:
- Purple moor grass/marshy grassland (largely species-poor) and acid grassland (unimproved/semi-improved);
 - Dry and wet heathland;
 - Broadleaved and conifer woodland (including notable species namely common wintergreen. Part of the broadleaved woodland is ancient woodland. Conifer woodland has been registered as PAW but as per technical note in Appendix 7Q, Volume 2 this has been misrecorded);
 - Waterbodies (including those supporting notable species: lesser bulrush, floating bur-reed, greater tussock sedge and spiked water milfoil);
 - Sphagnum rich bog/mire habitat (including the notable species: royal fern and floating bur reed);
 - Flushes;
 - Swamp;
 - Ditches;
 - Ponds;
 - Streams; and
 - Vegetated coal spoil (including the notable species: viviparous fescue) (occurs within acid grassland in the Site).

Areas of habitat loss is shown in

7.18.10	Habitat	Area in Hectares (Ha)
	Broadleaved woodland	2.10
	Conifer woodland	6.32
	Mixed woodland plantation	1.90
	Scrub-scattered	1.02
	Semi-improved acid grassland	15.11
	Improved grassland	0.80
	Marshy grassland	34.54
	Poor semi-improved grassland	0.19
	Dry heath/acid grassland	3.41
	Standing water	0.52

7.18.10 Habitat	Area in Hectares (Ha)
Watercourse	0.65
Quarry	1.15
Spoil	0.16
Ephemeral/short perennial	3.53
Tarmac surface	0.62
Total	72.03

Table 7.11: Habitats lost from the revised Celtic Energy restoration plan (Figure 1.2).

Habitat	Area in Hectares (Ha)
Acid Grassland	5.58
Acid Grassland (existing)	4.79
Broadleaved Woodland	0.07
Enclosed Pasture	1.32
Pond	0.44
Watercourse	0.03
Total	12.21

below.

Table 7.10: Habitat lost from the site based on the existing ecological baseline.

Habitat	Area in Hectares (Ha)
Broadleaved woodland	2.10
Conifer woodland	6.32
Mixed woodland plantation	1.90
Scrub-scattered	1.02
Semi-improved acid grassland	15.11
Improved grassland	0.80
Marshy grassland	34.54
Poor semi-improved grassland	0.19
Dry heath/acid grassland	3.41
Standing water	0.52
Watercourse	0.65
Quarry	1.15
Spoil	0.16
Ephemeral/short perennial	3.53
Tarmac surface	0.62
Total	72.03

Table 7.11: Habitats lost from the revised Celtic Energy restoration plan (Figure 1.2).

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Acid Grassland	5.58
Acid Grassland (existing)	4.79
Broadleaved Woodland	0.07
Enclosed Pasture	1.32
Pond	0.44
Watercourse	0.03
Total	12.21

- 7.18.11** In addition, other habitats of less conservation significance such as buildings, scrub, bracken, improved grassland present in the Site boundary, will be lost.
- 7.18.12** Due to the collective value of habitats within the Site, effects of habitat loss and fragmentation would be significant at a **County level**.
- 7.18.13** The Site will remain in perpetuity further to the completion of earthworks, and as such it is anticipated that disturbed areas, once left, will naturally re-vegetate and over time develop habitats including grassland and woodland as well as scrub. Some habitats, such as heathland, standing water, marshy grassland, swamp and bog will require particular ground conditions, and whilst it's possible that the conditions on Site post construction may be suitable for the natural establishment of these habitats, there is a risk that without mitigation during and post construction, that the lost habitats would not be replaced. As such, any effects from habitat loss/fragmentation may be permanent.
- 7.18.14** It is acknowledged that the revised restoration scheme will involve the creation of acid grassland, grazed pasture and woodland, as well as retention of existing habitats including some of those referred to above in particular: acid grassland, waterbodies, purple moor grass and heathland (with the latter two habitats not referred to in the restoration plan). Habitat loss associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). Furthermore, habitats to be created in other parts of the Site do not match those affected by the Project construction, or likely to support the same notable species.
- 7.18.15** Mitigation measures to address the habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this

Project. Mitigation will include habitat creation/translocation, long term, management and monitoring.

Habitat Severance/Fragmentation

- 7.18.16** Habitats will also be severed and fragmented as a result of the construction works, including those which provide wildlife corridors for mobile species known to occur within the site, and the wider area. In particular these include broadleaved woodland, heathland and waterbodies.
- 7.18.17** The severance of hydrological connections will result in the loss of water dependant habitats namely the peatland fen-mire complex which occurs in the centre of the site. Table 7.12 details the total habitat loss for this area, as result of changes to hydrology.
- 7.18.18** Due to the collective value of habitats within the Site, effects of habitat loss and fragmentation would be significant at a **County level**.
- 7.18.19** Mitigation measures to address the habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline) and will be proportionate to the impacts of this Project. Mitigation will include habitat creation/translocation, long term, management and monitoring.

Table 7.12: Indirect Habitat Loss

Habitat	Area in Hectares (Ha)
Standing Water	0.3
Fen – basin mire	1.49
Wet dwarf shrub heath	0.2
Dry dwarf shrub heath - acid	1.36
Total	3.35

Habitat Disturbance/Degradation

- 7.18.20** Construction and associated Site clearance could result in disturbance to habitats adjacent to the Site boundary, or where temporary works such as access are required disturbance to habitats within 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.
- 7.18.21** In addition to the habitats listed above, which will be lost during construction, habitats of conservation significance which are adjacent to the Site, and which may be disturbed during construction include mire, broadleaved and conifer woodland, marshy grassland, dry heathland, wet heathland, bog habitats, acid grassland, ponds and streams.

- 7.18.22 Effects of disturbance on habitats of conservation significance would be significant at a **County level**, however are likely to be of low magnitude and be reversible.

Fungi

Habitat Loss and Disturbance

- 7.18.23 Construction and associated site clearance will result in the loss and or disturbance of known and 'likely' valuable fungi habitats. Two areas of confirmed 'county' importance for fungi and one area of 'local' importance, are within the Site boundary. In addition, the remaining habitats within the Site also support habitats which are considered likely to support important fungi communities (but which have not been surveyed).
- 7.18.24 The loss/degradation of these small areas fungi habitat of county importance is considered to be significant at a **County level**, unless further surveys are possible prior to construction which prove otherwise.
- 7.18.25 Habitat loss and or disturbance from the earthworks, is however considered to be temporary – since the habitats of greatest value for fungi within the site have established on coal spoil, approximately 20-30 years ago. Therefore, those lost/damaged fungi habitats are likely to re-establish on areas within the Site (post construction) which will be left in perpetuity. The earthworks will involve the re-use of materials including coal spoil within the site, therefore providing a suitable substrate for the establishment of a diverse fungi assemblage. It should be acknowledged however that whilst fungi habitats will re-establish, it is likely to take a long period of time, and mitigation measures should therefore also be put in place to increase the rate at which fungi establish for example habitat translocation, and a long-term management/monitoring plan in place.
- 7.18.26 The revised restoration scheme will involve the retention and creation of habitats within the Site, which may be suitable for fungi. Loss of fungi habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time).
- 7.18.27 Mitigation measures to address the habitat loss/disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Invertebrates

Habitat Loss

- 7.18.28 Construction will result in the loss of habitats within the Site, which are of value to notable invertebrate species which are of county importance. Habitats of note for invertebrates, and which will be lost as a result of construction include species-rich ruderal grassland, heathland, acid bog pools, streams and woodland edges. As discussed under 'Habitats', post construction, disturbed areas once left, will naturally re-vegetate and over time develop habitats including grassland and woodland as well as scrub.
- 7.18.29 The loss/degradation of notable invertebrate habitat is considered to be significant at a **County level**.
- 7.18.30 As acknowledged under 'Habitats' some of the key invertebrate habitats require specific conditions, which in the absence of mitigation, may not be available for their successful establishment, and as such effects of habitat loss may be permanent.
- 7.18.31 Newly created habitats, providing they meet the specific species-requirements, are likely however to be rapidly utilised by notable invertebrates present within the Site, and adjoining habitats.
- 7.18.32 The revised restoration scheme will involve the retention and creation of habitats within the Site. Loss of invertebrate habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). Furthermore, habitats to be newly created as part of the restoration scheme, are not optimal habitats for notable invertebrates within the Site.
- 7.18.33 Mitigation measures to address the habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Habitat Disturbance

- 7.18.34 Habitats important for invertebrates may also be affected by habitat disturbance, when construction activities occur in adjacent areas and which may damage/degrade habitats. The most significant habitat is mire/fen, which occurs immediately adjacent to the Site boundary (in the centre of the Nant Helen site) and is therefore at risk from disturbance. Other notable habitats noted above also occur in the adjacent areas and would therefore be affected. Aquatic/wetland habitats (including mire, waterbodies and streams) would be

particularly sensitive to adverse changes as a result of pollution events or surface run-off with an increased sedimentation load.

- 7.18.35 Effects of disturbance on populations of notable invertebrates would be significant at a **County level**, however are likely to be of low magnitude and reversible.
- 7.18.36 Mitigation measures to address the habitat disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23.

Harm/Mortality

- 7.18.37 Construction works, particularly site clearance and or trampling of vegetation by machinery/equipment, will harm any invertebrates present. If vegetation clearance/disturbance is undertaken during sensitive times for notable invertebrates i.e. during breeding/egg-laying and or larval development stages, when animals are less mobile and more sensitive to disturbance, there would be more significant impact on species populations.
- 7.18.38 Effects of harm/mortality on populations of notable invertebrates would be significant at a **County level**.
- 7.18.39 Mitigation measures to address the habitat disturbance/species harm and mortality is detailed in Section 7.20, 7.21, 7.22 and 7.23.

Amphibians

Habitat Loss/Fragmentation

- 7.18.40 Construction and associated site clearance will result in the loss of notable amphibian habitat, including aquatic (breeding) and terrestrial (resting, foraging and hibernation) habitat. Suitable habitats which will be affected includes waterbodies, flushes and ditches for breeding, and connecting terrestrial habitat including mire/fen, woodland, plantation, heathland, scrub, acid grassland and marshy grassland.
- 7.18.41 Habitat fragmentation would also occur as a result of the loss of these habitats, therefore limiting movement of notable amphibians within the Site, and to/from adjacent areas.
- 7.18.42 Effect from habitat loss and fragmentation on notable amphibians would be significant at a **Local level**.
- 7.18.43 Whilst the majority of terrestrial habitats would re-establish over time (and therefore effects of the loss of these habitats would be temporary and reversible), some of the habitats such as wetland habitats require particular ground conditions, which in the absence of mitigation, may not re-establish on Site. As such, any effects from the loss/fragmentation of these habitats may be permanent. Suitable habitat for amphibian species occurring within the Site, is also present,

in the wider area, and therefore effects albeit potentially permanent are considered to be of low magnitude.

7.18.44 The revised restoration scheme will involve the retention and creation of habitats within the Site, including some acid grassland and ponds, which will be suitable for breeding, foraging, hibernating amphibians. Loss of amphibian habitat associated with the Project, as discussed above, will however occur within part of the restored site (including ponds and acid grassland), therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). It is also noted, that newly created habitats elsewhere within the Site, which are proposed as part of the site's restoration are considered to be less suitable for amphibians i.e. ponds, acid grassland and broadleaved woodland compared to the wide range of habitats currently present.

7.18.45 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Harm/Mortality

7.18.46 It is considered possible that construction activities would result in harm/mortality to common amphibians largely during any vegetation clearance, which will be required.

7.18.47 Effects from harm/mortality on notable amphibian populations are considered to be significant at a **Local level**.

7.18.48 Mitigation measures to address the disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23.

Reptiles

Habitat Loss/Fragmentation

7.18.49 Construction and associated site clearance will result in the loss of reptile habitat including heathland, scrub, marshy grassland, and woodland edges.

7.18.50 Habitat fragmentation would also occur as a result of the loss of these habitats, therefore limiting movement of notable amphibians within the Site, and to/from adjacent areas.

7.18.51 Effect from habitat loss and fragmentation on notable amphibians would be significant at a **Local level**.

7.18.52 Effects of habitat loss from the earthworks, are however considered to be temporary and reversible due to the Site (post construction)

remaining in perpetuity, and the likelihood of habitats suitable for reptiles re-establishing. It is acknowledged however that mature habitat such as heathland and woodland, will take longer to establish than habitats such as grassland. Suitable habitat for reptile species occurring within the Site, is also present, in the wider area, and therefore effects are also considered to be of low magnitude.

7.18.53 The revised restoration scheme will involve the retention and creation of habitats within the Site. Loss of reptile habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). It is also noted, that newly created habitats elsewhere within the Site, which are proposed as part of the site's restoration are considered to be less suitable for reptiles i.e. acid grassland and a broadleaved woodland compared to the wide range of habitats currently present.

7.18.54 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Harm/Mortality

7.18.55 Reptiles would be subject to an increased risk of mortality during construction activities namely vegetation clearance which is likely to be required prior to construction.

7.18.56 Effects from harm/mortality on reptile populations are considered to be significant at a **Local level**.

7.18.57 All native reptiles are protected under Schedule 5 of the Wildlife and Countryside Act 1981 with respect to killing, injury and sale only.

7.18.58 Mitigation measures to address the disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance within UK legislation.

Birds

Breeding and Wintering birds

Habitat Loss

7.18.59 Construction and associated site clearance will result in the loss of breeding bird and wintering bird habitat including woodland, plantation, heathland, scrub, marshy grassland, waterbodies and swamp.

- 7.18.60 Due to the conservation significance of a number of breeding birds present within the Site, effect from habitat loss would be significant at a **County level** to breeding birds, although effects on wintering birds would be significant at a **Local level**, due to supporting an assemblage of wintering birds, typically found within the area and less species of conservation significance.
- 7.18.61 Effects of habitat loss from the earthworks, are however considered to be temporary and reversible due to the Site (post construction) remaining in perpetuity, and the likelihood of habitats suitable for nesting/wintering birds re-establishing. It is acknowledged however that mature habitat such as heathland and woodland, will take longer to establish than habitats such as grassland. Suitable habitat for breeding/wintering species, occurring within the Site, is also present, in the wider area, and therefore effects are also considered to be of low magnitude.
- 7.18.62 The revised restoration scheme will involve the retention and creation of habitats within the Site, including some such as broadleaved woodland which will be suitable for breeding/wintering birds. Loss of breeding/wintering bird habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time).
- 7.18.63 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Disturbance

- 7.18.64 Disturbances for example as a result of increased noise or vibrations during construction have the potential to result in displacement of breeding/wintering birds within the Site, and in adjacent habitats.
- 7.18.65 Some of the breeding birds recorded within the Site, including lapwing and curlew, both species of conservation significance, are known to be particularly sensitive to disturbance.
- 7.18.66 Displacement of breeding birds is likely to result in abandonment of nests/young, and therefore reduced breeding success. Effects of disturbance on breeding birds would be significant at a County level and effects on wintering birds would be at a **Local level**.
- 7.18.67 Common crossbill, a Schedule 1 species, which is afforded additional protection against disturbance whilst breeding – has been recorded breeding within the Site.

- 7.18.68 Mitigation measures to address the disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance within UK legislation.

Harm/Mortality

- 7.18.69 Construction activities may result in harm or mortality to breeding birds through associated vegetation clearance.
- 7.18.70 Breeding birds will be particularly susceptible due to being less mobile, and either sitting on eggs or with young. Effects of harm/mortality on populations of breeding birds would be at a **County level** and effects on wintering birds would be at a **Local level**, although are not likely to be significant to populations of breeding/wintering birds.
- 7.18.71 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.
- 7.18.72 Mitigation measures are recommended in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance within UK legislation.

Badger

Habitat Loss/Fragmentation

- 7.18.73 Construction activities including site clearance will result in the loss of foraging/commuting habitat for badger. A number of setts are located in habitat adjacent to the Site, and badger are known to forage/commute within the Site.
- 7.18.74 Habitat fragmentation would also occur as a result of the loss of these habitats, therefore limiting movement of badger within the Site, and to/from adjacent areas.
- 7.18.75 Effect from habitat loss and fragmentation on badger foraging/commuting would be significant at a **Less than Local level**. Although not a valued ecological receptor (since its legal protection relates to welfare rather than conservation significance), mitigation measures are required to ensure compliance with UK legislation.
- 7.18.76 Effects of habitat loss from the earthworks, are however considered to be temporary and reversible due to the Site (post construction) remaining in perpetuity, and the likelihood of habitats suitable for badger re-establishing. It is acknowledged however that mature habitat such as heathland and woodland, will take longer to establish than habitats such as grassland. Suitable habitat for badger occurring within the Site, is also present, in the wider area, and therefore effects are also considered to be of low magnitude.

- 7.18.77 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.
- 7.18.78 The revised restoration scheme will involve the retention and creation of habitats within the Site. Loss of badger foraging/commuting habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats Will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). It is also noted, that newly created habitats elsewhere within the Site, which are proposed as part of the site's restoration are considered to be less suitable for badger i.e. acid grassland compared to the wide range of habitats currently present.
- 7.18.79 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Disturbance

- 7.18.80 Disturbances for example as a result of increased noise or vibrations during construction have the potential to result in displacement of badger within the Site, and in adjacent habitats.
- 7.18.81 Two badger (outlier) setts are located in adjacent habitats, within woodland in the north eastern part of the Site. It is of an offence, to interfere with a badger sett by disturbing a badger when it is occupying a badger sett.
- 7.18.82 Based on the approximate distance of the setts from the Site, and proposed earthworks, it is considered unlikely that there would be significant disturbance to badgers within these setts, particularly since they are outlier setts and not main setts used for breeding. Any disturbance effects would be significant at a **less than Local level** and would be temporary. However due to the lack of information available on construction methods or temporary works, a precautionary approach is taken.
- 7.18.83 Mitigation measures to address the disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance within UK legislation.

Otter

Habitat Loss/Fragmentation

- 7.18.84 No evidence of otter using the Site has been found. It is considered that this species would use the Site for foraging/commuting purposes infrequently due the nature of the Site.
- 7.18.85 Should any effects occur from habitat loss and fragmentation on otter foraging/commuting this would be significant at a **Local level**.
- 7.18.86 Any effects of habitat loss/fragmentation from the earthworks, are however considered to be temporary and reversible due to the Site (post construction) remaining in perpetuity, and the likelihood of habitats suitable for otter re-establishing. Suitable habitat for otter is also present, in the wider area, and therefore effects are also considered to be of low magnitude.
- 7.18.87 It is acknowledged, that otter are a mobile species, and suitable habitat occurs within the Site for resting/breeding. Therefore, otter resting/breeding places, although not recorded during recent surveys, could be present at the time of construction.
- 7.18.88 The revised restoration scheme will involve the retention and creation of habitats within the Site. Loss of otter foraging/commuting habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time). It is also noted, that newly created habitats elsewhere within the Site, which are proposed as part of the site's restoration are considered to be less suitable for otter i.e. acid grassland compared to the wide range of habitats currently present.
- 7.18.89 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.
- 7.18.90 Otters and their resting/breeding places are protected by UK and European legislation.
- 7.18.91 Recommended mitigation for otter is detailed in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance with UK and European legislation.

Disturbance

- 7.18.92 Construction activities may result in disturbance to otters for example through increased noise, vibrations and artificial lighting. As discussed above otters are considered to use the Site infrequently for foraging/commuting, although there is suitable habitat for

resting/breeding places to be established. Further mitigation is recommended as a precautionary approach, to protect otters that may be using any areas within close proximity to the construction works for foraging and breeding/resting.

- 7.18.93 Disturbance effects should they occur would be significant at a **Local level**.
- 7.18.94 Otters and their resting/breeding places are protected from disturbance by UK and European legislation.
- 7.18.95 Recommended mitigation for otter is detailed in Section 7.20, 7.21, 7.22 and 7.23 to ensure compliance with UK and European legislation.

Harm/Mortality

- 7.18.96 Any excavations created during construction could result in animals becoming trapped or injured, when moving through the site at night. There is also the potential for animals to collide with construction traffic within the site.
- 7.18.97 Effects of harm/mortality should they occur would be significant at a Local level.
- 7.18.98 Otters are protected from harm, by UK and European legislation.
- 7.18.99 Recommended mitigation for otter is detailed in Section 7.20, 7.21, 7.22 and 7.23 to ensure compliance with UK and European legislation.

Bats

Habitat Loss/Fragmentation

- 7.18.100 No evidence of bat roosts has been recorded within the Site or immediately adjacent habitats. Twelve trees within, and adjacent to, the Site, and were recorded to potential to support bat roosts, however.
- 7.18.101 Should any bat roosting habitat be lost this would be significant at a **Local level**, assuming more common species thus recorded were present. Suitable habitat for roosting bats is also present, in the wider area, and therefore any effects of habitat loss are considered to be of low magnitude.
- 7.18.102 It is acknowledged, that bats are a mobile species, and suitable habitat occurs within the Site for roosting. Therefore, bat roosts, although not recorded during recent surveys, could be present at the time of construction.
- 7.18.103 A minimum of eight bat species were recorded within the site, foraging and or commuting including the notable greater horseshoe bat and serotine bat.
- 7.18.104 Activity levels suggest that the site is a 'summer' (maternity period) feeding area predominantly. Bat activity levels (and activity by rarer

species: greater horseshoe and serotine) were highest at lower elevations and/or when near to optimal foraging habitat (e.g. woodland/water), and lowest at higher elevations and/or near to busier roads (as opposed to access tracks around the site).

- 7.18.105 Habitat fragmentation would occur as a result of the loss of habitats used as key commuting/foraging corridors, including broadleaved woodland and plantation. Therefore limiting movement of foraging/commuting bats within the Site, and to/from adjacent areas.
- 7.18.106 Due to the presence of rarer bat species, impacts on loss/fragmentation of foraging habitats would be significant at a **County level**, although it is acknowledged that with the infrequent use by low numbers of these rarer species, in addition to the presence of suitable habitats in the wider area, any effects would be of low magnitude.
- 7.18.107 The revised restoration scheme will involve the retention and creation of habitats within the Site. Potential bat roosting and foraging habitat will be created in the form of new broadleaved woodland and which will provide connectivity to adjacent habitats. None of the habitats to be retained within the restoration scheme, are suitable for roosting bats, so additional impacts (i.e. on the future baseline) do not need to be considered for roosting bats.
- 7.18.108 Bats and their resting/breeding places are protected by UK and European legislation.
- 7.18.109 Recommended mitigation for roosting is detailed in Section 7.20, 7.21, 7.22 and 7.23, which will also ensure compliance with UK and European legislation.

Disturbance

- 7.18.110 Construction activities may result in disturbance to bat roosts for example through increased noise, vibrations and artificial lighting. As discussed above bat roosts have not been recorded within or adjacent to the Site, but it is possible they may be present at the time of construction.
- 7.18.111 A range of bat species are known to forage/commute within the site, including rare species, and which may be disturbed by construction activities if they were to occur between dusk and dawn when bats are active.
- 7.18.112 Mitigation is recommended to avoid disturbance to foraging/commuting bats. Mitigation is also recommended as a precautionary approach, to protect any roosting bats that may be using any areas within close proximity to the construction works.
- 7.18.113 Bats and their resting/breeding places are protected from disturbance by UK and European legislation.

- 7.18.114 Recommended mitigation for roosting, foraging and commuting bat roosts is detailed in Section 7.20, 7.21, 7.22 and 7.23 to ensure compliance with UK and European legislation.

Harm/Mortality

- 7.18.115 Roosting bats would be subject to an increased risk of mortality during construction activities namely vegetation clearance which is likely to be required prior to construction.
- 7.18.116 Effects from harm/mortality on local bat roosting populations are considered to be significant at a **Local level**.
- 7.18.117 Bats are protected from harm, by UK and European legislation.
- 7.18.118 Recommended mitigation for bat roosts is detailed in Section 7.20, 7.21, 7.22 and 7.23 to ensure compliance with UK and European legislation.

Notable Mammal Species

Habitat Loss/Fragmentation

- 7.18.119 Construction and associated site clearance will result in the loss of notable mammal habitat including semi-natural and plantation woodland, known to be key habitats for polecat, acid grassland and heathland mosaics, known to be key habitats for brown hare. West European hedgehog are likely to use a range of habitats within the Site.
- 7.18.120 Habitat fragmentation would also occur as a result of the loss of these habitats, therefore limiting movement of notable mammals within the Site, and to/from adjacent areas.
- 7.18.121 Effect from habitat loss and fragmentation on notable mammals populations could be significant at a **Local level**.
- 7.18.122 Effects of habitat loss from the earthworks, are however considered to be temporary and reversible due to the Site (post construction) remaining in perpetuity, and the likelihood of habitats suitable for reptiles re-establishing. It is acknowledged however that mature habitat such as heathland and woodland, will take longer to establish than habitats such as grassland. Suitable habitat for notable mammal species occurring within the Site, is also present, in the wider area, and therefore effects are also considered to be of low magnitude.
- 7.18.123 The revised restoration scheme will involve the retention and creation of habitats within the Site. Loss of notable mammal habitat associated with the Project, as discussed above, will however occur within part of the restored site, therefore these habitats will not be retained as part of the restoration scheme (although the area will re-vegetate naturally over time).

- 7.18.124 Mitigation measures to address habitat loss are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will be provided for impacts on the existing habitats (i.e. existing baseline), in addition to the restored habitats (i.e. future baseline) (since these are subject to a separate planning consent) and will be proportionate to the impacts of this Project. Mitigation will include management and monitoring.

Harm/mortality

- 7.18.125 Any excavations created during construction could result in animals becoming trapped or injured, when moving through the site at night. There is also the potential for animals to collide with construction traffic within the site.
- 7.18.126 Recommended mitigation to address harm/injury to notable mammals is detailed in Section 7.20, 7.21, 7.22 and 7.23.

Invasive species

- 7.18.127 The site is known to support Japanese knotweed, montbretia, rhododendron, cotoneaster species. Although not valued ecological receptors and is considered to be of **Less than Local value**, mitigation measures are required to ensure compliance with UK legislation. These are detailed in Section 7.20, 7.21, 7.22 and 7.23. As plants listed under Schedule 9 plants of the Wildlife and Countryside Act 1981 (as amended), it is an offence to spread them from the site.
- 7.18.128 The INNS present within the Site (including Japanese knotweed, montbretia, rhododendron and cotoneaster), are likely to be disturbed by construction activities.
- 7.18.129 Mitigation measures to address the habitat disturbance are detailed in Section 7.20, 7.21, 7.22 and 7.23. Mitigation will include management and monitoring to control INNS within the Site.

7.19 Assessment of Effects Post Construction

- 7.19.1 The earthworks are anticipated to be left in perpetuity, and for the purposes of this assessment the future use of areas within the site is unknown. Therefore, no effects on completion are anticipated, and it is considered that areas left undisturbed will naturally re-vegetate over time.
- 7.19.2 Parts of the Site will be restored in accordance with the revised restoration plan including new habitat creation in previously mined areas/quarries and the protection of habitats elsewhere. As mitigation for the earthworks (i.e. the Project), additional habitat creation is proposed, including amendments to the restoration plan, where opportunities have been identified to improve this for the protection and enhancement of important ecological features within the site. Also, the translocation of habitats within the red line boundary to

other retained habitats is proposed to protect notable habitats, and enhance existing/retained habitats. Further management is proposed to enhance retained/newly created habitats proposed as part of the Project, and the restoration area.

7.19.3 These proposals will mitigate for impacts on the current ecological baseline and the future baseline, and provide enhancements, therefore meeting National and local policy requirements for biodiversity net gain.

7.19.4 As detailed within the assessment of construction effects, management and monitoring of the Site will be required post construction, to ensure the re-establishment and enhancements habitats and populations of notable species, and which are currently present within the Site.

7.20 Construction Mitigation

7.20.1 The following mitigation principles and measures will be implemented prior to or during the Construction Phase, through adherence to a Construction Environmental Management Plan (CEMP), Ecological Protection Plan (EPP) and Ecological Management and Monitoring Plan (EMMP), as detailed below:

Pre-Site Clearance/Construction

Habitats

- An indicative habitat creation and restoration plan has been prepared to mitigate/compensate for the habitat loss, severance and disturbance likely to occur to the baseline and restored habitats, as shown in Figure 7.9.
- Notable habitats to be created include the peatland fen-mire, waterbodies, broadleaved woodland, acid grassland/heathland (and lichen/fungi habitat) in areas disturbed by the works, or undisturbed areas/adjacent to the works, which are currently of lower nature conservation value.
- The design within the site facilitates the creation of a habitat mosaic using a varied landform. The re-profiled overburden mound within the larger enclosed area, which is proposed to be acid grassland, will facilitate the establishment of heath/lichen habitats⁴⁴ on its slopes and

⁴⁴ Humphries R N 2013. Case Study: The contribution of active surface mines in the conservation of lichen communities in the South Wales Coalfield, United Kingdom. Journal of American Society of Mine Reclamation, 2, 1, 80-98.

marshy grassland on its plateau (existing habitats which have developed on the existing structure over time).

Lichen heath will also likely recolonise the sides of cuttings⁴⁴.

- Shallow scrapes of varying sizes (area and depth) will be created within the plateaus of marshy grassland, which occur in the smaller enclosed areas in the east/south east of the site. In addition, a pond complex will be created within the newly created peatland mire-fen complex (discussed below). The creation of waterbodies in this area will provide a more diverse habitat, with the opportunity to develop into a species rich habitat.
- Re-profiled land in the form of cuttings/embankments by the earthworks will also provide an ideal habitat for the establishment of acid grassland and other habitats. This area will provide a pioneering habitat which can be colonised by lichen and heathland species, from adjacent areas. In addition, it will provide ideal conditions for the establishment of fungi species over time.
- To compensate for likely impacts on the peatland fen-mire habitat as a result of hydrology changes from the project, it is proposed that similar a habitat complex, is created in an area where the appropriate hydrology exists. It is acknowledged however that it will be difficult to create a like-for-like habitat replacement, but that the newly created habitat will have a similar peatland function. A location is proposed in Figure 7.9.
- It is proposed that the peatland fen-mire complex and marshy-grassland feeder-stream components be translocated to the incipient valley feature to the immediate northwest in the cusp of the overburden mound intersecting with the east-west ridge to the north. Here, in the former coal-washing facility there are ponds and a landform that could be formed into a valley-mire and pond complex⁴⁵. The acidic grassland-heathland mosaic surrounding the peatland mire-heathland complex would be left in situ and heathland used as a source of propagules to inoculate and enhance the remaining acid grassland that surrounded the complex as a more extensive area of heathland and a source for wider natural colonisation potential. The area to receive the removed peat would be sculptured to create a basin complex

⁴⁵ Humphries R N & Meade R. 2007. Design and reporting criteria for reed bed and fen restoration in mineral workings: Scope & Opportunity. In Mead R and Humphries R N (eds), Proceedings of a Workshop on Mineral Extraction and Wetland. Natural England, Peterborough.

of wet heath/wet grassland/ephemeral ponds. The methods to achieve both are well proven⁴⁶.

- Tree planting of native broadleaved tree species is proposed (in the north of the site across the new embankment, which will replace similar habitat lost as a result of the project. It will provide connectivity to new planting proposed as part of the revised restoration plan; and which will be important for species such as bats known to use the woodland for foraging/commuting in addition to providing landscape benefit.
- An area of woodland, currently recorded as PAWS will also be lost in the area of the embankment, in the north west corner of the site. It is recorded as an area of previously backfilled surface mining, and therefore the current ancient woodland inventory is incorrect and doesn't reflect the change in site conditions. This has been verified by the recent soil sampling, detailed in a separate technical note (See Appendix 7Q, Volume 2).
- The existing conifer plantation supports common wintergreen, a notable vascular plant. This plant occurs extensively within adjacent conifer plantation to the west, and it is therefore not necessary to translocate any affected plants.
- The treatments of any translocated habitats (namely peatland fen-mire) will be detailed within an Ecological Protection Plan (EPP), to ensure their protection during stripping, and translocation onto new areas. To avoid the deterioration of these habitats during long periods, long-term temporary storage is not recommended.
- In addition, details of mitigation measures, which are required during construction to ensure the protection of adjacent notable habitats (including habitat currently recorded as ancient woodland, waterbodies, and heathland), will need to be detailed within the EPP such as fencing and or buffer zones for adjacent habitats and species. This will also detail pollution control measures.
- Newly established and existing, retained habitats will also be subject to long-term management to enhance their ecological value and which will be detailed in an EMMP. For example, sympathetic management of acid grassland and marshy grassland within the smaller enclosed loops, in the east/south east of the site, is proposed to maintain short swards, and encourage the natural establishment of heathland in addition

⁴⁶ Humphries R N. 2000. Biodiversity, Curse or Opportunity. Mining Quarrying & Recycling, 29: 26-29.

to creating suitable conditions for the establishment of a diverse plant assemblage as well as fungi and lichen. To aid this, opportunities for appropriate controlled grazing within this area will be sought (subject to grazing agreements) and detailed within the EMMP, but where this is not possible alternative methods will be proposed.

- The retained conifer woodland (in the northwest corner of the site, adjacent to the embankment), which supports common wintergreen, also has an understorey of establishing broadleaved species such as oak and birch. This area of plantation could be managed through the removal of mature larch, to facilitate increased light levels, and the maturation of broadleaved species to form canopy. The change of woodland from plantation to broadleaved which be beneficial to a range of flora and fauna, including protected/notable species such as bats.
- Other long-term management measures will also be detailed in the EMPP for management of broadleaved woodland, and wetland habitats such as rotational thinning, removal of invasive species, and clearance of built up sediment.
- Table 7.12 below, details the total area of habitats lost before and after construction, for a) the baseline i.e. existing site and b) the future baseline i.e. the restored site.

Table 7.13: Total area of habitats lost before and after construction, for a) the baseline i.e. existing site and b) the future baseline i.e. the restored site.

Habitat	Area lost in Hectares (Ha) – Baseline (from earthworks)	Area lost in Hectares (Ha) – Restored site (from earthworks). Includes existing habitats to be retained ⁴⁷	Total habitat loss (baseline and restored site) ⁴⁸	To Create (of greater value) ⁴⁹	To Enhance	Create and enhance total
Broadleaved woodland	2.10	0.07	2.17	31.1	0	31.1
Conifer woodland	6.32	0	6.32	0	7.85	7.85
Mixed woodland plantation⁵¹	1.90	0	1.90	0	0	0sites
Scrub-scattered⁵¹	1.02	0	1.02	0		0
Semi-improved acid grassland⁵⁰	15.11	10.37	25.48	0	18.95	18.95
Improved grassland⁵¹	0.80	0	0.8	0	0	0

⁴⁷ Some habitats listed as having 0 ha are not included as proposed habitats within the restored site.⁴⁸ Of limited value for nature conservation.⁴⁹ For earthworks project only (additional habitats to be created as part of the restoration scheme).⁵⁰ Includes fungi-rich grassland of county value for nature conservation.

Habitat	Area lost in Hectares (Ha) – Baseline (from earthworks)	Area lost in Hectares (Ha) – Restored site (from earthworks). Includes existing habitats to be retained ⁴⁷	Total habitat loss (baseline and restored site) ⁴⁸	To Create (of greater value) ⁴⁹	To Enhance	Create and enhance total
Enclosed pasture (for grazing)	0	1.32	1.32	19.3	0	19.3
Marshy grassland	34.54	0	34.54	0	40 (enclosed loop area – subject to management)	40
Poor semi-improved grassland ⁵¹	0.19	0	0.19	0	0	0
Dry heath/acid grassland (lichen and fungi habitat)	3.41	0	3.41	82 (areas of cutting/embankment and top overburden mound)	19 (enclosed loop/area existing heathland/acid grassland – subject to management)	101
Standing water	0.52	0.44	0.96	3.92	0	3.92
Watercourse	0.65	0.03	0.68	0	0 (natural channels likely to	0

⁵¹ Not considered to be of significant value for nature conservation.

Habitat	Area lost in Hectares (Ha) – Baseline (from earthworks)	Area lost in Hectares (Ha) – Restored site (from earthworks). Includes existing habitats to be retained ⁴⁷	Total habitat loss (baseline and restored site) ⁴⁸	To Create (of greater value) ⁴⁹	To Enhance	Create and enhance total
					form in new topography)	
Fen-mire complex (including open water, wet and dry heath)	3.35	0	3.35	4 (including additional ponds)	0	4
Quarry⁴⁸	1.15	0	1.15	0	0	0
Spoil⁵¹	0.16	0	0.16	0	0	0
Ephemeral/short perennial⁵¹	3.53	0	3.53	0	0	0
Tarmac surface⁵¹	0.62	0	0.62	0	0	0
Total	74.75	12.85	87.6	140.32	85.8	226.12

- The long-term maintenance and monitoring of newly established habitats, and other habitats which will be retained and protected, will be detailed within an EMMP. This will include:
 - Details of the ecological baseline, including ecological survey results. It will also detail information of existing landownership, management and use, as well as geology/ground conditions, hydrology and topography, which will be essential to inform habitat establishment proposals.
 - Details of the newly established habitats and the enhancement of existing habitats including existing habitat translocations, where possible. It will include details of how these habitats, will provide suitable habitat for notable species i.e. suitable species as food plants within species-rich grassland for butterflies, a network of ponds of different sizes/shapes suitable for damselflies and amphibians, open areas with shallow pools and rushes for ground nesting birds such as curlew and lapwing.
 - Suitable prescriptions, for the management of newly created habitats, translocated 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, roosting and foraging/commuting bats, otter and notable mammals. This will include information on methods/equipment/timing etc.
 - A programme detailing the duration of each survey/habitat creation/management activity, what time of year it will need to be undertaken, and how frequently.
 - The duration of the EMMP is to be agreed with the LPAs/NRW and anticipated to be for five years, except for the translocated peatland mire and the heathland enhancement initiative associated with the retained in situ heath where a 25 year period would be appropriate. A programme detailing all management prescriptions for the first 5 years post-construction, which will be subject to review and extension.
 - Full details for the monitoring of the site post development, to provide information on changes in habitat condition/species populations and additional mitigation/management measures that may be required.

In addition, mechanisms to feedback and agree/implement such remedial measures will be detailed for example the establishment of an ecological management committee of relevant stakeholders and regular meetings.

Protected and Notable Species

- Pre-construction surveys including breeding birds (if works are planned between March and August inclusive), bat (in trees), otter and badger will be undertaken to determine the presence of these species within an appropriate distance from the construction works. Larger buffers will be required for more sensitive species (including some breeding birds such as lapwing and curlew) or where more significant impacts are likely to occur such as vibrations (for example a 60 m buffer would be required for bats). Details of buffer distances will be agreed with LPAs in advance.
- Pre-construction checks will also be undertaken of vegetation clearance areas where it is likely to support nesting birds, reptiles, or any Section 7 mammals such as West European hedgehog.
- Implementation of a reptile trapping and relocation programme, in accordance with a reptile method statement will be undertaken by a Suitably Qualified Ecologist (SQE). A suitable receptor site for reptile translocations will need to be identified prior to any reptile mitigation taking place, and be agreed by the LPA ecologists and the sites landowner. It is anticipated that adjacent/connecting habitats will be suitable, and which would also be subject to further enhancements for reptiles.
- Licences will be sought from NRW as required for any European and Nationally protected species, where the final design confirms likely impacts on these species, and once planning consent is obtained. 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 vascular plants (specifically common wintergreen, lesser bulrush, floating bur-reed, greater tussock sedge and spiked water milfoil, royal fern and viviparous fescue). It is considered that the existing habitats particularly heathland, marshy grassland will be sufficient for relocated reptiles, and areas of wetland habitat will be suitable for relocated vascular plants.

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.
- 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. The INNS will sit alongside the EPP and EMMP.

Construction

- An Ecological Clerk of Works (ECoW) will provide a tool box talk to all contractors prior to any works commencing, and be available to provide reports on the implementation of ecological mitigation on site during construction in line with the method statements and or licences provided.
- The INNS Management Plan will be implemented during construction.
- Any retained habitats (such as waterbodies, trees and woodland) will be clearly marked, and where necessary securely fenced off with appropriate temporary fencing at the start of construction work to prevent access and incidental damage by site vehicles, equipment and personnel.
- All retained trees will be treated in accordance with British Standard BS5837 (2005) Guidance for the Treatment of Trees in Relation to Construction. Damage to mature trees, as well as tree and scrub understorey and ground flora within mature woodland, should be avoided.
- Where possible vegetation clearance will take place outside of the bird breeding season (generally March to August inclusive); if this is not possible, pre-construction checks for nesting birds will be undertaken by an ecologist to ensure active nests are not disturbed.
- Where possible vegetation clearance will take place outside of the sensitive periods for notable invertebrate species i.e. egg laying etc, and therefore between October and March (at least in areas where notable species such as dingy skipper occur).
- Where protected/notable species are found during pre-construction checks (including example nesting birds, resting/breeding otter, bat roosts and or badger setts), an

appropriate buffer (based on best practice guidance for relevant species where available) will be demarcated and no construction works will take place within this area, until the SQE has confirmed otherwise. If it is not possible to avoid disturbing any protected species found within/adjacent to the site, a licence will be sought from NRW which includes the necessary mitigation.

- Pollution control measures will be implemented in accordance with industry standards and the Pollution Prevention Guidelines published by the Environment Agency⁵².
- In particular, measures to control and contain sediment and material arising from excavations and or piling operations at areas in proximity to waterbodies, will be included within the working method statements that will be developed as part of the agreed CEMP.
- Any task lighting or security lighting, which may be required on site during the winter months, is to be designed in consultation with an ecologist to ensure that there is no disturbance to habitats within the site, which are likely to support crepuscular or nocturnal species such as otter or bat. Where practicable, daytime working hours will be adopted for any construction works to commence no sooner than one hour after sunrise and finish no later than one hour before dusk.
- All tools, food, litter and construction materials and packaging that may constitute a hazard to otters and other Section 7 mammals, as well as roosting birds and reptiles, will be removed daily from the site.
- Any traffic plans produced will ensure that vehicle traffic is restricted to agreed low limits.
- Excavations are to be covered at night-time or a means of escape provided (such as a plank of wood) for otter, badger or other animals.

7.21 Post Construction

7.21.1 No on completion effects are anticipated, due to the earthworks being left in perpetuity. However, during and post construction, the site will be landscaped to incorporate notable habitats currently within the site; through the translocation of existing habitats (namely peatland-mire

⁵² It is noted that these Guidelines have been withdrawn by the Environment Agency, however they are considered to still be relevant and applicable until such time as new guidance is available.

complex), and elsewhere the creation of new habitats (including wetland features, broadleaved woodland and acid grassland).

7.21.2 Due to the current allocation of land within the site for the revised restoration scheme, additional land outside of the Project boundary is required for some of the habitat creation/enhancement necessary as mitigation. This will still be within Celtic Energy land however.

7.21.3 Newly established habitats will need to replace those lost, and in line with PPW and the Environment Act (Wales) 2016, there will also be the requirement to provide enhancements and promote ecosystem resilience. This will be achieved by sympathetic long-term management.

7.21.4 Habitat replacement will need to be provided for the existing baseline and the future baseline (i.e. restored site), as explained in section 7.16.3.

7.21.5 The EMMP will need to be implemented, to ensure the re-establishment of newly created habitats and translocated habitats, and enhancement of existing habitats. In addition, the EMMP will include measures to ensure populations of notable species are maintained within the site.

7.21.6 Newly established habitats will need to be protected in the long-term, although it is acknowledged that some habitats and species may benefit from some disturbance, where it maintains favourable conditions for example maintaining areas of species-rich grassland, through grazing (with stocking at appropriate conservation levels) or manual removal of scrub. Specific details will be provided in a EMMP.

7.22 Enhancements

7.22.1 The project offers significant opportunities to provide further ecological enhancements within the scheme design, and in doing so meet the requirements of PPW and the Environment Act (Wales) 2016, for biodiversity enhancement and the promotion of ecosystem resilience.

7.22.2 A summary of the proposed enhancements are detailed in Section 7.20.1 and shown in Figure 7.8/Table 7.12, including the creation of habitat at ratio >1:1 (i.e. heathland/acid grassland, waterbodies, broadleaved woodland). Habitat creation will also be designed to create more diverse, species rich habitats for example broadleaved woodland planting will comprise a more diverse mix of native trees and shrubs, than the existing habitats which will be lost as a result of the proposed works. The creation of waterbodies in this area will provide a more diverse habitat, with the opportunity to develop into a species rich habitat. Furthermore, the creation of acid grassland on re-

profiled land will provide a pioneering habitat for the establishment of heath, lichen and fungi.

7.22.3 Management will focus on existing and newly established habitats, with the aim to enhance the condition of these habitats, in terms of nature conservation value. In particular, it is considered that management of conifer woodland, broadleaved woodland, acid grassland, heathland, marshy grassland and wetland will provide significant enhancements to these habitats.

7.22.4 Management will also aim to enhance habitats for notable species known to occur within or adjacent to the site including vascular plants, fungi, invertebrates (particularly dingy skipper and scarce blue tailed damselfly), breeding birds, foraging bats 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 Monitoring Proposals

7.23.1 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^{53,54,55}.
- The peatland mire-fen and heathland complex (which qualifies as a SINC in accordance with published guidance⁴¹) is a special case given its historical importance as one of a few acknowledged examples of actual habitat recreation after mining at a national and international level⁵⁶. For this reason, prior to its translocation its

⁵³ JNCC, 2010. Handbook for Phase 1 habitat survey – a technique for environmental audit (2010) 2016.

⁵⁴ Jerram, R. & Drewitt, A. (1998). Assessing vegetation condition in the English uplands. Peterborough: English Nature Research Reports, No. 264.

⁵⁵ JNCC (2009). Common Standards Monitoring Guidance for Upland habitats, Version July 2009.

⁵⁶ Doley D & P.Audet, 2016. What part of mining are ecosystems?: Defining success for the ‘restoration’ of highly disturbed landscapes, Chapter 4, 8pp. In Squires V R (ed) - Ecological Restoration, Nova Science Pub. Inc.

physical and biological composition will be systematically monitored in detail to provide a detailed historical record (to include at least hydrology, peat distribution and depth, vegetation and plant species mapping (including the royal fern, lichens & mosses), reptiles, invertebrate assemblages (including dragonflies), and breeding birds).

- The peatland-mire translocation is to be recorded to provide a video record, as the UK Cabinet Office did for the original movement⁵⁷ of the deep blanket peat in 1993. Subsequent re-establishment of the peatland-mire and heathland complex as replacement habitat of SINC quality will be monitored annually for the first five years and then every 5 years over 25 years (the same period of time the existing mire complex has been in existence) and compared with the pre-translocation base line and previous data. The monitoring is to inform the annual reviews and requirements for remedial/management actions within the EMMP. Methods of monitoring will be determined once the attributes/targets have been set in the EMMP, and will follow the published methods as appropriate⁵⁸.
- 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.
- Monitoring results will be reported through a Steering Group, led by the site owner in partnership with NPTCBC and PCBC, NRW, and invited interested parties such as users/managers, advisory consultants/independent experts and local interested parties (e.g. Commoners representative) as appropriate. The site owner and the local authorities shall agree where additional remedial measures are required to ensure the objectives of the EMMP are implemented. .

7.24 Residual Effects

7.24.1 Table 7.14 (detailed in Appendix 7O) provides a summary of the evaluation of impacts, with and without mitigation. A total of 140.32

⁵⁷ Cabinet Office Information, 1994. Perspective – Repairing the Damage, Video 29mins. Ref 071 261 8558.

⁵⁸ Humphries R N, 2014. Why reinvent the wheel when there are established methodologies to aid the design and assessment of restored natural ecosystems on mined land? Pp 675-692. In Life of Mine 2014, Brisbane. Australian Institute for Mining and Metallurgy.

ha new habitat is proposed for creation and 85.5 ha of existing habitats will be enhanced.

- 7.24.2 Providing the measures as detailed in Section 7.20, 7.21, 7.22 and 7.23 are implemented prior to, during and post construction, it is considered likely that the scale of all impacts from the Project, on the majority of habitats, would be reduced sufficiently and there would be no significant residual impacts on the identified ecological receptors (in the long term i.e. 10 years post construction).
- 7.24.3 It is acknowledged that for those habitats which will take longer to establish namely the peatland mire-fen complex, heathland, lichen and fungi communities, that initially there will be an adverse effect as a result of the habitat loss/disturbance and fragmentation. However for the majority of these habitats excluding the peatland mire-fen complex and fungi habitats, it is likely that the newly proposed habitats to be created on/off site will establish over 10 years and therefore there will be no residual effects after this time.
- 7.24.4 Peatland mire-fen complex and fungi communities (of the same species diversity/abundance as those currently present on the site), are likely to take longer to establish (potentially between 20 and 30 years), and therefore after 10 years there will still be at least a minor adverse effect. The extent of potential fungi habitat, associated with grassland habitats predominantly, will be greater to compensate for this, however it is likely that the extent of re-created peatland will be slightly reduced as a result of the translocation, oxidation and handling (between approximately 20 and 40% in extent).
- 7.24.5 The above habitat establishment will be dependent on the appropriate long term management and monitoring, and which will be detailed within the EMMP.
- 7.24.6 For the majority of habitats there will no residual effect from the project. For re-created peatland, due to the limitations of the translocation and the marginally smaller area to be re-created, it is anticipated that there would however be a significant negative effect post construction. However, it should be noted that the existing deep peatland on site is a result of translocation undertaken in 1993 which demonstrates re-creation methods and subsequent management can be effective.
- 7.24.7 With the inclusion of enhancement measures (as detailed in section 7.22) 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, along with breeding birds.

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 on completion of the 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 Project;
- Identify the potential impacts of the Project 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 Project with the mitigation measures in place; and
- Assess the significance of the effects of the Project.

8.1.3 This chapter is supported by a historic environment desk-based baseline assessment, which forms Appendix 8A.

8.2 Review of proposed development

8.2.1 The Project includes the construction of earthworks, including cutting and embankment works and associated drainage works. Aspects of the Project which may have an effect on cultural heritage assets include:

- Ground preparation work, including the removal of topsoil prior to the building up of embankments;
- The excavation of cuttings;
- The excavation of trenches for drainage works;
- The alteration of the setting of heritage assets.

8.2.2 No specific design mitigation has been incorporated for cultural heritage.

8.3 Legislation, policy context and guidance

Legislation

8.3.1 *The Historic Environment (Wales) Act* (2016) received Royal Assent and became law on 21st March 2016. It is the first legislation enacted specifically for the Welsh historic environment. The Act makes important changes to the two main UK laws that provide the legislative framework for the protection and management of the historic environment: the *Ancient Monuments and Archaeological Areas Act* (1979) and the *Planning (Listed Buildings and Conservation Areas) Act* (1990). It also incorporates stand-alone provisions establishing: statutory historic environment records, a list of historic place names and an advisory panel for the historic environment.

8.3.2 *The Historic Environment (Wales) Act* (2016):

- gives more effective protection to listed buildings and scheduled ancient monuments;
- improves the sustainable management of the historic environment; and
- introduces greater transparency and accountability into decisions taken on the historic environment.

Policy context

8.3.3 *The Historic Environment (Wales) Act* (2016) stands at the centre of an integrated suite of legislation, policy, advice and guidance for the historic environment. National policy is included within:

- *Planning Policy Wales* (Edition 10, 2018), Chapter 6: Distinctive and Natural Places (section 6.1);
- *Technical Advice Note 24: The Historic Environment* (May 2017 — replacing the previous Welsh Office circulars on the historic environment).

8.3.4 The site straddles the administrative boundary between Powys County Council and Neath Port Talbot County Borough Council and local planning policy from both areas is relevant to this assessment.

8.3.5 The Powys *Local Development Plan* (2011-2026, adopted April 2018) includes the objective “to protect, preserve and/or enhance the distinctive historic environment, heritage and cultural assets of Powys, in particular local assets that are not statutorily protected or designated under national legislation, and to ensure that development respects local distinctiveness” (Objective 13.2 Landscape and the Historic Environment).

- 8.3.6** Further relevant policies are DM2: The Natural Environment, part 5: Trees, Woodlands and Hedgerows of Significant Public Amenity, Natural or Cultural Heritage and DM4 – Landscape, which includes consideration of the historic qualities of landscapes.
- 8.3.7** Two new Supplementary Planning Guidance documents are currently being prepared for Powys County Council, relating to Archaeology and the Historic Environment. These are currently in draft form but are likely to be adopted in 2020.
- 8.3.8** The Neath Port Talbot *Local Development Plan* (2011-2026, adopted January 2016) has several policies grouped around the topic of ‘Culture and Heritage’. Relevant to this assessment are:
- Policy SP21 Built Environment and Historic Heritage;
 - Policy BE 1: Design; and
 - Policy BE 2: Buildings of Local Importance.
- 8.3.9** Additionally, heritage issues are covered by Neath Port Talbot’s The Historic Environment Supplementary Planning Guidance (adopted April 2019).

Relevant guidance

- 8.3.10** Historic environment desk-based assessment (DBA) is covered by several pieces of best-practice guidance produced by the Chartered Institute for Archaeologists (CIfA) and Cadw, the Welsh Government’s historic environment service. CIfA’s¹ overall standard to which all DBAs should comply with states that “desk-based assessment will determine, as far as is reasonably possible from existing records, the nature, extent and significance of the historic environment within a specified area. In a development context desk-based assessment will establish the impact of the Project 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 that impact.”
- 8.3.11** In addition to compliance with this overarching standard, and the guidance that accompanies it there are several other codes and guidance documents that will inform the production of the DBA:
- CIfA² *Code of Conduct*.
 - Cadw³ *Conservation Principles for the Sustainable Management of the Historic Environment in Wales*. This sets out six principles

¹ CIfA (2017) *Standard and Guidance for Historic Environment Desk-Based Assessment*. Reading: CIfA, p4.

² CIfA (2014) *Code of Conduct*. Reading: CIfA.

³ Cadw (2011) *Conservation Principles for the Sustainable Management of the Historic Environment in Wales*. Cardiff: Cadw.

for conservation, including that historic assets will be managed to sustain their values and that understanding the significance of assets is vital. Heritage values are identified as comprising evidential value, historical value, aesthetic value and communal value.

- Cadw⁴ *Heritage Impact Assessment in Wales*, which outlines the principles for creating a Heritage Impact Statement, in particular that ‘sufficient information to enable both the significance of the asset and the impact of change to be understood. It should be proportionate both to the significance of the historic asset and to the degree of change proposed’.
- Cadw⁵ *Setting of Historic Assets in Wales*. This explains what setting is, how it contributes to the significance of a historic asset and why it is important.

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 Consultation

8.4.1 To inform initial consultation, 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 Ystradgynalis⁶, the earthwork remains of a 19th century tramway, runs across the southern part of the site. Physical effects to the tramroad were identified as being likely 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 cairn⁷, 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 Due to the potential for the Project to have significant effects on cultural heritage, consultation was carried out with the Cadw Senior Inspector of Ancient Monuments for the area and archaeological advisors from Clywd 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

⁴ Cadw (2017a) *Heritage Impact Assessment in Wales*. Cardiff: Cadw, p5

⁵ Cadw (2017b) *Setting of Historic Assets in Wales*. Cardiff: Cadw.

⁶ Scheduled Monument ID: GM399, referred to as CH001 in this report.

⁷ Scheduled Monument ID: BR327, referred to as CH002 in this report.

County Borough Council respectively. This was continued through the PAC process. Details of the consultation are included in **Table 8-1**.

8.4.3

A Written Scheme of Investigation, detailing the DBA methodology was submitted to CPAT and GGAT. The CPAT Development Control Archaeologist, in discussion of the potential for archaeological remains in areas of the site not previously open cast, requested that a detailed walkover survey be carried out. The results of this are included in Appendix 8A. Consultation with the CPAT and GGAT advisors has informed the development of the mitigation recommendations (see section 8.10).

Table 8-1: 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. GGAT were approached for comment regarding mitigation but declined to comment further prior to submission (email dated 21.11.2019).	Planning Policy Wales reference corrected.
	GGAT provided a response during the PAC process. The Trust stated that “the Scheduled Monument of the Tramroad at Ystrdynlais (Cadw ref. GM399) will be directly affected” and has stated that the following is required: - Scheduled Monument Consent (SMC) from Cadw before development works - historic environment mitigation with an agreed methodology The Trust concurs with the proposed mitigation and recommendations for Areas B and C and state mitigation should be undertaken to an agreed methodology within a written scheme to be submitted to GGAT.	It is proposed that SMC will be sought from Cadw prior to works commencing (see below).
	The Trust recommends that a condition be attached to any consent granted, recommending the submission of the written scheme and the programme of work to be implemented.	Comments noted.
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	Comments noted.
		Changes to the WSI and the subsequent approach to methodology have been followed by this ES. The results of the

Stakeholder	Comment	Response
	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. Potential mitigation was discussed in subsequent emails (20.11.2019).	walkover survey are included in Appendix A. The recommendations made by the CPAT archaeological advisor have been incorporated into the mitigation section of this chapter.
	During the PAC process, CPAT stated that they considered that the Environmental Impact Assessment has adequately identified the key archaeological impact issues and the mitigation suggested in 8.10.2 and 8.10.3 should be taken forward via an appropriate archaeological contractor (registered with the Chartered Institute for Archaeologists) if the application is given consent.	Comments noted.
Cadw	Cadw were approached in relation to the potential adverse effects on the Tramroad at Ystradgynlais Scheduled Monument. Pre-application advice was received by email on 20.11.2019. It was advised that a statement of significance would be required to identify the significance of the Scheduled Monument and that a heritage impact assessment would need to be undertaken in order to demonstrate the impact of the proposed works would not be harmful to the monument's heritage values. The Inspector referred to Paragraph 6.1.24 of Planning Policy Wales (Edition 10, Dec 2018) which states that there would be a presumption in favour of preservation in situ of nationally important archaeological remains and that permission will only be granted for a development which would result in a direct adverse impact on a scheduled monument in exceptional circumstances. The proposals will need to show why they should be approved against national planning policy. TAN 24 The Historic Environment further states that there is a primary presumption against proposals which	As described in section 8.3, this ES chapter contains the elements required for a Heritage Impact Statement, with further supporting evidence given in Appendix 8A. The earthwork proposals are largely policy compliant – the majority of the 6.44km long Scheduled Monument would not be physically affected and the 450m section which would be buried would be preserved in situ beneath the proposed embankment. This is with the exception of three trenches which would be cut into it for drainage, anticipated to be three trenches of c2.1m in width crossing the Scheduled Monument (c15m across).

Stakeholder	Comment	Response
	would involve significant alteration or cause damage, or would have a significant adverse impact causing harm within the setting of the remains. The proposals would require Scheduled Monument Consent The inspector further recommended that the works are relocated away from the Scheduled Monument as the incorporation of the monument into the proposed trackway embankment would constitute a 'significant alteration'. Evidence of consideration of alternative locations should be provided.	The Planning Statement which accompanies the planning application for Nant Helen provides further details of how the project meets policy tests (Section 5.7).
	During the PAC process Cadw stated that they have "significant concerns about the permanent major adverse and significant impact on the Scheduled Monument of the tramroad at Ystradynlais unless the scheme is redesigned". Currently, Cadw considers the proposals are contrary to TAN24 and PPW. Cadw "recommended that the scheme is redesigned" and the application for a Scheduled Monument Consent (SMC) is "made before submitting the planning application to ensure the setting is acceptable". Cadw has no concerns about the impact on the scheduled monument Bryn Lechwen Ring Cairn (BR327) as a temporary impact on setting will cease once development is completed.	The project team has had two follow on discussions with Cadw to explore the issues raised. It has been agreed that the SMC will be submitted soon after the submission of the earthworks application to address the concern raised. Provided Cadw is content with the SMC application, it will be in a position to agree to a conditional consenting of the Nant Helen earthworks application that will prevent works that will impact the scheduled area until the SMC has been granted. Noted.

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)⁸ 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”⁹ 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 full methodology for establishing the baseline conditions is included in Appendix 8A.

Assessment methodology

8.5.4 Assessment of the significance and impact of the Project 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 Project and then the significance of the effect.

8.5.5 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 Wales¹⁰, can be evidential, historical, aesthetic or communal in nature.

⁸ 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.

⁹ CIfA (2017), p10.

¹⁰ Cadw (2011) *Conservation Principles for the sustainable management of the historic environment in Wales*. Cardiff: Welsh Assembly Government, pp16-17.

8.5.6 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 significance 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 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.”¹¹

8.5.7 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 A4 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 8.9-8.10).

8.5.8 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.

8.5.9 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 8-2.

Table 8-2: 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

¹¹ Cadw (2017) *Setting of Historic Assets in Wales*. Cardiff: Welsh Government, pp5-6.

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.

8.5.10 The approach to assessing the magnitude of impact on heritage assets shown in **Table 8-3** 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 8-3: 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

8.5.11 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.

8.5.12 It should be noted that the initial assessment is made for the Project 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 8- 4, to arrive at a final judgement of the significance of effect.

8.5.13 Moderate or Major effects are considered to be significant.

Table 8- 4: 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 Historic Environment Record (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 record of known archaeological and historic assets. They are not exhaustive records of all surviving historic assets and does 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 and confirmed, where possible, with historic aerial photography. It is assumed that no archaeological remains survive in areas subjected to open cast mining.

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 A8 Appendix 8A). 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, 113 heritage assets were identified and assessed within the site and study area (see Section 8.5.1 for details of the study area). This included one Scheduled Monument located within the site; 35 non-designated heritage assets within the site; 39 designated heritage assets and 38 non-designated heritage assets located within the study area beyond the site. Additionally, eight 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 Project. This is because many of the recorded sites of archaeological remains or features identified from historic maps have been removed by open cast mining.

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, two areas in the north and south of the site (Areas B and C, Figure 8.4) were identified with greater potential. In both cases, 19th and 20th century mining activities were identified, which make the potential for archaeological remains pre-dating the post-medieval period unlikely. However, there is a high potential for archaeological remains of late post-medieval and modern date within these areas. 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.

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 A4 of Appendix A8).

8.8 Design mitigation

8.8.1 No specific design mitigation has been incorporated into the project for heritage purposes.

8.9 Assessment of effects

8.9.1 Effects have been identified arising from the construction of the Project. The construction of the earthworks would result in physical

effects to archaeological features within the site, in addition to effects arising from changes to the setting of heritage assets located beyond the site.

8.9.2 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 into the 1st year on completion, they are a continuation of an effect which would begin during construction rather than a new effect. After the first year it is assumed that the earthworks will be grassed over (see Chapter 9) and will no longer have an adverse effect on heritage assets.

8.9.3 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

8.9.4 The construction of the earthworks would involve both cuttings and embankments, with retaining walls in some locations. New drainage infrastructure would also be established.

8.9.5 The Tramroad at Ystradgynlais (CH001), or Claypon's Extension, is a nationally important earthwork dating to the 1830s. It is 6.44km in length and runs from Ystradgynlais across Mynydd y Drum towards where the Onllwyn Washery is today. It was built using a hybrid of horse-drawn and steam-driven technology, making it a historically significant feat of engineering and it was a part of the Brecon Forest Tramroad which was a vitally important route for the movement of raw materials for the flourishing iron trade in the area. It is a Scheduled Monument and a heritage asset of **high** value. The proposed earthworks would cross the Scheduled Monument near its eastern end, permanently burying 450m section of it. Three drainage pipes would be installed across the Scheduled Monument where the embankment crosses it. Trenches, c2.1m in width and 15m in length, would be cut into the surface of the Scheduled Monument prior to its burial. The cutting of the trenches and the burial under the embankment would constitute a moderate magnitude of impact; although the majority of the 6.44km long monument would not be physically affected, it is a linear feature and is understood as a line along which materials would have been transported. As a result, the loss of a section of the earthwork under the new embankment would lead to a loss of legibility as well as the removal of part of its physical fabric. Given the archaeological and historical values of this monument, this would constitute a permanent **major adverse** significance of effect. This is a significant effect.

8.9.6 There are a number of archaeological remains which have been identified within the site, relating to historic agricultural use (CH075), communications routes (CH071), quarrying (CH070) and mining (CH015-6, CH025, CH064, CH068, CH072-4). These features would

all be physically affected by the construction of the new embankments. Below ground remains may only be partially removed, as topsoil will only be stripped where the ground is too soft or unstable, but all of these features will be buried. This would result in, at minimum, the loss of legibility and contextual associations and, at worse, their complete removal. The following effects have been identified, none of which are significant:

- Burial and partial truncation of a covered mine shaft/air shaft identified during walkover survey (CH068) and remains of an early 20th century drift mine (CH073). These are heritage assets of negligible value and this would constitute a moderate magnitude of impact, resulting in permanent **minor adverse** significance of effect;
- Burial and partial truncation of infilled post-medieval quarry (CH070). This is a heritage asset of negligible value and would constitute a moderate magnitude of impact, resulting in a permanent **minor adverse** significance of effect;
- Removal of earthwork remains of trackways (CH071), thought to be 19th and 20th century in date. They are of negligible value. Their removal would constitute a major magnitude of impact, resulting in a permanent **minor adverse** significance of effect;
- Possible below-ground remains of two 19th century tramways (CH072 and CH025) would be removed or truncated during construction. They are heritage assets of negligible value. The proposed works would constitute a moderate magnitude of impact, resulting in a permanent **minor adverse** significance of effect;
- An area of spoil tips from late 19th and early 20th century mine workings extends into the area of the proposed earthworks (CH074). Although no traces of these can now be seen at ground level it is possible that below ground traces remain. This would be of negligible value. A small area would be truncated and then buried by the construction of the new embankment, constituting a minor magnitude of impact, resulting in a permanent **negligible adverse** significance of effect;
- Removal of a post-medieval field boundary (CH075) during construction of new embankment. This is a rare survival of the pre-industrial landscape on Mynydd y Drum and is of low value. Its removal would be a major magnitude of impact, resulting in a permanent **minor adverse** significance of effect; and
- Truncation and burial of below-ground remains relating to the early 20th century Drym Colliery (later Dulais Anthracite Colliery). Walkover survey has shown that above ground features have been cleared from the site but it is likely that shafts and other below-ground features, such as building foundations, still survive. The remains are of negligible value and their truncation and burial by the construction of the embankment would be a moderate magnitude of impact. This would result in a permanent **minor adverse** significance of effect.

8.9.7 Additionally, previously unrecorded archaeological remains could be affected by the construction of the embankments, cuttings and associated drainage. The model of archaeological potential (Appendix 8A) identified two areas of the site where there was a high potential for previously unrecorded post-medieval and modern archaeological remains (Figure 8.4). Although the value of previously unrecorded archaeological remains can only be estimated, they are most likely to be of post-medieval or modern date, or relate to paleoenvironmental remains present within peat, if present (Appendix A3.12). This makes it likely that they would be of low value. Their removal would constitute a major magnitude of impact which would most likely, constitute a permanent **minor adverse** significance of effect. This is not significant.

8.9.8 Effects would also arise from changes to the setting of heritage assets. Six Scheduled Monuments, all prehistoric in date, have been identified as having the site within their settings. The settings of these assets contribute to their value (see Appendix 8A). 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. As such, there would be no permanent effects on the cairn arising from the creation of the Project. However, during construction and until the embankments have grassed over, there would be a temporary adverse effect resulting from the increased noise, lighting and appearance of construction activities happening only a short distance from the cairn. Currently views to the east, while not contributing to the cairn's value, do not overly detract from it. This would alter during construction resulting in a 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 temporary **minor adverse** significance of effect. This is not significant.

8.9.9 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 does not make a particular contribution to the hillfort's value, the hillfort would have been deliberately sited to command views over this area. As such, during construction, the increased activity on the hillside, especially the restored areas east of the current void, would result in a minor magnitude of impact for the duration of construction and for the first year post completion (until the grass is established making the earthworks blend in to the wider landscape). This would

be a temporary **minor adverse** significance of effect. This is not significant.

8.9.10

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 works would appear in views during construction. However, the distance from these monuments to the site and the breadth of their views minimises the impact on them by the works. 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 temporary **minor adverse** significance of effect, which is not significant.

8.9.11

There are eight historic landscape areas within the site or its immediate vicinity (Appendix 8A, Figure 8.3). Of these, Coelbren, Cynant & Seven Sisters Urban Corridor, Dyffryn Tawe and Ystradgynlais/Abercraf are either unaffected by the Project or such a small part is affected as to have no effect on a landscape level. Of the remaining four historic landscape areas, the following effects have been identified during construction:

- 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 earthworks would alter the physical appearance and form of the historic landscape area but its characteristics would still be broadly legible. As a result, this is considered to be a minor magnitude of impact. This would result in a permanent **negligible adverse** significance of effect. This is not significant.
- 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 Project would involve the construction of the new embankment through the eastern part of this woodland, resulting in a change to its legibility. This would be a minor magnitude of impact, resulting in a permanent **negligible adverse** significance of effect. This is not significant.
- 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 Project would extend into the easternmost parts of the two areas, truncating the edges of the historic landscapes 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.

Assessment of effects on completion

8.9.12 No effects have been identified on completion of the earthworks. However effects arising from changes to the setting of 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) will continue throughout the first year post completion. After this date it is assumed that grass will have established and the earthworks will no longer be visible in views from the heritage assets.

8.10 Mitigation and enhancement

Mitigation of effects from construction

8.10.1 A significant adverse effect has been identified on the Tramroad at Ystradgynlais (CH001), a Scheduled Monument which would be partially buried by the construction of the embankment. In order to mitigate this, no topsoil would be removed during the construction of the embankment and any benches required to provide the necessary gradient would be cut outside of the scheduled area. However, it is anticipated that three trenches for drainage pipes would be cut into the surface of the monument prior to its partial burial. This would be kept to a minimum in order to leave the physical remains of the Scheduled Monument in situ. Although the Scheduled Monument would remain largely intact beneath the new embankment, there would be an interruption in its legibility, with the east and western sections of it divided. This would have an adverse effect on how the monument can be understood. Any such works would require Scheduled Monument Consent to be approved by Cadw and it is likely that archaeological monitoring would be required during construction to ensure that no physical damage is done to the Scheduled Monument during construction.

8.10.2 Although no significant adverse effects have been identified resulting from effects to non-designated archaeological remains, any adverse effects should be mitigated in line with national and local planning policy. As such, the following mitigation measures are proposed:

- Core transect across Area C to record any peat present. Should peat be identified this should be analysed for paleoenvironmental remains;
- Strip, map and sample prior to the commencement of construction focused on areas of recorded archaeological features (CH072, CH025, CH064) with a watching brief over the remainder of Areas B and C. The watching brief should include the recording of field

boundaries (CH075), trackways (CH071) and mining features (CH015-6, CH068, CH073-4).

- 8.10.3** 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.
- 8.10.4** 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 on completion

- 8.10.5** There are no effects on completion. No mitigation is proposed.

8.11 Residual effects

Residual effects from construction

- 8.11.1** Although it is proposed to keep physical removal of parts of the Scheduled Monument (CH001) to a minimum and carry out all works under archaeological monitoring, this would not reduce the residual effect. It would remain as **major adverse**. This is a significant effect.
- 8.11.2** The mitigation of effects to archaeological features can contribute to a reduction in magnitude of effect, as a record is created of the features prior to their removal. However, the effect of their removal cannot be reduced entirely. As only negligible and minor adverse effects on archaeological features have been identified, the residual effects will remain unchanged. These are not significant.

Residual effects on completion

- 8.11.3** As no completion effects have been identified, there are no residual effects arising at this stage.

8.12 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)	Comments
Burial of a part of the Scheduled Monument by embankment and the cutting of three trenches for drainage pipes into its surface	The Tramroad at Ystradgynlais (CH001)	High	Moderate	Major adverse (permanent)	No topsoil strip or removal of soft material in area of Scheduled Monument. Any benches required to be cut outside of the Scheduled area.	Moderate	Major adverse (permanent)	The proposed works constitute a significant alteration to the Scheduled Monument although it would, excluding the trenches, be physically preserved in situ. The works would require Scheduled Monument Consent and works are likely to need to happen under archaeological supervision.

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Change to the setting of Bronze Age cairn	Bryn Llechwen Ring Cairn (CH002)	High	Minor	Minor adverse (temporary)	NA	Minor	Minor adverse (temporary)	
Burial of asset and potential removal of physical remains during construction	Mine shaft/air shaft (CH068)	Negligible	Moderate	Minor adverse (permanent)	Watching Brief	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical remains during construction	Post-medieval quarry (CH070)	Negligible	Moderate	Minor adverse (permanent)	Watching Brief	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical remains during construction	Trackways (CH071)	Negligible	Major	Minor adverse (permanent)	Watching Brief	Major	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical	19 th century tramway (CH072)	Negligible	Moderate	Minor adverse (permanent)	Strip, map and sample excavation	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
remains during construction								remains are still removed.
Burial of asset and potential removal of physical remains during construction	Early 20 th century drift mine (CH073)	Negligible	Moderate	Minor adverse (permanent)	Watching Brief	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical remains during construction	Area of mine shafts and spoil tips (CH074)	Negligible	Minor	Negligible adverse (permanent)	Watching Brief	Minor	Negligible adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical remains during construction	Post-medieval field boundary (CH075)	Low	Major	Minor adverse (permanent)	Watching Brief	Major	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of asset and potential removal of physical remains during construction	Glynllech Colliery (tramway only) (CH025)	Negligible	Moderate	Minor adverse (permanent)	Strip, map and sample excavation	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Burial of asset and potential removal of physical remains during construction	Drym colliery/Dulais Anthracite Colliery (CH015-6, CH064)	Negligible	Moderate	Minor adverse (permanent)	Strip, map and sample excavation/ Watching Brief	Moderate	Minor adverse (permanent)	Effects cannot be reduced further as archaeological remains are still removed.
Burial of feature or removal through cutting during construction	Previously unrecorded archaeological and paleoenvironmental remains (Areas B and C)	Unknown but likely to be low	Major	Minor	Watching Brief and Core Transect	Major	Minor	Effects cannot be reduced further as archaeological remains are still removed.
Change to setting of Scheduled Monument	Craif-y-Rhiwarth, Hillfort (CH088)	High	Minor	Minor adverse (temporary)	NA	Minor	Minor adverse (temporary)	
Change to setting of Scheduled Monument	Dorwen Standing Stone (CH090)	High	Negligible	Minor adverse (temporary)	NA	Negligible	Minor adverse (temporary)	
Change to setting of Scheduled Monument	Lorfa Stone Circle (CH091)	High	Negligible	Minor adverse (temporary)	NA	Negligible	Minor adverse (temporary)	

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Change to setting of Scheduled Monument	Coed Ddu ring cairn (CH096)	High	Negligible	Minor adverse (temporary)	NA	Negligible	Minor adverse (temporary)	
Change to setting of Scheduled Monument	Carn Cornel Round Cairn (CH097)	High	Negligible	Minor adverse (temporary)	NA	Negligible	Minor adverse (temporary)	
Change to historic landscape	Twyn Eithinog (N and S)	Low	Minor	Minor adverse (permanent)	NA	Minor	Minor adverse (permanent)	
Change to historic landscape	Ystradgynlais/ Abercraf	Low	No Change	Neutral	NA	No Change	Neutral	
Change to historic landscape	Dyffryn Tawe	Low	No Change	Neutral	NA	No Change	Neutral	
Change to historic landscape	Nant Pen-rhos	Negligible	Minor	Negligible adverse (permanent)	NA	Minor	Negligible adverse (permanent)	
Change to historic landscape	Onllwyn	Negligible	Minor	Negligible adverse (permanent)	NA	Minor	Negligible adverse (permanent)	

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Change to historic landscape	Crynant & Seven Sisters Urban Corridor	Low	No Change	Neutral	NA	No Change	Neutral	
Change to historic landscape	Coelbren	Negligible	No Change	Neutral	NA	No Change	Neutral	

9 Landscape and Visual

9.1 Introduction

9.1.1 This chapter provides an assessment of the likely landscape and visual effects arising from the Project 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 project and its site before setting out the baseline conditions and how these will be affected by the project.

9.2 Review of proposed development

9.2.1 The Project includes the construction of earthworks including; cuttings and embankments, and drainage works associated with the revised landform.

9.2.2 The assessment of effects does not take account of any landscape mitigation. Mitigation measures have been proposed where there are significant effects post-completion and are described at the end of this chapter.

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:
- “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”
- 9.3.5** 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).”
- 9.3.6** Section 5 of the Act provides a meaning of 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.”
- 9.3.7** 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.
- 9.3.8** 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.

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- 9.3.9** The following paragraphs have been highlighted as they are of particular relevance to the project.
- 6.0.2** outlines the necessity for protecting landscape character and visual amenity.
- 6.3.5** outlines the statutory duty planning authorities have to National Parks and AONBs
- 6.3.6** outlines the purpose and importance of national parks.
- 6.3.8** outlines landscape and scenic importance of national parks.

6.3.9 outlines the importance of assessing national parks to ensure that effects are acceptable.

6.3.10 whilst the project does not fall within the Brecon Beacons National Park, this paragraph outlines the overall importance and weighting given to national parks in the decision-making process.

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

6.3.11 outlines the importance of conserving and enhancing local landscapes.

6.3.13 outlines the recognition of important landscapes through non-statutory designations such as SLAs.

6.4.26 outlines the importance and irreplaceable nature of Ancient Woodland which can contribute to landscape character and value.

Technical Advice Notes

9.3.10 “Technical advice notes (TANs) provide detailed planning advice. Local planning authorities take them into account when they are preparing development plans.”¹

9.3.11 The following TANs are of particular relevance to the project.

(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

9.3.12 The complementary restoration earthworks fall within Powys County Council and Neath Port Talbot County Borough Council.

9.3.13 Key policies within *Powys Local Development Plan (2011-2026, adopted April 2018)* have been identified:

Policy DM4 – Landscape

¹ GOV.WALES (2020) *Technical Advice Notes*

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.

9.3.14 Key policies within the *Neath Port Talbot LDP (2011-2026, adopted January 2016)* are listed below:

Policy EN2 Special Landscape Areas

9.3.15 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 Special Landscape Area has been designated.”

9.3.16 Whilst the site is not located within any Special Landscape Areas, Neath Port Talbot Special Landscape Area 2: Dulais Valley is considered relevant to the Project 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 Special Landscape Area shall be explored as part of the baseline studies and shall be taken into consideration when defining and assessing individual character areas.

Policy SP 14

9.3.17 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

9.3.18 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

9.3.19 The Project site is located in close proximity to the Brecon Beacons National Park and therefore information included within A Management Plan for the Brecon Beacons National Park 2015-20202 has been used to form judgments on the anticipated effects as a result of the Project.

9.3.20 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.

9.3.21 Most prevalent to this assessment is the potential impacts on the 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 impacts to the sense of peace and tranquillity, remoteness and ruralness.

9.3.22 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.

² Brecon Beacons National Park A Management Plan for the Brecon Beacons National Park 2015-2020

Relevant guidance

9.3.23 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
- LANDMAP Methodology Overview (2017)⁵.

9.4 Consultation

Stakeholder consultation

9.4.1 Brecon Beacons National Park Authority, Neath Port Talbot Council and Powys County Council were asked to comment on the appropriate selection of viewpoints and landscape character areas for the Project. The details of this consultation are outlined in the table below.

Table 9.1: Response to representations from stakeholders on scope of landscape and visual assessment.

Stakeholder	Comment	Response
Brecon Beacons National Park Authority	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.
Brecon Beacons National Park Authority	‘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.

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*

⁵ Natural Resources Wales (2017) *LANDMAP Methodology Overview*

	- 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.”.	
Neath Port Talbot Council	Provided comments in agreeance with extending the 2km buffer for the ZTV.	Following initial site surveys, the buffer was extended to 8km.
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.
NRW (PAC Requirement 1 – Landscape)	A 5m screen is proposed on the perimeter of the site to mitigate noise impact on properties in Caehopkin during construction. This area lies outside the NP, however given the proximity, there appears to be potential for impacts on tranquillity within the park during construction and arising from visual impacts. The visual impacts of developments outside the NP can also detract from its sense of tranquillity and remoteness. Peace and tranquillity are a noted Special Quality of the NP. We advise that this aspect should be assessed in the Landscape Visual Impact Assessment (LVIA).	The characteristics as defined within the Brecon Beacons Landscape Character Assessment; LANDMAP information and; the contents of the Brecon Beacons Management Plan, including the Special Qualities of the national park have all been used to form judgments on the Value of the Character Areas within the national park. Please refer to 9.3 Legislation, policy context and guidance, 9.5 Methodology and Appendix 9C – Baseline Environment. Whilst there are no direct impacts upon the national park, indirect impacts* have been considered, notably those that will affect the

	We note the 8 km Study Area, which includes landscape character areas and viewpoints within the NP. The LVIA notes significant landscape effects on the Nant Helen Reclaimed Uplands Landscape Character Area, which encompasses the site. There is the potential to impact the character of other nearby areas defined in the NP's Landscape Character Assessment. We believe changes may occur by impacting views and through effects on tranquillity to the visual character of the Waterfall Country, Southern Valleys, and Y Mynydd Du. The landscape assessment should refer to the National Park Management Plan, Special Qualities and Landscape Character Assessment, as well as detailed information in LANDMAP.	enjoyment and recreation of the national park due to impacts on the national park's special qualities. Further clarification has been included throughout the LVIA chapter with reference to the source of information. Effects on LCAs within the national park are experienced only at the edges of these large LCAs. Therefore, while the effects are noted, they are localised changes to the perception of the LCA experienced at the edges of the LCA, resulting in non-significant effects on the LCA as a whole. The perception of tranquillity is also slightly reduced at the edges of the national park, where there are existing influences on perception from development, infrastructure and the open cast mining. (*Effects that result indirectly from the proposed project as a consequence of the 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)
NRW (PAC Requirement 1 – Landscape)	Within the LVIA, significant adverse effects have been identified at construction stage on visual receptors within the NP at Viewpoints 1, 2, 3, 4, 5 and 11. Significant adverse effects on completion at viewpoints 2, 3, 4 and 5 within the NP, with receptors at viewpoint 1 assessed as experiencing a beneficial effect on completion. Photographs and photomontages from these viewpoints do not appear to have been produced to illustrate these findings, therefore we advise that this information is provided.	Wireframes have now been produced which indicate the size and extent and visibility of the proposed earthworks. The following viewpoints were selected to give an indication of the types of views that would be available from the north (VP03), east (VP12), south (VP18) and west (VP07). These also represent views outwards from the national park (VP03 and VP12) and views from the wider landscape back towards the national park (VP18 and VP07).
NRW (PAC Requirement 1 – Landscape)	To help integrate the engineered landform with the surroundings in the long term, woodland planting is proposed on the northern embankment. It is noted that broadleaved woodland is likely to take a long time to establish & we agree that this would be the case, due to the elevation and exposure,	Consideration of the slackening of embankment slopes has been given. To the north of the scheme this would result in the encroachment of engineered landform closer to residential properties and the removal of further woodland/vegetation, neither of which would be deemed

	steep slopes and poor substrate. The effects of planting would not be noticeable until after year 15. It is also stated that it may be feasible to achieve shallower gradients. We advise that further consideration is given to the design of the embankments and cuttings and location of the loops to establish whether a revised design can avoid or mitigate adverse impacts on the NP.	advantageous. Planting of broadleaved woodland along the northern embankment would, over time help to integrate the earthworks with the surrounding wooded valley character of the landscape. In order to reduce the timeframe for the integration of the Project, it is proposed that a proportion of the planting should be larger stock and that a perceptible reduction in adverse effects would be experienced within the first 5 years. As the future use of the earthworks is yet to be established, full details of planting proposals and a landscape strategy would be developed prior to implementation.
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9.5 Methodology

Overview

- 9.5.1** 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).
- 9.5.2** The assessment firstly describes the current baseline conditions. The assessment is carried out based on **construction** and on **completion year 1**, for which it is assumed that grass on earthworks will have established.
- 9.5.3** Due to the closely related nature of the Project and the restoration of the Nant Helen site as originally proposed in the 2011 Nant Helen Remainder Application, cumulative impacts have been assessed within this chapter because the earthworks cannot be completed without the restoration of the site.
- 9.5.4** This means that at construction, the assessment sets out the significance of effect due to the Project in isolation and then also describes the ‘in combination effects⁶’ of the Project and the restoration of the site. **The overall significance of effect is based on the combined magnitude of change from the Project and the Nant Helen Restoration.** 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.
- 9.5.5** On completion year 1, the assessment sets out the significance of effect due to the Project and the Nant Helen Restoration. As it is

⁶ “Where two or more developments are or would be within the observer’s arc of vision at the same time without moving her/his head.” - Landscape Institute and I. E. M. A (2013) *Guidelines for Landscape and Environmental Impact Assessment*

anticipated that there will be an overlap in the construction of the Project and Nant Helen Restoration, it is not possible to assess the Project in isolation on completion. Therefore, the overall significance of effect is based on the combined overall magnitude of change as a result of the completion of both the Project and Nant Helen Restoration.

- 9.5.6** The future use of the earthworks is at this stage undefined. Therefore, assessment of the significance of effects based on the future establishment/maturity of planting (typically presented as assessment of effects at year 15 and year 30) has been excluded. However, mitigation planting proposals that would reduce the significance of effects have been described at the end of this chapter.
- 9.5.7** The approach to identification and assessment of cumulative landscape and visual effects is based on *GLVIA3 – Chapter 7*⁷
- 9.5.8** 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 and the findings from initial site surveys.
- 9.5.9** 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

- 9.5.10** 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

⁷ Landscape Institute and I. E. M. A (2013) *Guidelines for Landscape and Environmental Impact Assessment*

Receptors and approach to identification of receptors

9.5.11 This study identifies landscape and visual receptors that may be affected by the Project. The types of receptors assessed and the methods for identification of these receptors are described below.

9.5.12 Landscape Receptors – (Landscape Character Areas)

This report assesses the impact of the scheme 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.

9.5.13 Identification of Landscape Character Areas

The following existing information sources were used to identify LCAs appropriate to the nature and scale of the Project.

- Brecon Beacons National Park – Landscape Character Assessment⁸
- Neath Port Talbot LANDMAP Landscape Assessment⁹
- Landscape and Seascape – Supplementary Planning Guidance¹⁰
- LANDMAP¹¹

Where appropriate, landscape character areas 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 landscape character areas within Powys County Council.

⁸ Fione Fyfe Associates (2012) *Brecon Beacons National Park – Landscape Character Assessment*

⁹ Neath Port Talbot County Borough Council and Countryside Council for Wales (2004) *Neath Port Talbot LANDMAP Landscape Assessment*

¹⁰ Neath Port Talbot County Borough Council (2018) *Landscape and Seascape Supplementary Planning Guidance*

¹¹ Natural Resources Wales (2019). *Natural Resources Wales / LANDMAP - the Welsh landscape baseline*. [online]

9.5.14 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.

Assessment methodology

9.5.15 This report assesses the anticipated impacts that will arise as a result of the project. The methodology for deriving the significance of effect for landscape and visual receptors is set out within Appendix 9A.

Limitations and assumptions

Limitations

9.5.16 Due to the project timeframes, it has not been possible to assess the Project based on summer and winter conditions. Instead, the assessment has been based on worst-case winter conditions only.

Assumptions

9.5.17 It is assumed that the construction of the Project and Nant Helen Restoration will overlap. The maximum combined construction period for the Project and Nant Helen Restoration is assumed to be 35 months as this represents a worst-case scenario.

9.5.18 It is assumed that all embankment and cutting slopes will be seeded only. The on-completion assessment is based on the completion of both the Project and Nant Helen Restoration. It is assumed that grass seeding will have been carried out and will be established across both developments at year 1.

9.5.19 The future use of the earthworks is at this stage undefined therefore the reduction in effects due to proposed mitigation assumes that no further development takes place.

- 9.5.20** There will be no overnight working required for the construction of the Project and night-time effects have therefore not been assessed.
- 9.5.21** It is assumed that the selection of appropriate viewpoints and landscape character areas for the Project and the Global Centre for Rail Excellence application will be the same. Therefore, combined comments for both applications were requested from Neath Port Talbot Borough Council, Powys County Council and Brecon Beacons National Park Authority. It is assumed that comments are applicable to both projects.
- 9.6 Baseline Environment - Landscape**
- 9.6.1** An overview of the Project site and surrounding landscape is provided below. Landscape character areas were derived from existing landscape character assessments and analysis of LANDMAP aspect areas. Appendix B provides summary tables of the aspect areas that form the constituent parts of larger character areas.
- 9.6.2** 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 and 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.
- 9.6.3** The site is located approximately 2km east of Ystradgynlais, and approximately 22km north-east of Swansea. The Brecon Beacons National Park lies approximately 96m from the Project 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.
- 9.6.4** A context plan showing the key landscape features identified within 8km of the site boundary is shown at Figure 9.1. Figure 9.4 shows the landscape character area boundaries that were generated.
- 9.6.5** **Table 9.2** provides a summary of the descriptions of the landscape character areas being assessed. Value and susceptibility¹² of the landscape character areas has been assigned based on the criteria as

¹² 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.

set out in Appendix 9A. For detailed landscape character area descriptions refer to Appendix 9C.

Table 9.2: Landscape Baseline Summary

Landscape Character Area	Key Features / Characteristics	Value
Banwen Uplands LCA	Inter Valley Road. Important habitats towards the northern boundary of the character area. Caeau Ton-Y-Fildre SSSI.	High
Black Mountain Southern Fringe LCA	Pattern formed by small-medium scale fields. Transition landform.	Medium
Bryn Henllys Reclaimed Open Cast LCA	Open character. Public access due to large number of PROWs. Long-distance panoramic views available from higher ground.	Low
Coelbren Settlement LCA	Prices Arms pub. Disused Neath and Brecon Railway and Swansea Vale Railway	Low
Cwm Twrch LCA	Enclosed fields with overgrown hedges. Valley landform. Woodland belt along north-eastern edge including Ancient Semi-Natural Woodland.	Medium
Dulais Valley LCA	Valley landform. River Dulais. Enclosed pastoral land with treed field boundaries. A4109. Neath and Brecon Railway. Crynant.	High
Fforest Fawr LCA	Remoteness. Peace and tranquillity. Dark skies. The Beacons Way. High proportion of open access land.	High

Landscape Character Area	Key Features / Characteristics	Value
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 grub LCA	Exposed rock and scree cover. Heathland. Views across Tawe Valley.	Medium
Mynydd Marchywel LCA	High proportion of coniferous plantation. Remoteness and tranquillity. Elevated landform and distinctive Varteg Hill. Pylons and wireless mast that are highly visible.	Medium
Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	Open character. Common Land. Panoramic views. Grazed landcover. Gwrhyd Welsh Independent Church.	High

Landscape Character Area	Key Features / Characteristics	Value
Nant Helen Reclaimed Uplands LCA	Past and present mining activity. Overburden mound. Open character. Marsh and grassland landcover. 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
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

Landscape Character Area	Key Features / Characteristics	Value
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

9.7 Baseline Environment – Visual

9.7.1 A summary of the descriptions of the representative views being assessed is set out in **Table 9.3**. Value and Susceptibility has been assigned based on the criteria as set out within Appendix 9A. See Figure 9.3 for viewpoint locations and Figure 9.5 to Figure 9.13 for viewpoint photography. For detailed baseline descriptions refer to Appendix 9C.

Table 9.3: Visual Baseline Summary

Viewpoint No.	Description	Value
1	View south-east from Ystradgynlais Bridleway 61 within the Brecon Beacons National Park. This viewpoint represents views experienced by recreational receptors.	Medium
2	View south from Ystradgynlais Footpath 64 within the Brecon Beacons National Park. This viewpoint represents views experienced by recreational receptors near the local high point, at c. 295m A.O.D.	High

Viewpoint No.	Description	Value
3	View south from the Trig Point on Cribarth. This viewpoint represents views experienced by recreational receptors.	High
4	View south-west from dismantled Neath & Brecon Railway line (Open Country), within Ogof Ffynnon Ddu National Nature Reserve. This viewpoint represents views experienced by recreational receptors. The Beacons Way is located to the north-east from this viewpoint however views are largely screened by topography.	High
5	View south from western edge of Ynswen. This viewpoint represents views experienced by residential receptors.	Medium
6	View south from Tanygarth, Abercraf. This viewpoint represents views experienced by residential receptors.	Low
7	View east from Gwrhyd Road, Pen-Rhiwfawr, on the north-eastern lower slopes of Mynydd Uchaf. This viewpoint represents views experienced by residential receptors.	Medium
8	View east from Ystradgynlais Footpath 4. This viewpoint represents views experienced by recreational receptors.	Low
9	View south from National Cycle Network Route 43 which largely follows the historic line of the Neath & Brecon Railway. This viewpoint represents views experienced by recreational receptors. Views from NCR43 are predominantly enclosed by dense, semi-mature vegetation along its route, south of Caehopkin. The view is from an open section of the NCR.	Medium
10	View south-west from Station Road, Coelbren and western end of Tawe-Uchaf Footpath 1. This viewpoint represents views experienced by residential receptors.	Low
11	View south-west from Tawe-Uchaf Footpath 5. This viewpoint is representative of views experienced by recreational receptors.	High
12	View from Ystradfellte Restricted Byway 74. This viewpoint represents views experienced by recreational receptors.	High
13	View north-east from School Road, Ystalyfera. This viewpoint is representative of views experienced by residential receptors.	Low
14	View north-east from Ystradgynlais Footpath 10. This viewpoint is representative of views experienced by recreational receptors.	Medium
15	View south-east from Tawe-Uchaf Footpath 49. This viewpoint is representative of views experienced by recreational receptors.	Medium
16	View north / north-west from properties on the A1049. This viewpoint is representative of views experienced by residential receptors.	Low

Viewpoint No.	Description	Value
17	View west from Onllwyn, Cemetery. This viewpoint is representative of visitors to the cemetery.	Low
18	View north from Sarn Helen Roman Road and Byway 28/39.N.Hi/1, along the ridge of Hirfynydd. This viewpoint is representative of recreational users of the footpath.	High

9.8 Design mitigation

9.8.1 The assessment of effects does not include consideration of landscape mitigation. Mitigation measures have been proposed where there are significant effects post-completion and are described at the end of this chapter.

9.9 Assessment of effects

Assessment of effects from construction (Landscape)

9.9.1 Appendix 9D provides a summary of the assessment for all landscape character areas. This section provides the assessment of the one identified landscape character area 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.

Nant Helen Reclaimed Uplands LCA

9.9.2 The LCA has the capacity to accommodate the Project without affecting its overall integrity across much of the LCA, however it is susceptible to the loss of its key features.

Value: **Low**

Susceptibility **Medium**

Sensitivity: **Medium**

9.9.3 Construction of the Project earthworks will result in the loss of legibility of key features of the landscape character area such as the Tramroad at Ystradgynlais (see Cultural Heritage assessment, Chapter 8). Previously restored landcover will also be removed. The encroachment of industrial scale activity and removal of previously restored features will result in a Medium (Adverse) magnitude of

change for this Medium sensitivity receptor. The significance of effect will therefore be Moderate (Adverse).

9.9.4 In combination with Nant Helen Restoration there will be limited further direct impacts to the LCA. However, the Project earthworks will limit the feasibility of the Nant Helen Restoration including proposed ponds, acid grassland and broadleaf woodland. The magnitude of change will remain Medium (Adverse).

9.9.5 Overall significance of effect: **Moderate** (Adverse)

Assessment of effects from construction (Visual)

9.9.6 Appendix 9D provides a summary of the assessment for all viewpoints. This section provides the assessment of viewpoints 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.

9.9.7 To aid with the understanding of visual impacts, the proposed earthworks were overlaid as a 'wireframe' onto selected viewpoints. Refer to Figure 9.14 and Figure 9.15.

Viewpoint 1

9.9.8 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.9 Construction activity will be visible within 2km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and overburden mound. The transportation and placement of material for the formation of the embankment will be visible to the east. To the south-east, direct views of the excavation works for the cutting will be visible, this includes the removal of material from the south-eastern corner of the overburden mound. Due to the existing industrial scale activity within the view the magnitude of change will be Negligible (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Minor (Adverse).

9.9.10 In combination with Nant Helen Restoration works, the overall magnitude of change will be Low (Adverse) due to the visibility of the excavation and movement of material from the prominent overburden mound on the horizon.

9.9.11 Overall significance of Effect: **Moderate** (Adverse)

Viewpoint 2

- 9.9.12** 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**

- 9.9.13** Construction activity will be visible within 1.7km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and overburden mound. Further vegetation removal will be required for the construction of the embankment to the east including mature field boundaries on the valley slope to the south of the A4221. The excavation and transportation of material for the cutting that follows the edge of the overburden mound will be visible to the south and the placement of material for the formation of embankments that chase the valley slope gradient will be visible to the south-east. Due to the removal of vegetation and encroachment of industrial scale operations down into the valley, the magnitude of change will be Medium (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Moderate (Adverse).

- 9.9.14** In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse) due to the visibility of excavation and movement of material across the site and from the prominent high points.

- 9.9.15** Overall significance of effect: **Major** (Adverse)

Viewpoint 3

- 9.9.16** 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**

- 9.9.17** Construction activity will be visible within 2km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and overburden mound. Further vegetation removal will be required for the construction of the embankment to the east including mature field boundaries on the valley slope to the south of the A4221. It is

anticipated that receptors will have views of the excavation of material for the cutting at the eastern extent of the scheme including the perception of works for the inner loop due to the elevated nature of the view. Due to the removal of vegetation, the encroachment of industrial scale operations down into the valley and the visibility of most of the works due to the elevation, the magnitude of change will be High (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Major (Adverse).

9.9.18 In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse) due to the visibility of excavation and movement of material across a prominent feature within the view. The period of construction activity will also be increased.

9.9.19 Overall significance of effect: **Major** (Adverse)

Viewpoint 4

9.9.20 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**

9.9.21 Construction activity will be visible within 4km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and further vegetation removal including mature field boundaries to the south of the A4221. The transportation and placement of material for the construction of the northern embankments will be visible with the embankment slopes chasing the gradient of the existing topography. Existing mining activity is well screened in views from this location and the Project will result in the loss of vegetation and field patterns that contribute to the scenic quality and complexity of the rural view. The magnitude of change will therefore be High (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Major (Adverse).

9.9.22 In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse) there will be limited visibility of the excavation and movement of material from the overburden mound and the construction period will be increased.

9.9.23 Overall significance of effect: **Major** (Adverse)

Viewpoint 5

9.9.24 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.25 Construction activity will be visible within 1km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and overburden mound. Further vegetation removal will be required for the construction of the embankment to the east including mature field boundaries on the valley slope to the south of the A4221. The transportation and placement of material for the formation of embankments that chase the valley slope gradient will be visible to the south. Construction works on the southern side of the ridge will not be visible. Due to the removal of vegetation, the encroachment of industrial scale operations down into the valley and the visibility of earthworks formation the magnitude of change will be High (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Major (Adverse).

9.9.26 In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse) due to the visibility of excavation and movement of material across a prominent feature within the view. The period of construction activity will also be increased.

9.9.27 Overall significance of effect: **Major** (Adverse)

Viewpoint 6

9.9.28 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**

Susceptibility: **High**

Sensitivity: **Medium**

9.9.29 Construction activity will be visible within 1km of the viewpoint. Receptors will have views of the removal of coniferous woodland plantation on the northern side of the opencast mining site and overburden mound. The excavation and transportation of material for the construction of the cutting at the western extent of the Project will be visible. It is anticipated that existing coniferous woodland plantation will provide some screening of construction activity to the south-east. Due to the removal of woodland and views of construction

activity on a prominent elevated feature within the existing view, the magnitude of change will be Low (Adverse) for these Medium sensitivity receptors. The significance of effect will therefore be Minor (Adverse).

9.9.30 In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse) due to the visibility of excavation and movement of material across a prominent feature within the view. The period of construction activity will also be increased.

9.9.31 Overall significance of effect: **Major** (Adverse)

Viewpoint 9

9.9.32 Recreational receptors have a High susceptibility to change as their attention is concentrated on surrounding views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.33 Receptors will have foreground views of the formation of the embankment at the northern extent of the Project. This viewpoint represents a rare, open view along the cycle route. The magnitude of change will be High (Adverse) for these High sensitivity receptors. The significance of effect will be Major (Adverse).

9.9.34 In combination with the Nant Helen Restoration the overall magnitude of change will remain High (Adverse) due to the restoration works not being visible.

9.9.35 Overall significance of effect: **Major** (Adverse)

Viewpoint 10

9.9.36 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Low**

Susceptibility: **High**

Sensitivity: **Medium**

9.9.37 Construction will be visible within 1km of the viewpoint. Receptors will have views of the removal of small areas of scrubby vegetation at the Nant Helen site. Receptors will have views of the excavation and transportation of material for the construction of cuttings for the inner and outer loop at the eastern extent of the Project. Due to views of the construction works including direct views for properties on Station Road with west facing windows the magnitude of change will be High

(Adverse) for these Medium sensitivity receptors. The significance of effect will therefore be Major (Adverse).

9.9.38 In combination with Nant Helen Restoration works, the overall magnitude of change will remain High (Adverse). Construction activity will be visible across a small additional section of the view on elevated ground and the overall construction period will be longer.

9.9.39 Overall significance of effect: **Major** (Adverse)

Viewpoint 11

9.9.40 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**

9.9.41 Construction activity will be visible within 2km of the viewpoint. Receptors will have views of the removal of hedgerow field boundaries on the rising topography to the west. Excavation and transportation of material for the construction of cuttings for the inner and outer loop of the Project will be visible in the same direction. Views of further excavations for cuttings at the south-eastern extent of the Project will be heavily filtered by intervening mature trees. Due to the increased perceptibility of industrial activity within the view, the magnitude of change will be Low (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Moderate (Adverse).

9.9.42 In combination with Nant Helen Restoration works, the overall magnitude of change will be Medium (Adverse). This is due to the increased visibility of the movement of material on top of the prominent overburden mound landform. Construction activity will break the horizon.

9.9.43 Overall significance of effect: **Moderate** (Adverse).

Viewpoint 14

9.9.44 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

- 9.9.45** Construction activity will be visible within 400m of the viewpoint. The excavation and transportation of material for the cutting at the south-western extent of the Project will be the closest construction activity. The formation of the embankment to the south of the overburden mound will also be visible, along with construction of the cuttings further into the distance to the north-west. To the north, views will comprise further excavation and transportation required for the construction of the cutting at the edge of current opencast mining. The overburden mound will screen construction activity to the north-east. Due to the close proximity, the magnitude of change will be Medium (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Moderate (Adverse).
- 9.9.46** In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse). Excavation and transportation of material from the overburden mound will also be visible, this will not result in a greater magnitude of change due to the close proximity of the receptor.
- 9.9.47** Overall significance of effect: **Major** (Adverse)

Viewpoint 16

- 9.9.48** Residential receptors have a High susceptibility to change due to the permanence and static nature of views.
- Value: **Low**
- Susceptibility: **High**
- Sensitivity: **Medium**
- 9.9.49** Construction will be visible within 500m of the viewpoint. Receptors will have direct views of construction activity. To the north-west views of the formation of the embankment and excavation of cutting at the western edge of the overburden mound will be visible. To the north and north-east, views of the excavation and transportation of material for the construction of the outer and inner loop cutting will be visible. Due to the direct views of construction activity that will be visible across a wide section of the view the magnitude of change will be High (Adverse) for these Medium sensitivity receptors. The significance of effect will therefore be Major (Adverse).
- 9.9.50** In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse). Excavation and transportation of material from the overburden mound will also be visible, and the period of construction will be increased.
- 9.9.51** Overall significance of effect: **Major** (Adverse)

Viewpoint 17

9.9.52 Visitors to the cemetery have a High susceptibility to change.

Value: **Low**

Susceptibility: **High**

Sensitivity: **Medium**

9.9.53 Construction activity will be visible within 250m of the viewpoint. The closest construction activity will be the construction of the retaining wall to the north. Intervening vegetation including roadside vegetation on the northern side of the A4109 will filter views of this construction however it is anticipated that activity will be perceptible. The formation of the embankment at the south-western extent of the Project will be visible in views toward the overburden mound. To the north-west, the excavation and transportation of material for the construction of the inner loop cutting will be visible. The magnitude of change will be Low (Adverse) for these Medium sensitivity receptors due to the introduction of construction activity within close proximity to receptors. The significance of effect will therefore be Moderate (Adverse).

9.9.54 In combination with Nant Helen Restoration works, the overall magnitude of change will be Low (Adverse). Excavation and transportation of material from the prominent overburden mound will also be visible, and the period of construction will be increased.

9.9.55 Overall significance of effect: **Moderate** (Adverse)

Viewpoint 18

9.9.56 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **High**

Susceptibility: **High**

Sensitivity: **High**

9.9.57 Construction will be visible within 2.7km of the viewpoint. Due to the elevation of the viewpoint, receptors will have views of the eastern, southern and western extents of construction of the Project. This includes the excavation and transportation of material for the construction of the inner and outer loop cuttings and the formation of the embankment at the south-western extent of the Project. The

construction activity visible within the view forms a small section of the wide panoramic view however due to its central location and the prominence of the overburden mound landform, views are concentrated in this direction and therefore the magnitude of change will be Medium (Adverse) for these High sensitivity receptors. The significance of effect will therefore be Major (Adverse).

9.9.58 In combination with Nant Helen Restoration works, the overall magnitude of change will be High (Adverse). Excavation and transportation of material from the prominent overburden mound will also be visible, and the period of construction will be increased.

9.9.59 Overall significance of effect: **Major** (Adverse).

Assessment of effects on completion (Landscape)

9.9.60 Appendix D provides a summary of the assessment for all landscape character areas. There are no significantly affected landscape character areas on completion.

Assessment of effects on completion (Visual)

9.9.61 Appendix 9D provides a summary of the assessment for all viewpoints. This section provides the assessment of viewpoints significantly affected on completion only.

9.9.62 To aid with the understanding of visual impacts, the proposed earthworks were overlaid as a 'wireframe' onto selected viewpoints. Refer to Figure 9.14 and Figure 9.15.

Viewpoint 1

9.9.63 Recreational receptors within the national park have a High susceptibility as their attention is concentrated on available views outwards from elevated topography.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.64 The loss of coniferous woodland plantation on the northern side of the open cast mining site and overburden mound will be visible. Views to the east will comprise the grassed embankment slopes that chase the gradient of the valley. To the south-east the Project will be in cutting, before becoming screened by the overburden mound as it passes around its south-western edge. The earthworks will be visible, but grass cover will help them integrate with surrounding grassed landcover.

9.9.65 In combination with the Nant Helen Restoration, the adverse effects of the Project will be offset by the loss of mining activity from the view and reinstatement of a more naturalistic landform. The overall magnitude of change will therefore be Medium (Beneficial) for these High sensitivity receptors.

9.9.66 Overall significance of effect: **Moderate** (Beneficial)

Viewpoint 2

9.9.67 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**

9.9.68 The loss of coniferous woodland plantation will be visible on the northern side of the open cast mining site and overburden mound as well as the loss of field boundaries on the valley slope to the south of the A4221. The grassed embankment slopes will be visible, chasing the valley slope between the overburden mound and the A4221 to the crest of the landform. Views of the cutting to the west of the overburden mound will also be available.

9.9.69 In combination with the Nant Helen Restoration, the adverse effects of the Project will be partially offset by the loss of mining activity from the view and reinstatement of a more naturalistic landform. The overall magnitude of change will therefore be Low (Adverse) for these High sensitivity receptors.

9.9.70 Overall significance of effect: **Moderate** (Adverse)

Viewpoint 3

9.9.71 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**

9.9.72 The loss of coniferous woodland plantation will be visible on the northern side of the overburden mound as well as the loss of field boundaries on the valley slope to the south of the A4221. Views of the grassed embankment on the northern side of the Project will be available including users of the footpath. It is anticipated that the inner

loop cutting will also be perceptible due to the elevation of the viewpoint.

9.9.73 In combination with the Nant Helen Restoration, the adverse effects of the Project will be partially offset by the loss of mining activity from the view however the loss of scenic quality and complexity of the landscape within the view and introduction of engineered form will result in a Medium (Adverse) magnitude of change for these High sensitivity receptors.

9.9.74 Overall significance of effect: **Moderate** (Adverse)

Viewpoint 4

9.9.75 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**

9.9.76 The loss of woodland plantation and mature vegetation / field boundaries to the south of the A4221 will be visible. The view will instead comprise the grassed slope of the northern embankment of the Project that chases the gradient of the topography. There will be a noticeable difference in the scenic quality of the view due to the loss of complexity and the introduction of engineered form.

9.9.77 In combination with the Nant Helen Restoration, there will be minimal additional changes due to the lack of visibility of the restoration. The magnitude of change will therefore be Medium (Adverse) for these High sensitivity receptors.

9.9.78 Overall significance of effect: **Moderate** (Adverse)

Viewpoint 5

9.9.79 Residential receptors have a High susceptibility to change due to the permanence and static nature of views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.80 The loss of coniferous woodland plantation will be visible on the northern side of the open cast mining site and overburden mound as well as the loss of field boundaries on the valley slope to the south of the A4221. Receptors will have views of the northern grassed embankment of the Project including users of the footpath.

9.9.81 Receptors have limited views of existing mining activity and will not benefit from the Nant Helen Restoration. Therefore, in combination with the Nant Helen Restoration, the overall magnitude of change will be High (Adverse) for these High sensitivity receptors.

9.9.82 Overall significance of effect: **Major** (Adverse)

Viewpoint 9

9.9.83 Recreational receptors have a High susceptibility to change as their attention is concentrated on surrounding views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.84 Receptors will have foreground views of the engineered form of the grassed embankment slope that runs along the northern side of the Project. The loss of existing foreground vegetation will result in a less naturalistic view.

9.9.85 Receptors will not benefit from the Nant Helen Restoration. Therefore, in combination with the Nant Helen Restoration, the overall magnitude of change will be Medium (Adverse) for these High sensitivity receptors.

9.9.86 Overall significance of effect: **Moderate** (Adverse)

Viewpoint 15

9.9.87 Recreational receptors have a High susceptibility as their attention is concentrated on surrounding views.

Value: **Medium**

Susceptibility: **High**

Sensitivity: **High**

9.9.88 There will be views of the Project in cutting in all directions, approximately 250m from the viewpoint. The loss of restored marshy grassland land cover and small areas of coniferous woodland and the engineered form of the earthworks will make the Project discernible from the surrounding establishing restored landscape.

9.9.89 Receptors will not benefit from the Nant Helen Restoration. Therefore, in combination with the Nant Helen Restoration, the overall magnitude of change will be Low (Adverse) for these High sensitivity receptors.

9.9.90 Overall significance of effect: **Moderate** (Adverse)

9.10 Mitigation and enhancement

Mitigation of effects

9.10.1 Investigations into the grading of earthworks to achieve shallower gradients to improve landscape integration were undertaken. However, this would require additional land take resulting in further vegetation removal on the northern boundary which forms a visual buffer between receptors and the engineered landform. Earthworks have been designed to 1:3 throughout to ensure that planting is feasible either now, or once future use has been established.

9.10.2 Planting of the northern embankment slopes would aid with the integration of the engineered earthworks into the adjacent wooded valley. Figure 9.16 outlines the proposed location of woodland planting that would serve as;

- reinstatement of landscape character;
- integration of the engineered landform and potential future screening, dependant on future use; and
- compensation for the loss of Plantation on Ancient Woodland.

Details of the woodland species planting mix should be developed prior to implementation, once the future use of the earthworks has been established. Though broadleaved native woodland would be preferred as this would integrate with the surrounding woodland cover.

9.10.3 The incorporation of mitigation proposals outlined above would result in reduced significance of effects. Planting of the northern embankment would reduce the effects for receptors north of the site, where all significant adverse visual impacts on completion (excluding VP15 which is within the site) are located.

To ensure the effectiveness of mitigation planting and reduce the timeframe for the reduction of significant effects, it is proposed that the woodland mix should contain a proportion of selected standard trees. Whilst an established woodland would take 15+ years, it is anticipated that the specification of larger stock would result in perceptible integration of the engineered landform and reinstatement of landscape character within the first 5 years.

9.11 Residual effects

9.11.1 It is anticipated that there would be a slight reduction in adverse effects within the first 5 years due to mitigation planting. Once

mitigation planting has established in 10 – 15 years it is anticipated there will be no residual significant landscape and visual effects.

9.11.2

Once the future use of the earthworks has been established, the development of a Landscape Strategy is recommended to ensure the surrounding landscape is fit for purpose and gives consideration to the local landscape character.

9.12 Assessment summary matrix

Table 9.4: Summary of Overall Landscape and Visual Effects

Potential Effect	Receptor (s)	Sensitivity of Receptor	Cumulative Overall Magnitude (prior to mitigation)	Cumulative Overall Significance (prior to mitigation)
Loss or degradation of character due to construction impacts.	Banwen Uplands LCA	Medium	Low (Adverse)	Minor (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	Low (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Coelbren Settlement LCA	Low	Negligible (Adverse)	Negligible (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)	Minor (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	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to construction impacts.	Hirfynydd LCA	Medium	Low (Adverse)	Minor (Adverse)
Loss or degradation of	Mynydd Allt y grub LCA	Medium	Negligible (Adverse)	Negligible (Adverse)

character due to construction impacts.				
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)
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	Low (Adverse)	Minor (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	High	Low (Adverse)	Minor (Adverse)
Loss or degradation of character due to construction impacts.	Y Mynydd Du LCA	High	Negligible (Adverse)	Minor (Adverse)
Loss or degradation of character due to the on completion impacts of the Project.	Banwen Uplands LCA	Medium	Negligible (Beneficial)	Negligible (Beneficial)

Loss or degradation of character due to the on completion impacts of the Project.	Black Mountain Southern Fringe LCA	Medium	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Bryn Henllys Reclaimed Open Cast LCA	Low	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Coelbren Settlement LCA	Low	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Cwm Twrch LCA	Medium	No Change	Neutral
Loss or degradation of character due to the on completion impacts of the Project.	Dulais Valley LCA	High	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Fforest Fawr LCA	High	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Head of Dulais Valley LCA	Medium	Low (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Hirfynydd LCA	Medium	Low (Beneficial)	Minor (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Mynydd Allt y grub LCA	Medium	No Change	Neutral
Loss or degradation of character due to the on completion impacts of the Project.	Mynydd Marchywel LCA	Medium	Low (Beneficial)	Minor (Beneficial)

impacts of the Project.				
Loss or degradation of character due to the on completion impacts of the Project.	Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd LCA	Medium	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Nant Helen Reclaimed Uplands LCA	Medium	Low (Beneficial)	Minor (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Slopes of Cefn Gwrhyd & Cwm Egel LCA	Medium	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Swansea Valley LCA	Medium	No Change	Neutral
Loss or degradation of character due to the on completion impacts of the Project.	Swansea Valley Settlements LCA	Medium	No Change	Neutral
Loss or degradation of character due to the on completion impacts of the Project.	Upland Settlements	Medium	Low (Beneficial)	Minor (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Waterfall Country and Southern Valleys LCA	High	Negligible (Beneficial)	Negligible (Beneficial)
Loss or degradation of character due to the on completion impacts of the Project.	Wooded Tawe Valley LCA	High	Negligible (Adverse)	Negligible (Adverse)
Loss or degradation of character due to the on completion impacts of the Project.	Y Mynydd Du LCA	High	Negligible (Beneficial)	Negligible (Beneficial)
Visual effects due to construction impacts.	Viewpoint 1	High	Low (Adverse)	Moderate (Adverse)

Visual effects due to construction impacts.	Viewpoint 2	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 3	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 4	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 5	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 6	Medium	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 7	High	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts.	Viewpoint 8	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts.	Viewpoint 9	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 10	Medium	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 11	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts.	Viewpoint 12	High	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts.	Viewpoint 13	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to construction impacts.	Viewpoint 14	High	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 15	High	N/A	N/A
Visual effects due to construction impacts.	Viewpoint 16	Medium	High (Adverse)	Major (Adverse)
Visual effects due to construction impacts.	Viewpoint 17	Medium	Low (Adverse)	Moderate (Adverse)
Visual effects due to construction impacts.	Viewpoint 18	High	High (Adverse)	Major (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 1	High	Medium (Beneficial)	Moderate (Beneficial)
Visual effects due to the on	Viewpoint 2	High	Low (Adverse)	Moderate (Adverse)

completion impacts of the Project.				
Visual effects due to the on completion impacts of the Project.	Viewpoint 3	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 4	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 5	High	High (Adverse)	Major (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 6	Medium	Negligible (Adverse)	Minor (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 7	High	Negligible (Beneficial)	Negligible (Beneficial)
Visual effects due to the on completion impacts of the Project.	Viewpoint 8	Medium	Low (Beneficial)	Minor (Beneficial)
Visual effects due to the on completion impacts of the Project.	Viewpoint 9	High	Medium (Adverse)	Moderate (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 10	Medium	Low (Adverse)	Minor (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 11	High	Negligible (Adverse)	Minor (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 12	High	Negligible (Adverse)	Minor (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 13	Medium	Low (Beneficial)	Minor (Beneficial)

Visual effects due to the on completion impacts of the Project.	Viewpoint 14	High	Low (Adverse)	Minor (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 15	High	Low (Adverse)	Moderate (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 16	Medium	Negligible (Beneficial)	Negligible (Beneficial)
Visual effects due to the on completion impacts of the Project.	Viewpoint 17	Medium	Negligible (Adverse)	Negligible (Adverse)
Visual effects due to the on completion impacts of the Project.	Viewpoint 18	High	Low (Beneficial)	Minor (Beneficial)

10 Noise and vibration

10.1 Introduction

10.1.1 This section of the ES provides an assessment of the noise and vibration effects associated with the construction of the proposed the northern embankments at Nant Helen. The construction noise and vibration assessment has been assessed with limited information available at the time of writing of this chapter.

10.1.2 An assessment of significant environmental effects arising from construction of the proposed development identified sensitive receptors is provided. Mitigation measures are also proposed which would be implemented to minimise residual effects of the proposed development on local noise and vibration as far as is practicable.

10.2 Methodology

10.2.1 The potential for noise disturbance at residential receptors due to heavy plant and equipment that could be used during construction has been considered in line with the recommendations of BS 5228, Part 1, 2009 (+2014 Amendments)¹.

10.2.2 Under this approach, the adverse impact threshold is determined at an existing residential dwelling using the existing ambient noise level, rounded to the nearest 5dB and evaluated in relation to the thresholds set out in Table 10.1 below.

10.2.3 A potential significant effect is indicated where the construction site noise (LAeq) level exceeds the threshold level, considered as Lowest Observed Adverse Effect Level (LOAEL), for the category appropriate to the ambient noise level. If the ambient noise level exceeds the highest threshold values given in **Table 10.1** (i.e. the ambient noise level is higher than the Category C values), then a potential significant effect is deemed to occur if the construction site noise (LAeq) level for the period is greater than the ambient noise level.

Table 10.1: Potential significant at dwellings from on-site noise sources (from BS 5228-1:2009+A1:2014)

Assessment category and threshold value period	Threshold values in decibels (dB), L _{Aeq,T}		
	Category A	Category B	Category C
Weekday Daytime (07:00-19:00)	65	70	75
Saturdays (07:00-13:00)			

¹ British Standard BS 5228, Code of practice for noise and vibration control on construction and open sites, Part 1, Noise: 2009+ A1: 2014 Amendments.

Night-time (23:00-07:00)	45	50	55
Weekday Evenings (19:00-23:00)	55	60	65
Saturdays (13:00-23:00)			
Sundays (07:00-23:00)			
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values			
Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values			
Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than the Category A values			

10.2.4 Recent baseline noise data is not currently available for receptors identified in Figure 10.1. It is assumed that all receptors are classified as ‘Category A’ considering the character of the existing environmental conditions.

10.2.5 The thresholds for potential significant effects for construction noise on residential properties, established using BS5228-1 ABC method are shown in **Table 10.2**. As construction activities are limited to daytime hours (07:00-19:00), threshold values for evening and night-time are not required.

Table 10.2: Free-field threshold levels of potential significant effects for construction noise (ABC method – BS 5228) for residential receptors

Receptor location	Approximate shortest horizontal distance to earthworks (m)	Threshold values in decibels (dB), $L_{Aeq,T}$
		Day (07:00 – 19:00)
Receptor 1	80	65
Receptor 2	180	65
Receptor 3	140	65
Receptor 4	95	65
Receptor 5	135	65

10.2.6 It is understood there is no optional activities associated after completion of the northern embankment construction. Therefore, operational effects are scoped out of the assessment.

10.3 Receptors

10.3.1 The representative sensitive receptors are identified for the assessment and displayed in Figure 10.1 (included below for ease of reference and in ES Volume III, Figures)

10.3.2 The construction assessments have only been carried out at those selected representative receptors which are located relatively close to the proposed embankment. It is assumed these properties are likely to

be the most affected location in terms of noise and vibration associated with construction activities.

10.3.3

Residential properties located in the eastern and the southern side of the site boundary are not assessed due to the distance separation between the main embankment construction works and the residential properties. It is unlikely the embankment construction works would result in a significant effect at residential properties located in these areas.

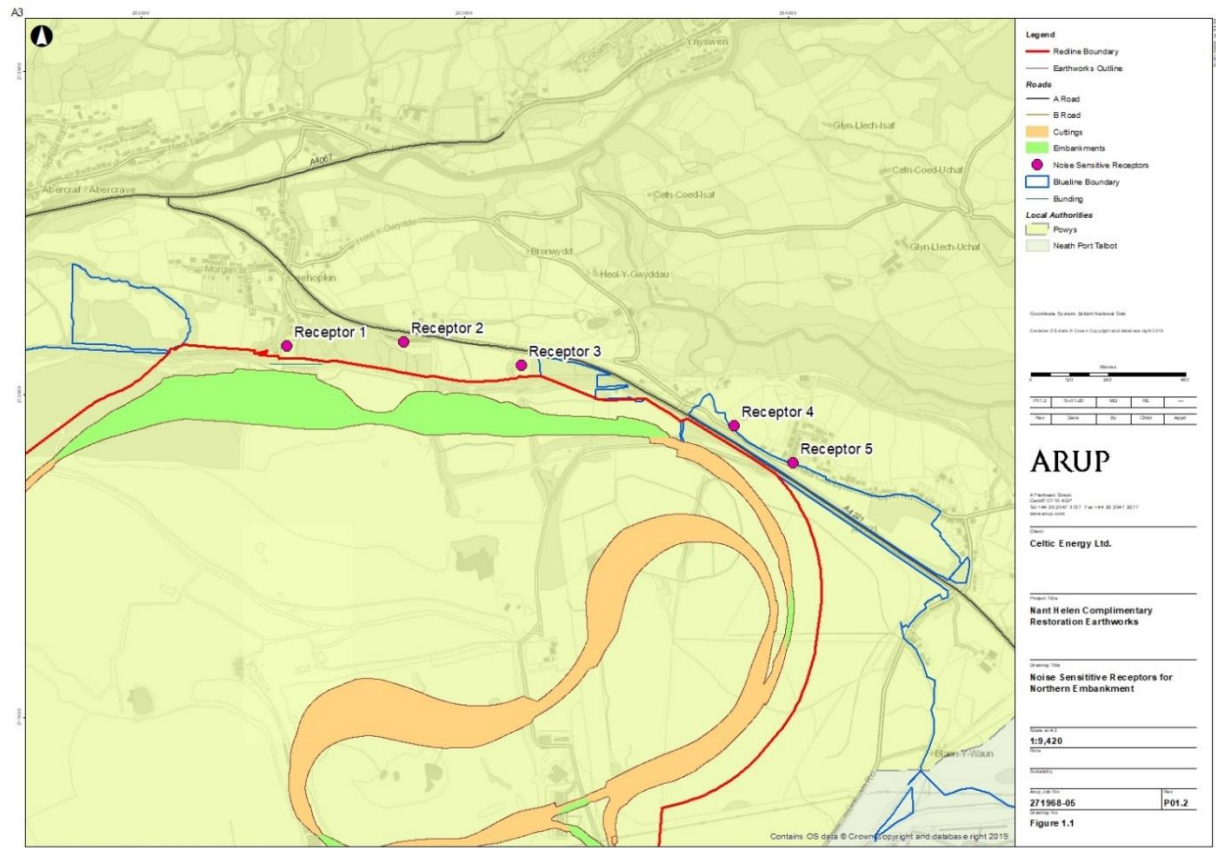


Figure 10.1 Noise Sensitive Receptors for Northern Embankment Construction Works

10.4 Consultation

10.4.1

Consultation was carried out with the environmental protection team at PCC. The responses received following the statutory PAC confirmed that the Environmental Health Officer (EHO) accepted the assessment methodology although a request was made for more information in relation to the mitigation measures being proposed. These have been addressed in this chapter and included within the outline CEMP (Appendix 3B).

10.5 Plant information

10.5.1 The northern embankment will be constructed from both ends simultaneously. Details of the plant and equipment that will be required during construction at any one time on the embankment are displayed in Table 10.3 below.

Table 10.3: Earthworks plant list

Activity	Equipment	Quantity	% on-time	L _w dB(A)	Source
Earthworks – Northern embankment	45 Tonne Articulated Dump truck	5	10	108	BS5228 Table C 10-18
	Cat D9 Dozer	2	80	111	BS5228 Table C 2-12
	Sit on Roller	2	80	103	BS5228 Table C 2-38
	Cat 777G Dump truck	2	10	118	BS5228 Table C 6-15

10.5.2 It is assumed that the construction activities will be limited to the following hours:

- Monday – Friday between 0800-1800; and
- Saturday between 0800-1300.

10.6 Construction assessment

Airborne noise

10.6.1 Noise levels have been predicted based upon the construction plant sound power level and typical percentage on-times, with corrections applied to allow for distance, reflections and screening attenuation where appropriate. Outline calculations have been carried out to provide an initial estimate of the likely noise levels at the nearest noise sensitive properties during these activities. The predicted construction noise levels at noise sensitive receptors are presented in **Table 10.4**:

Table 10.4: Predicted construction noise levels at noise sensitive receptors

Receptor location	Worst case sound pressure level at noise sensitive receptor, dB
Receptor 1	66
Receptor 2	57
Receptor 3	60
Receptor 4	54
Receptor 5	51

- 10.6.2** Predicted noise levels associated with construction activities do not exceed the adopted threshold values at receptor locations 2,3,4 & 5. Additionally, the predicted values would not exceed the adopted LOAEL. This signifies that construction works are unlikely to cause an adverse impact at these receptors. Therefore, it is assessed as **not significant**.
- 10.6.3** The unmitigated (without noise screening) predicted noise level associated with construction activities do exceed the adopted threshold values at receptor location 1. It is also predicted to exceed the adopted LOAEL and therefore has been assessed as **significant**. Mitigation to avoid this significant effect is presented in section 10.7.

Construction plant vibration

- 10.6.4** Given the large distance between the proposed site and the nearest residential receptors, vibration from construction activities is extremely unlikely to be perceptible at the nearest residential properties due to the localised nature of vibration from plant. As such, vibration from construction plant and equipment affecting nearby residential receptors is assessed as **not significant**.

Construction traffic noise

- 10.6.5** During the earthworks, construction traffic will predominantly travel within the site boundary redistributing material along haulage routes. Given the large distance between the proposed site and the nearest residential receptors, noise from construction traffic activities is unlikely to be more than currently perceived from the existing road network. Therefore, it has been assessed as **not significant**.

Construction traffic vibration

- 10.6.6** Given the large separation distances between the proposed development and the nearest residential receptors and the likelihood that levels of vibration generated by construction traffic will be low and similar to levels of vibration generated by existing traffic flows, it is proposed that the potential impacts of construction traffic vibration on receptors has been assessed as **not significant**.

10.7 Mitigation

- 10.7.1** Likely significant effects have been identified in relation to construction noise impacting receptor 1. Noise mitigation is most effective when applied directly at the source of noise. For construction noise, this could be achieved by introducing localised screening or advanced technology of plant items. However, it is not always viable. Therefore, mitigation to the path of noise should be considered between the onsite source of noise and receptor.

- 10.7.2** Noise screening at the perimeter of the scheme boundary would screen the properties from those site activities (soil stripping, embankment construction) closest to the properties, with the result of avoiding likely significant effects from construction noise.
- 10.7.3** Screening by provision of a bund was considered but was not deemed practicable due to the loss of mature trees and associated ecological habitat and visual screening they currently provide to nearby houses.
- 10.7.4** A temporary noise fence of approximately 150m in length and 5m in height located along the site perimeter would – whilst requiring some minor vegetation clearance and small foundations, provide a practicable solution. The barrier is shown in **Figure 10.2** and **Figure 10.3** below.

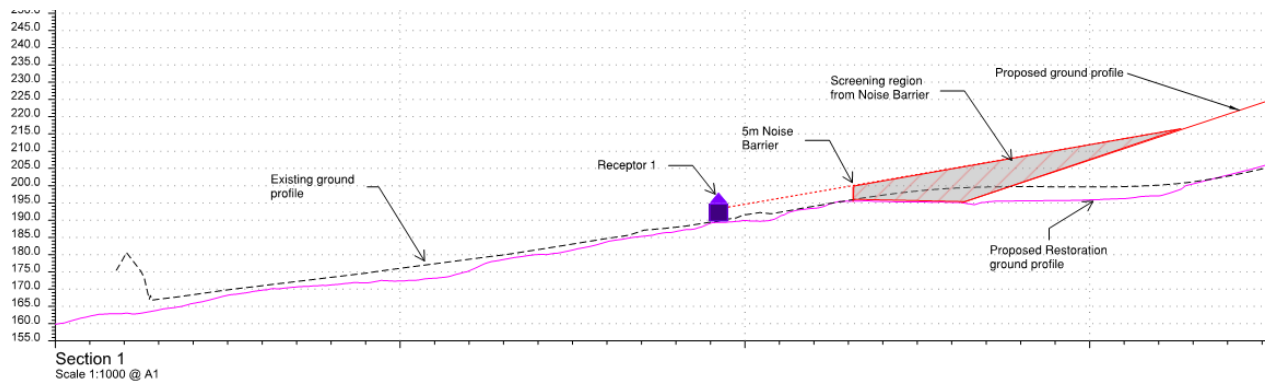


Figure 10.2: Cross-section showing noise barrier to screen dwellings at Receptor 1 from construction works



Figure 10.3: Plan showing noise barrier (green line) to screen dwellings at Receptor 1 from construction works

10.7.5 Noise reduction is anticipated when the line of sight from receptors to noise source is blocked. The proposed noise barrier would block the line of sight from receptor 1 to the noise source associated with construction activities. The predicted construction noise levels at receptor 1 is presented in **Table 10.5**.

Table 10.5: Predicted noise levels at receptor with the barrier

Receptor location	Worst case sound pressure level at noise sensitive receptor, dB	With mitigation, sound pressure level at noise sensitive receptor, dB
Receptor 1	66	61
Receptor 2	57	57
Receptor 3	60	60
Receptor 4	54	54
Receptor 5	51	51

With the mitigation design, the predicted noise levels at receptor 1 do not exceed the LOAEL.

10.8 Summary and residual assessment

10.8.1 The likely significant effects from the Project (excavation of cuttings and construction of embankments) have been assessed. The predicted noise levels without mitigation at receptor 1 would result in significant

effects. However, with mitigation (in the form of a 5m screen) on the perimeter of the site noise levels to these dwellings would be controlled and prevent a significant effect.

10.8.2 The noise and vibration impact that are associated with the construction phase of the Nant Helen earthworks and likelihood of significant effects are summarised in **Table 10.6**.

Table 10.6: Summary of potential impacts

Development Phase	Potential Impact	Receptor Type	Likely Significant Effect (unmitigated)	Residual Effect (with mitigation)
Earthworks	Plant noise	Residential	Yes (at Receptor 1)	Not Significant
	Plant Vibration	Residential	No	Unchanged
	Traffic noise	Residential	No	Unchanged
	Traffic vibration	Residential	No	Unchanged

11 Cumulative effects

11.1.1 Cumulative effects are those that arise as a result of additive impacts from more than one project (under construction or reasonably foreseeable projects), combining together to have an effect on a receptor that may be larger than if the effect were considered separately. Broadly, reasonably foreseeable projects are those that are known to the planning system or are already consented (but not yet built).

11.1.2 It is also necessary to have sufficient environmental information available from the identified projects in order to be able to make an assessment of any potential cumulative effects – without such information it is much harder to carry out a meaningful assessment.

11.2 Relevant guidance

11.2.1 There is currently no standard methodology for cumulative effects assessment (CEA) although there is a range of guidance available. The following guidance has been taken into consideration during the preparation of this CEA:

- Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2015).
- Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2012).

11.3 Identification of cumulative developments

11.3.1 The first step in a cumulative effects assessment is to identify what developments are under construction or permitted within the scheme area that may have environmental impacts that could combine with the predicted impacts of the Project. Consideration needs to be given as to whether in combination these impacts would result in greater impacts than they would, should they occur independently.

11.3.2 For this cumulative assessment a review was made of the planning portals for both NPTCBC and PCC to identify relevant planning applications. However, none were considered to be of relevance due to the small nature of the developments being proposed. These have therefore been discounted.

11.3.3 In contrast, two developments which warrant consideration include:

- Nant Helen Restoration works (committed development); and
- Global Centre of Rail Excellence (GCRE) (likely development).

- 11.3.4 These are discussed in more detail below with regards to cumulative effects.

Nant Helen Restoration Scheme

- 11.3.5 The restoration scheme for the site is linked to the planning consent of the open cast coal mine at Nant Helen and is therefore development that is committed. As the restoration is committed to taking place, the baseline for this assessment is, in most cases, the restored site.
- 11.3.6 Consequently, the assessment for the Nant Helen Complementary Restoration Earthworks has already included consideration of the restoration works into the assessment. No further assessment is required to identify cumulative effects.

Global Centre of Rail Excellence

- 11.3.7 GCRE is a Welsh Government proposed Scheme which would use the Nant Helen Complementary Restoration Earthworks as the basis for the development of a rail testing facility. Should the GCRE project be moved forward, there would likely be environmental effects that would need to be considered cumulatively with those of Nant Helen. However, at this stage, there is only an outline design and no detailed environmental assessments have been published of GCRE as the development of the proposal and its assessment is ongoing.
- 11.3.8 It is therefore considered appropriate to avoid making any assumptions within this assessment in regards to cumulative effects. The project team fully anticipates engaging with any assessment that comes forward for GCRE, should that project progress.