Carmarthen County Council

TOWY VALLEY PATH EASTERN SECTION

Environmental Statement



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Carmarthen County Council

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Environmental Statement

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1 This Environmental Statement (ES) has been prepared by WSP on behalf of Carmarthenshire County Council (CCC) (the applicant) in support of a full planning application for the construction of a new shared pedestrian path between Ysgol Bro Dinefwr, Fairfach in the east (referred to hereafter as "Fairfach") and Nantgaredig in the west, as identified in **Figure 1.1 (Site Location Plan) (Volume III).** The path is proposed to be constructed mainly along the disused railway line which runs from Carmarthen to Llandeilo. However, there are sections of the path which are proposed to be offline to avoid land or other constraints. The path will cross both the river Cothi and river Tywi and will be 14.64km long, of which approximately 7.33km will be situated on the track bed of the former railway line and approximately 7.0km of new path partially bisecting existing public rights of way. The path will require the construction of two new bridges over the rivers Cothi and Tywi. This proposal is the second phase of the Tywi Valley Path, and is known as the 'Eastern Phase' as identified on **Figure 1.1 (Volume III)**. In its entirety (both east and west section) the completed Tywi Valley Path will total 18.8km in length.

1.1.2 The proposed path is located adjacent to the River Tywi Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) and crosses the SAC in places. The Proposed Scheme is located entirely within a Registered Historic Landscape of Outstanding Historic Interest: Tywi Valley (HLW (D) 5), as defined by Cadw (1998) and there are several heritage assets, designated and non-designated within the wider landscape including two Iron Age enclosures and the Dinefwr Park Roman Forts.

1.1.3 The Tywi Valley Path scheme (herein referred to as 'the Proposed Scheme') will comprise the development of a shared use cycleway (and other non-motorised facilities where considered necessary) along the route of the disused railway line from Abergwili (just east of Carmarthen) to Ysgol Bro Dinefwr in Ffairfach (Referred to hereafter as Fairfach) together with links to some of the key settlements and tourist attractions within the Lower Tywi Valley. These include Aberglasney, Dinefwr Parc, National Botanic Gardens and Brechfa Forest cycling trails among others as well as links westwards towards Carmarthen Town Centre.

1.2 SCHEME OBJECTIVES

1.1.4 The Proposed Scheme has been developed to improve commuting and in particular the tourism potential of the valley, and aims to have a significant economic benefit to Carmarthenshire and South Wales. It is anticipated that new users to the path will increase expenditure on local facilities and attractions, which will increase and enhance the local economy. Additional expenditure from new users alone is estimated to be far higher than the capital and maintenance costs of the Proposed Scheme. Construction of the Proposed Scheme will safeguard jobs (137 jobs), and estimated additional 47 new jobs created either indirectly through the supply chain, or by further employment opportunities in the area that are created.

1.1.5 The City Region Local Transport Plan (LTP), (South West Wales) sets out the framework for improving connectivity to, from and within the region for 2015-2020[1]. The LTP has the following vision:

"to improve transport and access within and beyond the region to facilitate economic regeneration, reduce deprivation and support the development and use of more sustainable and healthier modes of transport".

1.1.6 The City Region Local Transport Plan sets out six objectives to achieve this vision:

- To improve the efficiency and reliability of the movement of people and freight within and beyond South West Wales to support economic growth in the City Region;
- To improve access for all to a wide range of services and facilities including employment and business, education and training, health care, tourism and leisure activities;
- To improve the sustainability of transport by improving the range and quality of, and awareness about, transport options, including those which improve health and well-being;
- To improve integration between policies, service provision and modes of transport in South West Wales;
- To implement measures which will protect and enhance the natural and built environment and reduce the adverse impact of transport on health and climate change; and
- To improve road safety and personal security in South West Wales.

1.1.7 The Active Travel (Wales) Act 2013[2] requires local authorities to develop existing Route Maps, and develop Integrated Network Maps to identify aspirations for future develop over the next 15 years. The Active Travel will place a duty on all local authorities to build infrastructure (cycleways/footpaths/facilities) to demonstrate a year-on-year improvement in quality and extent of Active Travel Infrastructure.

1.1.8 The Well-being of Future Generations (Wales) Act 2015 places a duty on public bodies to carry out sustainable development, working to improve the economic, social environmental and cultural well-being of Wales.

1.1.9 This scheme fully supports these local and national objectives for the promotion of active travel, healthier lifestyles, and connecting communities. The Proposed Scheme will contribute towards a low carbon society by promoting sustainable travel, encouraging walking and cycling as alternative travel modes over car use. The path will connect communities in this area of Carmarthenshire, as well as connecting key sites, this will better integrate people and communities within Carmarthenshire. These benefits combined align with The Well-being of Future Generations (Wales) Act 2015 that aims to improve the social, economic, environmental and cultural well-being of Wales.

1.3 DEFINITION OF ENVIRONMENTAL IMPACT ASSESSMENT

1.1.10 The term 'EIA' describes a procedure that must be followed for certain types of project before they can be given 'development consent'. The procedure is a means of drawing together, in a systematic

[1] City Region Local Transport Plan (LTP), (South West Wales) 2015-2020

[2] The Active Travel (Wales) Act 2013

way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects and the scope for reducing them are properly understood by the public and the relevant local planning authority before it makes its decision.

1.1.11 The aim of EIA is:

'to protect the environment by ensuring that a local planning authority when deciding whether to grant planning permission for a project, which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision making process'[3].

1.1.12 This ES describes the EIA process and presents the results of the assessment, including proposed mitigation where required.

1.4 LEGAL FRAMEWORK FOR THE ENVIRONMENTAL STATEMENT

1.1.13 The Proposed Scheme is considered to fall under Schedule 2, Part 10(f) (infrastructure project, construction of roads) of the EIA Regulations (Wales) 2017. The Proposed Scheme is located adjacent to the River Tywi SAC and SSSI, and crosses the SAC. Given the sensitivity of these designations, an EIA Screening Opinion request was submitted to CCC Planning Department and a screening opinion was received on 24 November 2017 (**Volume IV Appendix 1.A**).

1.1.14 With regard to the criteria set out in Schedule 3 of the EIA Regulations 2016 (current at the time of the request) and following consultation with internal consultees, CCC Planning Department adopted a Screening Opinion that the development comprises 'EIA Development' and as such an ES would be required to support a planning application for the Proposed Scheme.

1.1.15 A Scoping Report was submitted on the 5th May 2018 to CCC. The Scoping Opinion was received by the Applicant from planning advisory department of CCC on the 16 November 2018 after which further additional requirements were outlined for the ES as shown below:

- Biodiversity Net Gain (Ecological Enhancement) Chapter; and
- Updated hydrology model and Flood Consequence Assessment.

1.5 THE PROJECT TEAM

1.1.16 In line with Regulation 18(5)(a) – (b) of the EIA Regulations, the ES and technical assessments which inform it have been undertaken by a suitably qualified project team.

[3] Department of Communities and Local Government (DCLG) (online) Planning Practice Guidance (PPG) Paragraph 002(Reference ID: 4-002-20140306)

1.1.17 WSP is responsible for the coordination, compilation and procedural review of the ES. WSP is registered under the EIA Quality Mark operated by the Institute of Environmental Management and Assessment (IEMA) which recognises our commitment to excellence in EIA activities. WSP was one of the original eight pilot organisations in the UK that trialled the process in 2011 and developed the EIA Quality Mark scheme from the former Corporate Registered Assessor process. We have continued to maintain our EIA Quality Mark registration, following annual examination by IEMA in relation to our ongoing products, staff, innovation and promotion of EIA within the industry. WSP has and continues to support and lead nationally recognised guidance for EIA in the UK. WSP has developed and applies an in-house set of processes, procedures and guidance for EIA based on sound project management principles.

1.6 PLANNING APPLICATION DOCUMENTS

1.1.18 The Environmental Statement (3 x Volumes and Non-Technical Summary) is one of a suite of documents which will support the planning application for the Proposed Development.

1.1.19 The planning submission is also supported by the following Application Reports:

- Design and Access Statement; and
- Pre-application Consultation Report.

1.1.20 The key relevant planning policy from both the national and local level is detailed in Chapter 3: Description of the Proposed Scheme.

1.7 STRUCTURE OF THE ENVIRONMENTAL STATEMENT

1.1.21 The Environmental Statement is provided in four volumes for ease of reference:

- **Volume I – Non-Technical summary;**
- **Volume II – Main Text;**
- **Volume III – Figures; and**
- **Volume IV – Technical Appendices.**

1.1.22 **Volume II** (Main Text) contains the following chapters:

- Chapter 1 – Introduction
- Chapter 2 – Description of the Study Area and Surrounds
- Chapter 3 – Description of the Proposed Scheme
- Chapter 4 – Consideration of Alternatives
- Chapter 5 – Approach to EIA
- Chapter 6 – Landscape and Visual
- Chapter 7 – Historic Environment
- Chapter 8 – Biodiversity
- Chapter 9 – Water Environment and Flood Risk
- Chapter 10 – Geology and Soils
- Chapter 11 – Access and Land Use
- Chapter 12 – Materials and Waste
- Chapter 13 – Cumulative Effects
- Chapter 14 – Summary of the ES

1.1.23 **Volume IV** (Technical Appendices) contains the following reports:

- EIA Screening Response, CCC
- EIA Scoping Response, CCC
- Transport Corridor Ecological Constraints Report, AECOM December 2013
- EIA Scoping Report, WSP March 2018
- EIA Scoping Response, NRW September 2018
- HRA Stage 1 Screening, WSP July 2019
- HRA Stage 2 Appropriate Assessment, WSP October 2022
- Ext Phase 1 Habitat Survey Report, WSP January 2019
- Update Ecological Appraisal January 2023
- Preliminary Aquatic Ecology Assessment, WSP May 2022
- Badger Sett Classification – Carregllys, CCC June 2022
- Update Badger Report January 2023
- Otter Seasonal Survey, WSP January 2019
- Updated Otter Survey 2022, Geoff Lyles June 2022
- Bat Hibernation Inspections, WSP January 2023
- Bat Tree Climbing Survey, WSP September 2022
- Bryophyte Survey, Vegetation Survey & Assessment, November 2017
- Update Bryophyte Survey 2020, Vegetation Survey & Assessment August 2020
- Concept Landscape Mitigation Plans
- Landscape LVIA Methodology
- Visual Effects Table
- LVIA Figures 6.1 – 6.4
- LVIA Landscape Concept Figures 1 – 3
- Flood Consequence Assessment
- Water Framework Directive
- Geomorphological Dynamics Assessment
- Detailed Arboriculture Statement
- Historic Environmental Desk Based Assessment (HEDBA)
- Preliminary Geo-Environmental Assessment Report

1.8 REFERENCES

City Region Local Transport Plan (LTP), (South West Wales) 2015-2020

[2] The Active Travel (Wales) Act 2013

[3] Department of Communities and Local Government (DCLG) (online) Planning Practice Guidance (PPG) Paragraph 002(Reference ID: 4-002-20140306)

2 SITE DESCRIPTION

2.1 INTRODUCTION

2.1.1 The proposal is for a shared use facility along a defined route between Carmarthen and Ffairfach, along the Tywi Valley. The proposed path will be unsegregated and shared use for pedestrians and cyclists. The path will comprise predominantly a 3m wide, path with a 1m verge each side; this will be adapted locally when required to suit constraints identified on site.

2.1.2 The proposed path primarily follows the route of the former Carmarthen-Llandeilo railway line; the railway line follows the flat flood plain of the River Tywi. Generally, the route lies on low embankment, but at a few locations it also passes at grade and within cutting where mounds of superficial soils protrude through the alluvium of the flood plain.

2.1.3 Boundary treatments will be according to accommodation works agreed with the adjacent landowners. It is intended to use fences of stranded wire on wooden posts for most locations. Barriers and gates will be incorporated at key locations to manage access and ensure the site is used by cyclists and walkers. Cattle grids will be incorporated at some locations to assist containment of livestock. The gradients of the proposed path will be gentle and generally will not exceed 5%, with the exception of one location which will be slightly steeper at 5.7%. The path will require three new river crossings; a major crossing over the river Cothi on the trajectory of the former railway, and another major crossing over the Tywi away from the route of the former railway. The third is a more minor river crossing over the Gwynon.

2.2 SITE LOCATION

2.2.1 The former railway between Carmarthen and Ffairfach was closed by British Railway in 1963. This is the second section of the Tywi Valley Path, known as the Eastern Phase and is essentially the length of path between Nantgaredig and Llandeilo. In its entirety, when all the phases of the path have been completed the Tywi Valley Path will total 18.8km in length. The proposal the subject of the planning application and Environmental Statement is for a route of approximately 14.64km.

2.2.2 The eastern phase of the proposed path is located in the lower Tywi Valley; the site comprises primarily of a rural river valley landscape, the land being predominantly pasture land on the flood plains of the River Tywi. The Tywi Valley is wide with the river flowing in an east to west direction. The main land uses are comprised of agricultural pastureland, watercourses, small residential settlements, woodland, along with various roads and tracks. The land supports several farm holdings which are mainly dairy cattle, beef cattle and sheep; there are also a small number of equine units. Sections of the proposed path are close to the River Tywi and cross over smaller watercourses; with the topography of the region being a wide and flat river valley bottom.

2.3 LAND USE

2.3.1 The Site is 14.64km in length and 3m wide. It follows the flat flood plain of the River Tywi. The river is designated as a main river under the jurisdiction of Natural Resources Wales (NRW) and also holds a number of important environmental designations including both SAC and SSSI status. North of the River Tywi to the west of the town of Llandeilo is the Dinefwr Estate SSSI and Grade I Registered Historic Park of Plas Dinefwr. The former railway was closed in 1963 and in addition to the former

railway corridor, the path will utilise lengths of existing public rights of way and an embankment constructed for the former railway.

2.4 TOPOGRAPHY

2.4.1 The topography of the region is a typical wide flat river valley bottom, that contains a meandering river, circa 10m (AOD). The hills on either side typically reach heights of circa 150m on the north side and 200m on the south side of the valley.

2.5 LANDSCAPE AND VISUAL

2.5.1 The study area lies predominantly within National Landscape Character Area (NLCA) 41 Tywi Valley.

2.5.2 The key characteristics of this area are:

- Meandering River Tywi and its active flood plain – westward flowing and joined by many tributaries from nearby upland areas;
- Fertile grazing pastures – helped by alluvium-rich soils. Dairy cattle and sheep with occasional cereal cropping;
- Wooded slopes to valley sides - Broadleaved woodlands cover some slopes but cover is not continuous;
- Regular pattern of medium to large rectilinear fields enclosed by hedgerows and hedgerow trees – including species rich hedgerows with frequent hedgerow oaks;
- Historic designed parks and gardens; and
- Historic Defensive sites - the valley is overlooked by strategically located defensive sites including Iron Age hillforts and medieval stone castles.

2.5.3 The higher land beyond the Tywi Valley, and within 10km of the proposed path route, falls within NLCA 33 Gwendraeth Vales, NLCA 30 Brecon Beacons, and NLCA 42 Pembroke and Carmarthen Foothills. Elevated areas within these landscapes could fall within the Zone of Visual Influence and thus within the study area. An additional viewpoint (Supplemental Viewpoint B), beyond the extents of the visual envelope approximately 5.4km to the east of the Proposed Development on the upper slopes of the Brecon Beacons, has been included to illustrate that the scheme will not be visible, even when views from the BBNP are elevated and unobstructed.

2.5.4 The proposed path lies within the Tywi Valley Special Landscape Area (SLA). The lower Tywi Valley, downstream of Llandovery consists of the wide level flood plain, together with its northern and southern slopes, which provide outstanding views over the valley and from the north towards the Brecon Beacons.

2.5.5 The landscape of the study area contains distinctive elements and features, such as species rich hedgerows with frequent oaks and the meandering river, that make a positive contribution to its character and sense of place.

2.5.6 Although dominated by agricultural land, which is mostly improved pasture, the flood plain has a significant number of mature hedgerows and field trees, and the valley slopes, particularly the steeper southern slopes, are wooded.

2.5.7 Historic parklands and castles are also a feature of this part of the valley, including Dinefwr Park, and Dinefwr and Dryslwyn castles. These castles have imposing locations on limestone outcrops, over-looking the valley.

2.5.8 The proposed scheme is located within the Tywi Valley Registered Landscape of Outstanding Historic Interest.

2.5.9 The Llandeilo Conservation Area occupies a large area of land including the historic centre of the town and the Dinefwr Estate which are to the north of the scheme at its eastern extent. The smaller conservation area of Llangathen is situated north of the scheme to the west of the Llandeilo Conservation Area.

2.5.10 Traditional farms in the valley have typically expanded and often now include large agricultural buildings.

2.5.11 Most of the settlements in this part of the valley have also grown with an element of modern building around a more traditional core.

2.5.12 Brecon Beacons National Park lies to the immediate south-east of the valley at the eastern extremity of the scheme.

2.5.13 The valley has a significant number of mature hedgerow trees within the well managed flailed hedgerows and also mature field trees. The dismantled railway line is well vegetated along much of its length, with several linear belts of woodland and scrub apparent with the railway track itself being a gravel track.

2.6 HISTORIC ENVIRONMENTAL

2.6.1 The Site lies within the Tywi Valley Historic Landscape which comprises eight Historic Landscape Character Areas[4] as outlined by the Dyfed Archaeological Trust which includes the following:

- Nantgaredig – Derwen Fawr;
- Abergwili – Llanegwad Parish;
- Llangathen;
- Dryslwyn;
- Dinefwr Park;
- Llanfhangel Aberbythych;
- Carmarthen – Llandeilo; and
- Llandeilo.

2.6.2 Located north of Tywi Valley from Nantgaredig to Llandelio, Nantgaredig – Derwen Fawr contains numerous pockets of deciduous (possibly ancient) woodland on steep valley sides and dispersed farms illustrating dominant settlement patterns. Part of the boundary to the south lies against the flood plain of the Tywi, Dinefwr Park and Llandeilo town. Abergwili – Llanegwad Parish comprises of rolling

[4] http://www.dyfedarchaeology.org.uk/ [accessed 09/02/2018]

hills of enclosed pasture, and dispersed farms with steep valley sides and ancient deciduous woodland.

2.6.3 Llangathen character area consists of two low hills with the village of Llangathen and Aberglasne house and gardens, in addition to distinctive hedgerow trees with stands of woodland on steep hillsides and hedge less hilltop, lending to a parkland aspect to the landscape. Farms are dispersed, but concentrated on the south-facing slopes overlooking the Tywi Valley. The small character area of Dryslwyn consists only of Dryslwyn Hill but is very distinctive both historically and geographically, contrasting with surrounding lower-lying settled and enclosed farmland. Dinefwr Park is a distinct character area in sharp contrast with the surrounding farmland and with the urban setting of Llandeilo. It comprises the whole of Dinefwr Park and small areas associated with the estate, in particular Home Farm.

2.6.4 Llanfhangel Aberbythych contains numerous small stands of deciduous woodland, particularly on steep valley sides, some of which may be ancient. Woodland in Carmarthen to Llandeilo is now virtually non-existent, but distinctive trees and hedgerows provide a 'parkland' aspect. The old railway line which was built on a low embankment to avoid flooding is a distinctive feature of the floodplain. Tywi Valley was described in the Land Utilisation Survey of Britain, of 1946, as 'the best quality dairying land in the county' (Cadw/ICOMOS, 1998, 27). Llandeilo character area, comprising of the historic town, is situated on the north bank of the River Tywi with Ffairfach lying on the south bank and includes ribbon development either side of the A40(T) to the north.

2.6.5 15 Scheduled Monuments are present, two Grade I and seven Grade II* Listed Buildings, 68 Grade II Listed Buildings are also present and two conservation areas.

2.7 BIODIVERSITY

2.7.1 The baseline ecological description of the Site is based on the results of an Extended Phase 1 Habitat Survey carried out by WSP, (WSP, 2019) 5 over multiple site visits in March/April 2017, June 2017 and November 2017 as land access became available and route amendments were made.

2.7.2 The 2017 Phase 1 Habitat Survey covered the full length of the Tywi Valley Path East alignment (hereafter referred to as the Site) and extended up to 100m from the Site where landowner access allowed. In addition, as part of the Extended Phase 1 Habitat Survey, trees, buildings and structures within 20m of the Site were assessed for their potential to support roosting bats; and an area within 30m of the site was subject to a detailed inspection for badger Meles meles setts and signs of badger activity. The extent of survey coverage for the various survey types is hereafter referred to as the ‘Study Area’.

2.7.3 The Study Area consisted mainly of poor semi-improved grasslands and improved grassland. Several areas of broadleaved semi-natural woodland, marshy grassland and standing water were also recorded. The disused railway corridor typically comprised bare ground, scattered trees, woodland

[5] WSP (2019) Tywi Valley Cycleway East Eastern Section Extended Phase 1 Habitat Survey. WSP UK LTD.

and dense scrub. The Rivers Tywi and Cothi both intersect the Study Area at several points. Hedgerows bisect the Study Area and included both species-rich and species-poor examples.

2.7.4 Five habitats were recorded within the study area that qualify / potentially qualify as priority habitats within the UK Biodiversity Action Plan (BAP)6 / Section 7 of the Environment (Wales) Act 20167 (hereafter referred to as Priority Habitats). These were:

- Running water, present in the form of the River Tywi, River Cothi and several smaller streams and drains;
- Ponds, present in the form of numerous backwaters on the Tywi floodplain;
- Hedgerows segregating the farmland throughout the Study Area;
- Floodplain Grazing Marsh, present in two areas at Bremenda Uchaf and around Riverbed Wood; and
- Lowland woodland, present in the form of several blocks of varying size and composition.

2.8 WATER ENVIRONMENT

2.8.1 Much of the Proposed Scheme is located parallel to the River Tywi (River Tywi). Land use along the Proposed Scheme is mainly greenfield, comprising agricultural fields, watercourses, small wooded areas and roads. The majority of the route is proposed to be set back a minimum of 8m from the top of the River Tywi thereby affording a suitable buffer for maintenance and biodiversity purposes.

2.8.2 The River Tywi is a Main River and one of the two longest rivers flowing entirely within Wales. Two other Main Rivers flow into the River Tywi within the proximity of the Proposed Scheme; these are the River Cothi and the River Dulais. As Main Rivers they are under the jurisdiction of Natural Resources Wales (NRW) who has the powers to maintain them.

2.8.3 A number of Ordinary Watercourses are also located in the Study Area and are tributaries of the River Tywi, among them the River Ffinnant, Nant Cellyn, the River Gwynon, the River Myddyfi, the Nant Gurrey-fach and the River Dulais. As Ordinary Watercourses, CCC as the Lead Local Flood Authority (LLFA) will have jurisdiction over them. All of these watercourses therefore contribute flows to the River Tywi catchment, which is approximately 1,090 km2 in area at Nantgaredig.

2.8.4 There are understood to be 11 existing structures along the Proposed Scheme, however at present there are no crossings over the River Tywi, River Cothi or River Gwynon. Two new bridge crossings will be required to facilitate the crossings of the River Tywi and River Cothi. Both of these structures are towards the downstream (western) end of the Proposed Scheme. The new crossing over the River Gwynon is likely to comprise a bridge located a short distance upstream of the confluence of the River Gwynon with the River Tywi.

[6] UK Biodiversity Action Plan (BAP) list of Priority habitats. Available online at http://jncc.defra.gov.uk/page-5706. [Accessed 13/02/2018]

[7] Her Majesty's Stationary Office (HMSO) (2016) Environment (Wales) Act 2016. Available online at http://www.legislation.gov.uk/anaw/2016/3/introduction. [Accessed 13/02/2018]

2.8.5 In addition, it is considered that six new culverts or culvert extensions could be required on other tributaries of the River Tywi.

2.8.6 Review of 1:25,000 Ordnance Survey (OS) mapping indicates that in addition to the watercourses referenced above, a number of other static waterbodies exist within the Study Area. This includes the Llyn Brianne reservoir located further upstream along the River Tywi and approximately 10km downstream of the source of the Tywi. This reservoir was constructed in the late 1960s and early 1970s to regulate the flow of water along the River Tywi and sustain a large potable water abstraction plant at Nantgaredig, at the upstream extent of the proposed scheme. The plant provides a large area of South East Wales with water.

2.9 GROUND CONDITIONS

2.9.1 Review of the British Geological Survey (BGS) mapping indicates the site is underlain by varying geology along its length however the geology generally comprises bedrock of mudstone and superficial alluvial / glaciofluvial / river terrace / till deposits of sand, silt, clay and gravel.

2.9.2 The Geotechnical Scoping Report undertaken by Capita on behalf of CCC in January 2014 states that the site does not impinge on any groundwater source protection zones.

2.9.3 The report also states that the majority of bedrock geology underlying the site is designated as Secondary B Aquifer with smaller areas associated with the River Cothi being designated Secondary A aquifer. The Capita report also states that the majority of the superficial geology is designated Secondary B Aquifer with areas underlain by Till deposits considered to be non-aquifer.

2.9.4 Secondary A Aquifer is described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Secondary B Aquifer is described as predominantly lower permeability layers which may store and yield amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

2.10 HISTORIC LAND USE

2.10.1 Available historic mapping shows that the floodplain of the River Tywi within the site has remained in its current use as green space which supports agricultural activities (mostly dairy farming). The former railway was constructed during the 19th century.

2.11 REFERENCES

http://www.dyfedarchaeology.org.uk/ [accessed 09/02/2018]

[2] WSP (2019) Tywi Valley Cycleway East Eastern Section Extended Phase 1 Habitat Survey. WSP UK LTD.

[3] AECOM (2013) Tywi Valley Transport Corridor Ecological Constraints Report. AECOM LTD.

http://www.dyfedarchaeology.org.uk/ [accessed 09/02/2018]

[4] UK Biodiversity Action Plan (BAP) list of Priority habitats. Available online at http://jncc.defra.gov.uk/page-5706. [Accessed 13/02/2018]

[5] Her Majesty's Stationary Office (HMSO) (2016) Environment (Wales) Act 2016. Available online at http://www.legislation.gov.uk/anaw/2016/3/introduction. [Accessed 13/02/2018]

3 DESCRIPTION OF THE PROPOSED SCHEME

3.1 INTRODUCTION

3.1.1. The Proposed Scheme comprises a new cycle and pedestrian path 14.64km long, which is predominantly 3m wide and primarily follows the route of the former Carmarthen to Llandeilo railway line. It includes two new pedestrian and cyclist river bridges and will primarily follow the route of the former Carmarthen to Llandeilo railway between Nantgaredig and Ffairfach. Generally, the route lies on a low embankment, however, at some locations it passes at grade and within a cutting where mounds of superficial soils protrude through the alluvium of the flood plain. In addition to the former railway the path will utilise substantial lengths of existing public rights of way and the embankments constructed for the former railway.

3.1.2. The proposed path will be unsegregated and comprise of a 3m wide hard surfaced path with 1m verge either side, adapted locally, where required, to suit constraints on site. It is assumed the excavation of the path will be relatively shallow given that the path will only be used pedestrians and cyclists and will be of a standard detail. The expected excavation depth is a maximum of 300mm in fields and 250mm on the railway embankment. Boundary treatments are intended to comprise of fences of stranded wire on wooden post in most areas, however these will be agreed, where necessary, with adjacent landowners. Barriers and gates will be incorporated at key locations to manage access and cattle grids will be incorporated as necessary.

3.2 THE PROPOSED SCHEME

3.2.1. The proposed path will be unsegregated and comprise of a 3m wide hard surfaced path with 1m disturbance either side of the path anticipated. Running west to east the proposed scheme will link with the first phase (western phase) of the Tywi Valley Path at the B4310 in the village of Nantgaredig. The path will follow the former railway eastwards and after approximately 1km cross the river Cothi over a new clear span bridge on the trajectory of the former railway. After approximately 750m the path will diverge from the former railway onto a track to the north of the former railway before a 90 degree turn to the south crossing the former railway and then the River Tywi over a new clear span bridge.

3.2.2. Once the path crosses the River Tywi it will turn 90 degrees to the east following the southern river bank of the Tywi for approximately 750m, another 250m through fields/meadows before re-joining the former railway north of farmsteads known as Bremenda Uchaf and Bremenda Ganol. At this point the path will diverge immediately from the former railway around existing field boundaries for approximately 1km before re-joining the former railway approximately mid-way between the farmsteads of Barley Mount and Glantowy, both situated to the north of the former railways and between the former railway and the River Tywi.

3.2.3. The path is then proposed to follow the course of the former railway for approximately 7.5kms crossing the River Gwynon tributary, the B4297 at Dryslwyn Fawr and a C class road between Golden Grove to the south and Llangathen to the north.

3.2.4. Approximately 1km further to the east the path will diverge from the former railway to the north to follow a field boundary for approximately 400m re-joining the former railway at Pentrecwn. A further 300m to the east the path will diverge from the former railway to the south away from a bend in the river which appears to have eroded part of the former railway. After re-joining the former railway the

path diverges from the former railway after approximately 750m to the south along a track to join the B4300 for approximately 1.2km. The path then terminates at the south-east corner of Ysgol Bro Dinefwr in Ffairfach.

3.2.5. Boundary Treatments will consist of timber post and four-rail fences, timber post with wire mesh fences and timber post with wire strands fences for the majority of the path, using the traditional boundary treatments.

SCHEME PLANS

3.2.6. The Proposed Scheme design plans are illustrated on the following:

- Figure 1.1 Site Location Plan;
- Figure 2.1 Environmental Constraints Plan;
- Figure 3.1 Work Packages Overview Plan and Typical Details
- Figure 3.2 Structures Plans
- Figure 3.3 Compound Areas Plans
- Figure 3.4 Detail Section Plans
- Figure 6.1 – 6.4 Landscape Figures
- Figure 7.1 – 7.3 Heritage Figures
- Figure 8.1- 8.8 Biodiversity Figures
- Figure 9.1 and 9.2 Water Figures
- Figure 10.1 – 10.2 Arboriculture Figures

3.2.7. The Figures are within Volume III of the ES

BRIDGE STRUCTURE

3.2.8. There are 13 proposed structures within the scheme (**Volume III Figure 3.2**). Table 3-1 provides details of the structures, including materials used and chainage location. None of the structures are located within the boundary of the River Tywi SAC and SSSI.

3.2.9. The operational design life of the large bridges is estimated at 120 years, and smaller bridges estimated at 15 years.

Table 3-1 – Description of Proposed Structures

Structure	Chainage	Materials	Description	Crossing Type	Drawing No.
1	460	Steel beams, timber sleepers and concrete bank seats.	A 12m long bridge consisting of a 3m wide footway. The pier from existing bridge will remain at the centre of the structure. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Field – flood relief	2500.ST01 Rev A
2	690	Walled HDE pipes, Macadam surfacing, timber posts, galvanised sheep netting.	A 15m long field crossing consisting of a 3m wide footway. Tarmac surface will sit on two walled HDE pipes to provide the elevation. There will be a 1m verge on either side, followed with 1.2m high galvanised sheep netting help by timber posts.	Field – crossing at the request of the landowner	2500.ST02 Rev A
3	800	Concrete seats and piles. Steel beams.	Span 1 consists of a 50m stress truss arch bridge over the River Tywi, with a 4m wide deck. Foundations include reinforced concrete bank seats and piles. A 1.4m high pedestrian guardrail will run the length of each side, with 4m high steel trusses on the outside. Existing masonry abundant will remain below. Span 2 consists of a 12m footbridge, 4m wide deck. The bridge will sit on reinforced concrete bank seats and piles. A 1.4m high pedestrian guardrail will run along both sides.	River Tywi	2500.ST03 Rev A
4	878	Steel beams, timber sleepers and concrete bank seats.	A 6m long bridge consisting of a 3m wide footway. Existing masonry abutments to remain below. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Field – flood relief	2500.ST04 Rev A

Structure	Chainage	Materials	Description	Crossing Type	Drawing No.
5	1680	Concrete seats and piles. Steel beams.	A 58m stress truss arch bridge over the River Tywi, with a 4m wide deck. Foundations include reinforced concrete bank seats and piles. A 1.4m high pedestrian guardrail will run the length of each side, with 4m high steel trusses on the outside.	Tywi	2500.ST05 Rev B
6	4790	Concrete seats and ballast wall, steel plate, cross beams	An 18m long slightly arched bridge compromising of a 4m wide deck. The foundations consist of concrete bank seats and ballast wall. The deck will be made from 8m think steel plate over cross beams with anti-skid surfacing. A 1.4m high pedestrian guardrail will run the length on each side.	River Gwynon	2500.ST06 Rev B
7	5915	Steel beams, timber sleepers and concrete bank seats.	A 4m long bridge consisting of a 3m wide deck. The existing bridge deck of railway sleepers and steel beams, and existing abutments will remain. The proposed bridge will over span this. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Unnamed stream	2500.ST07
8	7450	Steel beams, timber sleepers and concrete bank seats.	A 4.8m long bridge consisting of a 4.1m wide skewed deck. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Unnamed stream	2500.ST08 Rev C
9	8390	Steel beams, timber sleepers and concrete bank seats.	A 4.7m long bridge consisting of a 4m wide footway. Existing abutments to remain below. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Unnamed stream	2500.ST09 Rev C
10	8520	Steel beams, timber sleepers and	A 4m long bridge consisting of a 4m wide footway. Existing abutments to remain below. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank	Unnamed stream	2500.ST10 Rev C

Structure	Chainage	Materials	Description	Crossing Type	Drawing No.
		concrete bank seats.	seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.		
SS01 - Allt Pant-Glas Boardwalks	8750	Concrete and Steel Raised Boardwalk	245m long in total sections of elevated boardwalks comprising 4m wide shared use path with 1.4m high parapet railings on either side.	Allt Pant-Glas	SS.E.01
11	9320	Steel beams, timber sleepers and concrete bank seats.	A 4m long bridge consisting of a 4m wide footway. Existing abutments to remain below. Timber sleepers will sit on steel beams to form the deck. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side.	Unnamed stream	2500.ST11 Rev C
SS02 - Llety Glyd Boardwalks	12300-12700	Concrete and Steel Raised Boardwalk	162m in total of elevated boardwalk section comprising 4m wide concrete slab shared use path on concrete posts with 1.4m high parapet railings either side of the path.	Llety Glyd	SS.E.02
12	12810	Steel beams, oak sleepers and concrete bank seats.	A 8.5m long bridge consisting of a 3m wide footway. The deck will consist of oak sleepers with an anti-slip surfacing combined with an aggregate, this will cross steel beams. The bridge will sit on concrete bank seats at each end. A 1.4m high pedestrian guardrail will run the length on each side, which will continue on as a timber post and rail fence.	Unnamed stream	2500.ST12 Rev A

ACCESS RAMPS

Table 3-2 – Access Ramps Proposed for Each Structure

Structure	Proposed Access Ramp
1 and 2	Structure at existing ground level.
3, 5 and 7	Earthwork access ramps will slope back to tie in with existing ground level at a gradient of 1 to 20 at both ends of the structure.
4, 6, 8, 9, 10 and 11	Earthwork access ramps will slope back to tie in with existing ground level at a gradient of 1 to 40 at both ends of the structure.
12	Suitable fill material will be used to raise the existing ground level around the structure so that it becomes the same level as the proposed path.

3.2.10. Structures 3 to 11 will have earthwork access ramps provided at each end of the bridge in order to cater for disabled access. The measurement of these will vary for each structure, and each end of the structure as existing ground levels differ.

CULVERTS

3.2.11. Existing culverts will be retained. When existing bridge decks are encountered the proposals are to construct new structures. Bank seats will be installed set back from the culvert and new decks sat on the bank seat which then over span each existing culvert. The benefits of this are minimal disturbance to existing structures, and no disturbance is anticipated to the watercourses.

Table 3-3 – Existing Culverts

Structure	Chainage
1	878
2	4790
3	7450
4	9280
5	9590
6	9990

LIGHTING

3.2.12. There will be no lighting along the path and structures on completion. This is to reduce the environmental impacts of the scheme on ecological grounds, such as disturbance to bat species and to reduce the carbon footprint by not introducing any energy costs. Some areas of the Scheme which are in urban areas may be lit unintentionally from nearby sources of light.

DRAINAGE

3.2.13. There are currently no drainage designs available. It is anticipated that water will flow back to drainage channels at abutments to be discharged into soakaways. Contamination Risk is considered minimal as the path will be used by cyclists and pedestrians.

FENCING

3.2.14. During the construction phase, it is also intended to install fencing, gates and other forms of barriers where appropriate as agreed with the land owners. These will provide the required access by cyclists and pedestrians whilst ensuring security to property is retained and agricultural tasks can be undertaken unimpeded. Boundary Treatments will consist of timber post and four-rail fences, timber post with wire mesh fences and timber post with wire strands fences for the majority of the path.

FOOTPATHS

3.2.15. Table 3-4 list the Public Rights of Ways (PRoWs) which will be directly impacted due to the scheme, and will require diverting during construction.

Table 3-4 – Directly affected PRoWs

PRoW No.	Drawing No.	Chainage	Distance from TVP at closest point
41/2	_70041839_ES_03_PROWs Sheet 1	290	Crosses
41/6	_70041839_ES_03_PROWs Sheet 1	1300-1520	Adjacent
31/27	_70041839_ES_03_PROWs Sheet 2	4500	Crosses and runs along from Llanarthne Village
42/1	_70041839_ES_03_PROWs Sheet 5	10900	Crosses
44/3	_70041839_ES_03_PROWs Sheet 7	14800	Crosses

3.2.16. Table 3-5 lists the Public Rights of Ways which will be indirectly impacted due to the Scheme as they are within close proximity to the site, and/or connect with a directly affected PROW.

Table 3-5 – Indirectly affected PRoWs

PRoW No.	Drawing No.	Chainage	Distance from TVP at closest point
41/1	_70041839_ES_03_PROWs Sheet 1	00	500m south
41/4	_70041839_ES_03_PROWs Sheet 1	1300	320m north
41/5	_70041839_ES_03_PROWs Sheet 2	1900	350m north
31/28	_70041839_ES_03_PROWs Sheet 2	2850	300m south
41/13	_70041839_ES_03_PROWs Sheet 2	4700	250m north
50/45	_70041839_ES_03_PROWs Sheet 4	7800	40m south
50/40A	_70041839_ES_03_PROWs Sheet 4	7900	430m south
50/47	_70041839_ES_03_PROWs Sheet 4	7950	430m south
50/49	_70041839_ES_03_PROWs Sheet 4	8900	300m south
50/51	_70041839_ES_03_PROWs Sheet 6	11100	200m south

FLOOD RISK

3.2.16. Flood warning signs will be strategically placed along the length of the route.

ACCESS

3.2.16. Table 3-6 identifies the access routes to the TVP and at what chainage they are present. It also identifies the permanent or temporary nature of these access routes and whether or not they are new proposed routes or existing routes.

Table 3-6 – Access Routes

Name/Description	Chainage	Temp or perm	Type of Access	New/Existing
Track	290	Permanent Publicly Accessible	Footpath PRoW 41/2	Existing
Track	1520	Permanent Publicly Accessible	Footpath PRoW 41/6	Existing

Name/Description	Chainage	Temp or perm	Type of Access	New/Existing
Track heading north from the B4300	1700	Temporary	Vehicle	currently a farm track
Track heading north from the B4300 using the existing access road to Davies GB&CA Dairy Farm	2650	Temporary	Vehicle	currently a farm track
Track heading north from the B4300 using the existing access road to Davies GB&CA Dairy Farm	2850	Temporary	Vehicle	currently a farm track
Road used to access farm buildings	4500 from the north	Permanent Publicly Accessible	Footpath PRoW 31/27	Existing
Road north from B4300 in Llanarthne	4500 from the south	Permanent Publicly Accessible	Vehicle	Existing
Track heading north from the B4300	5980	Permanent	Vehicle	Existing
B4297	6690	Publicly Accessible	Vehicle	Existing
Track heading north from the B4300 adjacent to farmstead	7610	Permanent	Vehicle	currently a farm track
Track heading north from the B4300	8700	Permanent	Vehicle	currently a farm track
Track heading north from the B4300	9600	Permanent Publicly Accessible	Vehicle	Existing
Track heading north from the B4300 using the existing access road to Gelli Aur College Farm	10890	Permanent Publicly Accessible	Footpath PRoW 50/025	Existing
Track heading north from A476, adjacent to Ysgol Bro Dinefwr	14800	Permanent Publicly Accessible	Footpath Prow 44/3	Existing

CROSSING AND ACCESS POINTS

3.2.17. Table 3-7 identifies where the crossing and access points are located along the scheme, these can be seen on **Figure 3.4 (Volume III).**

Table 3-7 – Crossing and Access Points Located Along the Scheme

Chainage	Description
4980	Vehicle crossing point – farm track
5450	Vehicle crossing point – farm track
5660	Vehicle crossing point – farm track
5820	Vehicle crossing point – farm track
6950	Vehicle crossing point – farm track
7280	Field Access
7390	Passing Place
8340	Field Access
10210	Field Access
10240	Field Access
10290	Field Access

3.3 CONSTRUCTION PROPOSALS

3.3.1. The key site activities during the construction phase are summarised below:

- Securement of the Site;
- Clearance and creation of temporary access and construction compounds;
- Vegetation and tree removal;
- Movement and use of static and mobile plant / construction vehicles, including works to enable access for cranes and construction of the crane foundations (in relation to the two new bridges);
- Measures to address findings of ground investigation (e.g. made ground);
- Installation of core bored piled foundations;
- Construction of the bridges; and
- Hard and soft landscaping including environmental mitigation.

PATH CONSTRUCTION METHODS

3.3.2. Along the proposed path three methods for laying the path will be uses, tarmac and concrete will be used for field crossing points. The methods for these three construction types are described below. The proposed length of construction type for this scheme is outlined within table 3-8 and described in Figure 3.1 and Figure 3.4 (Volume III).

Table 3-8 – Path Construction Types

Path Type	Length (m)
Existing road	250
Bridge	130
Tarmac	12220
Concrete	2000

Tarmac

- Following any required vegetation removal, and shallow excavation (300mm in fields and 250mm on the railway embankment) along the track, tarmac is applied in three layers using a tarmac mixer;
- The first layer is granular sub-base layer;
- A binder course layer is then applied to act as a load-bearing, strengthening layer;
- The binder course material is laid out, rolled to compact and levelled using a paver machine;
- The final layer of a surface wearing layer is then applied, and the road is rolled again to compact the layer; then
- Bonding between the layers is achieved by spraying a bitumen emulsion.

Concrete

- Following any vegetation removal and site clearance, a granular sub-base layer is applied to the track;
- Forms or moulds are then constructed along the edges of the road to act as a barrier to hold the concrete in place;
- Wet concrete will then be poured from a ready mix concrete truck along the path, while the wet concrete is being poured, contractors will use shovels and rakes to move the concrete to make sure there are no voids or air pockets;
- Once wet concrete has been placed into the forms, a large metal or wood board is used to screed the top of the concrete;
- The surface is then floated to further compact the concrete, even out any depressions or high areas, and create a smooth finish on the surface;
- The concrete will be left to rest until the surface begins to firm up;
- Once firm, steel trowelling is performed to create a smooth, hard and uniform finish across the concrete surface; then
- A liquid chemical curing and sealing compound is then applied to the concrete to enable the concrete to cure slowly and evenly.

STRUCTURE CONSTRUCTION METHODS

3.3.3. At this stage the exact construction methods for the structures are yet to be determined.

3.3.4. The piling technique for the foundations will use a pile boring method, this involves a drill being rotated into the ground to the required depth, and concrete pumped into the excavated void. The reinforced concrete bank seats will then sit on top of the piles to form the

foundations of the bridges. Cranes will be used for the assembly of structures 2 and 5, the larger bridges.

CRANES

3.3.5. It is assumed a working platform will be placed within compounds 1 and 2 to provide an area for cranes and heavy lifting equipment for the construction of the structures 2 and 5. Compound locations can be seen in **Figure 3.3** (Volume III).

ENABLING WORKS

3.3.6. The following enabling works are anticipated as part of the Proposed Scheme:

- Construction of temporary construction site access;
- Securing of the Site with fencing;
- Temporary diversion of footpath;
- Establishment of construction compounds / laydown areas; and
- General site clearance, including tree removal.

VEGETATION

3.3.7. Where possible, CCC has insured that any vegetation clearance will not occur within bird breeding season. It is assumed a suitable ecologist will be involved in the planning of when and where vegetation clearance will take place, method statements produced before construction, and all vegetation clearance will take place under the ecological supervision.

SECURING THE CONSTRUCTION SITE

3.3.8. It is assumed construction compounds and working areas within the Site will be secured through the use of temporary fencing where required and possible to do so.

3.3.9. It is anticipated that the temporary fencing would use either metal or wooden fencing.

TRAFFIC MANAGEMENT

3.3.10. It is expected that traffic management arrangements are to be implemented for the delivery of materials due to the narrow nature of many of the existing roads.

3.3.11. It is estimated there will be an additional 20 movements split between B4300 and Station Road (Nantgaredig), and A40 per day, per phase. There are no anticipated conflicts as the road networks regularly accommodate construction related vehicles of the same size expected to be used for this scheme.

3.3.12. Appropriate traffic management controls will be implemented to ensure the safety of other road users and to protect the environment including:

- Appropriate signing of the delivery route(s) to ensure vehicles use the approved route to and from the Site;
- Warning signs where appropriate in the vicinity of the Site entrance(s), both for vehicles and pedestrians / cyclists in accordance with the HSE site entrance warning signs standards;
- Layout of working areas to allow adequate space for goods vehicle manoeuvring within the Site;
- Temporary traffic management for short periods when delivery of abnormal / oversized loads may cause obstruction to the public highway; and

- Wheel washing facilities for vehicles leaving the Site.

CONSTRUCTION COMPOUND / LAYDOWN AREA

3.3.13. The assumed site compounds are described in table 3-9 and can be seen on **Figure 3.3 (Volume III).** A working platform for cranes and heavy equipment is likely to be placed in close proximity for the construction of the bridges over the River Tywi.

Table 3-9 – Construction Compound/Laydown Area

Compound	Chainage	Access
1	100	Temporary road east from B4310
2	1150	Existing road south from A40
3	2000	Existing access north off B4300
4	2700	Existing farm track accessed from B4300
5	8300	Temporary road north of B4300
6	12250	Existing road north from B4300, temporary road from farm
7	13450	Permanent road north from B4300
8	14625	Existing farm track from A476

3.3.14. Any disturbed ground will be reinstated upon completion of construction activities. An outline Construction Environmental Management Plan (CEMP) will be produced following the planning application which will contain the construction methods currently anticipated.

CONSTRUCTION PLANT AND EQUIPMENT

3.3.15. The following construction plant and equipment is envisaged:

- Excavators (various sizes);
- Dumpers (various sizes);
- Concrete wagons;
- Compactors (various sizes);
- Tarmac delivery vehicle;
- Paving machines (various sizes);
- Tractors (various sizes);
- Road sweepers;
- Bowsers (various sizes);
- Cherry pickers (various sizes);
- Wood chippers (various sizes);
- Grading plant;
- Cement mixing machines; and
- Cranes (various sizes).

SITE WORKING HOURS AND DAYS

3.3.16. It has been assumed that working hours for construction activities will be as follows:

- 08:00 – 18:00 Monday to Friday; and
- 08:00 – 13:00 on Saturday.

3.3.17. No work is anticipated on Sundays and Bank Holidays.

3.3.18. Exceptions to the standard working hours may arise, for example, when abnormal loads are delivered or in order to construct specialist activities; however appropriate permission and notifications would be sought from CCC should these circumstances arise.

REMEDIATION

3.3.19. No Ground Investigation surveys have taken place. As a large proportion of the route is located on the route of a former railway line it is therefore assumed that the site is at risk of ground contamination. Further details are outlined in Chapter 10: Geology and soils.

EARTHWORKS

3.3.20. Excavation within parts of the Site will be necessary for construction of the path. The maximum excavation depth in fields will be 300mm, with an expected average depth of 250mm. On the railway embankment it is likely to be less than 250mm.

3.3.21. Construction of the earthworks will be in accordance with a CL:AIRE compliant Materials Management Plan (MMP) to ensure re-used material does not present a risk to human health or the environment. Material moved around the Site or imported onto Site during the construction phase will have been subject to appropriate testing and will be assessed to see if they are chemically and geotechnically suitable.

TREE REMOVAL AND RETENTION

3.3.22. A detailed Arboriculture Report has been completed for the scheme detailing trees for removal and retention along the proposed path as identified in the **Appendix 6. A (Volume IV)**, no ancient trees are proposed to be removed

CONSTRUCTION EMPLOYMENT

3.3.23. A business plan has been undertaken for the scheme that states that during the construction of the scheme will result in approximately 137 new jobs directly, and estimated additional 47 new jobs created either indirectly through the supply chain, or by further employment opportunities in the area that are created.

CONSTRUCTION SEQUENCE

3.3.24. The sequence in which the construction of the Proposed Scheme will take place is yet to be determined and agreed. It is anticipated that the Scheme will be funded in stages, when funding is approved. Therefore, construction will take place in stages, approximately over 5 years.

3.3.25. It is assumed the construction programme will be aligned with the ecological calendar to reduce impact to the surrounding environment.

KEY CONSTRUCTION ENVIRONMENTAL MANAGEMENT PRACTICES

3.3.26. A outline Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Scheme. The CEMP will detail the environmental controls / protection measures and safety procedures that would be adopted during the construction of the proposed scheme

thereby providing a tool to ensure the successful management of the likely environmental effects as a result of construction activities.

3.3.27. The construction works would be managed in accordance with the EA Pollution Prevention Guidelines (although withdrawn) and CIRIA guidance 'C532 - Control of Pollution from Construction Sites' to help ensure a well-managed operation which minimises potential environmental risks.

DUST MANAGEMENT

3.3.28. It is anticipated that the outline CEMP would outline mitigation measures presented within the IAQM 'Guidance on the assessment of dust from demolition and construction'. The measures that would be considered include prevention measures such as screening stockpiles of material; deployment of windbreak netting; and dampening exposed soils as appropriate.

TEMPORARY LIGHTING

3.3.29. Good practice guidance documents prepared by the CIRIA[8] note that lighting on construction sites is typically part of on-site security and health and safety requirements. However, the online CIRIA guidance also notes that potential effects towards surrounding receptors need to be minimised through the controlled application of lighting in accordance with current best practice standards.

3.3.30. It is assumed there would be no floodlighting associated with construction compounds, car parking and working areas. It is anticipated that only low level lighting (for security / safety purposes) will be implemented along the perimeter of the construction area as part of a presence detection type security system.

NOISE MANAGEMENT

3.3.31. It is anticipated that the outline CEMP would detail the noise mitigation measures and the application of Best Management Practices of construction, as outlined in BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - noise'[9]. Mitigation measures which would be considered include using quiet construction methods, locating plant and equipment away from noise sensitive properties, limiting hours of construction, and ongoing monitoring and liaison with the local community and CCC.

CONSTRUCTION WASTE

3.3.32. Construction Waste is likely to include the following:

- Excavated material;
- Vegetation cleared;

[8] CIRIA (2015) Environmental good practice on site guide (fourth edition)

[9] BS 5228-1: 2009+A1: 2014 Code of practice for noise and vibration control of construction and open sites

- Packaging from materials brought to site; and
- Surplus materials brought to site.

3.3.33. The applicant would seek to reuse materials wherever possible on Site, and where not possible, waste will be disposed of using a suitable licensed waste carrier as outlined in Chapter 12: Materials.

3.4 PLANNING POLICY CONTEXT

INTRODUCTION

3.4.1. This sub-section describes the planning and regulatory framework. This section identifies the key relevant planning policy context from both the national and local level, including Planning Policy Wales, Technical Advice Notes and the Local Development Plan.

3.4.2. Further details of the planning policy framework and discussion as to how the proposal accords with this framework is included in a Design and Access Statement that has been prepared to support the application, but which does not form part of this ES.

CONTEXT

3.4.3. The principal development plan documents relating to the scheme comprises of the following:

- Planning Policy Wales, Edition 10 (December 2018);
- Technical Advice Notes:
  - TAN 5 – Nature Conservation and Planning[10];
  - TAN 12 – Design[11];
  - TAN 15 – Development and Flood Risk[12]; and
  - TAN 18 – Transport[13].
- Carmarthenshire County Council Local Development Plan (December 2014);
- Carmarthenshire County Council Emerging Local Development Plan; and
- Carmarthenshire County Council Supplementary Planning Guidance.

NATIONAL

Planning Policy Wales (10th edition, December 2018)

3.4.4. Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh

[10] Welsh Assembly Government (2009) Technical Advice Note 5: Nature Conservation and Planning

[11] Welsh Assembly Government (2016) Technical Advice Note 12: Design

[12] Welsh Assembly Government (2004) Technical Advice Note 15: Development and Flood Risk

[13] Welsh Assembly Government (2007) Technical Advice Note 18: Transport

Government Circulars, and policy clarification letters, which together provide the national planning policy framework for Wales.

3.4.5. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation.

3.4.6. The following extracts from PPW are considered to be relevant to, and support, the proposed development:

> *"Well-designed, people orientated streets are fundamental to creating sustainable places and increasing walking, cycling and use of public transport. New development should improve the quality of place and create safe, social, attractive streets where people want to walk, cycle and enjoy, and children can play."* (Paragraph 4.1.18).
>
> *"Walking and cycling are good for our health and well-being. They support valuable social and recreational opportunities and are integral to placemaking, creating life and activity in public places and providing the opportunity to meet people. Sustainable places invite people to walk and cycle as part of their everyday routine".* (Paragraph 4.1.25).
>
> *"The planning system has an important role to play in promoting and supporting the delivery of the Active Travel Act and creating the right environments and infrastructure to make it easier for people to walk and cycle, including new and improved routes and related facilities."* (Paragraph 4.1.28).
>
> *"Planning authorities should also seek to assist in completion of the national cycle network and key links to and from the network. These measures should, where appropriate, be aligned with approaches to secure green infrastructure."* (Paragraph 4.1.32).
>
> *"Planning authorities should consider scope to use disused land and routes as parks, linear parks or greenways in urban areas and encourage the provision of safe and attractive cycle routes and footpaths. Where recreational use of redundant railway lines or spaces alongside canals or rivers is proposed, planning authorities should ensure that there is no detriment to adjoining users, wildlife or flood defences."* (Paragraph 4.5.7).

Technical Advice Notes

3.4.7. Each Technical Advice Note (TAN) provides detailed planning advice on a different subject. They should be read along with the PPW document which sets out the land use planning policies.

3.4.8. The relevant TANs to this application have been set out below:

- TAN 5, Nature Conservation and Planning (September 2009);
- TAN 12, Design (March 2016);
- TAN 15, Development and Flood Risk (July 2004); and
- TAN 18, Transport (March 2007).

TAN 5, Nature Conservation and Planning (2009)

3.4.9. This TAN provides guidance on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. It also provides advice on development affecting designated sites and habitats, in addition to protected or priority habitats and species.

TAN 12, Design (2016)

3.4.10. This TAN provides guidance on how good design should be achieved through the planning process.

3.4.11. Paragraph 2.6 of TAN 12 states *"design which is inappropriate in its context, or which fails to grasp opportunities to enhance the character, quality and function of an area, should not be accepted, as these have detrimental effects on existing communities"*.

TAN 15, Development and Flood Risk (2004)

3.4.12. This TAN provides guidance which supplements the policy set out in PPW in relation to development and flooding. It includes development control procedures to mitigate flood risk when planning for new development.

TAN 18, Transport (2007)

3.4.13. This TAN describes how to integrate land use and transport planning. It explains how transport impact should be assessed and mitigated.

LOCAL

Carmarthenshire County Council Local Development Plan (December 2014)

3.4.14. The CCC Local Development (LDP) 2011-2021[14] was adopted on 10th December 2014.

3.4.15. In line with paragraph 3.4 of the Scoping Opinion received from CCC **(Volume IV Appendix 1.B)** on the proposed development, the following LDP policies are considered to be relevant to the proposal:

- TR4 – Cycling and Walking;
- TR6 – Redundant Rail Corridors;
- GP1 – Sustainability and High-Quality Design;
- SP9 – Transportation;
- SP1 – Sustainable Places and Spaces;
- SP14 – Protection and Enhancement of the Natural Environment;
- EQ4 – Biodiversity;
- EQ5 – Corridors, Networks and Features of Distinctiveness; and
- EP1 – Water and Environmental Capacity;

[14] Carmarthenshire County Council (2014) Carmarthenshire Local Development Plan

3.4.16. The proposed development broadly follows the route of, and seeks to implement, a proposed cycle route (policy TR4).

3.4.17. Furthermore, the proposal is located within a Special Landscape Area (Twyi Valley) (policy SP14 and EQ6); 20% and 30% affordable housing viability target (policy AH1); sand and gravel resource and sandstone area (policy MPP3) and Areas of International and National Nature Conservation (SP14).

3.4.18. Additionally, the site is in proximity to an existing employment area (policy EMP1) at its eastern end, Scheduled Ancient Monument (policy SP13) and Conservation Area (Llandeilo) (policy EQ1, SP13).

Emerging Planning Policy

3.4.19. On 10th January 2018[15], CCC resolved to prepare a revised LDP for Carmarthenshire. Once adopted the Revised LDP will be used as the basis for deciding planning applications and will assist in guiding future investment programmes.

3.4.20. At present, and in line with the Local Delivery Scheme, the Council are currently consulting on the LDP's Preferred Strategy as well as other supporting documents (which represents Key Stage 3 – Pre-Deposit Public Consultation in the Local Development Scheme).

3.4.21. The revised LDP is expected to be adopted during November/December 2021.

Carmarthenshire County Council Supplementary Planning Guidance documents

Nature Conservation and Biodiversity (currently in draft)[16]

3.4.22. The aim of this SPG is to ensure that the provisions of national policy and that of the LDP are delivered at a local level and that planning applications are accompanied by the correct information that follows best practice guidelines.

3.5 REFERENCES

CIRIA (2015) Environmental good practice on site guide (fourth edition)

[2] BS 5228-1: 2009+A1: 2014 Code of practice for noise and vibration control of construction and open sites

[3] Welsh Assembly Government (2009) Technical Advice Note 5: Nature Conservation and Planning

[4] Welsh Assembly Government (2016) Technical Advice Note 12: Design

[5] Welsh Assembly Government (2004) Technical Advice Note 15: Development and Flood Risk

[6] Welsh Assembly Government (2007) Technical Advice Note 18: Transport

[7] Carmarthenshire County Council (2014) Carmarthenshire

[8] Carmarthenshire County Council (2018) Emerging Local Development Plan

[15] Carmarthenshire County Council (2018) Emerging Local Development Plan

[16] Carmarthenshire County Council (2018) Supplementary Planning Guidance

[9] Carmarthenshire County Council (2018) Supplementary Planning Guidance Local Development Plan

4 CONSIDERATION OF ALTERNATIVES

4.1 INTRODUCTION

4.1.1. This Chapter outlines the main alternatives to the Proposed Scheme that have been considered by the Applicant, together with the principal reasons for proceeding with the current planning application.

4.2 REQUIREMENT FOR THE CONSIDERATION OF ALTERNATIVES

Schedule 4, Part 1 of the EIA (Wales) Regulations 2017[17] states that an ES should include;

"A description of the reasonable alternatives (for example in terms of development design, technology, locations, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of environmental effects".

To accord with the EIA (Wales) Regulations 2017, the following alternatives have been considered:

- Alternatives considered;
- The 'Do Nothing' Scenario; and
- Scheme Design Iterations.

4.3 ALTERNATIVES CONSIDERED

4.3.1. The alternative that was considered to the current scheme includes the installation of a cycle lane along the existing highway (A40/B4300) as has been completed for part of the route from Carmarthen. It has however been ruled out as a suitable option due to safety reasons for the rest of the scheme.

4.3.2. In total, 8 options were considered:

- Provide a cycle lane along A40;
- Provide shared use path along A40 between White Mill and Llandeilo;
- Undertake partial online/offline improvements along A40 corrido using minor roads where possible and shared use paths on A40 where necessary;
- Improve existing rights of way along A40 corridor and create new linkages;
- Create new right of way along River Tywi;
- Create a right of way along dismantled railway;
- Provide cycle lane along B4300;
- Provide shared use path along B4300 between Carmarthen and Ffairfach; and
- Undertake partial online/offline improvements along B4300 corridor using minor roads where possible and shared use paths on B4300 where necessary.

[17] EIA (Wales) Regulations 2017

4.3.3. Further details on the options considered can be seen in **Table 4-2**.

4.4 SCHEME DESIGN ITERATIONS

ISSUES AND OPPORTUNITIES

4.4.1. Throughout consultation with CCC representatives and key stakeholders, and in combination with site visits and desk-based assessments, the following key scheme issues and opportunities were identified in the WelTAG Planning & Stage 1 Report[18]. These are listed in **Table 4-1** below.

Table 4-1 – Identified Issues and Opportunities

Key Issues
Existing link between Carmarthen and Ffairfach along B4300 offers no segregated pedestrian or cycling facilities
Existing link between Carmarthen and Ffairfach along A40 offers no segregated pedestrian or cycling facilities between White Mill and Ffairfach
Lack of off-road links and connectivity in existing right of ways network
Road safety issues along existing road links
Existing routes along B4300 (includes NCN47) and A40 are not tailored to encourage walking and cycling as a reasonable alternative to the car
Key Opportunities
Improve existing National Cycle Network provision
Lower levels of car dependency, reducing carbon footprint, pollution and congestion
Encourage more tourism into the region by enhancing the attractiveness and accessibility of local visitor attractions
Improve access between communities, services and businesses within the Tywi Valley
Improve the environment, health and social wellbeing of the communities within the Tywi Valley
Improve connectivity between Carmarthen and Llandeilo
Improve connectivity between communities north and south of the River Tywi

[18] WelTAG Planning and Stage 2 Report

4.4.2. Following this, Transport Planning Objectives (TPOs) were derived, these were assessed against the issues and opportunities, and national and regional strategic priorities, these are as follows:

- TPO 1 - Develop a shared use route through the Tywi Valley that will encourage healthier lifestyles and well being for all;
- TPO 2 - Promote tourism in the region by establishing a shared use path that links visitor attractions within Tywi Valley;
- TPO 3 - Encourage economic regeneration and inward investment by establishing a shared use trial that links existing businesses;
- TPO 4 - Reduce the road traffic accident rate of cyclists and pedestrians along the A40 and B4300 from 2013 levels;
- TPO 5 - Increase level of usage for non car forms of transport for journeys up to 8km in distance;
- TPO 6 - Provide a commuter link between Carmarthen and Ffairfach that is achievable within 1hr on a bicycle; and
- TPO 7 - Contribution to reducing the negative impacts of transport on the natural and built environment.

4.4.3. The WelTAG stage 1 study team then considered potential solutions that have the potential to address all, or part, of the transport planning objectives improve connectivity between communities north and south of the River Tywi. These can be seen in the table below:

Table 4-2 – Potential Solutions

Solution	Description
Option 1: Provide cycle lane along A40	Provides a continuous cycle lane in both eastbound and westbound lanes of the A40 carriageway from Abergwili, just west of Carmarthen, to the junction at Llandelio. It is anticipated that the cycle lanes would be created by utilising the existing hardstrips where possible, with some degree of carriageway widening to achieve the desired width. In places the cycle lanes may have to be diverted or taken offline to navigate past pinch points in the network.
Option 2: Provide shares use path along A40 between White Mill and Llandeilo	Provides a shared use footway/ cycleway along one side of the A40, replicating the existing shared use paths between Abergwili and White Mill and at various other locations along the A40. It is anticipated that the shared use path would be created by replacing the grassed verge, and or, widening into the adjacent land to achieve the desired width. In places the path may have to be stopped up, diverted, or taken offline to navigate past pinch points in the network.
Option 3: Undertake partial online/ offline improvements along A40 corridor using minor roads where possible and shared use paths on A40 where necessary	The same as Option 2 between White Mill and Llanegwad, just east of Nantgaredig. Between Abergwili and White Mill an existing shared use path would be used along the front of the Carmarthen County Museum, at the museum, a new path would be created along an existing access track that leads on to an unclassified road running parallel to the A40 before connecting back into the A40 at White Mill. To the east of Llanegwad, the route would follow unclassified roads and right of ways north of the A40 until

Solution	Description
	reaching Broad Oak where it would cross south of the A40 on to another unclassified road before reaching Llandeilo It is anticipated that a new shared use path would be created on the A40 by replacing the grassed verge, and or, widening into the adjacent land to achieve the desired width. Whilst on unclassified roads, no improvements works would be undertaken.
Option 4: Improve existing rights of way along A40 corridor and create new linkages	This would follow the same route as Option 3 between Abergwili and White Mill. At White Mill, a new right of way would be created that links into an existing footpath running along the River Tywi embankment. The route would then broadly follow the path of the dismantled railway, with a new crossing of Afon Cothi just south of Nantgaredig before linking into an existing footpath and heading north towards the A40. At the A40, a new shared use path would be created just south of the highway that broadly follows its alignment and connects to an unclassified road at Felindre. A combination of new, or improved right of ways would then be developed that lead into Dinefwr Park and on to Llandeilo. It is anticipated that improved existing right of ways would be widened and surfaced to a suitable standard and new right of ways created by the purchase of land from the owners. Whilst on unclassified roads, no improvements works would be undertaken.
Option 5: Create new right of way along River Tywi	This would see the creation of a new shared use path along the River Tywi embankment, starting at an existing crossing of the A40 at Tanerdy, Carmarthen and ending at Llandeilo Bridge. It is likely that the northern embankment would be the preferred choice, although this could switch to the south if preferred at any one of the existing river crossings along the route. It is anticipated that the new right of way would be created by the purchase of the necessary land from the owners.
Option 6: Create right of way along dismantled railway	This would follow either Option 2, or Option 4 between Abergwili and White Mill. At White Mill a new shared use path would be created along the line of the dismantled Carmarthen to Llandeilo branch line, terminating at Ffarfach. To reconnect sections of the dismantled railway, two new crossings of River Tywi would need to be created. It is anticipated that the new right of way would be created by purchase of the necessary land from the owners.
Option 7: Provide cycle lane along B4300	This would follow the same principles as Option 1 by providing cycle lanes in both the eastbound and westbound lanes of the B4300 between Carmarthen and Ffarfach. It is anticipated that the cycle lanes would be created by utilising the existing hardstrips, or building out into the highway verge. Unlike the A40 however, there are numerous pinch points in the highway that would make creating a continuous cycle lane unfeasible, leading to discontinuities in the network.

Solution	Description
Option 8: Provide share use path along B4300 between Carmarthen and Ffairfach	This would follow the same principles as Option 2 by providing a shared use path along the B4300. It is anticipated that the shared use path would be created by replacing the grassed verge, and or, widening into the adjacent land to achieve the desired width. Similarly to Option 7, there are numerous pinch points in the highway that would make creating a continuous shared use path unfeasible, leading to discontinuities in the network.
Option 9: Undertake partial online/ offline improvements along B4300 corridor using minor roads where possible and shared use paths on B4300 where necessary.	Starting on the B4300 at Pensarn the route would turn south at the Police Headquarters and follow an unclassified road that runs parallel to the B4300, passing by Tywi View Caravan Park and Pen Y Bedw Lakes, before briefly rejoining the B4300 at Llanarthne. The route would then head south on an unclassified road towards Paxton's Tower, continuing east towards Gelli Aur Country Park before linking back into the B4300 and finishing at Ffarfach. It is anticipated that a new shared use path would be created when the route is on the B4300 by replacing the grassed verge, and or, widening into the adjacent land to achieve the desired width. Whilst on unclassified roads, no improvements works would be undertaken.

4.4.4. The options were analysed using the WelTAG process, and Option 6 was recommended to be taken forward for further development as it offers the greatest overall benefits against the Welsh Impact Areas and Transport Planning Objectives. The table below details how Option 6 was considered against each Transport Planning Objective:

Table 4-3 – Option 6 and Transport Planning Objectives

TPO 1	Beneficial – would be accessible to all and benefit communities across the Tywi Valley.
TPO 2	Beneficial – would provide a link to several tourist attractions and would be well positioned to serve attractions along the A40 and B4300.
TPO 3	Beneficial – would provide a link to a majority of businesses within the Tywi Valley.
TPO 4	Beneficial – likely to improve accident rates on A40 and B4300 by drawing users on to the new path.
TPO 5	Beneficial – likely to encourage some degree of shift to non-motorised transport modes over short distances.
TPO 6	Beneficial – would provide a direct cycle link between Carmarthen and Ffairfach achievable in 1hr.
TPO 7	Beneficial – likely to contribute to reducing the negative impacts of transport on the natural and built environment.

4.4.5. WelTAG Stage 1 recommended that during further development of Option 6, various alternatives should be considered for individual sections due to potential constraints, such as new infrastructure that has been built along the line of the previous railway. Sub options along the core route could be taken from elements of Options 2 and 4 and should be subjected to a detailed WelTAG Stage 2 Appraisal.

WELTAG STAGE 2

4.4.6. Other alternatives to the current design include the adjustments to the route as outlined below within Table 4-4 due to reasons such as habitat and flooding implications. All reasonable adjustments made to date have been outlined below.

Table 4-4 – Options Considered During WelTAG Stage 2

Chainage start - end	Reason for change	Moved to reduce impact on
0 – 300	Route to south along existing PROW 41/2 considered but impact to Dyffryn-Tywi/Blaenwinllan/Plas Bach significant. There is also poor visibility from PROW onto B4310 Station Road, Nantgaredig.	Visibility
1150 – 1300	Existing road bridge in very poor condition, public highway adjacent with very limited usage. Potential conflict with vehicles very unlikely.	Owner Request
1300 – 1650	Moved from old route of railway as it would cause un-necessary severance of the field parcel. Also requested by landowner.	Flooding, Severance, Owner Request
1650 - 2900	Moved from old route of railway into to land within CCC ownership to the south to minimise impact on potential habitat and cattle refuge/feeding area.	Habitat, Severance
2900 – 4000	Path moved to boundary of land owned by CCC to minimise impact on badger habitat within cutting at Barley Mount and to move the path away from the farmstead.	Habitat, Severance
4500	Various accesses from B4300 in Llanarthne considered to minimise impact on Glantowy access. Existing access is a PROW - public access in existence, cyclists could push their bikes here without any change, upgrading to a cycle path logical.	Other
8700 – 10600	Consideration given to moving the path adjacent to the B4300, but route would be through improved/semi improved grassland. Route of old railway is currently a gravel path used for agricultural access/fishing.	Habitat, Flooding
11700 – 12250	Route moved north in-field to minimise impact on the farm business operation at request of tenant.	Owner Request

Chainage start - end	Reason for change	Moved to reduce impact on
12400 - 12800	Route moved in field to remove the need for river training works at apex of bend in river. New route selected to minimise risk of flooding, though a section of land will be severed, the potential exists for habitat creation here. Proposed path will be raised by approximately 1m - an equivalent volume of material will be excavated from the front of the wall to offset any loss in flood storage.	Habitat, Flooding
13400 – 14350	Route moved adjacent to B4300 to minimise impact of fishing operation, potential otter habitat.	Habitat, Owner Request
14350 - 14850	Route moved adjacent to B4300 to minimise impact on school.	Owner Request

4.5 THE 'DO NOTHING' SCENARIO

4.5.1. The 'do nothing' scenario would see the Site continue to remain as it is currently. There are a number of missed opportunities associated with the 'do-nothing' scenario, these include:

- The loss of opportunity for significant improvement of pedestrian and cycle links between Nantgaredig and Ffairfach and associated benefits including;
- Improved road safety for pedestrians and cyclists;
- Improved access to a range of services and facilities including employment and business, education and training, health care, tourism, and leisure activities;
- Social benefits resulting from reduced severance;
- Opportunity to improve health and well-being through the promotion of active modes of travel; and
- Opportunity to improve local air quality and reduce greenhouse gas emissions through the promotion of sustainable forms of transport.

4.5.2. There are, however, a number of effects which would be avoided in the 'do nothing' scenario. These are as follows:

- Change in local landscape character
- Impacts to the environment from construction e.g noise, lighting and waste; and
- Avoidance of habitat removal, including trees.

4.6 SUMMARY AND CONCLUSIONS

4.6.1. A number of alternatives have been considered by the Applicant and the team. An overview and a summary of the design process has been provided above. The design of the Proposed Scheme has taken into account a number of environmental constraints and where applicable integrated them into the design.

4.7 REFERENCES

EIA (Wales) Regulations 2017

[2] WelTAG Planning and Stage 2 Report

5 APPROACH TO EIA

5.1 INTRODUCTION

5.1.1. The ES will be produced in accordance with Schedule 4 of the EIA (Wales) Regulations 2017[19] 'Information for Inclusion in Environmental Statements' and the Welsh Office Circular 11/99[20].

5.1.2. The planning application and ES will be accompanied by a suite of Application Documents, including:

- Planning Supporting Statement;
- Design and Access Statement;
- Pre Application Consultation Report;
- Flood Consequences Assessment;
- Water Framework Directive (WFD) Assessment; and
- Habitat Regulation Assessment.

5.1.3. The above documents will be submitted as standalone documents, although they are intended to be read in conjunction with the ES.

5.2 OBJECTIVES OF THE EIA

5.2.1. The Key objectives of the EIA are as follows:

- Set the legal framework;
- Document the consultation process;
- Establish bassline environmental conditions at the Site and within the surrounding area;
- Identify, predict and assess the significant of environmental effects associated with the Proposed Scheme: positive and negative; permanent and temporary; direct and indirect and short / medium / long term.
- Identify, predict and qualitatively assess the cumulative effects of the Proposed Scheme including those associated with the other identified committed developments; and
- Identify suitable mitigation, enhancement and monitoring measures to prevent, reduce or offset significant negative/or enhance and improve positive environmental effects and identify the residual effects following the implementation of these measures.

5.3 SCREENING (REGULATION 5)

5.3.1. The Proposed Scheme is considered to fall under Schedule 2, Part 10(f) (infrastructure project, construction of roads) of the EIA Regulations 2017. The Proposed Scheme is located adjacent to the River River Tywi Special Area of Conservation (SAC) and Site of Special Scientific Interest

[19] The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 – Statutory Instrument 2017 No. 567 (W.136)

[20] Welsh Office, Circular 11/99 Environmental Impact Assessment (EIA)

(SSSI) and crosses the SAC. Given the sensitivity of these designations, an EIA Screening Opinion request was submitted to CCC Planning Department and a screening opinion was received on 24 November 2017.

5.3.2. With regard to the criteria set out in Schedule 3 of the EIA Regulations 2016 (current at the time of the request) and following consultation with internal consultees, CCC Planning Department adopted a Screening Opinion that the development comprises 'EIA Development' and as such an Environmental Statement (ES) would be required to support a planning application for the Proposed Scheme. A screening request was sent on 27th January 2017 and **Appendix 1.A** contains a copy of the screening opinion dated 24th November 2017.

5.4 SCOPING (REGULATION 14)

5.4.1. An EIA Scoping Report (**Volume IV Appendix 5.3**) was submitted to CCC Planning Department on 5th May 2018 to support a formal request for a Scoping Opinion from CCC Planning Department, and to agree the scope of the EIA, both in terms of environmental topics and likely significant environmental effects that require consideration. The Report also sought agreement on the approach and information to be contained within the ES.

5.4.2. In accordance with Regulation 14(2)(a) of the EIA Regulations 2017 this Report contains the following:

- A plan sufficient to identify the land (Figure 1.1);
- A brief description of the nature and purpose of the development including its location and technical capacity (Section 3 and 4);
- It's likely significant effects on the environment (Section 6); and
- Such other information or representations as the person making the request may wish to provide or make (see below).

5.4.3. The EIA Scoping Report (and its associated appendices) also provided:

- The approach to EIA and content of the ES;
- A description of the Study Area and surrounds;
- Determination of the 'insignificant' environmental topics and effects which can be formally 'scoped out', supported by a suitable technical evidence base; and
- The methodology for the assessment of likely significant environmental effects identified.

5.4.4. This approach ensures that the ES is concise and focused on the likely significant environmental effects.

5.4.5. The Scoping Opinion (**Volume IV Appendix 1.B**) was received by the Applicant from planning advisory department of CCC on the 16 November 2018 after which further additional requirements were outlined for the ES as shown below:

- Biodiversity Net Gain (Ecological Enhancement) Chapter; and
- Updated hydrology model and Flood Consequence Assessment.

5.4.6. Detailed responses to the Scoping Opinion can be found in **Volume IV Appendix 1.D**.

5.5 SCOPE OF THE ES

5.5.1. The EIA Scoping Report (**Volume IV Appendix 5.3**) outlined that the Proposed Scheme has the potential to result in likely significant effects on the environment associated with the following topic areas or elements:

- Landscape and Visual (Chapter 6);
- Historical Environment (Chapter 7);
- Biodiversity (Chapter 8);
- Water Environment and Flood Risk (Chapter 9);
- Geology and Soils (Chapter 10);
- People and Communities (Chapter 11);
- Materials and Waste (Chapter 12); and
- Cumulative Effects (Chapters 13).

5.5.2. Several topics or elements have been scoped out of the EIA and are therefore not reported in the ES. The following table summarises this aspect of the process and the justification for scoping out these topics/elements.

Table 5-1 – Topics and Elements Scoped Out of the Assessment

Topic/element scoped out	Justification
Traffic and Transport	Given the details of the proposed scheme as a non-motorised traffic recreational walking and cycling path with limited interactions with the existing highway network, it is considered that, operationally, impacts would be insignificant and therefore a Traffic and Transportation assessment is be scoped out of the EIA.
Noise and Vibration	Given the details of the proposed scheme as a non-motorised traffic recreational walking and cycling path, it is considered that, operationally, impacts to noise and vibration would be insignificant. The construction contractor will provide the Construction Environmental Management Plan (CEMP) which will outline mitigation measurements, including Best Practicable means (BPM), to reduce the impacts from noise and vibration to in significant effects.
Climate Change	Due to the nature of the scheme, involving a relatively short stretch construction of the pathway, it is not expected that any significant additional climate risks will be present, nor will any existing risks be significantly increased. It is not expected that there will be significant effects in terms of GHG emissions or climate change impacts/resilience and therefore no further assessment has been undertaken.
Risks to the environment (due to accidents and disasters)	Please refer to Section 5.10 for further details
Health	No significant effects on human health have been identified as a result of the Scoping Report and therefore this topic specialism has bee scoped out of the Environmental Statement.

Topic/element scoped out	Justification
Air Quality	No likely significant effects are anticipated during the Scoping Report stage and therefore this topic specialism has been scoped out of the Environmental Statement.
Ecology	Those ecological features considered unlikely to be subject to significant effects from the Scheme have been scoped out of the ES either because the ecological feature is considered likely to be absent from the appropriate ZoI; because no potential effect pathway is envisaged; or because the potential effect pathway can and will be controlled via designed-in avoidance measures.
Materials and Waste	Lifecycle assessment (including embodied carbon and water) of materials and waste. The effort and resources required to undertake a full lifecycle assessment of these elements are deemed disproportionate to the benefit they would offer the assessment of the significance of effect. The consumption of material resources and waste production during operation have been scoped out, as their impacts and associated effects have been deemed to be not significant.
Water	It is proposed that impacts to groundwater resources and surface water and groundwater quality are scoped out of the operational impact assessment.

5.6 CONSULTATION

5.6.1. WSP and the applicant have had previous and ongoing discussions with several statutory consultees. The consultation activities undertaken with statutory consultees can be seen in Table 5-2, and technical consultation will be summarised within the individual technical chapters.

Table 5-2 – Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Carmarthenshire County Council	Scoping Opinion was received on the 16th November 2018	Monthly meetings	Appendix 1.D (Volume IV)
Cadw	A response was received from Cad on the 26th of June.		No concerns were raised other than a query relating to whether fencing would be a requirement of the scheme.

5.6.2. Throughout the EIA process technical and procedural consultation will continue as part of the ongoing scoping and PAC process. Given the size of the proposed scheme formal consultation under the Welsh Government's Pre Application Consultation legislation and guidance will take place. This process will involve consultation of local residents and landowners, community consultees and may involve additional consultees such as local environmental and historic interest groups. A Pre Application Consultation Report will be developed and submitted with the planning application summarising the issues raised during the consultation process, whether they have been addressed and how they have been addressed.

5.7 APPROACH TO THE ASSESSMENT OF THE PROPOSED SCHEME

5.7.1. This section outlines the approach to the assessments, including guidelines followed, phases of the proposed scheme, assessment scenarios, identification of likely significant effects, evaluation of significance and approach to mitigation measures.

PHASES OF PROPOSED SCHEME AND ASSESSMENT SCENARIOS

5.7.2. The following scenarios will be assessed for the Proposed Scheme:

1. **Baseline** – existing site conditions will be reported based on desk and field assessment;
2. **Construction** – report on the likely significant effects of the Proposed Scheme during the construction phase (over the next 5 years);
3. **Operation** – report on the likely significant effects of the Proposed Scheme once complete and operational; and
4. **+15 years/Future baseline** (in relevant technical chapters) – report on the likely significant effect of the Proposed Scheme after 15 years of being operational.

IDENTIFICATION OF LIKELY SIGNIFICANT EFFECTS AND EVALUATION OF SIGNIFICANCE

5.7.3. The technical assessments within the ES have included consideration of the following, in accordance with HA205/08 of the DMRB guidelines:

- Positive and negative effects;
- Short (0 – 2 years), medium (2 – 10 years) and long (> 10 years) term effects;
- Direct and indirect secondary effects;
- Permanent and temporary effects; and
- Cumulative effects.

5.7.4. Several criteria have been used to determine whether or not the likely environmental effects of the Proposed Scheme will be deemed 'significant'. The effects have been assessed quantitatively, where possible. Generally, the significance of effects has been assessed using international, national and local standards.

5.7.5. Where no published standards exist, the assessments presented in the technical chapters describe the professional judgements (assumptions and value systems) that underpin the attribution of significance. For certain technical topics, widely recognised published significance criteria and associated terminology have been applied and these are presented in the technical chapters and associated appendices where relevant.

5.7.6. The assessment of significance considers the magnitude of change (from the baseline conditions), the sensitivity of the affected environment / receptors and (in terms of determining residual effects) the extent to which mitigation and enhancement measures will reduce or reverse negative effects.

5.7.7. In addition, further influences such as those listed below have been factored into the assessment using professional judgement:

- Likelihood of occurrence;
- Geographical extent;
- The value of the affected resource;
- Adherence of the proposals to legislation and planning policy; and
- Reversibility and duration of the effect.

5.7.8. The magnitude (scale) of change for each effect has been identified and predicted as a deviation from the established baseline conditions, for the site preparation, demolition and construction phase, and the operational phase of the Proposed Development. The scale used (very high, high, medium, low, and negligible) is shown in Table 5-3.

5.7.9. The sensitivity of the receptors / receiving environment to change has been determined using professional judgement, consideration of existing designations (such as Conservation Areas and Air Quality Management Areas (AQMA's)) and quantifiable data, where possible.

5.7.10. Each effect has been assessed against the change of magnitude and the sensitivity of the receptor as shown in Table 5-3.

Table 5-3 – Matrix for Determining Significance of Effect

Environmental Value (sensitivity)	Magnitude of impact (degree of change)					
	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

5.7.11. The likely significance of effects reflects judgements as to the importance or sensitivity of the affected receptor(s) and the nature and magnitude of the predicted changes. For example, a moderate negative effect on a feature or site of low importance will be of lesser significance than the same effect on a feature or site of high importance.

5.7.12. Effects that are deemed to be significant for the purpose of this assessment are those that are described as being moderate or major positive or negative.

5.7.13. The characteristics of an effect will vary depending on the duration of the activity causing the effect, the sensitivity of the receptor and the resultant change. It is therefore necessary to assess whether the effect is short, medium or long term; temporary or permanent; positive and negative, and reversible or irreversible. Effects that are temporary are reversible and generally confined to the construction period.

5.7.14. For the purposes of this ES the terms used in the assessment of effects are generally defined as follows:

Table 5-4 – Description of the Assessment of Effects

Assessment of effects	Typical descriptors of effect
Short-term:	Where the effect would be of short duration and would occur for up to 2 years.
Medium-term:	Where the effect occurs for a period of between 2 - 10 years.
Long-term:	Where the effect occurs for 10 years or more and includes permanent effects.
Temporary:	Where the effect occurs for a limited period of time and the change at a defined receptor can be reversed.
Intermittent:	Where the effect occurs for short periods of time and may re-occur occasionally at regular or irregular intervals.
Permanent:	Where the effect represents a long-lasting change at a defined receptor.
Direct:	Where the effect is a direct result (or primary effect) of the Proposed Development;
Indirect:	A secondary effect which occurs within or between environmental components, may include effects on the environment which are not a direct result of the Proposed Development, often occurring away from the proposals or as a result of a complex biological or chemical pathway
Cumulative:	The collective effects of changes that may be insignificant individually but in combination, often over time, have the potential to be significant (see Section on cumulative below).

5.7.15. Where a more appropriate effect duration scale or definition of the above terms is applicable to a technical discipline this should be clearly outlined with the technical chapter

5.7.16. The following terms are used to describe the environmental value (or sensitivity), where they are predicted to occur:

Table 5-5 – Description of the Environmental Value or Sensitivity

Value (sensitivity)	Typical descriptors
Very high	Very high: very high importance and rarity, international scale and very limited potential for substitution.
High	High: High importance and rarity, national scale, and limited potential for substitution.

Value (sensitivity)	Typical descriptors
Medium	Medium: High or medium importance, and rarity regional scale, limited potential for substitution.
Low	Low: Low or medium importance and rarity, local scale.
Negligible	Negligible: Very low importance and rarity, local scale.

5.7.17. The following terms are used to describe the magnitude of impact, where they are predicted to occur:

Table 5-6 – Description of the Magnitude of Impact

Magnitude of impact	Typical criteria descriptors
Major positive effect:	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (beneficial).
Major negative effect:	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (adverse).
Moderate positive effect:	Benefit to, or addition of key characteristics, features or elements; improvement of attribute quality (benefit).
Moderate negative effect:	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (adverse).
Minor positive effect:	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).
Minor negative effect:	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one or maybe more key characteristics, features or elements (adverse).
Negligible:	Very minor loss or detrimental alteration to one or more characteristics, features or elements (adverse). Very minor benefit to or positive addition of one of more characteristics, features or elements (beneficial).
No change:	No loss or alteration of characteristics features or elements, no observable impact in either direction.

5.7.18. The following terms are used to describe the significance of effect categories, where they are predicted to occur:

Table 5-7 – Description of the Significance of Effect

Significance category	Typical description of effect
Very large:	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally but not exclusively associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large:	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision making process.
Moderate:	These beneficial or adverse effects may be important but are not likely to be key decision making factors. The cumulative effects of such factors may influence decision making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight:	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project.
Neutral:	No effects of those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

DESIGN SOLUTIONS AND MITIGATION MEASURES

5.7.19. Schedule 4, Part 7 of the EIA Regulations[1] states that an ES should include:

"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 (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

5.7.20. The Institute of Environmental Management and Assessment (IEMA) issued 'Shaping Quality Development' in November, 2015[21] and 'Delivering Quality Development'[22] in July, 2016, in accordance with these guidance documents, three types of mitigation have been identified and used within the ES: primary; secondary; and tertiary.

5.7.21. These terms are defined as follows:

[21] Institute of Environmental Management & Assessment (IEMA), EIA guide to Shaping Quality Development (2015)

[22] Institute of Environmental Management & Assessment (IEMA), EIA guide to Delivering Quality Development (2016)

- **Primary mitigation** – modifications to the location or design of the Proposed Scheme made during the pre-application phase that are an inherent part of the project;
- **Secondary mitigation** – actions that will require further activity in order to achieve the anticipated outcome. These may be imposed through inclusion within the ES; and
- **Tertiary mitigation** – actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.

5.7.22. As part of the iterative design process, the Proposed Scheme has evolved to take account of environmental constraints and opportunities. For further details of design iterations see **Chapter 4 - Consideration of Alternatives**. As a result of the design iterations a number of likely significant environmental effects have been 'designed out' or reduced in severity. This type of mitigation is described as primary mitigation and is considered as part of the Proposed Scheme as outlined in **Chapter 3 – Description of the Proposed Scheme**.

5.7.23. In addition, in the description of the construction proposals outlined in **Chapter 3 – Description of the Proposed Scheme**, there are a number of measures / actions that would occur with or without input from the EIA feeding into the design process. These measures / actions that will be undertaken to meet other existing legislative requirements or are considered to be standard practices used to manage commonly occurring environmental effects. These are tertiary mitigation and are outlined in **Chapter 3 – Description of the Proposed Scheme**.

5.7.24. The assessment of the effects of the Proposed Scheme has been based on the information contained within **Chapter 3 - Description of Proposed Scheme**, which details the primary and tertiary mitigation. This mitigation is also presented within the 'Relevant Elements of the Proposed Scheme and Establishing the Pre-Mitigation Scenario' section of each Chapter. The assessment of the likely significant environmental effects for the pre-mitigation scenario takes such mitigation into account in determining the magnitude of change.

5.7.25. Following the conclusion of the effects based on the Proposed Scheme, any further mitigation measures (i.e. secondary mitigation) is outlined within the 'Assessment of Effects, Mitigation Measures and Residual Effects' section of each Chapter. These mitigation measures will further reduce a negative effect or enhance a positive one.

5.7.26. The primary, secondary and tertiary mitigation is summarised in **Chapter 15 - Summary of the ES**. In line with the IEMA 'Delivering Quality Development'[4] a framework CEMP has also been produced, which documents / records primary, secondary and tertiary mitigation to ensure suitable identification and monitoring of mitigation beyond the submission of the planning application and through to delivery.

5.8 INTERACTION BETWEEN EIA, HRA AND WFD

5.8.1. The Habitats Directive (92 / 43 / EEC) and transposing UK Regulations (Conservation of Habitats and Species Regulations 2017) and Offshore Marine Conservation (Natural Habitats Regulations 2007) requires consenting authorities to decide whether or not a project may have a significant effect on a Natura 2000 site. This process is known as HRA. The overarching aim of HRA is to determine, in view of a site's conservation objectives and qualifying interests, whether a plan, either in isolation and / or in-combination with other plans or projects, would have a potentially significant effect on the integrity of a Natura 2000 ecological site. Given the proximity of the Study Area to the

River Tywi SAC, a HRA will be undertaken for the Proposed Scheme. This will provide the consenting authority with sufficient information to decide whether the Proposed Scheme may have a significant effect on the integrity of the River Tywi SAC.

5.8.2. Given the Scheme will require construction activities near the boundary of the River Tywi SAC, a full Appropriate Assessment (the second stage of the HRA process) may be required.

5.8.3. The WFD (2000 / 60 / EC) was transposed into UK legislation by The Water Environment (WFD) Regulations 2003[23]. The Directive aims to prevent the deterioration of aquatic ecosystems and associated wetlands through reoccurring pollution of surface and ground water whilst contributing to flood mitigation. The purpose of WFD is to prevent the deterioration of aquatic ecosystems and associated wetlands through reducing pollution of surface and ground water whilst contributing to flood mitigation. Under WFD legislation, no deterioration of waterbodies is permitted. As the Site includes a main river, the Proposed Scheme has the potential to affect the natural water environment.

5.8.4. As such, a standalone WFD assessment (**Volume IV of the ES**) has been prepared to support the EIA and provide the consenting authority with sufficient information to decide whether the Proposed Scheme may have an effect on the status of affected waterbodies.

5.9 RISK OF MAJOR ACCIDENTS AND/OR DISASTER

5.9.1. Schedule 4(8) of the EIA Regulations[1] requires an ES to include "*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. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies."*

5.9.2. The assessment of major accidents and disasters was not included in the EIA Scoping Report (**Volume IV Appendix 5.3**) submitted on 05 May 2018, nor was it a requirement identified within the Scoping Opinion received from Carmarthenshire County Council on 16 November 2018 (**Volume IV Appendix 1.B**).

5.9.3. Given the processes and measures that are in place as part of the Proposed Scheme, it is considered that the risks of any major accidents and disaster event occurring will be managed to be as low as reasonably practicable. Therefore, effects related to the risk of major accidents and / or disasters are not considered to be significant and will not be assessed further within this ES.

[23] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the 'Water Framework Directive')

5.10 REFERENCES

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 – Statutory Instrument 2017 No. 567 (W.136)

[2] Welsh Office, Circular 11/99 Environmental Impact Assessment (EIA)

[3] Institute of Environmental Management & Assessment (IEMA), EIA guide to Shaping Quality Development (2015)

[4] Institute of Environmental Management & Assessment (IEMA), EIA guide to Delivering Quality Development (2016)

[5] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the 'Water Framework Directive')

6 LANDSCAPE AND VISUAL

6.1 INTRODUCTION

6.1.1. This chapter reports the assessment of likely significant effects on the landscape and on visual amenity arising from the Proposed Scheme.

6.1.2. Landscape and visual assessments are separate although linked processes, describing closely related but distinct sets of effects.

LANDSCAPE

6.1.3. Landscape assessment considers the effects of change and development on landscape as a resource.

6.1.4. The character of the landscape derives from a combination of physical factors, natural processes and human intervention. Landscape effects are a combination of the physical changes to the fabric of the landscape arising from the Proposed Scheme and perceptual changes – the way these physical changes alter how the landscape is perceived.

6.1.5. The landscape assessment considers the effect of the Proposed Scheme on the landscape as a whole; effects on significant individual elements of the landscape; and effects on characteristic combinations or patterns of elements and how these are seen to affect its character and quality.

VISUAL

6.1.6. Visual assessment is concerned with the views that are available to people who may be affected by the Proposed Scheme, and their perception and responses to changes in these views.

6.1.7. Visual effects arise from changes in the composition and character of views available in the area affected. The assessment considers the likely change that would be experienced, including the effects both on specific views and on general visual amenity – the pleasantness of the view or outlook – that the people affected enjoy.

6.1.8. For the purposes of assessment, whilst it is the people living, working, passing through or enjoying recreational activities in the area who actually see the views and enjoy the visual amenity, it is the places they may occupy that are mapped and described as the visual receptors.

6.1.9. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to **Chapters 7 - Historic Environment, Chapter 8 – Biodiversity and Appendix 6.A- Detailed Arboricultural Report.**

6.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

LEGISLATION

6.2.1. The UK is a signatory to the European Landscape Convention (ELC) which was ratified in 2006 and became binding in the UK from 1 March 2007. The ELC requires “landscape to be integrated into regional and town planning policies and in cultural, environmental, agricultural, social and economic policies, as well as any other policies with possible direct or indirect impacts on landscape”. It also acknowledges that all landscapes can be important, whether or not they are designated.

6.2.2. There is no legislation specifically covering landscape character or visual amenity but the spirit of the ELC is carried through in planning policy and government guidance.

NATIONAL PLANNING POLICY

6.2.3. Planning Policy Wales (PPW) (Edition 11) (Ref 6.2) sets out the land use planning policies of the Welsh Government. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

LOCAL PLANNING POLICY

6.2.4. The study area lies wholly within Local Planning Authority (LPA) area: Carmarthenshire County Council.

6.2.5. The Planning Policy applicable to the Proposed Scheme is as follows:

- Carmarthenshire County Council Local Development Plan (CLDP) (adopted December 2014) (Ref. 6.3).

6.2.6. Of particular relevance is CLDP Policy EQ6 Special Landscape Areas, 6.6.37; The design of developments should be sensitive enough to ensure that the scheme makes a positive contribution to the landscape. In this regard, proposals will be expected to show that they will not have an unacceptable impact on their specific distinctive features or characteristics of the SLA.

6.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION

6.3.1. **Table 6.1** provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 6.1 Summary of Consultation Undertaken to Date

Body / organisation	Contact at body / organisation	Meeting dates and other forms of consultation	Response	Summary of outcome
Carmarthenshire County Council (CCC)	Landscape Officer	02/08/2018 and 28/08/18 A draft schedule of proposed viewpoints was emailed to CCC for consideration. 01.10.18 Emails and telephone discussions	N/A	01/10/2018:- CCC Landscape Officer responded with agreement of the locations. It was agreed that explanatory narrative will be included in the LVIA setting out the reasons for scoping out assessment of particular residential receptors within the ZTV, for example because property enclosed by dense vegetation, or views from property orientated away from scheme.

Carmarthenshire County Council (CCC)	Landscape Officer	05.05.2018 Scoping Opinion Response	The Brecon Beacons National Park lies immediately south east of the Tywi Valley at the eastern extremity of the scheme, as noted at 3.5.13 of the Scoping report. It is noted that 5.3 of the report states that landscape will be considered fully in the Environmental Statement and we agree with this statement. As noted in 3.5, elevated areas in the Brecon Beacons National Park could fall within the ZVI and the study area. The assessment should include consideration of views to and from the National Park along with potential impacts on the natural beauty, character and special qualities of the park. Reference should be made to the National Park Management Plan, Special Qualities and Landscape Character Assessment. Reference is made in 5.5 of the report to the National Landscape Character Area (NLCA 41 Tywi Valley) and Special Landscape Area. The assessment should also refer to and consider the 5 Aspect Areas of LANDMAP, the all-Wales landscape character assessment and the Visual and Sensory and Historic Landscape Aspect Areas.	All points to be covered in the LVIA
Carmarthenshire County Council (CCC)	Landscape Officer	December 2022	Highlighted need to provide at least one viewpoint within the BBNP	Additional viewpoints added

BEST PRACTICE GUIDANCE

6.3.2. This assessment has been carried out with reference to the following:

- Guidelines for Landscape and Visual Impact Assessment', 3rd Edition 2013 (GLVIA3) (**Ref. 6.4**);
- Design Manual for Roads and Bridges - LA107 – Landscape and Visual Effects (Ver 2 – Feb 2020) (**Ref. 6. 5**); and
- Visual Representation of development proposals, Technical Guidance Note 06/19 (2019) (**Ref. 6.5**).

OVERVIEW

6.3.3. As noted above, this chapter reports the assessment of likely significant effects on the landscape and on visual amenity arising from the Proposed Scheme. It describes the assessment methodology, the baseline conditions at the Site and area that may be affected, and the mitigation that has been built into the design.

6.3.4. It analyses the landscape and considers its sensitivity to the development proposed. It defines the extent to which the Proposed Scheme would be visible, sets out the range and type of people (or places they may occupy) likely to be affected, and it is illustrated with a representative sample of views.

6.3.5. The assessment reports on the residual effects of the design taking into account committed mitigation.

STUDY AREA

6.3.6. The study areas for the landscape and visual assessment are initially defined by the extent to which the Proposed Scheme may be visible (the visibility study below).

6.3.7. The study area for the landscape assessment is informed by the visibility study, and covers both the site itself and the full extent of the wider landscape around it which the Proposed Scheme may influence in a significant manner

6.3.8. The study area for the visual assessment is directly based on the results of the visibility study: by definition, visual effects can only occur where at least some part of the development is visible.

VISUAL ENVELOPE

6.3.9. This is the area from within which the development would likely be visible and any significant visual effects will therefore be contained within this area.

6.3.10. This zone has been established through study of topographical maps and site assessment. The visual envelope is defined by the topography and is also influenced by many other factors including intermediate visual intrusions such as blocks of vegetation, buildings, and structures. A visual envelope has been established to show the area of land from which there could be a view of any part of the proposed scheme including bridges, embankments, cycleway, signs, fencing, cyclists and pedestrians. See **Figure 6.1**, Visual Envelope.

6.3.11. The assessment will make the following considerations when using it as an analytical tool:

- A number of areas within the visual envelope, from which there are potential full or partial views of the Proposed Scheme, comprise land where access to the general public is not permitted;
- The visual envelop does not take account of the screening and/or filtering of views from all intervening features, particularly lower features; and
- The visual envelop does not take account of the orientation of a viewer.

VIEWPOINTS

6.3.12. The visual envelope was used to identify potential viewpoints from a range of distances and directions, to give a representative sample of the likely views of the Proposed Scheme to illustrate this assessment, and to illustrate key and important views.

6.3.13. The viewpoints agreed with the statutory consultees to illustrate this assessment are shown on **Figure 6.3, Landscape Context (Pages 1 to 3)** and listed in **Table 6.3**, in the baseline section of this chapter.

6.3.14. It should be noted that the assessment is not limited to consideration of the effects from the viewpoints illustrated.

BASELINE DATA COLLATION

6.3.15. Information has been gathered primarily from a structured site survey, supported by desk study and consultation with relevant consultees.

6.3.16. The desk study included:

- analysis of Ordnance Survey (OS) mapping relating to landform, vegetation, settlement patterns and the drainage regime;
- consideration of historic OS maps to understand the development history of the area;
- analysis of aerial photography and online photographic resources;
- review of relevant local planning documents and;
- review of relevant landscape character analyses.

6.3.17. Relevant publications that have been taken into consideration include:

- Natural Resource Wales (NRW) LANDMAP – the Welsh landscape baseline (**Ref. 6.7**); and
- NRW National Landscape Character Areas (NLCA) (**Ref. 6.8**).

6.3.18. Detailed landscape and visual site survey work was carried out on the 3rd May 2022 and subsequently during December 2022. The field survey was designed to collect data for both the landscape and visual impact assessments and the following tasks were undertaken:

- Recording the baseline landscape and its character;
- Checking and ground-truthing the visual receptors;
- Identifying impacts and evaluation of effects, both on the landscape and on visual amenity;
- Consideration of potential design and mitigation proposals; and
- Site photography from agreed viewpoints.

6.3.19. Photography was undertaken taken in overcast conditions, with clear air and good visibility.

6.3.20. A full frame digital camera with a 50 mm prime lens was used, mounted on a tripod with a levelled panoramic head.

METHODOLOGY

6.3.21. The assessment considers two distinct but closely related areas: landscape character and visual amenity.

6.3.22. Landscape assessment considers the effects of the Proposed Scheme on landscape character and landscape as a resource.

6.3.23. Visual assessment is concerned with the views that are available to people who may be affected by the Proposed Scheme, and their perception and responses to changes in these views.

6.3.24. The assessment involves four key stages:

- Establishment of the baseline conditions: the landscape character and visual context of the receiving environment and the sensitivity to change of these resources;

- Contributions to the iterative process of design & mitigation based on understanding the nature, form and features of the Proposed Scheme;
- An evaluation of the magnitude of change likely to result from the Proposed Scheme, both during construction and at completion on visual amenity and the landscape resource, and;
- An assessment of the significance of landscape and visual effects considering the sensitivity of resources and the magnitude of change.

6.3.25. For both the landscape and visual assessments, the significance of effect derives from the combination of the magnitude of change and the sensitivity of the landscape or visual receptor. A full methodology is set out in **Appendix 6.1**.

6.3.26. Effects found to be moderate or greater are normally considered to be significant in the context of the EIA Regulations, whilst effects less than moderate are considered not significant.

6.3.27. **Table 6.2** is derived from GLVIA 3 and provides general guidance on the inter-relationship between magnitude of change and the sensitivity of receptor. However, this matrix is used as a framework and guide for constancy, not as a prescriptive formula; the level of effect (and thus significance) would very be depending on the circumstances, the type and scale of the development proposed and the baseline context.

Table 6.2 Significance Matrix

		Magnitude				
		High	**Medium**	**Low**	**Negligible**	**Neutral (No change)**
Sensitivity	**High**	Major	Major to Moderate	Moderate to Minor	Minor	Neutral
	Medium	Major to Moderate	Moderate	Minor	Minor to Negligible	Neutral
	Low	Moderate to Minor	Minor	Minor to Negligible	Negligible	Neutral
	Negligible	Negligible	Negligible	Negligible	Negligible	Neutral

6.3.28. It should be noted that professional judgement is always used in determining both the sensitivity of a receptor and the magnitude of change.

6.3.29. There are situations where the conclusions regarding significance in this chapter differ from that suggested in **Table 6.2.**

6.3.30. This is most frequent where there is a low but not negligible magnitude of visual impact on a receptor of high sensitivity, where following the table gives a conclusion of moderate effect but the

assessor considers the effect not to be significant. In this circumstance the significance would be found to be 'minor to moderate' or even 'minor', depending on circumstances.

NATURE OF EFFECT

6.3.31. Effects can be either beneficial or adverse and, in some cases, neutral (neither beneficial nor adverse).

6.3.32. The aim of the LVIA is to provide an objective assessment of the relationship between the Proposed Scheme and the landscape in which it would be located and seen. As part of this it is also important to consider the nature of the proposed change in the context of the key characteristics of the landscape.

6.3.33. For the purposes of this LVIA, and to ensure this LVIA assesses the worst-case scenario, the nature of all effects is considered as adverse, unless otherwise identified.

6.3.34. The assessment considers the effects of the Proposed Scheme at various stages and the predicted duration of effect - whether these are temporary (short or medium term) or permanent.

Construction Period

6.3.35. The temporary effects specific to the construction process[24]

Operational period

Permanent effects

6.3.36. The effects arising from the existence of the development. The design life of the Proposed Scheme is 25+ years. For the purposes of this assessment that is considered long enough that an ordinary observer would reasonably consider it to be permanent.

Operational effects

6.3.37. The effects arising from the operation of the Proposed Scheme: the effects from the users using the cycleway.

6.3.38. The effect on the historic landscape, on conservation areas, and on the setting of cultural heritage assets is covered by the cultural heritage assessment in **Chapter 7**. The LVIA informs the cultural heritage assessment about the extent of study area that has been formed by the potential visibility. It addresses the 'present day' effects on heritage assets that are also landscape or visual receptors because they are distinct local landscapes or tourist/visitor attractions where views are an important contributory factor to the experience.

6.3.39. The landscape assessment also takes note of features or locations of natural heritage interest where these contribute to the character of the landscape.

6.3.40. The temporal scope of the assessment is based on the following timescales:

[24] The permanent (rather than temporary) effects that arise during this time – from landform changes, permanent loss of vegetation or landscape features, etc,- and that exist throughout the life of the Proposed Scheme are considered under the operational period.

- 2023 will be the baseline year;
- 2023 – 2025 will be the construction phase of the project;
- 2025 will be the opening year when the project is in operation; and
- 2040 will be the 'design' year, 15 years after opening.

6.3.41. The assessment will use the following scenarios:

- During the construction period, assuming a maximum visibility or maximum perceived change situation (i.e. when construction activity is at its peak for any given view), and noting how long that period would be likely to last;
- A winter's day in the year that the project would open to pedestrians and cyclists (i.e. before any planted mitigation has begun to take effect). This is usually a reflection of the operationally non-fully mitigated/maximum visibility scenario; and
- A summer's day in the fifteenth year after opening (i.e. when any planting mitigation measures can be assumed to be substantially effective). This is usually a reflection of the near fully mitigated scenario under normal conditions.

6.3.42. Landscape and visual effects will be assessed separately. Mitigation will be addressed as an intrinsic part of the assessment process.

6.4 BASELINE CONDITIONS

STUDY AREA

6.4.1. The study area for landscape effects covers the scheme site and the wider landscape context within which the scheme may influence landscape character. In this case, the study area for effects on landscape character is also the visual envelop and is the same as the study area for the assessment of visual effects.

6.4.2. The nature of landscape and visual receptors and the likely effects of the Proposed Scheme have been verified in the field through site visits carried out in May 2022 and subsequently in December 2022.

6.4.3. The visual envelope suggests that views of the Proposed Scheme will be available from some areas within the valley bottom and from locations on the northern and southern slopes.

6.4.4. The scale of the proposed bridges over the Cothi and Towy suggests that they would be unlikely to be visible to viewers beyond 2km. Equally landscape effects will be limited to either direct impacts on landscape features or potential impacts on landscape character that would be dependent on clearly perceptible indivisibility with the Site.

6.4.5. An additional viewpoint (Supplemental Viewpoint B), beyond the extents of the visual envelope approximately 5.4km to the east of the Proposed Development on the upper slopes of the Brecon Beacons, has been included to illustrate that the scheme will not be visible, even when views from the BBNP are elevated and unobstructed.

LANDSCAPE CONTEXT

6.4.6. The proposed path lies within the lower Towy Valley. The Towy Valley is a scenic historic landscape, including the broad floodplain, meandering river and wooded slopes, with parklands and castles. Downstream of Llandovery the valley consists of the wide and active level flood plain,

together with its northern and southern slopes, which provide outstanding views over the valley and from the northern slopes also towards the Brecon Beacons.

6.4.7. The meanders of the slow-moving river and its pools and oxbow lakes, contrast with the flat land and straight lines of the drainage ditches and hedges of the valley floor.



Looking east along the Towy Valley towards the Brecon Beacons, from Paxton's Tower

Vegetation

6.1.1. Although dominated by agricultural land, which is mostly improved pasture, the flood plain has a significant number of mature hedgerows and field trees, and the valley slopes, particularly the steeper southern slopes are well wooded.

6.1.2. The landscape of the study area contains species rich hedgerows with frequent oaks. Hedgerow species include hawthorn, hazel, field maple, willow, and ash. The disused railway is well vegetated in most areas.

6.1.3. Riverine trees include willow, oak, alder, sycamore and ash.



Riverine trees along banks of the River Towy, view from footpath 41/6, Aber Towy farm in middle distance.

6.4.8. Woodland within the valley bottom includes River Bed Wood, west of Gelli Aur College, dominated by oak, ash and willow. Lovelodge Wood is a coniferous plantation at the eastern end of the Scheme.

6.4.9. The disused railway in the study area is bordered by linear woodland along most of its length, generally dominated by oak and ash.



View from gateway south of Pentrecwn of linear tree belt alongside disused railway

6.4.10. There are a number of landmark oak trees to the west of the entrance to the Bro Dinefwr secondary school in Ffairfach.



View looking towards landmark oak trees on west side of school entrance

Settlement

6.4.11. There are a number of towns and villages and small settlements in the vicinity of the Proposed Scheme comprising;

- Nantgaredig, lies at the western end of the Scheme, a liner settlement on the B4310;
- Pont ar Gothi, on the River Cothi, and the A40;
- Llanegwad, to the north of the River Towy, and to the south of the A40;
- Llanarthne, south of the River Towy, on the B4300;
- Ffairfach, towards the eastern end of the Scheme; and
- Llandeilo, on the north bank of the River Towy, lies at the eastern end of the Scheme.

6.4.12. Small hamlets within the study area include Dryslwyn, Golden Grove and Llangathen.

6.4.13. Traditional farms in the valley have typically expanded and often now include large agricultural buildings.

Current Land Use

6.4.14. This is a rural pastural landscape on the flood plains of the river. Towards the western end of the site the scheme crosses the river Cothi, a tributary of the Towy. The Towy valley is wide with the river flowing in an east to west direction. The main land uses are agricultural pastureland,

watercourses, small residential settlements, and woodland. The land supports several farm holdings which are mainly dairy cattle, beef cattle and sheep; there are also a small number of equine units.

Public Rights of Way (PRoW)

6.4.15. Public footpaths are present within the study area. Footpaths cross the proposed cycleway at Nantgaredig, to the north of Llanarthne and at its approximate mid-length point close to Gelli Aur Farm.

6.4.16. National Cycle Route 47 runs close to the western extent of the scheme, along the B4300 as far east as the village of Llanarthne before turning south towards the National Botanical Gardens of Wales.

Cultural Heritage

6.4.17. The landscape of the study area is rich in heritage features. Historic parklands and castles are also a feature of this part of the valley, including Gelli Aur (Golden Grove), Dinefwr Park, and Dinefwr and Dryslwyn castles. These castles have imposing locations on limestone outcrops, over-looking the valley.

6.4.18. Paxton's Tower is a Grade II* listed Neo-Gothic folly on top of the hill south of Llanarthne.

6.4.19. The proposed scheme is located within the Towy Valley Registered Landscape of Outstanding Historic Interest.

6.4.20. The Site lies within the Towy Valley Historic Landscape which comprises eight Historic Landscape Character Areas as outlined by the Dyfed Archaeological Trust which includes the following:

- Nantgaredig – Derwen Fawr;
- Abergwili – Llanegwad Parish;
- Llangathen;
- Dryslwyn;
- Dinefwr Park;
- Llanfhangel Aberbythych;
- Carmarthen – Llandeilo; and
- Llandeilo.

6.4.21. The Llandeilo Conservation Area occupies a large area of land including the historic centre of the town and the Dinefwr Estate which are to the north of the scheme at its eastern extent. The smaller conservation area of Llangathen is situated north of the scheme to the west of the Llandeilo Conservation Area.

6.4.22. Cultural Heritage Designations are considered in the LVIA in terms of their contribution to landscape character and visual amenity where they are visitor destinations. Impacts on their cultural heritage and setting is addressed in **Chapter 7: Historic Environment.**

Topography

6.4.23. The Site lies in the bottom of the Towy Valley, where the land falls from around 200m AOD (above ordnance datum) on the south side of the valley, and 150m AOD on the north side, to around 10m AOD in the valley bottom.

Tranquillity

6.4.24. LANDMAP identifies the valley as having only slight night-time light pollution, with small sources of light and some glow from Carmarthen. The area is generally tranquil away from main roads.

LANDSCAPE DESIGNATIONS

National landscape designations

6.4.25. The Proposed Scheme is located approximately 0.5km from the Brecon Beacons National Park, which lies within the south-eastern end of the study area. As shown on **Figure 6.2.**

6.4.26. The Brecon Beacons National Park Management Plan (A Management Plan for the Brecon Beacons National Park 2015 – 2020) lists the park's Special Qualities. The following is of relevance to this assessment;

- *The Park's sweeping grandeur and outstanding natural beauty observed across a variety of harmoniously connected landscapes, including marvellous gorges and waterfalls, classic karst geology with caves and sink holes, contrasting glacial landforms such as cliffs and broad valleys carved from old red sandstone* ***and prominent hilltops with extensive views in all directions.***

Local landscape designations

6.4.27. Special Landscape Areas (SLA) are a non-statutory designation applied by the local planning authority to define areas of high landscape importance within their administrative boundary. Areas of high landscape importance may be designated for their intrinsic physical, environmental, visual, cultural and historical value in the contemporary landscape. Landscapes designated as a SLA may be unique, exceptional or distinctive to the local authority area.

6.4.28. The proposed path lies entirely within the Towy Valley SLA. The lower Tywi valley, downstream of Llandovery consists of the wide level flood plain, together with its northern and southern slopes, which provide outstanding views over the valley and from the north towards the Brecon Beacons.

6.4.29. The SLA are described in Appendix 6 of the CLDP. The key characteristics of the Towy Valley SLA relevant to this assessment are summarised as follows:

- The lower Tywi valley down stream of Llandovery consists of the wide level flood plain, together with its northern and southern slopes which provide outstanding views over the valley and from the north towards the Brecon Beacons. Although dominated by agricultural land and larger fields than in the mid and upper valley, the flood plain also has a significant number of mature hedgerow and fields trees, and the valley slopes, particularly the steeper southern slopes are well wooded. Historic parklands and castles are also a feature of this part of the valley, e.g. Gelli Aur and Dinefwr Park, and Dinefwr and Dryslwyn castles. The castles in the valley have imposing locations on limestone outcrops, overlooking the valley. Traditional farms in the valley have typically expanded and often now include large agricultural buildings. Most of the settlements in this part of the valley have also grown with an element of modern building around a more traditional core. Inappropriate development continues to threaten the conservation of this outstanding landscape, hence the reason for its designation.

NATIONAL LANDSCAPE CHARACTER AREA (NLCA)

6.4.30. The study area lies predominantly within National Landscape Character Area (NLCA) 41: Tywi Valley.

6.4.31. The key characteristics of this area are:

- *Meandering River Towy and its active flood plain – westward flowing and joined by many tributaries from nearby upland areas;*
- *Fertile grazing pastures – helped by alluvium-rich soils. Dairy cattle and sheep with occasional cereal cropping;*
- *Wooded slopes to valley sides - Broadleaved woodlands cover some slopes but cover is not continuous;*
- *Regular pattern of medium to large rectilinear fields enclosed by hedgerows and hedgerow trees – including species rich hedgerows with frequent hedgerow oaks;*
- *Historic designed parks and gardens; and*
- *Historic Defensive sites - the valley is overlooked by strategically located defensive sites including Iron Age hillforts and medieval stone castles.*

6.1.4. The southern periphery of the study area runs parallel, and in parts, just within the boundary of NLCA 33: Gwendraeth Vales. The key characteristics of this area relevant to this assessment are:

- *Small valleys with minor streams - cross the landscape, feeding the Gwendraeth, Lougher and Tywi rivers;*
- *Exposed land on the limestone and sandstone ridges - common grazed;*
- *Patchwork of medium sized pasture fields enclosed by thick hedges;*
- *Mining and quarrying industrial remains – some now reclaimed but many quarries still visible, and old limekilns and C19th century coal mining settlements;*
- *Linear settlements - linked by a network of roads. Modern suburban and industrial development is spreading along roads in places and at nodes; and*
- *Quiet, tranquil, rural part within National Park – though linked geologically, the NE finger lies within the Brecon Beacons National Park and is much quieter and not industrialised.*

6.4.32. Parts of the northern edges of the study area lay within NLCA 42: Pembroke and Carmarthen Foothills. The key characteristics of this area relevant to this assessment are:

- *Hills and valleys, foothills - between the Cambrian Mountains and Preseli Hills. The underlying geology mainly comprises Ashgill grits, shales, sandstones and conglomerates from the Ordovician system;*
- *Incised small river and stream valleys – numerous examples, usually wooded, feeding the adjacent Teifi and Tywi rivers;*
- *Small areas of heather moor and upland fringe – around the north-south watershed, however in many places improved and enclosed pasture is the dominant element;*
- *Improved pasture for sheep and cattle with rough grazing on the uplands;*
- *Woodlands - Conifer plantations are found on some plateau slopes, whilst valleys are clothed in mixed and broadleaved woodland;*
- *Thick hedgerows – areas of small fields enclosed by thick hawthorn hedges or banks topped with trees or gorse interspersed with areas of larger, improved fields and fences or thin hedges;*
- *Small settlements are located along streams - connected by winding rural roads;*
- *Modern developments at variance to traditional character – including wind turbines and modern agricultural buildings; and*
- *Tranquil, quiet - peaceful rural area.*

LANDMAP

6.4.33. The LANDMAP evaluations of the immediate context to the site are summarised below.

Cultural

6.1.5. The site lies within the Twyi (Towy) Valley RHL. It is assessed to be of outstanding value, as an evolved, heavily designated registered historic landscape with strong literary associations, and in fair condition, subject to environmental pressures from development, agriculture, traffic increase, water quality, etc.

Geological

6.4.34. The Site lies mainly within the following areas;

- Ancient lowland river flood plain system of the River Towy. The superficial geology of the area is from fluvial and glacial processes leaving terrace deposits and minor glacial till and periglacial head. It is assessed to be of moderate value and in good condition.
- Active lowland river-flood plain system. The superficial geology of the area is from fluvial deposits, active floodplain alluvium, also low terrace deposits and point bar deposits. It is assessed to be of high value and in good condition.

Visual and Sensory

6.4.35. The following Visual and Sensory areas are within the immediate vicinity of the Site:

- Dyffryn Tywi flood plain: Flat open farmland, outstanding evaluation;
- Dyffryn Tywi valley sides south: Mosaic lowland valleys, outstanding evaluation;
- Dyffryn Tywi valley sides north: Mosaic lowland valleys, outstanding evaluation; and
- Llandeilo and Fairfach: Urban, high evaluation.

6.4.36. The following provides a short summary of the key characteristics of the Visual and Sensory aspect areas within the vicinity of the Site:

Dyffryn Tywi flood plain CRMRTVS311

- Wide level agricultural valley floor and flood plain, part of classic u-shaped valley. River now meanders across the flood plain, and floods dramatically most years. The valley is interrupted by occasional small hills such as at Dryslwyn. Imposing, but now ruined castles of Dryslwyn and Dinefwr, overlook the valley floor. Roads run along the sides of the valley and there are few bridging points. Settlement's area scattered farms and small villages, the farms tend to be larger than on the surrounding hills, and more intensively managed. Some areas of parkland landscapes on the valley floor at Gelli Aur. Relatively little woodland, mostly improved pasture with some arable cropping, e.g. maize, hedgerows and a notable quantity of hedgerow and field trees give considerable character to the area.
- Outstanding because of the scenic quality of this area, character and rarity - a distinct valley landscape, with its river meandering through a well-treed agricultural landscape, with field trees, castles and parkland. A high degree of integrity largely un-spoilt.
- This visual and sensory evaluation also includes recommendations to conserve the tranquil rural quality of this scenic landscape. The principal management recommendation is to conserve the visual elements of this landscape particularly hedgerow and field trees, and the hedges, as well as the quality of the river corridor itself.

Dyffryn Tywi valley sides south CRMRTVS274

- Southern slopes of Dyffryn Tywi reaching to the valley floor and forming part of the lowland valley landscape. The slopes tend to be steep and more wooded than the northern slopes. Agricultural grazing dominates with a strong medium sized field pattern, and there are more hedgerow and field trees than on the northern side of the flood plain. There is also a significant amount of woodland on these steeper slopes, often fairly large blocks of conifers or mixed woodlands, covering almost all of the valley side. The settlement pattern is scattered farms linked by small lanes other than the B4300 that passes through this landscape. There is little or no roadside development associated with this route other than the small villages often with a linear layout, through which it passes. The area also includes traditional buildings, and other more parkland type landscapes e.g Gelli Aur. Scenic views are possible over Dyffryn Tywi, and to the north as well as within the area.
- Outstanding because this is a harmonious, attractive mosaic wooded valley landscape with a mix of agricultural, wooded and planned landscapes. Stunning views are possible across Dyffryn Tywi, towards the north. The area is a well-managed and unspoilt rural area only partially disrupted by a few new agricultural buildings. This steep valley side has a strong sense of place as it is a part of the Dyffryn Tywi complex with scenic views within and out from the area. The significant area of woodland adds diversity to this landscape, as do the parkland landscapes including Gelli Aur. As part of the Dyffryn Tywi it is one of only a few valleys of this scale in Wales.
- This visual and sensory evaluation also includes recommendations to conserve the rural quality of this area and its tranquillity. The principal management recommendation is to manage to conserve and enhance the views within and from the area.

Dyffryn Tywi valley sides north CRMRTVS970

- Northern slopes to the flood plain, and part of the lowland valley landscape of Dyffryn Tywi, this area is almost undulating, with small rises, some larger - at e.g. Broad Oak elsewhere tributaries of the Tywi broaden out in their own valleys and cut through this area. Agricultural - grazing dominates, strong field pattern, with some hedgerow trees, but less so than on southern side and in the flood plain. Scattered farms, small lanes other than the main A40 that pass through much of this landscape, and along which there is some roadside development, and small villages linear in layout. Includes traditional buildings - e.g. Aberglasney, and other more parkland type landscapes. Scenic views over Dyffryn Tywi, and within the area - a gentle rolling landscape. More woodland than in flood plain, mostly deciduous but some conifers.
- Outstanding because of the views within and out from the area. Great variety of visual elements. Linked to the Dyffryn Tywi flood plain. The scenic quality and rarity is outstanding and the integrity and character score is high.
- This visual and sensory evaluation also includes recommendations to conserve the rural quality of this area and its tranquillity.

Llandeilo and Fairfach CRMRTVS527

- A distinct settling of Llandeilo, in an elevated position overlooking the Tywi, with its beech clumps above the town on the hill. Fairfach is less distinct, linked previously more to the railway. This area is undulating and dominated by urban development.
- Attractive views are available over the Tywi valley to the west and to the Brecon Beacons to the southeast.

- High because of its scenic qualities and magnificent views. The scenic quality and rarity is high and the integrity and character score is high.
- This visual and sensory evaluation also includes recommendations to conserve and enhance the elements that make up this attractive town and also its setting in the Tywi valley.

Historic Landscape

6.4.37. The Site lies mainly within the Nantgaredig – Derwen Fawr historic landscape area. It is assessed to be of high value as a good example of a Carmarthenshire agricultural landscape. It contributes to the general historic landscape character of the wider region, and in good condition.

Landscape Habitats

6.4.38. The Site lies mainly within Improved Grassland landscape habitat area; floodplain of the River Tywi characterised by low-lying and intensively managed agricultural land dominated by improved grassland. The river is the key biodiversity feature, but mature trees and hedgerows provide further focus for biodiversity interest within the landscape. The area is of high value, condition unassessed.

VISUAL AMENITY

6.4.39. Views within and across the Towy Valley are highly valued for the natural setting of the flood plain, wooded slopes and hills. Historic and cultural landmarks such as hill top castles and follies are features within key views. There are few visual detractors and recent building development is mainly restricted to farm expansion in the form of large agricultural structures.

6.4.40. The potential visual receptors considered were local residents, users of Public Rights of Way and other publicly accessible areas, visitors to Historic Parks and Gardens, historic sites and heritage assets and users of local roads and lanes. The visual envelop is generally contained within the valley and its northern and southern slopes.

6.4.41. Following the establishment of the visual envelop a schedule of potential visual receptors was identified through desk study using OS mapping, Google Maps and Google Earth. The location of these potential visual receptors can be found on **Figure 6.3**. A list of representative viewpoints was then agreed with CCC on the 01/10/18. Viewpoint locations are identified in **Table 6.3** below. Viewpoint locations are also shown in **Figure 6.3**, and the photographs are included in **Figures 6.4 - 6.12**.

6.4.42. The viewpoints are summarised in **Table 6.3** below:

Table 6.3 Visual Receptors and Representative Viewpoints

Receptor/Type Location and Grid Reference * Indicates Representative Viewpoint location	Approx. closest distance of view from Scheme/ direction of view	Sensitivity	Description of views	Figure No.
1. SN 493208 Bungalows in cul-de-sac east side of B4310, Nantgaredig	17 m South	High	Direct views from front of properties to tarmac cul-de-sac road.	-

Residential				
2. SN 495209 'Maesycrug', two storey, set back from east side of B4310, Nantgaredig Residential	80 m South	High	Views over field towards gappy, linear tree belt along disused railway.	-
3. SN 493207 Duffryn-Towy, 7 Properties on east side of B4310, south of disused railway, Nantgaredig Residential	86 m North-East	Medium	Views over field and field hedge towards linear tree belt along disused railway.	-
*4. SN 49577 20639 Footpath between Pont-ar-gothi and Nantgaredig, (Footpath 41/2) Recreational	Crosses scheme	High	Fields enclosed by hedgerows. River Cothi and trees along disused railway.	Figure 6.4
*5. SN 50681 20718 Footpath between Llanegwad and lane south east of Abercothi House (Footpath 41/6) Recreational	0 m (Joins proposed cycleway) South	High	Fields enclosed by hedgerows, and hills on horizon. Trees alongside River Towy in middle distance.	Figure 6.5
6. SN 505209 Abercothi House, two storey Residential	96 m South / South-West / West	High	Panoramic view, through gaps between mature garden trees, of Towy valley from west elevation with River Cothi in the foreground. Panoramic view of Towy valley from south elevation with disused railway line in the foreground.	-
7. SN 506205 Abercothi Farm, two storey farmhouse and nearby cottages Abercothi Estate Fishery holiday accommodation	294 m North / North-East	High	Views from first, and some ground, floor windows of fields enclosed by hedgerows. River Towy in immediate foreground and riverside trees.	-

Residential				
8. SN 509202 Aber Towy, single and two storey properties and farm buildings Residential	469 m North-East	Medium	Expansive views across valley bottom of fields enclosed by hedgerows. Oblique view from first floor windows of proposed River Towy crossing point.	-
9. SN 513201 Penybanc Uchaf farm house Residential	391 m North	Medium	Panoramic view from upper windows across Towy valley of fields enclosed by hedgerows. River Towy in mid distance.	-
10. SN 514204 Bremenda Isaf, two storey farmhouse and farm buildings Residential	75 m West	Medium	Views from second storey across valley with mature riverside trees framing the view.	-
11. SN 516204 Manteg, two storey house, south side of B4300 Residential	143 m North	High	Views from upper windows of front elevation of B4300 and riverside woodland which contains most of the view with glimpsed views of distant hills between taller trees.	-
12. SN 520205 Bremenda Ganol, two storey farmhouse adjoining Bremenda Uchaf, on north side of B4300 Residential	0 m East	Medium	Views from first floor windows across fields along valley.	-
13. SN 520205 Bremenda Uchaf two storey farmhouse adjoining Bremenda Ganol Residential	0 m North - East	Medium	Views from first floor windows across fields along valley.	-
14. SN 526209 Barley Mount, two storey farm house	270 m East	Medium	View of fields and hedgerows from first and second floors.	-

Residential			Oblique view of disused railway line.	
15. SN 529203 Tre-clais, two storey farm house Residential	191 m North-East	Medium	Panoramic view over valley fields from first floor windows. Unvegetated embankment of disused railway line in mid view.	-
16. SN 533206 Glantowy, two storey farmhouse and farm buildings adjacent to PRoW (31/27) Residential	65 m West	Medium	Panoramic view to W across valley from first floor window. (Disused railway in cutting to south of property).	-
17. SN 533205 Station House Residential	0 m North	High	Disused railway in immediate foreground.	-
18. SN 534205 Glantowy Farm Caravan Club certified site Recreational	0 m East / South	High	Caravan park on farm, next to disused railway line, with views of Paxton Tower, Dryslwyn Castle and the river Towy.	-
*19. SN 53426 20303 Footpath between Llanarthne and Glantowy (PRoW 31/27) Recreational	0 m (Crosses scheme) North and South	High	Views over low hedges of valley fields, towards disused railway line and caravan park.	Figure 6.6
20. SN 542207 Ffer m Typicca, two storey farmhouse and cottages/workshops in courtyard complex Residential / Commercial	433 m East / South	Medium	Panoramic views over low hedges and river, towards disused railway line.	-
21. SN 54147 19057 Paxton's Tower Grade II listed Neo-Gothic folly on top of hill near Llanarthney. Visitor attraction	1.03 km North	High	Panoramic views over the Towy valley to the west, north and east.Dryslwyn Castle in centre view and	Figure 6.7

under the care of the National Trust. Recreational			disused railway in middle distance. Windfarm in far distance on horizon.	
*22. SN 55422 20245 Dryslwyn Castle Recreational	374 m North	High	Panoramic views over the Towy valley to the east, south and west.	Figure 6.8
23. SN 558195 Rhydarwen, north side B4300, Two storey farmhouse Residential	290 m North	Medium	Views of valley from upper windows.	-
24. SN 562195 Glanrwyth, north side B4300 Two storey farmhouse Residential	200 m North	High	View of disused railway through field gate.	-
25. SN 569197 Bwthyn Ynyslas, two storey Residential	14 m North	High	B4300 in immediate foreground. Open panoramic views of Towy valley over marginal ruderal vegetation on disused railway running alongside river.	-
26. SN SN 569197 Ynyslas, two storey Residential	14 m North	High	B4300 in immediate foreground. Open panoramic views of Towy valley over marginal ruderal vegetation on disused railway running alongside river.	-
27. SN 590210 The Gatehouse, two storey Residential	0 m West and North	High	Railway building converted to residential. View of disused railway next to N side of property. Open views of valley in middle and distant view.	-
*28. SN 59541 19682 Golden Grove Country Park	1.25 km North	High	Panoramic view, over and between tree canopies, of Towy valley from balcony	Figure 6.9

Recreational			deck of café. Disused railway in middle distance.	
29. SN 593211 Gelli Aur College Farm Workers and Students	20 m North	Medium	Views from majority of college buildings restricted by adjacent buildings in courtyard arrangement. Open views across car park to disused railway/farm track to valley from ground and first floor windows of western most building on the campus.	-
*30. SS 58169 88003 Footpath through Gelli Aur College Farm to Cilsan Bridge (PRoW 42/1) Recreational	0 m (Crosses scheme) South	High	Views across fields and tree belt alongside disused railway.	Figure 6.10
31. SN 598215 Towy Cott, two storey Residential	130 m South	Medium	Views from first floor windows to disused railway/farm track.	-
32. SN 604214 Pentrecwn, two storey farm house Residential	50 m North-East	High	Near views to NE from rear of property of mature tree belt alongside disused railway. Dynevor Castle and woods on horizon.	-
33. SN 603212 Pentrecwn Cottage, single storey Residential	100 m North-West	High	Panoramic view across adjacent field, over farm building rooves to wider Towy valley.	-
34. SN 605212 Ynys y Cwn, two storey Residential	120 m East	High	Views from ground floor window at rear of property across adjacent paddock to dense mature trees alongside River Towy, disused railway and hedgerows with Dinefwr Castle and woods on horizon.	-

35. SN 605211 Hendy, two storey farm house Residential	129 m East	Medium	View of valley from first floor windows at rear of farmhouse over farm buildings. Dynevor Castle and woods on horizon.	-
*36. SN 61180 21640 Dinefwr Park and Castle Recreational	617 m South – South-West	High	Panoramic long-distance view from castle ruins with River Towy and flood plain in foreground. Paxton's Tower and Dryslwyn Castle in far distance.	Figure 6.11
37. SN 611209 Llettyglyd, two storey farm house Residential	149 m North-West	High	Fields enclosed by hedgerows. Trees and scrub alongside disused railway line in right of view.	-
38. SN 624216 Ysgol Bro Dinefwr (College) Students and workers	80 m South and East/South-East	Medium	Views to south dominated by college car park. Views to east – south east of fields and housing on edge of Ffairfach.	-
39. SN 626215 2 Llys yr Onnen, Ffairfach, single storey Residential	20 m North	High	View restricted by evergreen garden hedge.	-
40. SN SN 626215 3 Llys yr Onnen, Ffairfach, single storey Residential	20 m North	High	Open views of field and hedgerows and wooded hills on horizon.	-
41. SN 628217 Ger y Bont. single storey Residential	Scheme adjacent to north side of property North and West	High	Open views of field and hedgerows. College buildings in middle distance and wooded hills on horizon.	-
42. SN 628217 1 – 4 Towy Terrace, Ffairfach Residential	20 m West	High	A483 in immediate foreground. Glimpsed view of field, hedgerows and woodland from some windows.	-

*43. SN 62698 21709 Footpath in Ffairfach (PRoW 44/3) Recreational	Crosses scheme West - South	High	Field and hedgerows, occasional field trees. College buildings and residential properties on edge of Ffairfach.	Figure 6.12
*Supplemental A: SN 64084 20846 The Heart of Wales Line Trail (Footpath 44/14) within the Brecon Beacon National Park	1600m West - North	High	Enclosed view comprising field and hedgerows, with no views of the Proposed Development	Figure 6.13
*Supplemental B: SN 68251 22161 The Beacons Way (Footpath 48/73) within the Brecon Beacons National Park	5400m West	High	Elevated open view comprising fields and hedgerows, with no views of the Proposed Development	Figure 6.14

6.5 SENSITIVE RECEPTORS

6.5.1. The following are the sensitive receptors which have been assessed within this Chapter:

Table 6.4 Sensitive Receptors

Receptor	Reason for Inclusion
Landscape Character	
The Brecon Beacons National Park	The Proposed scheme has the potential to significantly affect the setting and foreground of the National Park.
Local Landscape character of the Towy Valley and SLA	The Proposed scheme has the potential to significantly affect the landscape character and quality of these areas.
Visual Amenity	
Local residents	The proposed scheme has the potential to significantly affect the residential visual amenity from local properties.
Workers and students of local educational facilities	The proposed scheme has the potential to significantly affect the visual amenity from the facilities/places of work.
Users of Public Rights of Way within the local area	The proposed scheme has the potential to significantly affect views from this public right of way, where the proposed cycleway and bridges would be visible.

Visitors/tourists to Historic Parks and Gardens, historic sites and heritage assets	The proposed scheme has the potential to significantly affect views from these assets, where the proposed cycleway and bridges would be visible.

6.6 RELEVANT ELEMENTS OF THE PROPOSED SCHEME AND ESTABLISHING THE PRE-MITIGATION SCENARIO

DESIGN AND DESIGN ASSUMPTIONS

6.6.1. The Proposed Scheme comprises a new cycle and pedestrian path 14.9km long, with the majority situated on the track bed of a former railway. It includes two new pedestrian and cyclist river bridges and will primarily follow the route of the former Carmarthen to Llandeilo railway between Nantgaredig and Ffairfach. Generally, the cycleway lies on a low embankment, but at a few locations it also passes at grade and within cutting where mounds of superficial soils protrude through the alluvium of the flood plain. In addition to the former railway the path will utilise some lengths of existing public rights of way paths.

6.6.2. The proposed path will be unsegregated and comprise a 3m wide surfaced path with 1m verge either side, adapted locally, to suit constraints on site. It is assumed that the path will require minimal excavation.

6.6.3. Several surface types are proposed; reclamation of existing ballast, tarmac, concrete and raised timber boardwalk with a 1.4m high parapet. There are some sections that will be on the existing carriageway. The locations of these are shown on the Surface Treatment Plans.

6.6.4. Boundary treatments will be fences of stranded wire on wooden post in most areas, however these will be agreed, where necessary, with adjacent landowners and tie into existing character wherever possible. Barriers and gates will be incorporated at key locations to manage access and cattle grids will be incorporated as necessary.

6.6.5. The two new river crossings, one over the river Cothi on the trajectory of the former railway, and one over the Towy, will have a parapet hight of 4m and will be prefabricated bridges in the colour Olive Green. There will also be several smaller bridges crossing ditches, streams and culverts. Generally, these structures will have a hand-rail of approximately 1.4m.

6.6.6. The cycleway will not be lit.

6.7 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

POTENTIAL IMPACTS

6.7.1. The Proposed Scheme may affect the landscape and visual amenity of receptors in a number of ways, including:

Construction period – temporary impacts

6.7.2. During the construction period there may be temporary landscape impacts from a number of sources including:

- General construction activities including: movement of construction machinery; presence of site compounds and parking on site; material stockpiles; presence of hoardings and protective fencing; presence of temporary lighting and signage; installation of new planting;
- Site clearance and soil stripping, including the removal of existing trees, shrubs, scrub, hedges and grassland;
- Presence of light in a currently dark landscape, from floodlighting to allow a full working day in winter;
- The installation of the cycleway surface and verges;
- Installation of prefabricated bridges (by crane) and associated infrastructure;
- Exposed earthworks and formation layers; and
- Vehicles moving to and from the site.

6.7.3. The construction period assessment considers the temporary effects of the construction activities. The long-term effects of the introduction of the Proposed Scheme are considered as operational period permanent impacts, although it is acknowledged that they occur progressively during the construction period.

Operational Impacts – permanent impacts

6.1.6. The impacts assessed during the operational phase assume that the cycleway, bridges, fencing, cattle crossings and planting are in place.

6.1.7. Permanent impacts predicted to arise at operation are:

- Loss of vegetation;
- Changes to local landscape character, including the introduction of new bridges and hard surfacing that could erode the rural landscape character and local tranquillity;
- Changes impacting on the composition of views; and
- Views of users of the cycleway.

ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

6.7.4. The following section provides an assessment of the predicted impacts from the Proposed Scheme on landscape elements, landscape character and visual receptors.

6.7.5. The assessment takes account of the sensitivity of the receptor to change and the degree or magnitude of change for that receptor due to the project. The assessment provides impacts after the incorporation of the mitigation measures outlined below.

6.7.6. The Significance Matrix set out in **Table 6.2** defines the methodology for calculating effects resulting from the Proposed Scheme.

CONSTRUCTION PERIOD

6.7.7. Landscape and visual impacts during construction are those that arise between the start and completion of the works. Construction activities are likely to result in a greater area of disturbed land and a concentration of seemingly discordant features and activities compared to the areas affected by the operational phase. They generally cannot be mitigated during this phase due to the scale and nature of the works.

The Site

6.7.8. Temporary impacts, even when likely to be 'major' are regarded as less significant than similar impact magnitudes arising from a permanent effect.

6.7.9. During the construction phase of the Proposed Scheme, the scale of the works and the loss of vegetation on the Site itself, would result in an overall effect on the landscape character of **major adverse and significant.**

Landscape Character

6.7.10. The construction of the Proposed Scheme would result in some short-term effects within the surrounding landscape, from site clearance to installation of the cycleway. The construction stage increased activity would have the potential to disturb the tranquillity of the immediate (within 1km) landscape character. It is considered that effects on the immediate landscape character during the construction stage would be of a **temporary major adverse** and significant, particularly around the 2 proposed bridges. Beyond approximately 1km, the construction of the Proposed Scheme would result in some short-term effects, but these effects would lessen as distance from the Proposed Scheme increases. It is considered that effects on landscape character beyond 1km during the construction stage would be of a **temporary moderate to minor adverse** and not significant.

Landscape Designations

6.7.11. The construction of the Proposed Scheme would result in some short-term effects within the Twyi (Towy) Valley SLA, from site clearance to installation of the cycleway and particularly the 2 bridges. The construction stage increased activity would have the potential to disturb the tranquillity of the immediate (within 1km) area of the SLA's character. It is considered that effects on the immediate Twyi (Towy) SLA's landscape character during the construction stage would also be of **temporary major adverse** and significant. Beyond approximately 1km, the construction of the Proposed Scheme would result in some short-term effects, but these effects would lessen as distance from the Proposed Scheme increases. It is considered that effects on the wider SLA landscape character (beyond 1km) during the construction stage would be of a **temporary moderate to minor adverse** and not significant.

6.7.12. As the Proposed Scheme is located outside of the Brecon Beacons National Park, effects would be limited to outward looking views from open elevated locations within the National Park. The construction stage increased activity would be viewed within open panoramic views and have very little effect on the landscape character of the small section of the Brecon Beacons National Park, that falls within the Study area. It is considered that effects on the Brecon Beacons National Park landscape character during the construction stage would be **negligible**.

Visual Amenity

6.7.13. The construction of the Proposed Scheme would be using some existing public rights of way and much of the construction work, apart from the consecution of the two bridges would be at ground level which would be largely contained within the existing network of vegetation. Receptors with open views toward the Proposed Scheme would experience the most noticeable changes but would be localised along the routes and for a short term. It is considered that effects on visual amenity during the construction stage would vary from **temporary minor to major adverse**, depending on the openness of the view and proximity to the Proposed Scheme.

6.7.14. Detailed visual impacts on identified sensitive visual receptors, arising during the construction phase are described within the Visual Effects Table (VET) in **Appendices 6.2**.

OPERATIONAL IMPACTS

6.7.15. The proposals would result in loss of a small area of agricultural land within the off-disused railway line sections. Additionally, the Proposed Scheme would result in the loss of some mature native species rich hedgerow as well as some individual trees, including mature hedgerow trees. Some small areas of semi natural broad-leaved woodland would also be removed from the area within the scheme footprint.

6.7.16. A key principle of the design of the cycleway is that removal of existing woodland, including the linear tree and scrub belts along the disused railway line, individual trees and hedgerows will be minimised to limit the impact on these valuable landscape features.

6.7.17. It has been assumed that all vegetation within a 5m corridor centred on the centre line of the cycleway will be removed. The concept landscape mitigation plans (See **Figures 70041839-WSP-DR-LS-0101 to 0115**) have been created to mitigate this vegetation loss.

The Site

6.7.18. In Year 1, the new cycleway and particularly the new bridges would not quite fit the landscape setting and would appear as a new noticeable feature within the landscape and removed vegetation would be a notable loss of in some areas along the route. The magnitude of impact on the site would be medium on a landscape receptor of high sensitivity resulting in a **major to moderate adverse** significant effect.

6.7.19. By Year 15, landscape mitigation planting would have achieved its design objectives. The vegetation would have established to a level of maturity which would help integrate the proposals into the Site setting. The magnitude of impact on the site would be negligible on a landscape receptor of high sensitivity resulting in a **minor adverse** non-significant effect.

Landscape Character

NLCA 41: Tywi Valley

6.7.20. In Year 1, parts of the new cycleway and particularly the new bridges would appear as a new noticeable feature within the landscape and would result in the loss of a very small proportion of the existing characteristics of the NLCA, such as tree and hedgerows. The bridges in particular would be a noticeable new feature but would not alter the overall balance of features that make up the character of the landscape as a whole. The magnitude of impact on the NLCA as a whole, would be low adverse on a landscape receptor of high sensitivity resulting in a **moderate adverse** significant effect.

6.7.21. By Year 15, landscape mitigation planting would have achieved its design objectives, particularly around the bridges. The vegetation would have established to a level of maturity which would help integrate the proposals into the surrounding landscape. The magnitude of impact would have reduced to negligible resulting in a **minor to negligible** adverse non-significant effect.

NLCA 33: Gwendraeth Vales and 42: Pembroke and Carmarthen Foothills

6.7.22. In Year 1, parts of the cycleway and particularly the new bridges may be perceptible above and between intervening vegetation and any effects would be limited to their presence in characteristic

views out with the NLCAs. As the Proposed Scheme is located outside of the NLCAs there would be no loss of landscape features for both these NLCAs. The bridges would be the most notable additional feature, but these would be viewed alongside other man-made features within the available views. The magnitude of impact on the NLCAs as a whole, would be negligible on a landscape receptor of high sensitivity resulting in a minor to **negligible** non-significant effect.

6.7.23. By Year 15, landscape mitigation planting would have achieved its design objectives, particularly around the bridges. The vegetation would have established to a level of maturity which would help integrate the proposals into the surrounding landscape. The magnitude of impact would remain as negligible resulting in a **negligible** effect.

LANDMAP

Towy Valley Floodplain CRMRTVS311

6.7.24. In Year 1, the new cycleway and particularly the new bridges would not fit the landscape setting and would result in the loss of some of the existing characteristic features such as woodland, trees and hedgerows. The magnitude of impact on the site would be moderate adverse on a landscape receptor of high sensitivity resulting in a **major to moderate adverse** significant effect.

6.7.25. By Year 15, landscape mitigation planting would have achieved its design objectives. The vegetation would have established to a level of maturity which would help integrate the proposals into the floodplain setting, although the bridges will still be perceptible from some limited locations. The magnitude of impact would have reduced to minor adverse resulting in a **slight adverse** non-significant effect.

Dyffryn Tywi valley sides south CRMRTVS274 and Llandeilo and Fairfach CRMRTVS527

6.7.26. In Year 1, only a very small part of the cycleway will pass through these aspect areas, therefore there will be very limited impacts on existing landscape features. The vast majority of effects on these aspect areas would be limited to the cycleway and bridges being present in characteristic views out to the north and west of the aspect areas. The bridges would be the most notable additional feature, but these would be viewed alongside other man-made features within the available views. The magnitude of impact on the aspect areas as a whole, would be negligible on a landscape receptor of high sensitivity resulting in a **minor to negligible** non-significant effect.

6.7.27. By Year 15, landscape mitigation planting would have achieved its design objectives, particularly around the bridges. The vegetation would have established to a level of maturity which would help integrate the proposals into the surrounding landscape. The magnitude of impact would remain as **negligible**, resulting in a negligible effect.

Dyffryn Tywi valley sides north CRMRTVS970

6.7.28. In Year 1, parts of the cycleway and particularly the new bridges may be perceptible above and between intervening vegetation and any effects would be limited to their presence in characteristic views out with the aspect area. As the Proposed Scheme is located outside of the aspect area there would be no loss of landscape feature. The bridges would be the most notable additional feature, but these would be viewed alongside other man-made features within the available views. The magnitude of impact on the aspect area as a whole, would be negligible on a landscape receptor of high sensitivity resulting in a **minor to negligible** non-significant effect.

6.7.29. By Year 15, landscape mitigation planting would have achieved its design objectives, particularly around the bridges. The vegetation would have established to a level of maturity which would help integrate the proposals into the surrounding landscape and views. The magnitude of impact would remain as negligible resulting in a **negligible** effect.

Landscape designations

Twyi (Towy) Valley SLA

6.7.30. In Year 1, parts of the new cycleway and particularly the new bridges would be perceptible, from parts of the SLA. From these locations, the bridges in particular would be a noticeable feature in the view but would not alter the overall balance of features that make up the view. The magnitude of impact on the SLA as a whole, would be low adverse on a landscape receptor of high sensitivity resulting in a **moderate adverse** significant effect.

6.7.31. By Year 15, landscape mitigation planting would have achieved its design objectives. The vegetation would have established to a level of maturity which would help integrate the proposals into the SLA. The magnitude of impact would have reduced to negligible resulting in a **minor to negligible** adverse significance of effect.

Brecon Beacons National Park

6.7.32. In Year 1, parts of the cycleway and bridges may be perceptible above and between intervening vegetation and any effects would be limited to their presence in characteristic views out with the National Park. As the Proposed Scheme is located outside of the National Park there would be no loss of landscape features. The bridges would be the most notable additional feature within in view, but these would be viewed alongside other man-made features such as the close settlement of Llandeilo and Ffairfach and several roads crossing the landscape within the available views. The magnitude of impact on the small area of the National Park that falls within the study area, would be negligible on a landscape receptor of high sensitivity resulting in a **minor to negligible** non-significant effect.

6.7.33. By Year 15, landscape mitigation planting would have achieved its design objectives, particularly around the bridges. The vegetation would have established to a level of maturity which would help integrate the proposals into the surrounding landscape and views. The magnitude of impact would remain as negligible resulting in a **negligible** effect.

Visual amenity

6.7.34. The visual assessment illustrates the varied scale of effects of the Proposed Scheme that would occur across the study area which is largely a result of the valley landform and intervening vegetation around the Site and in the wider landscape. The floodplain that contains the Site and minimal vegetation, allows for some open views and for the potential for some high scale effects from locations close to the Site.

6.7.35. From the more elevated valley slopes to the north and south, the scale of effect would vary between high and negligible scale of effects, depending on intervening vegetational cover. From the more open elevated areas, the Proposed Scheme would occupy a wide proportion of the view but appear clearly associated with the valley bottom and would be viewed in conjunction with existing manmade features such as the network of roads, other footpaths and urban settlements.

6.7.36. Detailed visual impacts on identified sensitive visual receptors and agreed viewpoint locations arising during the operational phase are described within the Visual Effects Schedule (VES) in **Appendices 6.2.**

PROPOSED MITIGATION

6.7.37. Removal of existing woodland, trees and scrub will be minimised to limit the impact on these valuable landscape features. It has been assumed that all vegetation within a 5m corridor centred on the centre line of the cycleway will be removed.

6.7.38. New planting will be carried out to mitigate for the loss of sections of linear tree belts and individual trees. New planting will be carried out near the bridge take-offs and landings to reduce the visual impact of these structures on sensitive visual receptors and help 'anchor' them to the immediate rural setting.

6.7.39. The concept landscape mitigation plans (See **Figures 70041839-WSP-DR-LS-0101 to 0115**) have been created to mitigate this vegetation loss.

6.8 LIMITATIONS AND ASSUMPTIONS

6.8.1. The following visual envelope limitations, should be taken into consideration when being considered and used in this assessment:

- The visual envelope (unless otherwise specified) is based on 'bare ground' and does not take into account the screening effects of built form, forestry, vegetation, distance and visibility (e.g. weather conditions). All of which can prevent or reduce visibility.

6.8.2. With these limitations, the visual envelope is used as a starting point in the assessment, providing an indication of where the Proposed Scheme would theoretically be visible. The visual envelope should not be relied upon to accurately represent or definitively show the extent of the Proposed Scheme's visibility.

6.8.3. Landscape professionals are unable to access private and commercial land, and residential premises identified within the study area. Professional judgement will be used to approximate the likely views from these locations.

6.9 SUMMARY

6.9.1. A summary of all the significant effects can be found in **Table 6.5** below.

6.9.2. The Proposed Scheme is located within the Tywi Valley NLCA and Twyi Valley floodplain LANDMAP visual and sensory aspect area, landscape character is wide level valley floor and flood plain, part of classic u-shaped valley with occasional small hills. Relatively little woodland, mostly improved pasture with some arable cropping, and a notable quantity of hedgerow and field trees give considerable character to the area. Roads run alongside the valley and settlements consist of scattered villages and farms. All these above character attributes allow for cycleway development in addition to other existing public rights of way.

6.9.3. There would be some significant construction effects on the landscape character but limited to within approximately 1km of the Proposed Scheme. It should be noted that all construction effects will be short term.

6.9.4. The physical effects on the landscape would be limited to areas of vegetation removal for the cycleway and bridges. Use of the existing disused railway would minimise areas of removal. It is considered that effects on the physical elements of the landscape would be significant in Year 1, reducing to non-significant in Year 15 as any proposed mitigation planting would have matured and achieved its design objective.

LANDSCAPE CHARACTER

6.9.5. The LVIA had assessed that there would be no significant effects for the NLCAs and LANDMAP visual and sensory aspect areas within the study area. Although the addition of the Proposed Scheme would appear as a new noticeable feature within the landscape and would result in the loss of a very small proportion of the existing characteristics of the landscape character, such as tree and hedgerows, the Proposed Scheme would not alter the overall balance of features that make up the character of the landscape as a whole.

LANDSCAPE DESIGNATIONS

6.9.6. The LVIA had assessed that there would be no significant effects for the Twyi (Towy) Valley SLA. Although the addition of the Proposed Scheme would appear as a new noticeable feature within the landscape and would result in the loss of a very small proportion of the existing characteristics of the landscape character. Although, the Proposed Scheme would not alter the overall balance of features that make up the character of the SLA as a whole.

6.9.7. The LVIA had assessed that there would be no significant effects for on the Brecon Beacons National Park.

VISUAL AMENITY

6.9.8. The assessment of visual effects was informed by the scale of effect assessed at 43 visual receptor and nine viewpoints that were selected to represent visibility from a range of receptors and distances throughout the study area. The Proposed Scheme would introduce visibility of the cycleway and bridges in close proximity to local residents, walkers and road users, although the full extent of the Proposed Scheme would be partially screened by the existing vegetation along the existing disused railway line, as well as hedgerows, woodland and hedgerow trees along the Twyi (Towy) valley bottom.

6.9.9. Significant effects were assessed on the recreational route (PRoW 44/3) which abuts the end of the Proposed Scheme in Ffairfach.

6.9.10. Significant effects were assessed on visitors from the Glantowy Farm Caravan Club certified site, where the Proposed Scheme would be an immediately noticeable adjacent to the park.

6.9.11. Significant effects were assessed from several properties within approximately 1km of the Proposed Scheme, as presented in **Table 6.5** below. It found that there would be potential for the Proposed Scheme to be clearly visible in front of the property. It should be noted that for several of these significantly affected residential properties, once proposed mitigation planting has established and matured, significant effects would reduce to non-significant.

Table 6.5 Summary of Likely Significant Effects

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
Construction Phase			
Landscape Character			
The scale of the works and the loss of vegetation	The Site	Permanent Major adverse	-
Site clearance and installation of the cycleway. Increased activity would have the potential to disturb the tranquillity of the immediate (within 1km) landscape character.	Immediate landscape character	Temporary Major adverse	-
Site clearance to installation of the cycleway and particularly the 2 bridges. The construction stage increased activity would have the potential to disturb the tranquillity of the immediate (within 1km) area of the SLA's character.	Twyi (Towy) Valley SLA (within 1km)	Temporary Major adverse	-
Visual Amenity			
Construction activities would dominate the view.	Viewpoint 1: Bungalows in cul-de-sac east side of B4310, Nantgaredig	Major adverse	-
Construction activities would form a noticeable feature or element of the view.	Viewpoint 2: Maesycrug'	Moderate adverse	-
Construction activities would form a noticeable feature or element of the view.	Viewpoint 4: Footpath between Pont-ar-gothi and Nantgaredig, (PRoW 41/2)	Moderate adverse	-

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
Construction activities would form a noticeable feature or element of the view	Viewpoint 5: Footpath between Llanegwad and lane south east of Abercothi House (PRoW 41/6)	Moderate adverse	-
Construction activities, including those for the bridge over the Cothi, would form a noticeable element of the view.	Viewpoint 6: Abercothi House	Moderate adverse	-
Construction activities, including those for the bridge over the Towy, would form a noticeable element of the view.	Viewpoint 7: Abercothi Farm	Moderate adverse	-
Construction activities, including those for the bridge over the Towy, would form a noticeable element of the view.	Viewpoint 9: Penybanc Uchaf farm house	Moderate adverse	-
Construction activities, including those for the bridge over the Towy, would form a noticeable element in oblique view.	Viewpoint 10: Bremenda Isaf	Moderate adverse	-
Construction activities would form a noticeable element of the view, in front of the woodland in the middle distance.	Viewpoint 11: Manteg	Moderate adverse	-
Construction activities would form a noticeable element of the view.	Viewpoint 12: Bremenda Ganol	Moderate adverse	-
Construction activities would form a noticeable element of the view.	Viewpoint 13: Bremenda Uchaf	Moderate adverse	-

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
Construction activities would dominate the view.	Viewpoint: 17: Station House	Major adverse	-
Construction activities would dominate the view.	Viewpoint: 18: Glantowy Farm Caravan Club certified site	Major adverse	-
Construction activities form a noticeable element of the view.	Viewpoint 19: Footpath between Llanarthne and Glantowy (PRoW 31/27)	Moderate adverse	-
Construction activities form a noticeable element in the middle ground of the view	Viewpoint 22: Dryslwyn Castle	Moderate adverse	-
There is potential for glimpsed views of construction activities from upper windows. Existing garden and route side vegetation -partially screen the c-ycle path.	Viewpoint 23: Rhydarwen	Moderate adverse	-
-Construction activities would dominate the view in less vegetated areas of the cycleway.	Viewpoint 24: Glanrwyth	Major adverse	-
Construction activities would dominate the view.	Viewpoint 25/26: Bwthyn Ynyslas and Ynyslas	Major adverse	-
Construction activities would dominate the view	Viewpoint 27: The Gatehouse	Major adverse	-
Construction activities would dominate the view.	Viewpoint 29: Gelli Aur College Farm	Major adverse	-
Construction activities would dominate the view.	Viewpoint 30: Footpath through Gelli Aur College Farm to Cilsan Bridge (PRoW 42/1)	Major adverse	-

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
Construction activities would dominate the view.	Viewpoint 31: Towy Cott	Major adverse	-
Construction activities would dominate the view	Viewpoint 32: Pentrecwn	Major adverse	-
There would be glimpsed views of construction activities in gaps in linear tree belt alongside disused railway. These would introduce a noticeable element to the wider view.	Viewpoint 36: Dinefwr Park and Castle	Moderate adverse	-
There will be views during the construction phase.	Viewpoint 38: Ysgol Bro Dinefwr (College)	Moderate adverse	-
Construction activities would dominate the view.	Viewpoint 40: 3 Llys yr Onnen, Ffairfach	Major adverse	-
Construction activities would dominate the view.	Viewpoint 41: Ger y Bont	Major adverse	-
Construction activities would be visible from property.	Viewpoint 42: 1 – 4 Towy Terrace, Ffairfach	Major adverse	-
Construction activities would dominate the centre of the view	Viewpoint 43: Footpath in Ffairfach (PRoW 44/3)	Major adverse	-
Construction activities will not be visible from this location	Supplemental Viewpoint A: The Heart of Wales Line Trail (Footpath 44/14) within the Brecon Beacon National Park	No effect	-
Construction activities will not be visible from this location	Supplemental Viewpoint B:	No effect	-

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
	The Beacons Way (Footpath 48/73) within the Brecon Beacons National Park		
Operational Phase			
Landscape Character			
The new cycleway and particularly the new bridges would not quite fit the landscape setting and would appear as a new noticeable feature within the landscape and removed vegetation would be a notable loss of in some areas along the route.	The Site	Major to moderate adverse	New planting will be carried out to mitigate for the loss of sections of linear tree belts and individual trees lost during the construction phase. New planting will be carried out near the bridge take-offs and landings to reduce the visual impact of these structures on sensitive visual receptors and help 'anchor' them to the immediate rural setting.
Parts of the new cycleway and particularly the new bridges would appear as a new noticeable feature within the landscape and would result in the loss of a very small proportion of the existing characteristics of the NLCA, such as tree and hedgerows.	NLCA 41: Tywi Valley	Moderate adverse	
The new cycleway and particularly the new bridges would not fit the landscape setting and would result in the loss of some of the existing characteristic features such as woodland, trees and hedgerows	Towy Valley Floodplain CRMRTVS311	Major to moderate adverse	
Parts of the new cycleway and particularly the new bridges would be perceptible, from parts of the SLA.	Twyi (Towy) Valley SLA	Moderate adverse	

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
From these locations, the bridges in particular would be a noticeable feature in the view but would not alter the overall balance of features that make up the view			
Visual Amenity			
The cycleway, and cyclists and walkers using it, would be visible in front of the properties.	Viewpoint 1: Bungalows in cul-de-sac east side of B4310, Nantgaredig	Moderate adverse	New planting will be carried out to mitigate for the loss of sections of linear tree belts and individual trees lost during the construction phase. New planting will be carried out near the bridge take-offs and landings to reduce the visual impact of these structures on sensitive visual receptors and help 'anchor' them to the immediate rural setting.
The bridge would be noticeable feature of the view. The cycleway, and cyclists and walkers using it, would be noticeable in winter	Viewpoint 6: Abercothi House	Moderate adverse	
The bridge would be perceptible in the view. The cycleway, and cyclists and walkers using it, would be visible in winter.	Viewpoint 9: Penybanc Uchaf farm house	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible in front of the property	Viewpoint 17: Station House	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible in front of the property	Viewpoint 18: Glantowy Farm Caravan Club certified site	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible in front of the property.	Viewpoint 25/26: Bwthyn Ynyslas and Ynyslas	Moderate adverse	

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
The cycleway, and cyclists and walkers using it, would be visible immediately in front of the property	Viewpoint 27: The Gatehouse	Major to moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible in front of the college.	Viewpoint 29: Gelli Aur College Farm	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible from the property.	Viewpoint 32: Pentrecwn	Moderate adverse	
There will be some views of cyclists, walkers and cycleway during winter period.	Viewpoint 38: Ysgol Bro Dinefwr (College)	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible from the rear of the property.	Viewpoint 40: 3 Llys yr Onnen, Ffairfach	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible from the property.	Viewpoint 41: Ger y Bont.	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible from the properties.	Viewpoint 42: 1 – 4 Towy Terrace, Ffairfach	Moderate adverse	
The cycleway, and cyclists and walkers using it, would be visible through intervening vegetation in the middle ground, with clear unobstructed views of users as they approach the far	Viewpoint 43: Footpath in Ffairfach (PRoW 44/3)	Moderate adverse	

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement
end of the cycleway as it joins the A483.			
Operation phase will not be visible from this location	Supplemental Viewpoint A: The Heart of Wales Line Trail (Footpath 44/14) within the Brecon Beacon National Park	No effect	N/A
Operation phase activities will not be visible from this location	Supplemental Viewpoint B: The Beacons Way (Footpath 48/73) within the Brecon Beacons National Park	No effect	

6.10 REFERENCES

Ref. 6.1: Council of Europe (2000) The European Landscape Convention

Ref. 6.2: Welsh Government, Planning Policy Wales (PPW), Edition 11, (2021) [Online] https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

Ref. 6.3: Carmarthenshire County Council, Adopted Local Development Plan (LDP) (2014) [Online]

http://www.cartogold.co.uk/CarmarthenshireLDP/english/text/00_Contents.htm

Ref. 6.4: Landscape Institute and Institute of Environmental Management and Assessment, Guidelines for Landscape and Visual Impact Assessment, 3rd edition (2013)

Ref. 6.5: Landscape Institute, Visual Representation of development proposals, Technical Guidance Note 06/19 (2019)

Ref. 6.6 Highways England, Design Manual for Roads and Bridges - LA107 – Landscape and Visual Effects, Version 2 (Feb 2020)

Ref. 6.7: Natural Resources Wales – LANDMAP data [Online]

https://smnr-nrw.hub.arcgis.com/apps/c7770d2881394c899123bae210afe370/explore

Ref. 6.8: Natural Resources Wales – National Landscape Character Areas (NCLA) (2019) [Online]

https://naturalresources.wales/evidence-and-data/maps/nlca/?lang=en

7 HISTORIC ENVIRONMENT

7.1 INTRODUCTION

7.1.1. This Chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Scheme upon the Historic Environment. The focus is on changes to the settings of designated and non-designated assets from the construction and operation phases, and the loss of, or disturbance to, known and potential archaeological assets/remains during the construction phase.

7.1.2. The Chapter describes the assessment methodology; the baseline conditions at the Proposed Scheme and in the surrounding area; any primary mitigation measures adopted for the purposes of the assessment; a summary of the likely significant effects; the further mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been employed.

7.1.3. A Historic Environment Desk Based Assessment (HEDBA) including a Setting Assessment has been prepared in support of this Chapter. Please refer to **Appendix 7.A (Volume VI).**

7.1.4. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, and in particular alongside the introductory chapters (Chapters 1 to 5), Chapter 6 – Landscape and Visual, and Chapter 12 – Cumulative Effects.

7.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

LEGISLATIVE FRAMEWORK

7.2.1. The assessment has been carried out in line within the following legislative framework:

- *Ancient Monuments and Archaeological Areas Act 1979* (**Ref. 7.1**); nationally important archaeological sites (both above and below-ground remains) of any period may be identified and protected under this Act. Statutory protection is given to any structure, building or work which is considered to be of particular historic or archaeological interest and this Act regulates any activities which may affect such areas. Under the Act any work that is carried out on a scheduled monument must first obtain Scheduled Monument Consent (SMC). Development affecting the setting of a scheduled monument is dealt with wholly under the planning system (see **Appendix 7.B (Volume IV)**;
- *Planning (Listed Buildings and Conservation Areas) Act 1990* (**Ref. 7.2**); applies special protection to buildings and areas of special architectural or historic interest. Section 66 (1) of the Act states that 'In considering whether to grant planning permission for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses.' Within Wales, the mechanisms by which appropriate consents for works affecting listed buildings and conservation areas are to be applied for is set out in the Planning (Listed Buildings and Conservation Areas) (Wales) Regulations 2012;
- *Historic Environment (Wales) Act 2016* (**Ref. 7.3**); this Act became law in March 2016, and amends the two pieces of legislation identified above, as well as providing new stand-alone provisions.

7.2.2. **Appendix 7.B** provides a summary of applicable planning policy.

GUIDANCE

7.2.3. The following guidance documents have been used during the preparation of this Chapter:

- Welsh Office Circular 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas (**Ref. 7.4**);
- Conservation Principles for the sustainable management of the historic environment in Wales (**Ref. 7.5**);
- Setting of Historic Assets in Wales (**Ref. 7.6**); and,
- The Chartered Institute for Archaeologists Guidance for Desk-based Assessments (2020) (**Ref 7.7**).

7.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

SUMMARY OF CONSULTATION

7.3.1. **Table 7-1** provides details of the consultation activities undertaken in support of the preparation of this Chapter.

Table 7-1 – Summary of Consultation Undertaken to Date

Body / organisation	Contact at body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Carmarthenshire County Council (CCC) Scoping Opinion	n/a	Scoping Opinion (SO) was received from Carmarthenshire County Council in November 2018 and included recommendations to incorporate aerial photography and Lidar data within the assessment. In relation to scheduled monuments, it was recommended that Cadw were consulted regarding visual impacts on their settings. The SO also recommended a walkover survey at the diversion of the Proposed Scheme from the disused railway.	Consultation was undertaken with Dyfed Archaeological Trust (DAT) for aerial photography and an updated HER search. LiDAR data provided by WSP PM team. Due to issues with land access a walkover survey did not take place at the diversion of the Proposed Scheme from the railway. Instead, an analysis of aerial photography was undertaken. This did not reveal any archaeological earthwork remains.
Cadw	Louise Mees	Telephone Communication took place in July 2019, in response to the SO which suggested contacting Cadw about the visual	Cadw expressed no initial concerns about the impacts on scheduled monuments. The most recent design changes will not introduce any new

		impacts on the setting of scheduled monuments.	impacts on the scheduled monuments.

SCOPE OF THE ASSESSMENT

7.3.2. An EIA Scoping Report was submitted to CCC on 7 May 2018, as presented in **Appendix 5.3 (Volume IV)**. This section provides the scope of the assessment and reiterates the evidence base for insignificant effects.

7.3.3. A Historic Environment Desk-based Assessment was prepared in October 2018 and subsequently updated in 2022 with updated scheme designs and new Historic Environment Data, see **Appendix 7.A (Volume IV).**

INSIGNIFICANT ENVIRONMENTAL EFFECTS

7.3.4. The elements shown in Table 7-2 are not considered to give rise to likely significant effects as a result of the Proposed Scheme, and have therefore not been considered within this assessment.

Table 7-2 – Elements Scoped Out of the Assessment

Elements Scoped Out	Justification
Operational impacts on buried archaeological remains	Any effects of potential buried archaeological remains will take place during the construction phase only
Historic assets located over 1km from the Proposed Scheme boundary	These are unlikely to experience significant effects on their setting because of the intervening distance and topography.
Historic assets identified as experiencing insignificant effects	Insignificant effects are those identified as no change, negligible or minor effects. These are not significant effects and have been reported in the Historic Environment Desk-based Assessment in Appendix 7.A but are not reiterated in this chapter.

LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS

Construction Phase

7.3.5. The following elements are considered to have the potential to give rise to significant effects during the construction of the Proposed Scheme and have therefore been considered within this assessment:

Table 7-3 – Elements Scoped into the Assessment

Elements Scoped In	Justification
Unknown Buried Historic Assets	Works associated with the construction of the Proposed Scheme may result in the loss of or disturbance to unknown buried historic assets.
Site of Abercothy Cottage (21266)	The asset is located within the boundary of the Proposed Scheme. The value of the asset is unknown as it survives as buried remains only,

Elements Scoped In	Justification
	therefore it has been included within this assessment.
Bridges, Abutments and Culverts over water courses	Design proposals include the partial demolition of existing masonry abutments.
Maes y Crug Round Barrow (CM328)	The construction of the Proposed Scheme will have temporary impacts on the setting of the scheduled monument.

Operation Phase

7.3.6. Works associated with the operation phase of the Proposed Scheme may result in changes to the setting of designated and non-designated heritage assets. These effects are likely to include;

- noise/light pollutants;
- a reduction of rural tranquillity; and
- possible glimpses of the Proposed Scheme.

7.3.7. The following elements are considered to have the potential to give rise to significant effects during the operation of the Proposed Scheme and have therefore been considered within this assessment:

Table 7-4 – Element Scoped into the Assessment

Elements Scoped In	Justification
Ffairfach Standing Stone Scheduled Monument (CM325)	The Proposed Scheme could have a beneficial impact on the setting of the asset, due to its close proximity to the asset which could open up the asset for appreciation.

EXTENT OF THE STUDY AREA

7.3.8. An inner Study Area of 500m extending out from the limits of the Proposed Scheme boundary was applied for the identification of all historic assets (designated, non-designated and potential archaeological remains) to establish the known historic environment context and the potential for hitherto unknown below-ground archaeological remains.

7.3.9. A second, wider Study Area was applied for the assessment of settings of designated historic assets and Conservation Areas, and this extends up to 1km from the Scheme.

ASSESSMENT METHODOLOGY

7.3.10. **Chapter 5 – Approach to EIA** sets out the general methodology used to determine the significance of environmental effects. The determination of the heritage significance of the known or potential receptor (historic asset) is based on existing designations and professional judgements, considering evidential, historical, aesthetic and communal value as outlined in Cadw's *Conservation Principles* (**Ref 7.5**). The predicted magnitude of change (impact) upon the known or potential heritage significance of historic assets arising from the Proposed Scheme during the construction and operation phases is then considered in order to determine the likely resulting significance of environmental effects.

Evaluating the Significance of Historic Assets

7.3.11. The 'significance' of an historic asset embraces all of the cultural heritage values that people associate with it, or which prompt them to respond to it. This then allows these special qualities to be protected, enhanced, enjoyed and understood by future generations (**Ref 7.5**).

7.3.12. In accordance with the Conservation Principles set out by Cadw (**Ref 7.5**) significance is based on four heritage values which are summarised below:

- Evidential: this derives from the elements or remains of an asset that can provide evidence about past human activity. These remains provide the primary evidence for when and how an asset was made or built and how it has changed over time. Additional evidence can be gained from documentary sources.
- Historical: an asset might illustrate a particular aspect of past life or it might be associated with a notable family, person, event or movement. These can be less tangible than evidential value.
- Aesthetic: This is derived from the way in which people draw sensory and intellectual stimulation from an historic asset. This might include the form of the asset, its external appearance and how it lies within its setting.
- Communal: This derives from the meanings that an historic asset has for the people who relate to it, or for whom it figures in their collective experience of memory. Communal value might be commemorative or symbolic.

7.3.13. In relation to designated historic assets, the assessment takes into account the contribution which setting makes to the overall significance of the asset. The setting of a historic asset includes the surroundings in which it is understood, experienced and appreciated, embracing present and past relationships to the surrounding landscape. Setting as per the 'setting of historic assets in Wales' guidance produced by Cadw (**Ref 7.6**) often extends beyond the property boundary of a historic asset and into the surrounding landscape. It incorporates a number of factors including: views to, from and across the historic asset, and other non-visual factors such as historical associations.

7.3.14. 'Setting of Historic Assets in Wales' guidance produced by Cadw (**Ref 7.6**) has been used to adopt a staged approach to assessing the potential for impacts on the significance of the settings of historic assets, as follows:

- Stage 1: Identify the historic assets that might be affected by the 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; and
- Stage 4: Consider options to mitigate or improve the impact of a proposed change or development on that significance.

7.3.15. Consideration of views in terms of a person as the receptor are considered in **Chapter 6 – Landscape and Visual**.

Magnitude of Change

7.3.16. Determination of magnitude of change upon the significance of historic assets is based on the severity of the likely impact (e.g. physical activity that would entail ground disturbance, from piling,

excavation etc, or the permanent presence of new structures etc. that result in changes to setting). Table 7-5 describes the criteria used in this assessment to determine the magnitude of change.

Table 7-5 – Magnitude of Change for Historic Assets/Remain

Degree of magnitude	Description
High	Complete destruction of the asset or its setting (i.e. total loss of significance); change to the asset or its setting resulting in loss to significance which fundamentally changes our ability to understand and appreciate the resource. Minor works which adversely impact on heritage values which are intrinsic to the significance of the asset/setting have the potential to cause substantial harm.
Medium	Change to the asset or setting (some loss of significance) resulting in an appreciable change in ability to understand and appreciate the resource. Some heritage interest remains unaffected.
Low	Change to the asset or setting (some loss of significance) resulting in a slight change in ability to understand and appreciate the resource. Overall, the heritage interests remain unaffected.
Negligible	Negligible change or no material changes to the asset or setting. No real change in our ability to understand and appreciate the resource. The heritage interests remain unaffected.

Significance Criteria

7.3.17. The assessment of likely significant environmental effects as a result of the Proposed Scheme has taken into account both the construction and operational phases. The environmental significance level attributed to each effect has been assessed based on the heritage significance of the affected receptor and the magnitude of change due to the Proposed Scheme upon that receptor.

7.3.18. The environmental effect is outlined in Table 7-6. This is based on the assessment table of the Design Manual for Road and Bridges (DMRB) (**Ref 7.8**). Whilst DMRB is intended for use on road schemes it provides a robust assessment methodology with regard to the historic environment, hence its application here. Effects may be either negative (adverse) or positive (beneficial) and are defined initially without secondary mitigation. Where information is insufficient to be able to quantify either the resource significance or magnitude of change with any degree of certainty, the effect is given as ‘uncertain’.

Table 7-6 – Significance of Effect

Magnitude of Change	Historic Asset Significance					
	Very High	High	Medium	Low	Very Low	Uncertain
High	Major	Major	Major or Moderate	Moderate or Minor	Minor	Uncertain
Medium	Major	Major or Moderate	Moderate	Minor	Negligible	Uncertain
Low	Moderate	Moderate or Minor	Minor	Minor	Negligible	Uncertain
Negligible	Minor	Minor or Negligible	Negligible	Negligible	Negligible	Uncertain
Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain

7.3.19. The effect reflects the success rating for the recommended mitigation strategy. Table 7-7 defines the significance of effects.

Table 7-7 – Criteria for Assessment of Significance on Effects on the Settings of Historic Assets

Level of Harm or Benefit	Guideline Criteria
Major beneficial	The contribution of setting to the historic asset's significance is considerably enhanced as a result of the development; a lost relationship between the asset and its setting is restored, or the legibility of the relationship is greatly enhanced. Elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance are removed.
Moderate beneficial	The contribution of setting to the historic asset's significance is enhanced to a clearly appreciable extent as a result of the development; as a result, the relationship between the asset and its setting is rendered more readily apparent. The negative effect of elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance is appreciably reduced.
Minor beneficial	The setting of the historic asset is slightly improved as a result of the development, slightly improving the degree to which the setting's relationship with the asset can be appreciated.
Negligible	The setting of the historic asset is changed by the development in ways that do not alter the contribution of setting to the asset's significance.
Minor negative	The contribution of the setting of the historic asset to its significance is slightly degraded as a result of the development, but without adversely affecting the interpretability of the asset and its setting; characteristics of historic value can still be appreciated, the changes do not strongly conflict with the character of the Proposed Scheme, and could be easily reversed to approximate the pre-development conditions.

Level of Harm or Benefit	Guideline Criteria
Moderate negative	The contribution of the setting of the historic asset to its significance is reduced appreciably as a result of the development. Relevant setting characteristics can still be appreciated but less readily.
Major negative	The contribution of the setting of the historic asset to its significance is effectively lost or substantially reduced as a result of the development, the relationship between the asset and its setting is no longer readily appreciable.

METHOD OF BASELINE DATA COLLECTION

Desk Study

7.3.20. The following sources were consulted during the desk-based study:

- Dyfed Archaeological Trust Historic Environment Record (HER);
- Cadw, Cof Cymru – National Historic Assets of Wales;
- Historic maps including Ordnance Survey;
- Aerial photos sourced from the Central Register of Air Photography for Wales, Aerial Photography Unit, Welsh Government; and
- Online sources (key documentary sources such as the Archaeological Data Service.

Site Visit

7.3.21. A site visit was undertaken in August of 2018. The visit considered the settings of the designated historic assets. The assets' physical surroundings were noted including: aspect, relationship to other assets, definition, design, open space, enclosure, boundaries, and degree of change over time.

7.3.22. A further site visit was undertaken in April 2019. The visit considered the settings of the non-designated historic assets and adopted the same approach as for designated assets.

7.3.23. An additional site visit was undertaken in May 2022, in order to consider the impacts of the Proposed Scheme on new assets identified as a result of updates to the Historic Environment Record and assess any changes in setting that had occurred since the original visit was undertaken.

7.4 BASELINE CONDITIONS

7.4.1. The section below presents an overview of baseline conditions. A more detailed baseline assessment is presented in the HEDBA **Appendix 7.A (Volume IV)**.

DESIGNATED AND NON-DESIGNATED HISTORIC ASSETS

7.4.2. A total of 337 historic assets are present within the inner and wider study areas. Of these:

- 133 are statutory designated;
- 9 Scheduled Monuments;
- 2 Grade I Listed Buildings;
- 6 Grade II* Listed Buildings;
- 111 Grade II Listed Buildings;
- 2 Conservation Areas;
- 1 Grade I Registered Park and Garden; and
- 2 Grade II* Registered Parks and Gardens lie within the wider study area (1km).

A total of 204 non-designated assets lie within the inner study area (500m). These include below ground archaeological remains and built historic assets. A gazetteer is presented in the HEDBA, **Appendix 7.A (Volume IV)** and the locations of the assets are present on Figures 1 and 2 in **Appendix 7.A (Volume IV)** .

LANDSCAPE DESIGNATIONS

7.4.3. There are four Historic Landscape Characters located within the 500m study area;

- Ystrad Tywi: Carmarthen to Llandeilo Character Area 182;
- Llandeilo Character Area 202;
- Dryslwyn Character Area 224; and
- Llanarthne Character Area 189

ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

7.4.4. Full baseline conditions can be found in the HEDBA, **Appendix 7.A (Volume IV)**.

7.4.5. The Scheme lies within a rich historic environment, with evidence of activity dating from the Prehistoric Period to modern times.

7.4.6. Prehistoric evidence within the study area can be found in the form of two Scheduled Monuments. The scheduled monument of Maes Y Crud Round Barrow (CM328), dates to the Bronze Age (4,000 – 1,500 BC) and lies within the Scheme Footprint. The Scheduled Monument Ffynnon-Newydd (CM042) standing stones, also date to the Bronze age and are located within the outer study area.

7.4.7. The Roman Period (AD43 - AD410) saw a fort established at Dynefwr, and there is evidence of the Roman road between Llandovery and Carmarthen.

7.4.8. The early Medieval period (AD410-1100) saw the development of the early Christian Church, evidence of which can be found in the church at Llandeilo Fawr (HER890) and its associated stone cross (Llandeilo Fawr Parish Church Cross HER890). The Norman expansion into South Wales continued throughout the Late-medieval period, therefore South Wales has a rich resource of castles, palaces and defended towns.

7.4.9. The importance of religious life continued into the post-medieval period, where villages built up around a focal point, usually a church or chapel. The later post-medieval and industrial (1750-1899) and modern period (post-1900) was dominated by the introduction of the Llanelly Railway to the area.

FACTORS AFFECTING ARCHAEOLOGICAL SURVIVAL

7.4.10. The Proposed Scheme is located along a 14.64km route, within the Towy Valley and between the towns of Nantgaredig and Ffairfach. Both areas feature settlements which are concentrated on the A40 and the A483. The river Towy is a prominent feature in the landscape, alongside rolling hills, dispersed farms and small to medium sized fields. The study area has remained predominantly agricultural in nature.

7.4.11. Historic mapping (discussed in **Appendix 7.A (Volume IV)** indicates that besides the Llanelly Railway, very little change has occurred in the area. There is a lack of major infrastructure such as modern housing developments within the area. Therefore, there are few factors which would affect the survival of any archaeological remains.

STATEMENT OF SIGNIFICANCE: ABOVE AND BELOW GROUND HISTORIC ASSETS AND THEIR SETTINGS

7.4.12. The statement of significance is applied where it is considered that the Proposed Scheme will cause harm to the significance of the asset, and therefore not all of the assets presented in the gazetteer in the HEDBA are included in the statement.

7.4.13. It is considered that the assets presented in Table 7-8 below are likely to be subject to either a physical impact from the Proposed Scheme or an impact resulting from harm to their settings. Only assets within a significant (moderate or major) impact are discussed below. Any insignificant (uncertain, negligible or minor) impacts are discussed within the Historic Environment Desk-based Assessment, **Appendix 7.A (Volume IV)**:

Table 7-8 – Significance of Historic Assets to be Impacted by the Proposed Scheme

Significance	Asset Name
Designated Historic Assets	
Very High	None
High	Maes Y Crug Scheduled Monument (CM328) Ffairfach Standing Stone Scheduled Monument (CM325)
Medium	None
Non-designated Historic Assets	
Medium	Bridges, abutments and culverts over watercourses
Low	Abercothy Cottage (HER21266)
Negligible	None

Non-designated Historic Assets

7.4.14. The site of Abercothy cottage (HER21266) is located 600m east from the town Nantgaredig and 80m west of the river Towy and directly south of the railway line. The cottage was shown on tithe map but not on the late 20th century OS maps. Although the building is no longer extant it is possible that there are some below ground remains associated with the asset. As the asset survives as buried archaeological remains, the significance is unknown, however, due to the number of similar post-medieval cottages within south Wales, the remains are predicted to be of low significance.

Bridges, Abutments and Culverts over Water Courses

7.4.15. Although the following are not included within the Historic Environment Record, the abutments of the former Gwynon Bridge and other bridges, abutments and culverts over water courses are historic assets which are part of the former railway line. They are of **medium significance** and hold value due to their association with the former railway line.

Designated Historic Assets

7.4.16. Maes y Crug Round Barrow Scheduled Monument (CM328) comprises the remains of a round barrow, a burial monument probably dating to the Bronze Age (c.2300 BC - 800 BC) and is situated in an enclosed improved pasture immediately to the south-east of Maes y Crug House. The grass-covered barrow was circular in plan and measured about 17m in radius and at least 0.5m in height. However, the barrow was cut by the construction of a railway line in 1864 (a stone cist is recorded as being found, containing pottery and bronze implements). Only the north-north-west half of the barrow remains, although much potential for archaeological information remains. The monument is of national importance for its potential to enhance the knowledge of prehistoric burial and ritual. The monument is an important relic of a prehistoric funerary and ritual landscape and retains significant archaeological potential, with a strong probability of the presence of both intact burial or ritual deposits and environmental and structural evidence, including a buried prehistoric land surface. The area scheduled comprises the remains described and an area around them within which related evidence may be expected to survive. The monument represents part of a prehistoric landscape, comprising other scheduled monuments; Ffynnon-Newydd Standing Stones (CM325), Pen Y Garn Camp (CM150), Ffairfach Standing Stone (CM325) and the remains of an Iron Age fort at Dryslwyn Castle (CM030). As an asset of national importance its value is considered **high**.

7.4.17. Ffairfach Standing Stone Scheduled Monument CM325, comprises a standing stone, located within a yard/field that belongs to the cattle market in Ffairfach. The large block of stone is 1.6m in height and likely dates to the Bronze Age (c.2300 BC – 800 BC). The monument is of national importance for its potential to enhance our knowledge of prehistoric ritual practices. The monument retains significant archaeological potential with a strong probability of associated archaeological features and forms an important element in the wider prehistoric funerary and ritual landscape. As an asset of national importance its value is considered as **high**.

7.5 SENSITIVE RECEPTORS

7.5.1. The following assets are the sensitive receptors, for which there are predicated significant impacts, and have been assessed within this Chapter:

- Maes y Crug Scheduled Monument (CM328);
- Ffairfach Standing Stone Scheduled Monument (CM325);
- Site of Abercothy Cottage (HER21266);
- Bridges, Abutments and Culverts over water courses and
- Unknown buried historic assets.

7.6 RELEVANT ELEMENTS OF THE PROPOSED SCHEME AND ESTABLISHING THE PRE-MITIGATION SCENARIO

CONSTRUCTION PHASE

7.6.1. The following measures / elements are considered relevant to the assessment of the likely significant environmental effects in relation to the historic environment:

- The extent of excavation and foundation solutions with regard to the cycle path as detailed in **Chapter 3 – Description of the Proposed Scheme**;

- Retention of existing features (see **Chapter 3 – Description of the Proposed Scheme**);
- The excavation and construction of the river crossings as detailed in **Chapter 3 – Description of the Proposed Scheme**;
- The use of cranes during certain phases of the construction phase, however, their use on the Scheme will only be for the duration of particular activities (i.e. temporary and short-term);
- Location of the construction compounds within the Scheme boundary (see **Chapter 3 – Description of the Proposed Scheme**);
- A Construction Environmental Management Plan (CEMP) will be implemented prior to the commencement of the development, to include the construction environmental management practices as detailed in **Chapter 3 – Description of the Proposed Scheme**; and
- Construction of barriers, gates cattle grids at key locations to manage access and will be incorporated as necessary.

OPERATIONAL PHASE

7.6.2. The following measures / elements are considered relevant to the assessment of the likely significant environmental effects in relation to the historic environment:

- The bridge structure will have a span of approximately 60m and will be 3.4m (including 1.4m parapet) above the existing bank level. As outlined in **Chapter 4 – Consideration of Alternatives**, the Proposed Scheme was designed at this height in order to minimise the visual impact and associated impact on the setting of historic assets, despite the lower design being inaccessible during flood events; and
- The structural beams and cladding of the bridge will be glulam laminated timber. This is a material has been chosen for its characteristics such as its non-reflective attributes and natural appearance, and are sympathetic to visual amenity and heritage setting. The cladding uses a complex pattern designed to appear visually recessive from distant views, a quality that will be enhanced by the subtle differences in the way in which each shingle will weather over time to create a subtle patina effect.

7.7 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION AND OPERATION

Loss of or disturbance to below-ground archaeological remains

7.7.1. The magnitude of impact on archaeological remains will be largely influenced by works associated with construction. Works that have the potential to disturb below-ground and earthwork remains include, but are not limited to, the construction of the cycle route, two new bridges, barriers, gates, compound areas, landscaping features and temporary access routes. These works could possibly remove or partially disturb unknown archaeological assets within their footprint.

7.7.2. Historic mapping (discussed in the HEBDA, **Appendix 7.A (Volume IV)** indicates that besides the Llanelly Railway, very little development has occurred within the area, therefore the potential for the survival of any hitherto unknown archaeological remains is likely to be high. The baseline data indicates the potential for survival of buried archaeological remains dating from the Prehistoric to the Post-medieval period. The value of any such buried assets is currently unknown but has the potential to range from negligible to high, depending on their archaeological interest. There is the

potential for moderate adverse impacts on unknown buried historic assets which result in effects ranging from **negligible to moderate** (depending on the value of the asset).

Buried Archaeological Remains

7.7.3. The site of Abercothy Cottage (HER21266) is located within the footprint of the Proposed Scheme. Although the building is no longer extant, it is possible that the construction of the Proposed Scheme will permanently harm any below-ground remains associated with the asset. The significance of the asset is unknown as it survives as buried archaeological remains. Should the asset be of moderate value and the magnitude of impact is high, there is expected to be a **moderate negative** significance of effect.

Maes y Crug Round Barrow Scheduled Monument (CM328)

7.7.4. Maes y Crug Round Barrow is located directly north of the Proposed Scheme. Construction-related traffic noise, movement, activity and lightspill associated with the Proposed Scheme, has the potential to affect the appreciation of the scheduled monument within its peaceful agricultural setting. The significance of effect is anticipated to be **moderate negative**, due to the high value and moderate magnitude of impact on the asset.

Built Heritage (Impacts on Setting)

7.7.5. It is anticipated that there could be a positive impact to Ffairfach Standing Stone (CM325) through modifications to the assets setting. The enclosed nature of the setting does not allow an experience or appreciation of the assets historic value. The Proposed Scheme could benefit the asset by opening it up to appreciation if treated sympathetically. The significance of effect is anticipated to be major beneficial, due to the high value and high magnitude of impact on the asset.

Bridges, Abutments and Culverts over Water Courses

7.7.6. Although the following are not included in the Historic Environment Record, the abutments of the former Gwynon Bridge and other bridges, abutments and culverts over water courses are historic assets which are part of the former railway line. Due to their association with the former railway line, these assets are of regional value. Design proposals include the retention of the abutments, with the exception of Structures 1 and 6 which suggest the existing masonry abutments to be demolished and partially demolished. The significance of effect is anticipated to be **major negative**, due the medium value and high magnitude of impact on these assets. Despite the demolition of the abutments at Structure 1 and partial demolition of abutments at Structure 2, the assets can still be appreciated as a group associated with the former railway line.

MITIGATION / ENHANCEMENT

Maes y Crug Round Barrow Scheduled Monument (CM328)

7.7.7. Maes y Crug Round Barrow is located directly north of the Proposed Scheme. Construction-related traffic noise, movement, activity and light spill associated with the Proposed Scheme, has the potential to affect the appreciation of the scheduled monument within its peaceful agricultural setting. Any suitable mitigation measures would be outlined in the Construction Environment Management Plan (CEMP).

Buried Archaeological Remains

7.7.8. The site of Abercothy Cottage (HER21266) is located within the footprint of the Proposed Scheme. Although the building is no longer extant, it is possible that the construction of the Proposed Scheme will impact any below-ground remains associated with the asset. It is recommended that an archaeological watching brief take place during construction, in order to record any remains associated with the asset.

7.7.9. Current legislation draws a distinction between archaeological remains of national or international importance and other remains considered to be of lesser importance. Those perceived to be of international or national importance may require preservation in situ, whilst those of lesser importance may undergo archive recording, where they are Regional/ County or Local/ Borough importance. If impacts occur on currently unknown but nationally important assets, preservation in-situ would be explored, where practicable.

7.7.10. Any archaeological work will be undertaken in consultation with the relevant Archaeological Advisor, and in accordance with an archaeological Written Scheme of Investigation (WSI) approved by the scope and method of investigation, along with the post-excavation reporting and dissemination strategy. The requirement of a WSI should be included in the CEMP, and it is anticipated that archaeological investigation would be a stipulated condition of planning.

Built Heritage (Impacts on Setting)

7.7.11. The impacts on these assets are associated with construction works and, in this instance, a construction traffic plan could mitigate any temporary impacts on the setting of designated historic assets.

7.7.12. Ffairfach standing stone (CM325) lies in a paddock on the edge of the village. The stone is currently located on private land to the rear of Ffairfach cattle market. The enclosed nature of this area does not allow the historic value of the asset to be appreciated or experienced, as the asset is on private land, bordered by a hedge row. The location of the Proposed Scheme could benefit the asset by opening it up to appreciation if treated sympathetically.

7.7.13. Further enhancement of the asset could be achieved by including interpretation panels.

Bridges, Abutments and Culverts over Water Courses

7.7.14. Current design proposals for structures, include the retention of existing masonry abutments, with the exception of Structures 1 and 6 which includes the demolition and partial demolition of the existing masonry abutments. It is suggested a Level One Type Building Investigation take place at both locations for the existing masonry abutments, which will include a detailed photographic and written record.

RESIDUAL EFFECTS

Buried Archaeological Remains

7.7.15. The Proposed Scheme would result in the removal of archaeological remains associated with the site of Abercothy (HER21266) during the construction phase. The **moderate negative** effects of the removal of the asset could be offset following an archaeological watching brief. The adverse effect would not be offset entirely, as preservation by record cannot replace the loss of a historic asset.

Built Heritage (Impacts on Setting)

7.7.16. During the construction phase, the Proposed Scheme has the potential to affect the appreciation of Maes y Crug (CM 328) scheduled monument within its peaceful agricultural setting. For the purpose of this assessment, it is assumed that these effects could be mitigation by suitable measures outline in the CEMP.

7.8 LIMITATIONS AND ASSUMPTIONS

7.8.1. The following assumptions and limitations apply to this chapter:

- The information presented in this chapter has been drawn from data obtained from a variety of sources and includes secondary information. It is assumed this information is accurate;
- The data provided by Historic Environment Records is not a record of all surviving historic assets, but a record of the discovery of a wide range of archaeological and historical components of the historic environment. There is a potential for the presence of further, unrecorded, historic assets and components of the historic environment;
- This assessment is based on the Proposed Scheme proposals as presented at the time of compiling this report. Any comments received on this document from Cadw or the Dyfed Archaeological Trust Planning Archaeologist should be taken into consideration for future assessment or investigations;
- No site visits were undertaken for historic assets located on the verge of the two highways for health and safety reasons;
- It is assumed that all existing masonry abutments associated with the former railway will be retained. This is with the exception to the masonry abutments at Structures 1 and 6 which will be demolished and partially demolished; and
- It is assumed that there will be no impact on existing crossing gates associated with the former railway line. These crossing gates should be protected during construction.

7.9 SUMMARY

7.9.1. This Chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Scheme upon the Historic Environment. This comprises known and currently unknown below-ground remains and above ground historic assets.

7.9.2. The assessment identified five sensitive receptors; Maes y Crug Scheduled Monument (CM328), Ffairfach Standing Stone Scheduled Monument (CM325), the Site of Abercothy Cottage (HER21266), Bridge, Abutments and culverts over water courses and unknown buried historic assets.

7.9.3. The site of Aberycothy cottage (HER21266) is the only non-designated historic asset anticipated to be physically impacted by the Proposed Scheme. The asset is of **low** to **moderate value** and as the magnitude of impact is **high**, there is expected to be a **moderate** significance of effect. Mitigation measures in the form of an archaeological watching brief should take place in order to record any remains associated with the asset. The adverse effect would not be offset entirely, as preservation by record cannot replace the loss of a historic asset.

7.9.4. A Construction Traffic Management Plan and Construction Environmental Management Plan should also be implemented to mitigate any temporary impacts on the setting of designated and non-designated historic assets.

7.9.5. Current design proposals for structures, include the retention of existing masonry abutments, with the exception of Structure 1 which included the demolition of the existing masonry abutments and Structure 6 which includes the partial demolition of the existing masonry abutments. The significance of effect is anticipated to be **major negative**, due the **medium valu**e and **high adverse magnitude** of impact on these assets. It is suggested a Level One Type Building Investigation take place for the existing masonry abutments, which will include a detailed photographic and written record.

Table 7-9 – Summary of Likely Significant Environmental Effects for Historic Environment

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement	Significance and Nature of Effect Following Mitigation / Enhancement (Residual Effect)
Construction Phase				
Loss of or disturbance to below ground archaeological remains	Unknown below ground historic assets	Currently unknown but has the potential to range from negligible to high	There is the potential for moderate adverse impacts on unknown buried historic assets which result in effects ranging from negligible to moderate, depending on the value of the assets.	Moderate / - / P / D / LT
Loss of or disturbance to below ground archaeological remains	Site of Abercothy Cottage (21266)	Moderate / - / P / D / LT	For the site of Abercothy Cottage (HER21266), it is recommended a programme of intrusive archaeological investigation take place, in the form of a watching brief.	Moderate / - / P / D / LT
Physical impacts to above ground historic assets	Bridges, Abutments and culverts over water courses	Major / - / P / D / LT	Current design proposals for structures, include the demolition of the existing masonry abutments at Structure 1 and the partial demolition of the existing masonry abutments by Structure 6. It is suggested a Level One Type Building Investigation take place for the existing masonry abutments at	Negligible / - / P / D / LT

Likely Significant Environmental Effects	Receptor	Significance and Nature of Effect Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement	Significance and Nature of Effect Following Mitigation / Enhancement (Residual Effect)
			Structure 1 and 6, which will include a detailed photographic and written record.	
Change to the setting of designated and non-designated historic assets	Scheduled Monument Maes y Crug Round Barrow	Moderate / - / T / D / ST	Construction-related traffic noise, movement, activity and light spill associated with the Proposed Scheme, has the potential to affect the appreciation of the scheduled monument within its peaceful agricultural setting. Any mitigation measures would be reported in the Construction Environmental Management Plan.	No mitigation has been recommended, as the impact is temporary and the asset should return to baseline conditions once the construction phase is complete.
Operation Phase				
Changes to the setting of designated and non-designated historic assets	Scheduled Monument Ffairfach Standing Stone (325)	Moderate / + / P / D / LT	The siting of the Proposed Scheme alongside the location of the asset, if treated sympathetically, could benefit the asset by opening it up to appreciation.	Moderate / + / P / D / LT

NB: Aspects of the Proposed Scheme considered as part of the pre-mitigation scenario are summarised above in Section 7.10, and within Chapter 13 - Summary of ES. *Key to table: + / - = Positive or Negative; P / T = Permanent or Temporary; D / I = Direct or Indirect; ST / MT / LT = Short Term, Medium Term or Long-term; N/A = Not Applicable

7.10 REFERENCES

Ref. 7.1 - Ancient Monuments and Archaeological Areas Act 1979

Ref. 7.2 – Planning (Listed Buildings and Conservation Areas) Act 1990

Ref. 7.3 - Historic Environment (Wales) Act 2016

Ref. 7.4 - Welsh Office Circular 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas

Ref. 7.5 - Conservation Principles for the sustainable management of the historic environment in Wales (Cadw, 2011)

Ref. 7.6 - Setting of Historic Assets in Wales, Cadw (2017)

Ref. 7.7 - The Chartered Institute for Archaeologists Guidance for Desk-based Assessments (2020)

Ref. 7.8 – Department for Transport (2020) Design Manual for Roads and Bridges. Sustainability and Environment, LA 106 Cultural Heritage Assessment

8 BIODIVERSITY

8.1.1. This Chapter reports the assessment of the likely significant effects arising from the Proposed Scheme upon the biodiversity of the Site and the potential Zone of Influence (ZoI) around the Site. The Chapter describes:

- Relevant legislation, policy and guidance;
- Consultation undertaken;
- Assessment methodology;
- Baseline conditions;
- Preliminary assessment of likely significant effects;
- Assessment of likely significant effects with mitigation;
- Residual effects; and
- Next steps.

8.1.2. A detailed description of the Proposed Scheme is provided in Chapter 3 of this report and therefore has not been reproduced here. Reference should be made to Chapter 3 when cross-referencing likely impacts and effects of the Proposed Scheme (Section 8.9).

8.1.3. For the purposes of this Chapter, the construction footprint of the Proposed Scheme, including any compound areas is referred to as 'the Site' (Figure 1.1).

8.1.4. Impacts during construction and operation will include loss of damage to and disturbance of existing habitats resulting from site clearance and groundworks required to facilitate the Proposed Scheme. These habitats may be Important Ecological Features (IEFs) in their own right, and may support a range of species, also potentially IEFs, that use them.

8.1.5. This Chapter is intended to be read as part of the wider ES, with particular reference to Chapter 6: Landscape and Visual and Chapter 9: Water Environment and Flood Risk, as well as the Arboricultural Statement **(Appendix 6.A (Volume IV)),** Habitats Regulations Assessment (HRA) Screening **(Appendix 2.E (Volume IV))** and Water Framework Directive (WFD) Assessment **(Appendix 4.B (Volume IV)),** which have been appended to this ES.

8.1.6. In addition, this Chapter is supported by a series of Technical Figures (Figure 8-1 to 8-9) and Appendices **(Appendix 2.A to 2-R (Volume IV)).**

8.2 LEGISLATIVE AND POLICY FRAMEWORK AND GUIDANCE

8.2.1. A summary of the international, national, and local legislation, planning policy and guidance relevant to the Biodiversity assessment for the Proposed Scheme is set out below.

LEGISLATIVE FRAMEWORK

International

8.2.2. Applicable legislative framework at an international level includes the following:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 ('The Habitats Directive') (**Ref. 8.1**), transposed to the Conservation of Habitats and Species Regulations 2017 (as amended) (see below, National);

- Council Directive 2009/147/EC on the Conservation of Wild Birds 2009 ('The Birds Directive') (**Ref. 8.2**), transposed to the Conservation of Habitats and Species Regulations 2017 (as amended); and
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat ('Ramsar Convention') (**Ref. 8.3**).
- Water Framework Directive (2000/60/EC) (**Ref. 8.4**). A legal act of the European Union that mandates a requirement for waterbodies to achieve good ecological and chemical status in relation to development. Further detail is provided in Chapter 9 Water Environment and Flood Risk of this ES.

8.2.3. The relevance of this legislation in a UK context is described below.

National

8.2.4. Applicable legislative framework at a national level includes:

Conservation of Habitats and Species Regulations 2017 (as amended)

8.2.5. The Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations') consolidate the Conservation of Habitats and Species Regulations 2010 with subsequent amendments. The Habitats Regulations transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive), into national law. They also transpose elements of the EU Wild Birds Directive in England and Wales.

8.2.6. All species listed under Annex IV of the Habitats Directive require strict protection and are known as European Protected Species (EPS). Under Regulation 43 of the Habitats Regulations it is unlawful to: deliberately kill, capture or disturb; deliberately take or destroy the eggs of; and damage or destroy the breeding site/resting place of any species protected under this legislation.

8.2.7. If it is determined that impacts to an EPS during a development are unavoidable then the works may need to be carried out under a site-specific mitigation licence from the Statutory Nature Conservation Organisation; Natural Resources Wales (NRW).

8.2.8. Certain EPS are also listed under Annex II of the Habitats Directive and are afforded protection by the establishment of core areas of habitat known as Special Areas of Conservation (SACs). In addition, all bird species listed under Annex I of the Birds Directive are rare or vulnerable and afforded protection by the classification of Special Protection Areas (SPAs). This means that 'Annex II species' under the Habitats Directive and Annex I bird species under the Birds Directive are a relevant consideration in a Habitats Regulations Assessment (HRA).

8.2.9. Following the UK's exit from the EU, the Habitats Regulations were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (**Ref. 8.5**). Many of the changes made were only those necessary to ensure that the Habitats Regulations remain operable now that the UK has left the EU.

The Ramsar Convention

8.2.10. In addition to the above, the UK is a signatory to the Ramsar Convention. The Convention has three main 'pillars' of activity: the designation of wetlands of international importance as Ramsar sites, the promotion of the wise use of all wetlands in the territory of each country, and international co-operation with other countries.

8.2.11. The UK has chosen to underpin the designation of its Ramsar sites through prior notification of these areas as Sites of Special Scientific Interest (SSSIs) in Wales. Accordingly, these receive statutory protection under the Wildlife and Countryside Act 1981 (as amended) (see below). The
Welsh Government has also issued policy statements relating to the special status of Ramsar sites. This extends the same protection at a policy level to listed Ramsar sites in respect of new development as that afforded to SACs and SPAs.

The Wildlife and Countryside Act 1981 (as amended)

8.2.12. Protected birds, animals and plants are listed under Schedules 1, 5, 8 and 9 respectively of the Wildlife and Countryside Act 1981 (WCA) (**Ref. 8.6**).

8.2.13. Birds listed under Schedule 1 of the WCA are afforded additional protection with regard to intentional or reckless disturbance whilst nest-building, or at a nest containing eggs or young, or disturbance to the dependent young of such a bird.

8.2.14. Species listed in Schedule 5 can either be fully protected or be partially protected under Section 9, which makes it unlawful to intentionally: kill, injure or take; possess or control (live or dead animal, part or derivative); damage or destroy any structure used for shelter or protection; disturb them in a place of shelter or protection; obstruct access to place of shelter or protection; sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative); and advertise for buying or selling.

8.2.15. The WCA makes it an offence (subject to exceptions) to pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8.

8.2.16. Invasive species listed under Schedule 9 are prohibited from release into the wild and the Act prohibits planting or “causing to grow” in the wild of any plant species listed in Schedule 9.

8.2.17. Under the WCA all wild birds, their nests and eggs (with exception of species listed under Schedule 2) are protected whilst breeding.

The Countryside and Rights of Way (CRoW) Act 2000

8.2.18. The Countryside and Rights of Way (CRoW) Act (**Ref. 8.7**) has amended the WCA in England and Wales, strengthening the protection afforded to SSSIs and the legal protection for threatened species. It adds the word ‘reckless’ to the wording of the offences listed under Section 9(4) of the WCA. This alteration makes it an offence to recklessly commit an offence, where previously an offence had to be intentional to result in a breach of legislation.

Environment (Wales) Act 2016

8.2.19. This Act (**Ref. 8.8**) sets out the requirement for the “sustainable management of natural resources” together with new ways of working to achieve this. Part 1 of the Environment Act sets out Wales' approach to planning and managing natural resources at a national and local level with a general purpose linked to statutory principles of sustainable management of natural resources defined within the Act.

8.2.20. Section 6 under Part 1 introduced an enhanced biodiversity and resilience of ecosystems duty (the S6 duty) for public authorities in the exercise of functions in relation to Wales, superseding provisions previously set out in the Natural Environment and Rural Communities (NERC) Act 2006. The S6 duty requires that public authorities must seek to maintain and enhance biodiversity so far

as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems.

8.2.21. Section 7 of the 2016 Act replaces the duty in Section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales which they consider are of key significance to sustain and improve biodiversity in relation to Wales. The Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps. Lists of species and habitats in Section 7 are known as Priority Species and Priority Habitats or Species of Principal Importance (SPI) and Habitats of Principal Importance (HPI) and replace the lists in Section 42 of the NERC Act.

The Well-being of Future Generations Act (2015)

8.2.22. This Act (**Ref. 8.9**) links with the Environment (Wales) Act 2016 to form part of an integrated legislative framework for the delivery of sustainable development. It places a duty on public bodies in Wales to carry out sustainable development, by achieving each of the seven well-being goals identified within the Act. Of these well-being goals, a 'Resilient Wales' is most notable to biodiversity, as defined by

'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)'.

The Hedgerows Regulations 1997

8.2.23. In England and Wales, The Hedgerows Regulations (**Ref. 8.10**) are intended to protect 'important' hedgerows. In order to be classified as important from a biodiversity standpoint, hedgerows must meet a series of certain criteria, which relate their length, species mix, associated features, and ability to support protected or notable species.

8.2.24. A Local Planning Authority (LPA) must apply The Hedgerows Regulations in relation to plans or projects that may damage or destroy important hedgerows and refuse development where such impacts may be incurred. Alternatively, where it is determined that works affecting an important hedgerow are essential, a Hedgerow Removal Notice must be provided to the LPA, and appropriate compensatory planting must be implemented following removal.

The Protection of Badgers Act 1992

8.2.25. This Act (**Ref. 8.11**) makes it an offence to kill or take a badger, or to interfere with a badger sett unless such action is licenced by Natural Resources Wales. Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural Resources Wales takes this definition to include seasonally used setts.

The Salmon and Freshwater Fisheries Act 1975 (as amended); Ref 8.12

8.2.26. This Act **(Ref. 8-12)** covers regulation of fisheries in England and Wales and includes legislation that covers the introduction of polluting effluents, the obstruction of fish passage (screens, dams, weirs, culverts etc.) illegal means of fishing, permitted times of legal fishing and fishing licencing (which covers electric fishing). Under this act any person who causes or knowingly permits to flow, or puts or knowingly permits to be put, into any waters containing fish or into any tributaries of waters

containing fish, any liquid or solid matter to such an extent as to cause the waters to be poisonous or injurious to fish or the spawning grounds, spawn or food of fish, shall be guilty of an offence.

8.2.27. The act also requires that fish passes are installed on new and rebuilt barriers that affect waters frequented by salmon or migratory trout.

POLICY FRAMEWORK

National

Planning Policy Wales (PPW) 2021

8.2.28. PPW (Edition 11, February 2021; **Ref. 8.13**) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of additional documentation which, in combination, provide the national planning policy framework for Wales. Its primary objective is:

"to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales."

8.2.29. An overarching theme of PPW is resilient biodiversity and ecosystems. This is discussed in most detail in Section 6 'Distinctive and Natural Places'. Section 6.4 discusses biodiversity and ecological networks, with specific reference to the S6 Duty set out in the Environment (Wales) Act 2016. It states that:

"the planning system has a key role to play in helping to reverse the decline in biodiversity and increasing the resilience of ecosystems… by ensuring appropriate mechanisms are in place to both protect against loss and to secure enhancement."

Technical Advice Note 5; Nature Conservation and Planning 2009

8.2.30. Technical Advice Note (TAN) 5 (**Ref. 8.14**), provides further advice and detail about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. TAN 5 brings together advice on sources of legislation relevant to various nature conservation topics which may be encountered by LPAs.

Nature Recovery Action Plan Wales – the Biodiversity Strategy for Wales. Part 1: Our Strategy for Nature (2015) and Part 2: Nature Recovery Action Plan (2020 – 2021)

8.2.31. The Nature Recovery Action Plan (**Ref. 8.15**) links to and complements The Well-being of Future Generations (Wales) Act 2015 and the Environment Act (Wales) 2016.

8.2.32. The Plan sets out how the United Nations Environment Programme's Convention on Biological Diversity's (CBD) Strategic Plan for Biodiversity (and the associated Aichi Biodiversity Targets for 2011-20 in Wales) is addressed in Wales. The Plan includes two parts;

- Part 1: 'Our Strategy for Nature' , which sets out the commitment to reversing the loss of biodiversity in Wales, and the objectives for action, first adopted in 2015; and
- Part 2: 'Our Action Plan', which has been refreshed for 2020 - 2021 to provide focus and prioritisation within a fast changing policy context and the emerging ecological crisis.

Local

Carmarthenshire County Council Local Development Plan 2006 – 2021 (adopted 2014)

8.2.33. The Local Development Plan (**Ref. 8.16**) is the statutory development plan for the county and provides the local policy framework against which development proposals will be considered. In

conjunction with national policy outlined above, Carmarthenshire County Council (CCC)'s Local Development Plan seeks to safeguard environmental quality by enhancing areas of landscape and/or nature conservation interest and affording appropriate protection to the general environment of the plan area. Specific policies of relevance under Section 6.6 Environmental Qualities – Built & Natural Environment include:

- Policy EQ4 – Biodiversity: seeks to ensure that notable habitats and species identified as being of national, regional and local importance within the Local Biodiversity Action Plan (below) are suitably enhanced, protected and not adversely affected by development proposals. The policy sets out the need for development proposals to consider suitable mitigation measures to minimise impacts on sensitive ecological receptors, as well as the requirement for habitat and species management and monitoring plans, where applicable. The role of habitats and associated areas as connectivity pathways, 'ecological networks' or 'animal corridor networks' will also, where applicable, be considered under Policy EQ5 below.
- Policy EQ5 – Corridors, Networks and Features of Distinctiveness. This policy seeks to protect a diverse range of linear or continuous features which make an important contribution to the landscape qualities of the County, as well as playing an important role in protecting and enhancing biodiversity, geodiversity and culture. Such features include: hedgerows, ditches and banks, stone walls, streams, tree belts, woodlands, veteran trees, parklands, green lanes, river corridors, lakes, ponds, road verges, or habitat mosaics or networks of other locally important habitats including peat bogs, heathland, wetlands, saltmarshes, sand dunes and species rich grass lands. In utilising this Policy, proposed developments are encouraged to support the retention, management and development of these features.

Carmarthenshire County Council Local Biodiversity Action Plan (LBAP) 2000

8.2.34. The policy (**Ref. 8.17**) has been produced by a partnership of organisations concerned with the conservation of Carmarthenshire's biodiversity. The plan strives to achieve the following aims:

- *'To maintain and enhance the biodiversity of Carmarthenshire through the preparation and implementation of individual action plans, covering a range of selected habitats and species which reflect both national and local priorities;*
- *To develop effective local partnerships to co-ordinate and deliver biodiversity action in Carmarthenshire;*
- *To raise public awareness of the importance of conserving and enhancing Carmarthenshire's biodiversity; and,*
- *To monitor progress in achieving local biodiversity targets and to report on such progress to a national biodiversity database'.*

8.2.35. The LBAP contains a series of action plans covering nationally threatened or declining species and habitats across Carmarthenshire, as well as species and habitats of local concern. The LBAP focuses on local action that meets the objectives for each habitat and species within the Plan.

8.2.36. Habitats have been classified into nine groups: woodland, upland habitats, freshwater, wetlands, farmland, lowland grassland and heathland, brownfield/urban, and coastal and marine habitats and species.

8.2.37. Species have been grouped in with habitats where possible, as habitat management is often the main action in achieving conservation of species. However a number of species have also been assigned their own individual action plans.

Carmarthenshire Nature Recovery Action Plan

8.2.38. Prepared by the Carmarthenshire Nature Partnership, this plan (**Ref: 8.18**) (once adopted) will replace the LBAP for Carmarthenshire. The plan will contribute towards the Nature Recovery Action Plan Wales, working to reverse the decline in biodiversity in Wales and build the resilience of our ecosystems.

GUIDANCE

National

8.2.39. The ecological assessment has been undertaken using the approach detailed in the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EcIA) (**Ref. 8.19**), hereafter referred to as 'the CIEEM EcIA guidelines'. These guidelines represent the current best practice for assessing the ecological impacts of development projects.

8.2.40. Ecological surveys undertaken to inform the baseline, as detailed in Section 8.6 of this chapter, have been completed with due regard to current good practice guidelines as detailed within the individual technical appendices.

Local

Carmarthenshire Nature Conservation and Biodiversity, Draft Supplementary Planning Guidance

8.2.41. The ecological assessment has also been undertaken in accordance with the approach outlined within the Carmarthenshire Nature Conservation and Biodiversity, Draft Supplementary Planning Guidance (**Ref. 8.20**), in assessing the impacts of proposed developments on ecological features.

8.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

SUMMARY OF CONSULTATION

8.3.1. NRW and CCC were consulted on the ecological aspects of the Proposed Scheme during the scoping stage of the Proposed Scheme. The responses are set out in **Appendix 1.D (Volume IV).**

Further consultation to inform the ES (and future Biodiversity Net Benefit assessment) included discussions between CCC and WSP on 11th March 2022 in relation to the ratio of habitat loss: habitat gain which can be achieved within the Proposed Scheme footprint, for habitats being permanently lost. The ratios in Table 8-1 were agreed for habitats being permanently lost:

Table 8-1 – Agreed ratio of habitat loss: habitat gain, for habitats permanently lost.

Habitat type	Habitat loss : habitat gain ratio
Broadleaved woodland - semi-natural	1 : 2

Coniferous woodland - plantation	1 : 2
Mixed woodland – semi-natural	1 : 2
Scrub dense / continuous	1 : 2
Scrub - scattered	1: 1
Broadleaved parkland / scattered trees	1 : 2
Neutral grassland – semi-improved	1 : 1
Semi-improved grassland	1 : 1
Poor semi-improved grassland	1 : 1
Improved grassland	1 : 1
Hedge with trees – native species-rich	1 : 2
Hedge with trees – species-poor	1 : 2
Intact hedge – species poor	1 : 2
Intact hedge – species not specified	1 : 2
Intact hedge – native species-rich	1 : 2

SCOPE OF THE ASSESSMENT

8.3.2. An EIA Scoping Report was submitted to CCC on 27th March 2018 (**Appendix 5.3**). This section of the ES chapter confirms the scope of the assessment and the evidence base used to confirm insignificant and significant effects.

8.3.3. The CCC response to the EIA Scoping Report indicated that the proposed scope of the assessment (as set out in the EIA scoping report) in relation to Biodiversity was appropriate. Thus, the assessment is based on the scope as presented in the Scoping Report albeit with the following updates:

- A desk study and various ecological surveys including extended Phase 1 Habitat Survey, otter survey and bryophyte survey were completed from 2017 – 2022 to inform the EIA Scoping Report. The results of ecological surveys and assessments are considered valid for 18 months (**Ref. 8-20**). An update desk study, Update Ecological Appraisal, otter survey and bryophyte survey has therefore been completed to inform this ES.

- Bat surveys of the River Gwynon bridge and up-close / aerial inspections of trees previously identified as having suitability to support roosting bats have also been completed to determine the presence or likely absence of roosting bats. The results have informed this ES chapter.
- The ES has been informed by the updated Proposed Scheme footprint (Figure 1.1), and habitat clearance plans (Figure 8-8 and 8-9) and updated Arboricultural Statement (**Appendix 6.A (Volume IV)**), particularly in relation to the assessment of dormouse and bats.
- Updated designs and clearance plans (The ES and supporting HRA Stage 2 Appropriate Assessment has been informed by a Preliminary Aquatic Ecology Assessment which has been undertaken to identify the suitability of habitats at watercourse crossings along the Proposed Scheme to support protected fish species listed as qualifying features of the River Towy SAC.
- Updated structure designs ensure that no temporary or permanent land take within the River Towy SAC / SSSI will be required. New structure abutments will be set back from the river channel and behind existing abutments that will remain in-situ.

INSIGNIFICANT EFFECTS

8.3.4. Sites, habitats and species have been considered as important ecological features for inclusion within the ES based on a range of factors including being designated or legally protected, or inclusion on lists of priority, endangered or controlled habitats or species. Those important ecological features considered unlikely to be subject to significant effects from the Proposed Scheme have been scoped out of the ES either because the ecological feature is considered likely to be absent from the Zone of Influence (ZoI); because no potential effect pathway is envisaged; or because the potential effect pathway will be controlled via designed-in avoidance measures (embedded mitigation).

Source-Pathway-Receptor Approach

8.3.5. The source-pathway-receptor approach was used to understand the mechanisms by which the Proposed Scheme could result in likely significant effects on ecological resources. The approach started by identifying potential sources of effects, defining the ZoI, and then mapping the progression of the effect along potential mitigation pathways. Where it was observed that an effect was potentially connected, via a pathway, to an ecological resource, an analysis was undertaken to assess the implications for the resource, including the likely sensitively of the resource.

8.3.6. In order for an effect to occur, all three elements (source, pathway, and receptor) of the concept must be linked. The absence or removal of one of the elements means there is no likelihood for the effect to occur.

8.3.7. Habitats and species which may be impacted by the Proposed Scheme are considered to be within the ZoI. The ZoI is specific to the Important Ecological Feature (IEF) and is defined by the pathways available for the impact, either directly or indirectly, to result in a potential effect to the habitat or species.

8.3.8. The ZoI is assessed according to the anticipated construction work methods and the extent to which they can affect ecological features within and outside the boundaries of the Proposed Scheme. The ZoI for each ecological feature will vary depending on the nature of the ecological feature being considered and in accordance with published guidance where available. Table 8-2 shows the ZoI identified for IEFs for the Proposed Scheme.

Table 8-2 – Identified Potential Impacts and Zone of Influence

Potential Impact	Description	Zone of Influence	Rationale
Land take	Temporary or permanent loss of land or waterbodies as a result of construction or operation	The area within the temporary or permanent Proposed Scheme footprint	N/A
Changes in air quality	Changes in air quality as a result of dust during construction which can affect plant communities	Statutory designation; non-statutory designation and important habitats (IEFs) within 100 m of the Proposed Scheme footprint	CIEEM (2016) (**Ref. 8.21**) IAQM (2016) (**Ref. 8.22**).
Changes in noise and vibration	Noise and vibration emitted by plant and machinery during the construction.	Statutory designation; non-statutory designation and important habitats and species (IEFs) within 600 m of the Proposed Scheme footprint	Highways England DMRB (**Ref 8.23**) Scottish National Heritage (**Ref 8.24)**
Changes in hydrology (water quality and quantity)	Changes in water quality/flows as a result of discharge from the Proposed Scheme during construction and operation.	Any watercourse connected downstream to the Proposed Scheme up to a distance of 2 km	Chapter 9
Direct mortality during construction	Species mortality due to the presence of machinery / activities during construction	The area within the temporary or permanent Proposed Scheme footprint	N/A
Introduction of invasive species	Potential to introduce invasive species during the construction stage	The area within the temporary and permanent Proposed Scheme footprint	N/A

INSIGNIFICANT EFFECTS

8.3.9. Insignificant effects resulting from the Proposed Scheme, and therefore not considered within this ES, are detailed in Table 8-3

Table 8-3 – Insignificant Effects Resulting from Proposed Scheme

Effect	Reason for Being Scoped Out	Justification
Detrimental effects on populations of Great crested newt (GCN) *Triturus cristatus*	Feature absent or not important	Species considered likely absent from ZoI due to absence of records within local area and geographic range of species. Agreed with CCC Biodiversity Officer
Detrimental effects on populations of water vole *Arvicola amphibious*	Feature absent or not important	Species considered likely absent from ZoI due to absence of records within local area. Agreed with CCC Biodiversity Officer
Temporary disturbance of common and widespread species and habitats of negligible nature conservation value	Feature absent or not important	Do not meet criteria for requiring full EcIA (CIEEM), 2018) (**Ref 8-19**)
Degradation of designated sites other than the River Towy SAC and SSSI	Impact absent or no effect pathway	Dinefwr Estate SSSI / NNR is designated for parkland habitats which are unlikely to be effected by construction and operation of the Proposed Scheme. All other designated sites were considered too isolated from the Proposed Scheme with no suitable effect pathway.
Shading of aquatic habitats of River Towy SAC and SSSI	Impact absent or no effect pathway	Proposed bridge structure (Structure 5 on Figure xx) over the River Towy is 4m wide and would result in a minor increase in shading (already heavily shaded by large trees). Given that aquatic and terrestrial plant species are not qualifying interests/reasons for designation of River Towy SAC and SSSI, increase in shading would have negligible or no impacts.

Effect	Reason for Being Scoped Out	Justification
Direct harm and mortality of protected species due to site/construction traffic.	Impact absent or no effect pathway	Dinefwr Estate SSSI / NNR is designated for species that are unlikely to be effected by construction and operation of the Proposed Scheme.
Temporary loss of habitats which are or support qualifying interests of River Towy SAC / SSSI	Effect pathways controlled	Designs of all new structures ensures no temporary or permanent land take within the River Towy SAC / SSSI. New structure abutments set back from river channel and behind existing abutments that will remain in-situ.
Fragmentation of habitats / wildlife corridors	Effect pathways controlled	Proposed Scheme is unlikely to result in barriers for wildlife due to its narrow width (3m), absence of artificial lighting and relatively low levels of disturbance compared with roads and railways. Embedded design features at locations of hedgerow breaks and within woodland blocks, as well as the implementation of CEMPs and habitat / ecological management plans (prescribing detailed method statements / precautionary methods of work and future management) will be adopted to minimise fragmentation.
Detrimental effects of lighting on protected and notable species	Effect pathways controlled	Artificial lighting used during construction (winter months only) and for security reasons within site compounds will be task-specific and directed away from sensitive ecological receptors and boundary features; measures secured by the CEMPs and habitat / ecological management plans. Site compounds are all situated over 50m away from the River Towy SAC and SSSI. No artificial lighting will be used during the operational phase of the Proposed Scheme.
Detrimental effects on individuals of dormouse *Muscardinus avellanarius*	Effect pathways controlled	Dormice are assumed to be present within the Site due to the presence of suitable habitats, which are connected to the wider landscape (which is known to support dormice) (desk study records and CCC Biodiversity Officer pes comms).

Effect	Reason for Being Scoped Out	Justification
		At the Scoping Opinion stage, minimal loss of suitable dormouse habitat was anticipated. However the updated (final) designs for the Proposed Scheme will result in a greater loss of suitable dormouse habitat. Targeted mitigation, compensatory and habitat management measures will be employed to ensure the Favourable Conservation Status (FCS) of dormouse is maintained. Such measures will be safeguarded by a European Protected Species (EPS) development licence for dormice, CEMPs and habitat / ecological management plans for the scheme.
Detrimental effects on individuals of slow worm *Anguis fragilis*	Effect pathways controlled	Slow worm are considered likely present due to the presence of suitable habitats and confirmed records within 2km. However the extent of suitable habitat being lost is considered to be small and the likelihood of slow worm being present within those small areas, and for the small areas to be important habitat resources for the species, is considered negligible. CEMPs and habitat / ecological management plans will be employed prescribing detailed method statements and precautionary methods of working to minimise impacts in sensitive areas and to minimise the risk of incidental mortality of any individual slow-worms, in the event these are present in the ZoI.
Spread of invasive non-native species (INNS) (plants)	Effect pathways controlled	INNS (plants) are present within the Proposed Scheme footprint. Detailed method statements and biosecurity risk assessments will be designed and employed by a specialist INNS contractor to control and avoid the spread of INNS, along with implantation of measures prescribed with the CEMP and habitat / ecological management plans.

ASSESSMENT METHODOLOGY

8.3.10. Assessment methods for all potentially significant effects considered in this Chapter were based on the methodology described in the Guidelines for Ecological Impact Assessment in the UK (CIEEM 2018 (**Ref 8-19**)).

8.3.11. The importance and sensitivity of ecological features was evaluated with reference to the quality or extent of designated sites or habitats; to habitat or species rarity; to the extent to which they are threatened throughout their range; or to their rate of decline, and their legal status. This level of importance was then qualified at a relevant geographical scale.

8.3.12. Effects are deemed significant if they affect the structure and function of a site, or they impact upon the conservation status of a habitat, species or constituents of a species assemblage.

Significance Criteria

8.3.13. This section sets out the methodology followed to assess the potential ecological impacts of the Proposed Scheme, taking into account both the construction and operational phases. The construction phase includes enabling works, clearance, earthworks and construction activities as set out in Chapter 3: 'Description of Scheme'.

8.3.14. The methodology for this assessment is in accordance with guidance provided by the Chartered Institute of Ecology and Environmental Management (**Ref. 8-19)** and follows the key stages listed below:

- Establishing the Study Area and Survey Area;
- Collating information on the baseline studies and evaluation of ecological receptors;
- Identification of Important Ecological Features (IEFs);
- Identification and characterisation of potential impacts;
- Identification and assessment of significant effects from potential impacts upon IEFs; and
- Identification and assessment of residual effects.

Study Area and Survey Area

8.3.15. The ecological baseline was determined and appraised through a combination of desk-based study (Study Area) and field surveys (Survey Area) for protected / notable habitats and species of conservation concern.

8.3.16. The Study Area and Survey Area varies for each ecological feature in accordance with best practice guidelines and the likely ZoI of impacts. These are determined as follows:

- European and nationally designated sites within 1 km of the Proposed Scheme;
- Locally / non-statutory designated sites up to 100 m from the Proposed Scheme;
- Desk study records of protected and notable species up to 1 km from the Proposed Scheme;
- Field surveys for habitats and protected, notable and non-native invasive species up to 1 km from the Proposed Scheme were undertaken within individually defined Survey Areas.

8.3.17. The Survey Areas was determined as a result of the potential for impacts and where relevant, consideration of species behaviour, including their mobility.

BASELINE STUDIES AND EVALUATION OF ECOLOGICAL RECEPTORS

8.3.18. Baseline information regarding ecological features, including designated sites and protected / notable species and habitats, was obtained from existing data from published sources, databases

and local record centres, and ecological surveys. The surveys undertaken and methodologies adopted are detailed in Table 8-4.

Table 8-4 – Summary of Ecological Surveys and Assessments Undertaken to Inform the Baseline

Ecological Resource	Survey Type	Methodology
Designated sites	Desk study using West Wales Biodiversity Information Centre (WWBIC) data search	Professional judgement of ecologist
Non-statutory sites	Desk study using WWBIC data search	Professional judgement of ecologist
Habitats	Extended Phase 1 habitat survey, WSP, January 2019 v4 (Appendix 2.G) Update Ecological Appraisal, WSP, January 2023 (Appendix 2.H). Bryophyte Assessment, Vegetation Survey and Assessment, November 2017 (Appendix 2.P) and August 2020 (Appendix 2.Q). Preliminary Aquatic Ecology Assessment, WSP, May 2022 (Appendix 2.I)	Handbook for Phase 1 Habitat Survey (2010) (**Ref. 8-25)** Professional judgement of expert bryologist.
Protected Species	Badger Sett Classification – Carregllys, CCC June 2022 (Appendix 2.J). Update Badger Report, (appendix 2.K) Otter survey, January 2019 (Appendix 2.L). Updated Otter Survey, The Otter Consultancy June 2022 (Appendix 2.M). Bat Hibernation Inspections, WSP January 2023 (Appendix 2.N). Bat Up -close / Aerial Tree Inspection Survey, WSP September 2022 (Appendix 2.O).	Professional judgement of expert otter ecologist and adapted from DMRB. Volume 10 Environmental Design Section 4 Nature Conservation – Part 4 HA81/99 Nature Conservation in Relation to Otters (Highways Agency, 2011) Monitoring the Otter, Conserving Natura 2000 (Chanin, 2003) (**Ref 8-8-26**) Bat Surveys for Professional Ecologists, Good Practice Guidelines (Collins, 2016) (**Ref 8-27**) Bat Tree Habitat Key (Andrews, 2018) (**Ref 8-28**)

Desk Study

8.3.19. A desk study was undertaken in March 2017, followed by an update desk study in August 2021, to obtain and review records of designated sites and protected and notable species (terrestrial) surrounding the Site. A further desk study specifically for collecting aquatic ecology information was undertaken in March 2020.

8.3.20. Statutory designated sites (those considered nationally and internationally important for nature conservation) and non-statutory designated sites (those that are important in a local context) were searched for within 2 km of the site. Records of protected and notable species (terrestrial and aquatic) were searched for within a 2 km buffer from the site. The search buffers were considered suitable for the scale and type of the Proposed Scheme and surrounding land use. Only records collected within the last 10 years were considered relevant, with the exception of bat roost records for which all available records were considered.

8.3.21. The following data sources were contacted and / or reviewed to obtain records of the above species and designated sites:

- West Wales Biodiversity Information Centre (WWBIC);
- Multi Agency Geographic Information for the Countryside (MAGIC);
- NBN Atlas (aquatic ecology information only);
- Natural Resources Wales (aquatic ecology information only); and
- OS mapping and publicly available aerial photography.

Site Visits

Extended Phase 1 habitat survey

8.3.22. An Extended Phase 1 Habitat survey of the Survey Area was undertaken on 29th – 31st March, 3rd April, and 8th – 9th June 2017. Following an amendment to the proposed route, another survey visit was undertaken on 9th November 2017. The survey covered the Proposed Scheme plus a 100 m buffer where landowner access was granted. Areas within 100 m on the opposite bank of the River Towy were only surveyed from a distance.

8.3.23. An updated Phase 1 habitat survey of the Proposed Scheme was undertaken on 27th and 31st of July 2020, with an additional survey day on 7th of August 2020.

8.3.24. Habitats were described and mapped following the standard Phase 1 habitat survey methodology (JNCC, 2010). Full details of methods used and results are provided in **Appendix 2.G and 2.H (Volume IV).**

Preliminary Aquatic Ecology Assessment

8.3.25. A preliminary aquatic ecology assessment was completed on 27th - 29th July 2020 of proposed watercourse crossing points along the Proposed Scheme. The survey assessed the potential of the aquatic habitats to support legally protected and / or notable aquatic species. Channel and bank characteristics assessed included substrate type, water depth and estimated flow, riparian vegetation, artificial modifications, any notable features (such as woody debris, stepped weirs, etc.), and potential sources of anthropogenic stress. Observations were also made on habitat suitability, connectivity, and the presence of INNS **(Appendix 2.I (Volume IV)).**

Badger Survey

8.3.26. A badger survey was undertaken between 29th – 31st March, 3rd April 2017, 8th – 9th June and 9th November 2017 during the Phase 1 habitat survey. The survey followed methodology based upon standard best practice (**Ref 8-29 and Ref 8-30).** Badger surveys involved a detailed search for badger field signs of the accessible areas of the Proposed Scheme together with suitable habitats up to 30 m of the Proposed Scheme where access allowed.

8.3.27. During the updated Phase 1 habitat survey of the Proposed Scheme in 2020, new signs of badger evidence was identified, including a new potential sett. A visual survey of the new potential sett was completed by CCC in December 2020 and February 2021, followed by further visual inspections and remote camera deployment between 10th- 31st March 2022.

8.3.28. Full details of the methods and results of all badger surveys are included in **Appendix 2.F, 2.G, 2.H and 2.J (Volume IV).**

Otter survey

8.3.29. An otter field signs survey was undertaken between 3rd and 6th April and 8th and 9th June 2017. The survey was carried out using standard methodology as recommended in the English Nature Monitoring the Otter guide, and Scottish Natural Heritage guidance. The survey aimed to access areas of suitable habitat within approximately 200-250 m of the Proposed Scheme where landowner access was permitted.

8.3.30. An additional site visit was undertaken on 19th September 2017 to investigate the potential for River Bed Wood to support breeding otters.

8.3.31. Otter seasonal surveys of all areas of suitable habitat within 200-250 m of the Proposed Scheme were undertaken in 9th and 13th – 17th November 2017; 15th, 19th, 21st and 23rd February 2018; 21st – 24th May 2018 and 30th, 31st July and 1st August 2018. Although there are protocols for monitoring otter distribution (**Ref 8-26**) and for identifying otter breeding sites (**Ref 8-31**), there are no published detailed methodologies for carrying out otter surveys for developments. The survey methodology described here was developed by the lead surveyor (Geoff Liles, The Otter Consultancy) and has been used as a standard methodology for 20 years.

8.3.32. Remote camera monitoring of strategic locations along the Proposed Scheme was undertaken between November 2017 and August 2018 to supplement the otter seasonal surveys.

8.3.33. An update otter survey of all previously identified resting sites and travel routes was undertaken in 2022. The purpose of the update survey was to establish whether there have been any changes in the status of such sites and baseline assessment.

8.3.34. Full details of the methods and results of all otter surveys are included in **Appendix 2.L and 2.M (Volume IV).**

Bat Survey

8.3.35. An external ground-based bat roost assessment was undertaken between 29th – 31st March, 3rd April 2017, 8th – 9th June and 9th November 2017 alongside the Phase 1 habitat survey. The purpose of the survey was to determine the level of suitability of each building, bridge, structure or tree within 20 m of the Proposed Scheme for roosting bats. An additional visit was undertaken on 27th July 2018 to complete an assessment of one bridge structure that had been inaccessible previously.

8.3.36. An update external ground-based bat roost assessment of all buildings, bridge, structures and trees within the Proposed Scheme was conducted alongside the update Phase 1 habitat survey on 27th – 31st July and 7th August 2020. This assessment was conducted in accordance with best practice guidelines (**Ref 8-27**).

8.3.37. Dusk emergence surveys of the River Gwynon bridge abutments were undertaken on 26th September 2018, 13th August 2019 and 27th August 2019. The surveys were undertaken by two experienced ecologists assisted with infrared cameras and lamps.

8.3.38. An endoscopic inspection of all potential roosting features (PRFs) within the River Gwynon bridge abutments was also completed on 13th September 2019 by an experienced ecologist with a NRW licence to survey bats. The aim of the survey was to characterise the internal suitability of PRFs identified, search for evidence of use by bats and to supplement survey data gathered during the emergence surveys.

8.3.39. Aerial climbing surveys of trees identified as having suitability to support roosting bats were also undertaken on 19th April – 6th May, and again on 27th – 29th June 2022. The purpose of these surveys was to characterise the internal suitability of PRFs identified and confirm the presence or likely absence of roosting bats within the trees.

8.3.40. Full details of the methods and results of all bat surveys are included in **Appendix 2.N and 2.O (Volume IV).**

Bryophyte survey

8.3.41. Detailed inspections for protected and notable bryophyte species was undertaken on 3rd - 4th April, 16th June and 9th November 2017, with update inspections 27th – 31st July 2020. The surveys targeted areas of suitable aquatic and riparian habitat within 30 m of the Proposed Scheme.

8.3.42. All species of bryophyte (moss, liverwort and hornwort) found during the surveys were identified and noted. Most species were identified in the field, although it was necessary to collect a few small / difficult specimens for subsequent microscopic examination in order to confirm their identity. Nomenclature used in this report follows Hill et al (2008) for bryophytes and Stace (2010) for vascular plants.

8.3.43. Full details of the methods and results of all bryophyte surveys are included in **Appendix 2.P 2.Q (Volume IV).**

IDENTIFICATION OF IMPORTANT ECOLOGICAL FEATURES

8.3.44. The value of sites, species and habitats were evaluated in line with CIEEM guidelines with reference to their importance in terms of conservation value (which relates to the need to conserve representative areas of different habitats and the generic diversity of species populations); and their legal status. For the purposes of this assessment, sites, species populations, species assemblages and habitats were valued using the following geographical scale:

- International;
- National (UK or Wales);
- County;
- Local;
- Of value within the context of the project; and
- Negligible.

8.3.45. Guidelines on ecological impact assessment note the difficulty of devising valuation criteria that can be consistently applied to designated sites, species and habitats in the same way in all parts of the country. It recommends an approach to valuation that involves teasing apart the different values that can be attached to the ecological features under consideration. However, it is beneficial to give examples of the sorts of criteria used in the valuation process, and these are summarised in Table 8-5.

Table 8-5 - Examples of Criteria used to Evaluate Important Ecological Features

Level of Value	Examples of Definitions
International	An internationally important site, e.g. Special Protection Area (SPA), SAC, or Ramsar site (or a site considered worthy of such designation); a regularly occurring population of an internationally important species (listed on Annex IV) of the Habitats Directive); 1% of the known international population of a particular species.
National/UK or National/Wales	A nationally designated site, e.g. SSSI, or a site considered worthy of such designation; a viable area of a habitat type listed in Annex 1 of the Habitats Directive, or smaller areas of such habitat which are essentially to maintain the viability of a larger habitat; any regularly occurring population of a nationally important species, e.g. listed on Schedules 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); a feature identified to be of Principal Importance Under Section 7 Wales of the Environment Wales Act 2016, 1% of the known UK population of a particular species.
County	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; viable areas of key habitat identified in LBAPs, or smaller areas of such habitat which are essential to maintain the viability of a larger whole, a site designated as a Wildlife Site or a Site of Interest for Nature Conservation (SINC), a regularly occurring, locally significant number of a nationally important species; 1% of the known population of a particular species within the county.
Local	Designated sites including: Local Nature Reserves (LNRs) designated in the local context. Trees that are protected by Tree Preservation Orders (TPOs) and areas of habitat that are considered to enrich the habitat resource in the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.
Of value within the context of the project	Woodland plantations, structure planting, small extents of species-rich grassland or other species-rich habitat that is not included in the LBAP.
Negligible	No intrinsic natural conservation value associated with the habitat. Generally these are areas of hardstanding or buildings.

8.3.46. It is impractical and inappropriate for an assessment of the ecological effects of a development to consider every species and habitat that may be affected. Instead, it focuses on IEFs which are the species and habitats present within the ZoI of the Proposed Scheme that are of sufficiently high value that certain impacts upon them, as a result of the development, could result in a significant effect.

8.3.47. In this assessment, nature conservation sites, species populations, species assemblages and habitats can qualify as IEFs if they are within the ZoI and of local or greater importance.

8.3.48. It is considered that no significant effect can occur to ecological features of less than Local importance.

8.3.49. The description and valuation of ecological features will take into account any likely changes including, for example, trends in the population size or distribution of species, likely changes to the extent of habitats, and the effects of other proposed developments or land-use changes.

8.3.50. Due consideration will be given to non-important ecological features (i.e. those nature conservation sites, species and habitats below local importance) throughout the construction and operation period, with regard to legislative protection.

CHARACTERISATION OF POTENTIAL IMPACTS

8.3.51. Where identified, potential significant effects are considered as direct effects and indirect effects:

- Direct effects are changes attributable to a defined action such as the physical loss of a habitat or the immediate mortality of an individual species; and
- Indirect effects are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor. An example would be an impact on a sensitive habitat through atmospheric pollution.

8.3.52. The likely impacts of the Proposed Scheme during construction and operation, as well as cumulative impacts (**see Chapter 13 – Cumulative Effects**), and the potential ecological effects arising from them are identified and characterised, taking into consideration the following parameters:

- Positive or negative – whether the impact will result in net loss or degradation of a IEF or whether it will enhance or improve it;
- Magnitude – the size or intensity of the impact measured in relevant terms, e.g. number of individuals lost or gained, area of habitat lost or created or the degree of change to existing conditions (e.g. noise or lighting levels);
- Extent – the spatial scope of the impact, for example the physical area affected or the geographical pattern of the impact;
- Duration – the length of time over which the impact occurs;
- Reversibility – the extent to which the impacts are reversible either through natural regeneration and succession or through active mitigation; and
- Timing and frequency – consideration of the timing of events in relation to ecological change, some impacts may be of greater magnitude if they take place at certain times of year (e.g. breeding season). The extent to which an impact is repeated may also be of importance.

8.3.53. The separation of IEFs in the assessment of impacts enables significant effects to be more easily associated with a specific receptor.

MAGNITUDE OF POTENTIAL EFFECTS

8.3.54. Ecological receptors are usually nature conservation sites, habitats, species assemblages or communities, or populations or groups of a species. Impacts can be permanent or temporary, direct or indirect, and can be cumulative. These factors are brought together to assess the magnitude of the impact on particular IEFs and, wherever possible, the magnitude of the effect is quantified. Professional judgement is then used to assign the impacts on the IEFs to one of four classes of magnitude, defined in Table 8-6

Table 8-6 - Magnitude of Potential Effects

Magnitude	Definition
High	A permanent or long-term effect on the extent or size or integrity of a site, habitat, species assemblage or community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.

Medium	A permanent or long-term effect on the extent or size or integrity of a site, habitat, species assemblage or community, population or group. A short-term effect that will adversely affect the integrity of a receptor in a permanent manner. If adverse negative effect, this is unlikely to threaten its overall sustainability, if positive this is likely to be sustainable but is unlikely to significantly enhance its conservation status.
Low	A permanent or temporary, long-term reversible or short-term effect on a site, habitat, species assemblage or community, population or group whose magnitude is detectable but will not threaten/change its conservation status.
Negligible	A short-term reversible effect on the extent, size or integrity of a site, habitat, species assemblage or community, population or group that is within the normal range of natural variation and has no discernible lasting effect.

8.3.55. Potential impacts are characterised initially in the absence of any mitigation, except where this is integral to the design of the Proposed Scheme (embedded mitigation).

DEFINING SIGNIFICANCE OF EFFECT

8.3.56. The significance of the predicted effects on receptors arising from the identified impacts of the Proposed Scheme is assessed. Significance is assessed as Adverse, Beneficial or Not Significant on the integrity of an IEF and / or the conservation status of IEFs within a given geographical area.

8.3.57. In considering the integrity and conservation status of the receptor, the key considerations are:

- Will any site / ecosystem processes be removed or changed or subject to disturbance?
- What will be the effect on the nature, extent, structure and function of component habitats?
- What will be the effect on the average population size and viability of component species?

8.3.58. In determining the significance of a potential effect, the above factors including the value of the feature, magnitude of the potential impact, and the duration of the impact are considered.

8.3.59. Where possible, the assessment of these parameters needs to be expressed quantitatively and to be based on research and published information. However, it is also recognised that many ecological effects are complex and poorly understood, so professional and qualitative judgements are often required to prescribe the significance of the effect.

IDENTIFICATION OF MITIGATION MEASURES AND RESIDUAL IMPACT

8.3.60. Following the assessment of how each IEF may be affected and its subsequent level of significance, relevant mitigation and / or compensation measures are identified. Once identified, the mitigation will be designed to reduce potential significant impacts. With respect to nature conservation sites that support protected species, there may also be a legal obligation to provide such mitigation.

8.3.61. The likely effectiveness of all the mitigation is then assessed and any residual impacts described.

USE OF EMBEDDED MITIGATION MEASURES

8.3.62. Embedded (or primary and tertiary as described in Chapter 5 – Approach to EIA) mitigation is an integral part of the Proposed Scheme design. The potential impacts of the Proposed Scheme on biodiversity resources are initially assessed with these measures included:

- Alignment changes to avoid or reduce the potential for significant effects, specifically to minimise land take from designated sites and habitats;

- During operation, no permanent lighting will be installed, avoiding light spill onto the river and surrounding environments;
- During construction, all works will take place during daylight hours. Some lighting may be required during construction activities within winter months, or for security reasons within site compounds, but will be task specific, directed away from sensitive habitats and receptors and controlled appropriately in accordance with the CEMPs and habitat / ecological management plans. Site compounds have all been designed to be situated over 50m away from the River Towy SAC and SSSI;
- Designs of all new structures ensure no temporary or permanent land take within the River Towy SAC / SSSI. New structure abutments set back from river channel and behind existing abutments that will remain in-situ.
- Two new bridges over the River Cothi (Structure 3) and River Towy (Structure 5) comprise a narrow profile (4m), minimising impacts resulting from shading and / or land take;
- Structure 5 has its foundations to the north of the SAC, 5 m from the SAC boundary. It is located outside the 'normal' flow of the river;
- The design avoided a main badger sett;
- Commitment to a CEMP which would include details of the measures to be employed to minimise effects on air quality, noise and vibration, traffic and water quality;
- Commitment to habitat / ecological management plans which would include details of the measures to be employed to minimise impacts on sensitive ecological receptors;
- Commitment that any vegetation clearance will not occur within the bird breeding season and employment of an Ecological Clerk of Works (ECoW) during clearance activities; and
- Commitment to comply with best practice guidelines on environmental protection, for example CIRIA C741 – Environmental Good Practice on Site (4th Edition) (CIRIA, 2015a), CIRIA C532 – Control of Water Pollution from Construction Sites (CIRIA, 2001) and The Environments Agency (EA) Pollution Prevention Guidance (PPG), although withdrawn should still be referred to as a means of avoiding potential pollution events. In combination these would minimise the risk of any negative effects of sediment disturbance (which could include increased water turbidity, release of other pollutants which have been locked up in the sediment and the potential for smothering fish spawning grounds).

8.4 LIKELY SIGNIFICANT EFFECTS ON BIODIVERSITY TO BE ASSESSED

8.4.1. Table 8-7 sets out the likely significant effects that are assessed within the ES.

Table 8-7 – Likely Significant Effects to be Assessed

Effect	Source	Important Ecological Features	Zone of Influence
Construction Phase			
Habitat loss	Land take (permanent)	Priority habitats (woodlands and hedgerows), including Ancient Woodland	Within the construction footprint
Habitat loss	Land take (permanent)	Loss or reduction of a small population of the Nationally Scarce hornwort *Phaeoceros carolinianus* identified in a ditch to be culverted.	30 m (based on the professional judgement of the bryologist. Informed by the scope of works and potential range at which works may impact bryophytes).
Disturbance	Noise, vibration and visual disturbance (e.g. from piling)	Qualifying interests of the River Tywi SAC/SSSI.	Construction footprint and up to 200 m of construction zone. Otters are highly mobile and are sensitive to disturbance at approximately 200 m when breeding (Scottish National Heritage[25]).

[25] Scottish Natural Heritage, Scottish wildlife series, otters and development available at https://www.nature.scot/sites/default/files/2017-07/A1959316%20-%20Species%20Planning%20Advice%20Project%20-%20otter%20-%20FINAL.pdf [accessed 09/02/18], and SNH Protected Species Advice for Developers

Disturbance	Noise, vibration and visual disturbance (e.g. from piling)	Birds	Working buffers in relation to nesting birds varies widely. The accepted working buffers from breeding red kites, that are known to breed in the local area, are considered to be up to 600 m during incubation, depending on the individual circumstances and tolerance of disturbance of the individual red kite. Ruddock & Whitfield (2007)[26], Petty (1998)[27], Currie & Elliott (1997)[28].
Habitat degradation	Pollution and contamination incidents; release of silts and sediments (during piling)	Qualifying interests of the River Tywi SAC/SSSI; other protected species	Construction activities are considered to have a small ZoI within terrestrial habitats. However the ZoI of the Proposed Scheme has been extended to 2 km due to the presence of water courses

[26] M. Ruddock & D.P. Whitfield, 2007, A Review of Disturbance Distances in Selected Bird Species, A report from Natural Research (Projects) Ltd to Scottish Natural Heritage

[27] Petty, S.J. (1998). Ecology and conservation of raptors in forests. Forestry Commission Bulletin 118. HMSO, London

[28] Currie, F. & Elliott, G. (1997). Forests and Birds: A Guide to Managing Forests for Rare Birds. Forestry Authority, Cambridge and Royal Society for the Protection of Birds, Sandy, UK.

			within the Site (CIEEM (2017)[29], Highways England DMRB[30]).
Habitat degradation	Release of dust during construction (changes in air quality)	Qualifying interests of the River Tywi SAC/SSSI; other protected species; priority habitats	100 m of the construction zone based on the anticipated scope of works and likely maximum range at which works may impact on habitats. The potential indirect effect pathways are considered to dissipate in under 100 m of the site, for instance dust emissions are considered to dissipate within 50 m of the works (CIEEM (2016)[5], IAQM (2016)[31].
Habitat fragmentation	Land take (permanent)	Severance of hedgerows.	Construction zone
Operational Phase			

[29] CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd Edition Chartered Institute of Ecology and Environmental Management, Winchester

[30] Highways England. Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HD44/09 Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment). Highways England.

[31] Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1. IAQM.

Disturbance	Disturbance and interference by humans and dogs	Qualifying interests of the River Tywi SAC/SSSI; other protected species (e.g. disturbance of otters and badgers using holts/layup sites/setts by recreational users of the cycleway and dogs).	Within the operational footprint

8.5 BASELINE CONDITIONS

STATUTORY DESIGNATED SITES

8.5.1. A total of 11 statutory designated conservation sites were identified during the desk studies completed to inform the Proposed Scheme. As part of the EIA Scoping Study **(Appendix 1.C (Volume IV)),** effects on all but two of these sites were assessed as being insignificant as no effect pathway could be identified.

8.5.2. Two sites, the River Towy SSSI and the River Towy SAC are detailed below and considered further in this report. All other designated sites identified are listed in Table 8-8 but are subsequently not considered further in this report, due to the lack of any potential for significant effects.

Table 8-8 - Statutory Designated Nature Conservation Sites within 2km

Site Name	Designation	Distance to the site	Description
River Towy	Special Area of Conservation (SAC)	Located within the Site	River Towy SAC is designated for supporting a number of protected species. Annex II species that are a primary reason for selection are twaite shad *Alosa fallax* and otter *Lutra lutra*. The SAC supports a large self-sustaining spawning population of twaite shad. Spawning sites occur throughout the lower reaches of the river between Carmarthen and Llangadog, with most spawning occurring downstream of Llandeilo. The SAC is one of the best rivers in Wales for otters. There are abundant signs of otters and they are regularly seen on the river. Annex II species present as qualifying features but not primary reasons for site selection are sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa* and bullhead *Cottus gobio*.
River Towy	Site of Special Scientific Interest (SSSI)	Located within the Site	Afon Tywi SSSI extends downstream from Llandovery to the confluence with the Afon Taf and Pembrey Coast SSSI in Carmarthen Bay. It is an actively eroding river meandering across a wide flood plain which is composed of alluvium, glacial sands and gravels. This has resulted in extensive shingle banks being formed. These are important for birds such as the little ringed plover *Charadrius dubius* which lay their eggs amongst the shingle and for breeding populations of sand martin *Riparia riparia* which nest in holes in the eroded banks. The river is also of special interest for its fish species, otters, and the nationally scarce club-tailed dragonfly *Gomphus vulgatissimus.* The river system supports an important range of vegetation communities including submerged aquatic plants, vegetation of exposed gravel shoals, marginal vegetation, and a diverse range of saltmarsh communities in the lower reaches. Two rare bryophyte species are also of special

			importance (*Orthotrichum sprucei* on silty willows and *Fissidens monguillonii* on rock shelves and logs). In addition to those listed above under the SAC, the SSSI supports Atlantic salmon *Salmo salar* and freshwater pearl mussel *Margaritifera margaritifera*.
Dinefwr Estate	National Nature Reserve (NNR)	0.1 km	Dinefwr Estate is the only parkland NNR in Wales, which is one of the finest examples in Wales of pasture woodland with large veteran trees.
Dinefwr Estate	SSSI	0.1 km	Dinefwr Estate is of special interest because of its lichen and invertebrate assemblages that are principally associated with the parkland and woodland trees. The woodland and oxbows on the floodplain are also of special interest for their plant assemblages.
Ffairfach Railway Cutting and River Section	SSSI	0.3 km	The site is designated for its geological interest and is therefore not considered further in this report.
Allt Y Wern	SSSI	0.8 km	A small oak wood that has apparently been managed as coppice-with-standards, an unusual sylvicultural practice in this part of Wales. Many of the mature pedunculate oaks *Quercus robur* are at least 200 years old.
Allt Y Gaer	SSSI	0.9 km	A conifer plantation containing the largest known heronry in Dyfed, and one of the largest in Wales. The total number of pairs using the site varies from year to year, but the figure is in the region of 45-50. This is 7-10% of the Welsh population of herons *Ardea cinerea*, which is believed to be 500-700 pairs.
Cwm Yr Abbey Stream Section	SSSI	0.9 km	The site is designated for its geological interest and is therefore not considered further in this report.

Coedydd Tregyb / Tregyb Woodlands	SSSI	1.1 km	Three woodlands forming the largest block of deciduous woodland in Dyfed. All three woods have a well-developed and species-rich shrub and ground layer, being largely free of grazing animals. At least 100 species of flowering plants have been recorded in the ground layer.
Birdshill Quarry	SSSI	1.5 km	The site is designated for its geological interest and is therefore not considered further in this report.
Crug Farm Quarry	SSSI	1.3 km	The site is designated for its geological interest and is therefore not considered further in this report.

NON-STATUTORY DESIGNATED SITES

8.5.3. Eight non-statutory designated conservation sites were identified within 2km of the Proposed Scheme. Effects on these sites were assessed as being insignificant as no effect pathway could be identified.

8.5.4. Details of the non-statutory designated sites are included in Table 8-9 for conclusiveness but are subsequently not considered further in this report.

Table 8-9 - Non-statutory designated sites within 2 km

Site Name	Designation	Distance to the Site	Description
B-lines	Bug life – insect pathway	Within the Site	The B-Lines are a series of 'insect pathways' which have been established by Buglife. They run throughout the British countryside and towns, and act as a restorative series of wildflower-rich habitat steppingstones. They link existing wildlife areas together, creating a network which provides large areas of brand-new habitat benefiting bees and butterflies.
Dinefwr Deer Park	Important Plant Area (IPA)	0.2 km north	Designated site by plantlife.org for its important plant biodiversity.
Dryslwyn Castle	Regionally Important Geodiversity Site (RIGS)	0.2 km north	No information available
Castle Woods	Wildlife Trust Reserve (WTR)	0.2 km north	Bluebell woods surrounding Dinefwr Castle.
Ffinnant Road Section	RIGS	0.7 km south	No information available
Aberglasney Gardens	RIGS	1.3 km north	No information available
Llandeilo-Cross Hands Road Cutting	RIGS	1.5 km south	No information available
Cennen Road Section	RIGS	1.7 km south	Regionally important section of road which demonstrates the evolution of the south-east margin of the Lower Palaeozoic Welsh Basin during the mid to late Silurian.

OTHER HABITATS OF CONSERVATION IMPORTANCE

8.5.5. A total of 256 Ancient Woodland Inventory (AWI) woodlands were identified within 2 km of the Site. AWI woodland was classified as being either Ancient Semi-Natural Woodland (ASNW), Restored Ancient Woodland Sites (RAWS), Plantations on Ancient Woodland Sites (PAWS) or Ancient Woodland Site of Unknown Category (AWSUC).

8.5.6. Three AWI (one RAWS, one PAWS and one AWSUC) woodlands were located within the Site itself and are discussed under Habitats below.

8.5.7. Two NRW Priority Areas (excluding PAWS) were identified within 2 km of the Site.

HABITATS

8.5.8. The Study Area consisted mainly of poor semi-improved grasslands and improved grassland. Several areas of broadleaved semi-natural woodland, marshy grassland and standing water were also recorded. The disused railway corridor typically comprised bare ground, scattered trees, woodland and dense scrub. The Rivers Towy and Cothi both intersect the Study Area at several points. Hedgerows bisect the Study Area and included both species-rich and species-poor examples.

8.5.9. Five habitats were recorded within the Study Area that qualify / potentially qualify as priority habitats within the UK Biodiversity Action Plan (BAP)[32] / Section 7 of the Environment (Wales) Act 2016[33] (hereafter referred to as Priority Habitats). These were:

- Running water, present in the form of the River Towy, River Cothi and several smaller streams and drains;
- Ponds, present in the form of numerous backwaters on the River Towy floodplain;
- Hedgerows segregating the farmland throughout the Study Area;
- Floodplain Grazing Marsh, present in two areas at Bremenda Uchaf and around Riverbed Wood; and
- Lowland woodland, present in the form of several blocks of varying size and composition.

8.5.10. A summary of habitats recorded during the extended Phase 1 habitat surveys are provided below and shown on Figure 8.3.

Broadleaved semi-natural woodland

8.5.11. Broadleaved semi-natural woodland was identified throughout the Survey Area with several sections located along the Proposed Scheme. Species composition varied between stands, with dominant species including pedunculate oak, ash *Fraxinus excelsior* and willow *Salix* sp., with understorey species including hazel *Corylus avellana*, hawthorn *Crataegus monogyna* and field maple *Acer campestre.* Ground floral species varied across different woodland stands and included lesser

32 UK Biodiversity Action Plan (BAP) list of Priority habitats. Available online at http://jncc.defra.gov.uk/page-5706. [Accessed 13/02/2018]

33 Her Majesty's Stationary Office (HMSO) (2016) Environment (Wales) Act 2016. Available online at http://www.legislation.gov.uk/anaw/2016/3/introduction. [Accessed 13/02/2018]

celandine *Ficaria verna*, common nettle *Urtica dioica*, wood anemone *Anemone nemorosa*, and dog's mercury *Mercurialis perennis*.

8.5.12. Broadleaved semi-natural woodland is considered to be a priority habitat under the UK BAP / Section 7. It is also listed as a priority habitat within the Carmarthenshire LBAP. The majority of woodland habitat within the Survey Area comprised was relatively species-poor and small in size. It is a widespread habitat type which considered to be of **local conservation value**.

8.5.13. One large area of woodland (River Bed Wood) contained ancient woodland indicators and was large in size and extent and contained standing deadwood. This parcel was also identified as RAWS within the desk study. This is therefore considered to be of **county conservation value.**

Coniferous plantation woodland

8.5.14. Two parcels of coniferous plantation woodland in the far east of the Study Area, dominated by larch *Larix decidua*., with semi-mature and young sycamore *Acer pseudoplatanus*, elder *Sambucus nigra* and beech *Fagus sylvatica*. The ground flora was dominated by bramble *Rubus fruticosus* agg and male fern *Dryopteris filix-mas* and herb Robert *Geranium robertianum*.

8.5.15. These habitat parcels were also classified as PAWS and AWSUC within the desk study. This is therefore considered to be of **county conservation value**

Mixed semi-natural woodland

8.5.16. Woodland to the south of the Study Area dominated by mature pedunculate oak and pine. Viewed from a distance and not directly accessed.

8.5.17. Due to the large size and extent of woodland, the presence of mature trees and lack of access the woodland is considered to be of **county conservation value** as a precautionary assessment.

Dense and scattered scrub

8.5.18. Dense and scattered scrub was identified throughout the Study Area, particularly along the banks of the River Towy and along the railway embankment. The dominant species identified were bramble, common nettle, common gorse *Ulex europaeus*, willow, hawthorn and blackthorn *Prunus spinosa*. Himalayan balsam *Impatiens grandiflora* was regularly recorded in conjunction with this habitat.

8.5.19. This habitat type is relatively common and is considered to be of **value within the context of the Study Area.**

Broadleaved parkland / Scattered trees

8.5.20. Scattered trees were identified throughout the Study Area, comprising mature and semi-mature standard trees within hedgerows and fields. Tree species included ash, alder *Alnus glutinosa*, birch *Betula* sp., pedunculate oak, hawthorn, hazel and willow.

8.5.21. This habitat type is relatively common and is considered to be of **value within the context of the Study Area.**

Semi-improved neutral grassland

8.5.22. Three areas of semi improved neutral grassland were noted within the Study Area. One was waterlogged and dominated by tufted hair grass *Deschampsia cespitosa*, Yorkshire fog *Holcus lanatus* and soft rush *Juncus* effusus, with meadowsweet *Filipendula ulmaria*, creeping buttercup *Ranunculus repens* and broad-leaved dock *Rumex obtusifolius*. The second was a damp, neglected

pasture with low-growing herbs including creeping buttercup and meadowsweet and swamp plants including branched bur reed *Sparganium erectum* and reed sweet-grass *Glyceria maxima*. A third grassland with possible higher species diversity was noted on the northern bank of the Towy in the centre / east of the Study Area, however this area was viewed from the southern bank and could not be surveyed.

8.5.23. As the grasslands comprised relatively herb poor, isolated stands, they are considered to be of **value within the context of the Study Area**.

Improved grassland

8.5.24. Improved grassland was common throughout the Study Area. The dominant species was perennial rye-grass with occasional cock's-foot *Dactylis glomerata*, broad-leaved dock, ribwort plantain *Plantago lanceolata*, white clover *Trifolium repens,* creeping buttercup and dandelion *Taraxacum officinale* agg.

8.5.25. Due to the low species diversity, this habitat is considered to be of **negligible value.**

Marshy grassland

8.5.26. Marshy grassland was identified in several sections of the Study Area and was dominated by soft rush with scattered Yorkshire-fog and cuckooflower *Cardamine pratensis*. No devil's-bit scabious *Succisa pratensis* was noted.

8.5.27. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area.**

Poor semi-improved grassland

8.5.28. Poor semi-improved grassland was regularly encountered within the Study Area. Species comprised perennial rye grass *Lolium perenne*, cock's-foot, red fescue *Festuca rubra* and crested dog's-tail *Cynosurus cristatus*. Limited herbs were recorded within the sward with species comprising occasional white clover, broad leaved-dock, ribwort plantain *Plantago lanceolata*, dandelion and meadow buttercup *Ranunculus acris*.

8.5.29. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area.**

Tall ruderal vegetation

8.5.30. Scattered stands of tall ruderal vegetation were recorded within the Study Area, often in conjunction with other habitat types. Species consisted of common nettle, common hogweed *Heracleum sphondylium*, cock's-foot and creeping thistle *Cirsium arvense*. Abundant stands of Himalayan balsam were recorded in association with tall ruderal vegetation.

8.5.31. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area.**

Swamp

8.5.32. Areas of swamp habitat were noted in several locations within the Study Area. The habitat was associated with areas of standing water and dense scrub and was dominated by bulrush *Typha* sp.

8.5.33. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area.**

Standing water

8.5.34. Several areas of standing water were noted throughout the Study Area. These were generally associated with areas of swamp and included ephemeral waterbodies caused by flooding.

8.5.35. Standing water within the Study Area is considered to be of **local conservation value**.

Running water

8.5.36. The Rivers Towy and Cothi and their tributaries were recorded across the Study Area. Both rivers were natural in character, with silt noted within the river channel. The banks of the river varied in height and comprised a mosaic of heavily vegetated areas and areas of bare or poached ground. Marginal vegetation was noted along the banks and included greater wood rush *Luzula sylvatica*, bramble, willow and meadowsweet. Trees and corridors of woodland also flanked the running water habitat, with species including ash, alder, sycamore and willow. Stands of Himalayan balsam were recorded within the bankside vegetation.

8.5.37. Several small streams and drains were noted throughout the Study Area. These were generally less than 2 m wide and less than 0.5 m deep. Drains through the Study Area were generally associated with adjacent pastoral fields and were bordered by marginal soft rush

8.5.38. The River Cothi, tributaries of the Rivers Towy and Cothi and streams are Section 7 priority habitats that feature in the LBAP and are considered to be of **local conservation value**. The drains are considered to be of **value within the context of the Study Area**. The River Towy is designated as a SAC and SSSI and it is of **international and national conservation value**.

Intact species-rich hedge

8.5.39. Several species-rich, intact hedgerows were recorded within the Study Area. A range of woody species were recorded within the species-rich hedgerows. Species comprised hazel, hawthorn and blackthorn, with ash, elder and English elm *Ulmus procera*. Bramble and honeysuckle *Lonicera periclymenum* were also regularly recorded within the species-rich hedgerows. Associated species were varied including cow parsley *Anthriscus sylvestris*, cock's-foot, dog's mercury, herb Robert, foxglove *Digitalis purpurea,* meadowsweet, hedge woundwort *Stachys sylvatica*, ground ivy *Glechoma hederacea* and primrose *Primula vulgaris*. Bracken *Pteridium aquilinum* was locally abundant within some hedgerows.

8.5.40. Species-rich hedgerows are a UK BAP / Section 7 and LBAP priority habitat and are likely to qualify as 'Important' under the hedgerow regulations. They are considered to be of **county conservation value.**

Intact species-poor hedge

8.5.41. Several species-poor, intact, hedges were recorded. Blackthorn and hawthorn formed the dominant woody species, with occasional hazel, bramble and ash.

8.5.42. Species-poor hedgerows are a UK BAP / Section 7 and LBAP priority habitat. Species-poor hedge with trees left to grow out. Woody species noted were hawthorn, elder, blackthorn (*Prunus spinosa*) with an understory of common ivy and bramble. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area**.

Defunct species-poor hedge

8.5.43. Species-poor, defunct, hedges were recorded. Blackthorn and hawthorn formed the dominant woody species.

8.5.44. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area**.

Species-rich hedge with trees

8.5.45. Species-rich hedges with trees were noted within the Study Area. Species within this habitat included occasional sycamore, hazel, hawthorn, holly, blackthorn and elder. Bramble and honeysuckle were also regularly recorded. Associated species were varied including cow parsley, cock's-foot, dog's mercury, herb Robert, hedge woundwort, ground ivy and primrose.

8.5.46. Species-rich hedges with trees are a UK BAP / Section 7 and LBAP priority habitat and are likely to qualify as 'Important' under the hedgerow regulations. They are considered to be of **county conservation value.**

8.5.47. Species-poor hedges with trees were noted within the Study Area. Species within this habitat included occasional sycamore, hazel, hawthorn and ash.

8.5.48. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area**.

Dry Ditch

8.5.49. Dry ditches were noted within the Study Area. These ditches had been colonised by species including; broadleaved willow herb *Epilobium montanum*, false oat grass, field bindweed *Convolvulus arvensis*, great willowherb, hemlock waterdrop wort *Oenanthe crocata,* meadowsweet *Filipendula ulmaria*, rose bay willowherb *Chamaenerion angustifolium* and soft rush.

8.5.50. Due to the low species diversity, this habitat is considered to be of **value within the context of the Study Area**.

Bare ground

8.5.51. Areas of bare ground were recorded within the Study Area, such as gateways, and were occasionally being colonised by species such as pineapple weed *Matricaria discoidea* and wavy bitter-cress *Cardamine flexuosa*.

8.5.52. Due to the low species diversity, this habitat is considered to be of **negligible value.**

Amenity grassland

8.5.53. Areas of amenity grassland were recorded within the Study Area.

8.5.54. Amenity grassland is a highly managed habitat and is considered to be of **negligible value.**

Invasive non-native plant species

8.5.55. Invasive non-native plant species were identified in the Study Area and included Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Reynoutria japonica*.

8.5.56. Habitats considered to be of a conservation value below **local conservation value** are not considered further in this report

SPECIES

Badger

8.5.57. Six records of badger were returned during the desk study, comprised of two unknown records, one record of a latrine and one record of feeding remains. The closest record was of a latrine directly adjacent to the Study Area. The presence of badger in the area of the record was verified by the identification of a badger sett during the field surveys

8.5.58. Numerous signs of badger were identified throughout the west of the Study Area including a number of setts. Details are not provided here due to the sensitivity of badger records in the context of historic persecution of the species.

8.5.59. The badger population in the vicinity of the Proposed Scheme is considered to be of **local conservation value**.

Otter

8.5.60. The desk study returned 42 records of otters within 2 km of the Study Area. The River Towy is additionally designated as a SAC and SSSI for its otter population. For this reason, the otter population is of **international conservation value.**

8.5.61. Targeted otter surveys completed in April and June 2017 identified evidence of otter activity in several locations within the Study Area including several potential otter holts or resting sites.

8.5.62. During additional otter surveys (conducted in autumn 2017, winter 2017/2018, spring and summer 2018), remote camera monitoring and seasonal surveys identified four actual confirmed and 12 possible otter holts or resting sites within the Study Area.

8.5.63. An update survey in 2022 confirmed one new possible resting site and that three possible resting sites previously identified were no longer suitable for use by otter. Therefore, a total of four actual and 10 possible otter holts or resting sites are considered present within the Study Area.

8.5.64. Some of the actual and possible holts and resting sites were located within 30 m to 10 m from the Proposed Scheme.

8.5.65. No natal holts were identified, and no conclusive evidence was collected to indicate that otters are breeding within the vicinity of the Proposed Scheme. Evidence of otters commuting between areas of suitable foraging habitat was collected at several locations demonstrating that otters cross the Proposed Scheme.

Bats

8.5.66. The desk study returned 246 records of bats within the 2 km search area, comprising nine species of bat, including lesser horseshoe *Rhinolophus hipposideros* and greater horseshoe bat *Rhinolophus ferrumequinum*. The records include 54 records of roosts.

8.5.67. During the preliminary bat roost assessment survey in 2020 (conducted as part of the update Phase 1 habitat survey), a total of 21 trees along the Proposed Scheme were identified as having either low, moderate or high bat roosting suitability. Two buildings were also identified as having low bat roosting suitability, and three structures were considered to offer moderate bat roosting suitability. One building directly adjacent the Proposed Scheme was identified as a known bat roost through anecdotal evidence of previous assessments from the resident.

8.5.68. A further assessment of trees during the up-close / aerial inspections identified an additional three trees with bat roosting suitability. Following internal inspections of tree PRFs, a total of 17 trees were considered to have bat roosting suitability (two trees with high suitability, nine trees with moderate suitability and six trees with low suitability). No signs or evidence of bat use were recorded and bats were considered to be likely absent during the surveys.

8.5.69. Further surveys of River Gwynon bridge were carried out including emergence surveys and endoscopic inspections. The surveys concluded the likely absence of bat roosts within the bridge abutments at the time of survey, however PRFs present were considered suitable for use by hibernating bats.

8.5.70. Habitats recorded within the Study Area, namely grassland, hedgerows, running water and woodland all provide foraging habitat for bats. The linear features (hedgerows and river corridors) provide commuting habitat for bats. Low numbers of bat species were recorded foraging and commuting during the single dusk emergence survey completed.

8.5.71. No bat roosts were identified within the Study Area during surveys however based on the species assemblage identified in the desk study records, and the type and quality of the habitat in and surrounding the Proposed Scheme, the local bat population is considered to have a conservation value of **county conservation value**.

Dormouse

8.5.72. Seven records of dormouse were returned by the desk study, the closest six of which were approximately 110 m from the Proposed Scheme. These records were from 2012 and included details of both adult and juvenile dormice handled between April and October 2012. Presence of dormouse within the wider landscape has also been confirmed by the CCC Biodiversity Officer. Hedgerows, scrub and broadleaved semi-natural woodland with connectivity to other areas of habitat featured regularly within the Study Area. Several hedgerows were species-rich and contained a good variety of potential food sources for dormice (e.g. berry and nut producing species).

8.5.73. The hedgerow network and areas of scrub and woodland in the Study Area are considered suitable for supporting dormice. The dormouse population in the vicinity of the Proposed Scheme is considered to be of **local conservation value**.

Water Vole

8.5.74. No records of water vole were returned by the desk study. Discussions with the CCC Biodiversity Officer also revealed that there are no recent records of water vole in the area, though populations have been noted near the Llanelli, Kidwelly, Pembrey, Laugharne and Pendine areas (Personal communication, Rendle, 2017).

8.5.75. Water voles tend to favour slow-flowing water bodies. The fast-flowing nature of the River Towy and River Cothi makes them less suitable for water vole. Owing to the lack of records of water vole in the area and limited availability of suitable habitat, water vole is considered likely absent from the Survey Area and they are considered to be of **negligible conservation value.**

Birds

8.5.76. A large number of bird records were returned during the desk study, including 123 protected or notable bird species.

8.5.77. Habitats within the Study Area, namely scrub, buildings, trees, hedgerows, broadleaved semi-natural woodland and swamp and marginal vegetation along the Rivers Towy and Cothi have the potential to provide nesting and foraging habitat for a number of species. Evidence of breeding, nesting and foraging birds were recorded during the updated Phase 1 habitat survey in 2020. This included visual sightings of a pair of likely breeding stonechats *Saxicola torquate*, sand martin *Riparia riparia* nesting within banks of the River Towy. Several bird boxes on trees were also noted present along with other incidental sightings on or close to the Proposed Scheme. Communications with the CCC Biodiversity Officer also confirmed that little ringed plover *Charadrius dubius* nest within the shingle banks of the River Towy.

8.5.78. Of particular note, the desk study returned records of a tree sparrow *Passer montanus* monitoring scheme undertaken by Carmarthenshire Bird Club between 1999 and 2006. The Towy floodplain population of tree sparrow was noted as the largest population in Wales and highly isolated from other populations. Tree sparrow were observed during survey visits. Red kite *Milvus milvus* were also observed during survey and anecdotal evidence was also received of red kite breeding in the local area.

8.5.79. No targeted surveys were undertaken for local bird populations. The conservation value for this group is based on desk study information, incidental sightings and anecdotal evidence and has been agreed with the CCC Biodiversity Officer. Based on the species assemblage identified in the desk study information and the type and quality of the habitat in and surrounding the Proposed Scheme, birds are considered to be of **county conservation value**.

Reptiles

8.5.80. The desk study returned four records of slow-worm *Anguis fragilis* within 2 km of the Study Area. No incidental sightings of reptiles were made during any of the site visits. However the Study Area contained habitat suitable for foraging, resting and breeding common species of reptiles. Scrub and hedge habitat and associated earth banks were considered to be suitable for reptiles and may offer hibernacula opportunities. The majority of semi-improved and improved grasslands were sup-optimal for reptiles, with optimal habitat being located around field edges / margins.

8.5.81. Reptiles are considered to be of **value within the context of the Study Area**.

Amphibians

8.5.82. The desk study returned records of common amphibians within the Study Area, namely common frog *Rana temporaria*, palmate newt *Lissotriton helveticus* and common toad *Bufo bufo*. Discussions with Carmarthenshire County Council (Personal communication, Rendle, 2017) indicate that great crested newts (GCN) *Triturus cristatus* are not known in the area. Based on the lack of local records and the site being outside of their range it is considered unlikely that GCN are present within the Study Area.

8.5.83. No amphibians were observed during any of the site visits, however several areas of standing water were recorded within the Study Area. Terrestrial habitat, namely areas of scrub, hedgerow and marginal habitat along the River Towy provides suitable habitat for common amphibians.

8.5.84. The local amphibian populations are considered to be of **value within the context of the Study Area**.

Fish

8.5.85. The desk study returned records of Atlantic salmon *Salmo salar*, bullhead, European eel *Anguilla anguilla*, stone loach *Barbatula barbatula*, brown trout *Salmo trutta* and minnow *Phoxinus phoxinus* within 2km of the Study Area.

8.5.86. The River Towy SAC is designated for supporting twaite shad, sea lamprey, brook lamprey, river lamprey, allis shad and bullhead. In addition to those listed above under the SAC, the SSSI supports Atlantic salmon.

8.5.87. The Preliminary Aquatic Ecological Assessment concluded that eight of the 22 watercourse crossing locations along the Proposed Scheme were suitable for supporting fish species. Four of these offered high quality habitat for Atlantic salmon and twaite shad and suitable habitat for lamprey species, whilst a further four locations provided silty substrate with some potential to support lamprey ammocetes.

8.5.88. No targeted catch surveys for fish have been undertaken, however due to the presence of suitable habitat, the local fish populations are therefore considered to be of **international and national conservation value**.

White-clawed crayfish

8.5.89. The desk study returned no records of white-clawed crayfish *Austropotamobius pallipes* within 2 km of the Study Area. Discussions with Carmarthenshire County Council (Personal communication, Rendle, 2017) indicate that white-clawed crayfish are not known in the area. Based on the lack of local records it is considered unlikely that white-clawed crayfish are present within the Study Area they are therefore considered to be of **negligible conservation value**.

Invertebrates (excluding white-clawed Crayfish)

8.5.90. The desk study returned 103 records of protected or notable invertebrates within 2 km of the Study Area. This did not include any records of marsh fritillary butterfly *Euphydryas aurinia* that were reported as being recorded in a desk study carried out as part of a previous Phase 1 habitat survey report for the Scheme in 2013.

8.5.91. Devil's-bit scabious *Succisa pratensis* is the primary larval food plant of the marsh fritillary butterfly and was not recorded within the accessible sections of the Study Area. It is considered unlikely that the Study Area will support this species and marsh fritillary are therefore considered to be absent and of **negligible conservation value**.

8.5.92. The River Towy is reported to support the freshwater pearl mussel *Margaritifera margaritifera* though no records were returned by the desk study. The River Towy is additionally designated as a SSSI for its freshwater pearl mussel population. If present within the ZoI this species would be of **national conservation value**. This species will be grouped together with fish in the subsequent impact assessment presented in this chapter.

8.5.93. Habitats within the Study Area are considered suitable for supporting common species of terrestrial and aquatic invertebrates. The local populations of invertebrates are considered to be of **local conservation value**.

Flora

8.5.94. The desk study returned 284 records of protected flora, including 268 records of protected bryophytes. All records were distant from the footprint and a significant proportion were associated with botanical recording in the Dinefwr Estate. Within the Proposed Scheme areas of species-rich habitats were limited to woodland and hedgerow habitats and small areas of flood plain meadows.

8.5.95. Targeted bryophyte surveys identified three notable bryophytes within the Study Area. These were:

- Small numbers of the Nationally Scarce moss *Orthotrichum sprucei* were found on a branch of osier *Salix viminalis* in low-lying floodplain woodland by the River Towy;
- A single population of the Nationally Rare moss *Fissidens monguillonii* was found between the confluence of the River Towy and the Gwynon at Llanarthne in 2017. This was not re-found during the updated 2022 survey but as the surrounding habitat appeared unchanged, it was considered probable that the population persists; and
- A small population (fewer than 10 plants) of the Nationally Scarce hornwort *Phaeoceros carolinianus* was recorded growing in a farm gateway by the disused railway line in 2020 only. In 2017, a single population of this species was also recorded along a recently dredged field drain near Llanarthne, but the ditch had revegetated in 2020 and the species was absent.
- A small population of the Nationally Scarce liverwort *Porella pinnata* was recorded on a willow overhanging the River Cothi within the Proposed Scheme footprint in 2017 but was considered absent in 2020.

8.5.96. Owing to their rarity, populations of the bryophyte species noted above are considered to be of a **National conservation value**.

8.6 FUTURE BASELINE

8.6.1. The following literature are referenced in this section:

- Committee on Climate Change (2017) UK Climate Change Risk Assessment 2017 Evidence Report (**Ref. 8-32**); and
- Natural Environment Research Council (2015) Biodiversity Climate Change Impacts Report Card (**Ref. 8-33)**.

CLIMATE CHANGE

8.6.2. Long-term global warming implies annual UK temperatures increasing in the range of 2°C to 6°C, depending on emission levels. Sea-level and rainfall are both set to continue to rise.

8.6.3. There is strong evidence to suggest that climate change is affecting biodiversity in the UK and that the size of the impacts will continue with increases in climate change.

8.6.4. Potential changes to the ecological resources relevant to IEFs are summarised below.

HABITATS

Running water

8.6.5. Rivers are predicted to increase in flow during the winter and decrease in flow over the spring and summer. Flood events are expected to increase in magnitude.

8.6.6. Future increases in water temperature are predicted to broadly follow increases in air temperature.

8.6.7. Freshwater ecosystems are vulnerable to climate change because the metabolic rates of organisms and overall rate of productivity of ecosystems are regulated by temperature.

8.6.8. Higher temperatures and reduced summer flows could impact upon water quality by increasing the risk of algal blooms, altering acidification, and reducing oxygen availability in the water column.

8.6.9. It is important to recognise that aquatic ecosystems will be affected not only by climate change directly but also indirectly by changes in bordering land use and the building of flood defences, for example.

SPECIES

Otter

8.6.10. As an aquatic hunting species, otters will likely be affected by varying river flow rates and changes in food availability and abundance. Juveniles are likely to be more susceptible than adults to extreme weather events (such as drought, flooding and cold periods), which could impact upon otter populations.

8.6.11. Flooding events could result in holt submersion resulting in entire litters drowning, thereby reducing the local population of otters.

Fish

8.6.12. Fish species will be directly impacted by changes to rivers including alterations in temperature, dissolved oxygen concentrations, flow and water quality.

8.6.13. Additionally, increased average water temperatures may result in the increased incidence of fish diseases and facilitate the emergence of new diseases.

8.6.14. There is likely to be a trend of decreasing cold-water species such as salmonids and an increase in those adapted to warm water, such as cyprinids as well as an increased prevalence of invasive species.

CLIMATE CHANGE INFLUENCE IN ASSESSMENT

8.6.15. One important way to limit the potential adverse impacts of climate change is to ensure that existing ecosystems are maintained and enhanced when designing a new development. The Proposed Scheme incorporates embedded mitigation in order to integrate this ‘maintenance and enhancement’.

8.7 SENSITIVE RECEPTORS

8.7.1.

8.7.2.

8.7.3.

8.7.4. Table 8-10 summarises the value given to IEFs identified as having potential to be affected by the Proposed Scheme. All other receptors are assessed as local value and below are not included.

Table 8-10 – Important Ecological Features and their Conservation Value

Site Name	Designation	Value	Description
Designated sites			
River Towy	SAC	International	Designated under European legislation as an internationally important nature conservation site. Designated for Annex II species (see below).
River Towy	SSSI	National	Designated under UK legislation as a nationally important nature conservation site.
Species			
Otter	-	International	Annex II species. Part of the River Towy SAC (see above). Primary reason for site selection.
Twaite shad	-	International and National	Annex II species. Part of the River Towy SAC (see above). Primary reason for site selection.
Sea lamprey	-	International and National	Annex II species. Part of the River Usk SAC (see above). Qualifying feature but not a primary reason for site selection.
Brook lamprey	-	International and National	Annex II species. Part of the River Usk SAC (see above). Qualifying feature but not a primary reason for site selection.
River lamprey	-	International and National	Annex II species. Part of the River Usk SAC (see above). Qualifying feature but not a primary reason for site selection.
Bullhead	-	International and National	Annex II species. Part of the River Usk SAC (see above). Qualifying feature but not a primary reason for site selection.
Allis shad	-	International and National	Annex II species. Part of the River Usk SAC (see above). Qualifying feature but not a primary reason for site selection.

Freshwater Pearl Mussel		National	Annex II and IV species. Designatory feature of the River Towy SSSI.
Bryophytes	-	National	Nationally Scarce and Nationally Rare bryophytes. The bryophytes which have been flagged in the area (along the River Towy) are *Dendrocryphaea lamyana* (Schedule 8 species), along with a Nationally Scare moss *Orthotrichum sprucei* on silty willows and *Fissifens monguillonii* on rock shelves and in the river.
Bats	-	County	Trees with bat roosting potential were recorded in the area. Linear features for commuting and foraging bats regularly occur in the Study Area.
Breeding birds	-	County	The mosaic of habitats prevalent in the survey area are likely to support a range of bird species. Notably a tree sparrow population has been recorded within the Towy floodplain. Red kite are also known to breed in the area.
Habitats			
Woodland (including AWI)	-	County	Woodland habitat was regularly recorded within the Study Area. This habitat is a Section 7 habitat. Several sections were species-poor and small in extent. Three areas of AWI were present within the Site and were considered to be of County Value.
Intact species rich hedge and species rich hedge with trees		County	Several intact species rich hedge and species rich hedge with trees were present within the Site. These habitats are Section 7 priority habitats and are likely to qualify as 'Important' under the hedgerow regulations.

8.8 DESIGN DEVELOPMENT, IMPACT AVOIDANCE AND EMBEDDED MITIGATION

8.8.1. The following impacts on IEFs were scoped out as a result of embedded mitigation and will not be discussed further within the ES:

- Land take (temporary and permanent) of otter and fish habitat: The design avoids the need for temporary and permanent works within the channel of the River Towy and River Cothi.
- Disturbance of otter, bats and fish from lighting: The design has been developed to avoid the installation of artificial lighting during the operational phase. Temporary lighting may be required during the construction phase (winter months only) or for security reasons within site compounds. However embedded mitigation, included within the CEMPs include the use of task lighting, and restrictions to the time of works along river corridors (restricted to commence one hour after sun-rise and stop one hour before sunset in order to allow undisturbed passage of crepuscular and nocturnal species). Site compounds have also been designed to be situated more than 50m from the River Towy.
- Disturbance of otter and fish from noise and vibration: Piling of the structure foundations will be carried out by rotary drill rather than vibration in order to minimise the impact to IEFs including otter and fish (qualifying features of the Rover Towy SAC and SSSI). This has also minimised any potential changes in morphology of the river beds.

Scoped out of further assessment

8.8.2. Ecological resources scoped out from further assessment are listed below. Impacts for certain IEFs were scoped out as a result of embedded mitigation avoiding a pathway or impact on an IEF. Any resources of local value or less, or not considered to be at any risk of being significantly affected by the Proposed Scheme were scoped out of the assessment. These resources were:

- Badger;
- Dormice;
- Water vole;
- Great crested newt;
- White-clawed crayfish; and
- Widespread and / or common habitats, including improved grassland, poor semi-improved grassland, scrub, coniferous plantation woodland, immature trees.

8.8.3. Consideration will be needed for these groups within the mitigation and enhancement sections in relation to the legal and policy framework relating to them.

8.9 PRELIMINARY ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

8.9.1. Table 8-11 gives the assessment of the predicted effects on IEFs without mitigation, during construction and operational phases of the Proposed Scheme.

Table 8-11 – Predicted Effects (pre-mitigation)

Effect	Source	Important Ecological Feature	Assessment of Effect
Construction			
Habitat loss	Land take - permanent removal of a small population of lower plants during construction	Possible loss of Nationally scare hornwort *Phaeoceros carolinianus and Nationally r*are moss *Fissidens monguillonii.*	Possible permanent removal of a small population of Nationally Scarce hornwort *Phaeoceros carolinianus* identified in a farm gateway that is a few meters from the Proposed Scheme footprint as a result of resurfacing and / or reprofiling works. Two other small populations of bryophytes were recorded, namely the Nationally Scarce moss *Orthotrichum sprucei* recorded on a branch of osier in low-lying floodplain woodland by the River Towy (not directly affected by the Proposed Scheme) and a single population of the Nationally Rare moss *Fissidens monguillonii* was also found near the confluence of the Towy and Gwynon at Llanarthne (not found in 2020 but assumed to remain present).
Habitat loss	Land take - permanent loss of holts / resting sites	River Towy SAC/SSSI qualifying interests (otters)	Land take during construction could result in the loss of holts or resting places for otters, particularly in the sensitive locations where resting places were recorded during the otter surveys. Permanent loss of holts / resting sites could impact upon otters using these features, resulting in significant impacts to the dynamics of the local otter population in the area. Land take has potential to impact above and below ground resting places or holts. Types of activities affecting above ground features include scrub clearance, removal of resting site features (timber piles, root plates and hollow trunks) and accidental damage such as resting site vegetation being flattened by vehicles, materials storage and waste storage. Types of activities impacting below ground features could include removal of tree

			roots, excavations within 9 m of entrances, and the use of heavy machinery or piling within 30 m of a holt.
Habitat loss	Land take - permanent removal of woodland and hedgerows during construction	Ancient Woodland, Priority Habitat - woodland / hedgerow	The Proposed Scheme will result in permanent loss of up to 670m^2 (0.06ha) of Ancient Woodland, 17,601m^2 (1.76ha) of permanent woodland loss and 822m^2 (0.08ha) of permanent hedgerow loss.
Habitat degradation / direct mortality	Pollution and contamination incidents; release of silts and sediments	River Towy SAC qualifying interests (fish and FWPM)	There is potential for contaminant and fine sediment release during construction works, particularly relating to the construction of the bridge structures over the River Towy (Structure 5) and River Cothi (Structure 3) but also possible throughout the construction zones owing to the presence of ditches across the site. This may result in reduced water quality causing migratory deterrent and mortality to fish species. This is likely to be very localised effect given the size of the River Towy and the buffering of the continual influx of water from upstream.
Disturbance of species	Noise, vibration and visual disturbance (e.g. from piling activities)	River Towy SAC qualifying interests (otters)	Construction activities could result in disturbance to otters, particularly in sensitive locations where holts and resting places were recorded. Increased noise and vibration during construction works can cause avoidance in otters. The threat of disturbance is specifically to an otter lying up in a resting site. Although all works close to a resting site can potentially disturb an otter using underground resting sites (e.g. tree root systems). These typically provide more security for otters than above ground sites therefore the risk of disturbance by low-key activities (e.g. scrub cutting) in the vicinity of underground sites will be less. The distance between a work activity and a resting site where disturbance may occur is determined by the work activity (e.g. scrub clearance by hand, foundation digging using a mechanical digger) and the type of resting site (e.g. bramble thicket, tunnel into a root system). Therefore the disturbance distance must be determined for each individual resting site.

Disturbance of species	Noise, vibration and visual disturbance (e.g. from piling activities)	River Towy SAC qualifying interests (fish)	Increased noise / vibration from piling and construction activities can stress fish and be a deterrent to migration. This is potentially important as shad populations are particularly susceptible to noise impacts due to their specialised hearing system (**Ref. 8-34**). 'Noise' causes avoidance behaviours however is considered unlikely due to the short duration time of the works. This is a greater concern at night because both salmon and shad spawn at night, however the embedded mitigation integral to the design of the Proposed Scheme means that there will be no night time working, eliminating this impact. Embedded mitigation also includes the use of rotary drill for piling (when constructing structure foundations) instead of driven piling, minimising the impact of noise and vibration to IEFs.
Habitat loss	Land take - permanent loss of roosting features for bats	Bats	The permanent removal of the bridge abutment of the former River Gwynon bridge (at Structure location 6) could result in a loss of roosting habitat for bats. Removal of trees identified as being suitable for roosting bats within the construction zone could result in loss of roosting sites.
Disturbance of species	Resulting from vegetation clearance for birds	Breeding birds	Removal of woodland, scrub and grassland habitat along the Proposed Scheme could result in disturbance to breeding birds and removal of nesting habitat. However the embedded mitigation integral to the design of the Proposed Scheme means that vegetation clearance of suitable bird habitat will be minimised and / or compensated for, and any clearance will be undertaken outside the breeding bird season.
Operation			
Disturbance	Noise and disturbance from recreational users of the Proposed Scheme	River Towy SAC species (otters)	Otters are highly mobile and are considered sensitive to disturbance to a distance of approximately 200 m when breeding. Disturbance to otters or their use of holts/resting places could result from recreational use of the cycleway and dogs. If people and dogs are able to leave the cycleway and venture to the river and backwater habitats, direct disturbance to otter

			resting sites, as well as potential damage to sites and habitats, is also possible. These impacts are likely to affect a species cited as primary reason for the designation of the statutory designated site.

8.10 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS WITH MITIGATION, AND RESIDUAL EFFECTS

8.10.1. Within the context of EcIA, mitigation is one of the hierarchies of measures that are undertaken to prevent or reduce adverse impacts as follows:

- Avoidance / prevention: measures taken to avoid or prevent adverse impacts, for example the Proposed Scheme layout or timing of the site works;
- Reduction / mitigation: measures taken to reduce adverse impacts, e.g. retaining walls; pollution interceptors; and
- Compensation / offsetting: measures taken to offset significant residual adverse impacts, i.e. those that cannot be entirely avoided or mitigated to the point that they become insignificant. This would typically involve habitat creation or enhancement.

8.10.2. In this section, specific mitigation measures are proposed for all significant ecological effects on the IEFs identified. Generic mitigation measures are also proposed that include best practice methods and general principles that can be applied to the Proposed Scheme and are relevant to habitats and species present.

8.10.3. A suite of mitigation measures will be employed during works to reduce and avoid impacts resulting from the Proposed Scheme. Detail on the mitigation is provided below.

SPECIFIC MITIGATION MEASURES

Watercourse mitigation

8.10.4. Construction of the bridge structures over the River Cothi (Structure 3) and River Towy (Structure 5) will be completed in the summer months 1st July - 30th September inclusive to avoid shad and salmon spawning seasons, when they are most vulnerable. Spawning season for Atlantic salmon in the UK is between October and January, with eggs remaining in the water until April. Spawning season for shad species in the UK is April to June. Works will avoid these sensitive spawning times.

8.10.5. Large plant vehicles have the potential to destabilise the bank structure and thereby cause increased fine sediment inputs (most notably during spate conditions), with associated impacts on habitat quality and water chemistry. Salmonid nursery habitat, as well as juvenile lamprey habitat is sensitive to smothering by fine sediments. This includes restrictions on working near water to avoid any bank collapse during works.

Otter mitigation measures

8.10.6. An overview of otter mitigation is provided within this Chapter, with full details of otter mitigation provided in **Appendix 2.K (Volume IV).** The otter mitigation follows the principles outlined below:

- protect existing resting sites from damage and disturbance, and create new resting sites to provide additional protection to help otters withstand increased disturbance levels;
- ensure that banks of river, tributaries, backwaters and ditches remain undisturbed and should therefore be inaccessible to people and dogs;
- ensure that otter travel routes remain open. With increased daytime disturbance otter behaviour may change – either becoming more crepuscular and nocturnal, or avoiding crossing the cycleway (so possible increase in the use of culverts); and,
- undertake appropriate monitoring of otter activity and use of resting and feeding sites.

8.10.7. During construction two – three artificial holts are to be installed as compensation for the temporary or permanent disturbance or loss of resting site features. This will mitigate for the overall loss of

resting site opportunities along the Proposed Scheme and maintain the overall suitability of the area for otters.

8.10.8. Fencing to exclude humans and dogs from the areas around resting sites is required. Human and dog access from the Proposed Scheme to water course banks, ditches and backwaters to be prevented by mesh fencing where important otter habitat has been identified.

8.10.9. At each of the otter travel routes, dense ground cover must be retained or created on each side of the track. This can be achieved by:

- ensuring that existing dense ground cover, at, and within 2m of, the otter path is retained, especially during fence construction;
- managing existing vegetation to create dense ground cover by, for example, cutting tall scrub and leaving the brash at the crossing point;
- planting bramble scrub; and,
- ensuring that future maintenance of the cycleway retains dense cover at the crossing points. Discrete posts should be used to identify otter crossing points where vegetation is to be retained.

8.10.10. During operation, Habitat / Ecological Management Plans for the Proposed Scheme is required that addresses:

- timing of works, and particularly with reference to locations of natural and artificial resting sites so that disturbance is avoided or minimised; and,
- vegetation management and protection / development of dense ground cover in the vicinity of otter crossing points.

8.10.11. Post-construction monitoring should be carried out to determine the efficacy of mitigation measures and to identify mitigation improvements where necessary. A three-year interval between Proposed Scheme opening and monitoring investigations is needed to allow time for otter behaviour to adjust to changes in disturbance levels and for mitigation measures to become accepted by them. An otter seasonal survey should be conducted in the fourth year following completion of construction works, undertaken during each season over a 12-month period.

Bat mitigation

River Gwynon Bridge

8.10.12. Retaining the River Gwynon bridge abutments is not possible. Although no bats were recorded roosting within the structure during surveys undertaken, there is a risk that a transitional or hibernation bat roost could be present at the time of works.

8.10.13. Works to dismantle the River Gwynon bridge abutments will be undertaken during the summer months, May to August inclusive, when bats are considered least likely to be present (avoiding the seasonal periods of both transitory roosts; March/April and September/October, and hibernation roosts; November to February).

8.10.14. A method statement will be produced to direct the precautionary method of works employed during the deconstruction of the abutments. Due to the location, and the poor structural integrity of the abutments on the River Gwynon the exact method of works will need to be developed in collaboration between contractors and an ecologist who holds a licence to survey and disturb bats and has experience of designing and implementing method statements to establish a safe but

effective precautionary methodology. The method statement will follow the steps outlined below as closely as is practicable and safe.

8.10.15. Prior to works, at least one bat box will be erected on a suitable tree that is close to the area of works but that will be retained following construction. In the unlikely event that a bat is found during works, then it should be transferred by gloved hand into the bat box by the employed ecologist, who must hold a licence to survey and disturb bats.

8.10.16. Prior to the commencement of works, it is recommended that the following procedure is completed:

1. One week prior to the commencement of works a licensed bat ecologist should inspect all PRFs that can be fully inspected to ensure no bats are present.
2. Providing no bats are present, the licensed bat ecologist would then block all features to ensure no bats enter them.
3. Those features that cannot be fully inspected would be fitted with one-way exclusion devices, allowing any bats present to leave but not return to the PRFs.
4. Exclusion devices would then be left in situ for a minimum of 5 nights with minimum overnight temperature of 8°C to ensure bats had left. Site contractors will carry out daily inspections of the exclusion devices under guidance of the ecologist to check that they remain an effective barrier. Any exclusion devices which have become dislodged will be re-fitted for a further 5 nights with a minimum overnight temperature of 8°C.
5. A repeat inspection would then be conducted immediately prior to the start of works.

8.10.17. Works to dismantle sensitive sections of the River Gwynon railway bridge abutments should be undertaken in the presence of a NRW licensed bat ecologist. It is recommended that the following procedure is followed during deconstruction works:

1. If possible to complete safely, works to dismantle the masonry should be undertaken by hand, and using hand tools. As this is unlikely, works may be undertaken using an excavator with the excavator operative working in close communication and under the supervision of the licenced bat ecologist.
2. The excavator will be used to carefully lift the cap stones, taking care not to close any gaps or scrape materials together.
3. The bat licensed ecologist will inspect the exposed structures to check for the presence of bats or evidence of use by bats (e.g. droppings). If bats are found to be present, works will cease and the structure left open to allow the bats to disperse of their own accord. If it is not safe, for humans or bats, to leave the site as it is then the bat(s) will be captured and moved to the previously erected bat box. If evidence of use by bats is recorded during dismantling, contact will be made with NRW to seek advice on how to proceed. Works will not recommence until cleared to do so by the licenced bat ecologist.
4. The excavator will be used to carefully remove the masonry at sensitive locations, taking care not to close any gaps or scrape materials together, repeating Step 3 as appropriate under the supervision of the licenced bat ecologist.
5. Once all suitable features have been exposed and found clear of bats, the licenced bat ecologist will sign off works to be completed without ecological oversight.

Trees

8.10.18. Surveys completed on Site have concluded that bat roosts are likely absent from the trees on Site. The definitive absence of roosting bats is very difficult to prove; however, it is considered unlikely

that maternity roosts or other roosts of high conservation status are currently present. A total of 18 trees were along the Proposed Scheme offered bat roosting suitability.

8.10.19. The Proposed Scheme will result in the loss of nine of these trees (one trees with high suitability, four trees with moderate suitability and four trees with low suitability). The remaining nine trees with suitability for supporting bats are also considered to be 'at risk' of being felled or directly impacted by the Proposed Scheme. This includes one trees with high suitability, five trees with moderate suitability and three trees with low suitability. The locations of the trees subject to removal and those 'at risk' are shown on Figure 8.8

8.10.20. All trees subject to removal, irrespective of their suitability level for supporting roosting bats, will be subject to a pre-felling inspection by an experienced ecologist with a licence to survey and disturb bats.

8.10.21. Prior to the removal of trees with suitable roosting provision, alternative roosting provision will be provided in the form of bat boxes. A total of 15 bat boxes will be installed along the Proposed Scheme to compensate for the removal of trees with suitable roosting provision; one bat box per tree lost with low suitability, two boxes per tree lost with moderate suitability and three bat boxes per tree lost wit high suitability.

8.10.22. Up to a further 16 bat boxes may also be installed to compensate for the removal of trees within the 'at risk' category, based on the same compensatory ratio described above.

Bryophyte mitigation

8.10.23. *Phaeoceros carolinianus* is a short-lived species that requires exposed soil. Mitigation for this species will comprise dredging part of the field drain where it was found in 2017, using mechanical dredge to create the unique habitat requirements for re-establishment of the spores of this short-lived species.

8.10.24. One other nationally rare species was recorded close to the construction zone. *Fissidens monguillonii* recorded near the River Gwynon (Structure 6) in 2017. The species was not re-found during the updated 2020 survey however as the surrounding habitat was unchanged, it was considered that the species remained present.

8.10.25. Mitigation for *Fissidens monguillonii* will involve fencing the triangle of woodland north of the railway embankment where it was recorded in 2017, during construction. Direct impacts are unlikely given the distance from the Structure

Bird mitigation

8.10.26. A commitment has been made by CCC to undertake all vegetation clearance of suitable bird nesting habitat outside the breeding bird season in order to negate the potential requirement for working buffers regarding breeding red kite *Milvus milvus* and effects on the isolated tree sparrow population.

8.10.27. Should this not be possible, it is recommended that targeted breeding bird surveys and / or checks be undertaken to ascertain the presence or likely absence of breeding activity of these species and to define suitable working buffers if they are present.

8.10.28. In the event that breeding birds are found to be present within or near the Proposed Scheme during construction, suitable buffers would need to be implemented to avoid a breach of relevant legislation. It should be noted that the accepted working buffers from breeding red kites are considered to be between 300 m and 600 m during incubation with a potential reduction in buffer distance of 25 – 50 % once chicks have hatched depending on the individual circumstances and

tolerance of disturbance of the individual red kite (Currie and Elliott, 1997, Petty, 1998, Ruddock and Whitfield, 2007).

8.10.29. Should works be required within the breeding bird season all vegetation clearance would additionally require assessment by an ecologist no more than 24 hours prior to commencement of works. Any nesting birds identified must be left to fledge before works may commence. Should nesting birds be identified, safe working distances should be determined by an ecologist to avoid disturbance / destruction of any active nests of any species.

Habitat mitigation

8.10.30. A suite of habitat mitigation measures will be incorporated within the Proposed Scheme. This will include mitigation and enhancement along the Proposed Scheme, in addition to woodland, hedgerow and grassland creation within 20 sites identified for compensation. Full details will be included within the Biodiversity Net Benefit assessment of the Proposed Scheme. Habitat loss: gain ratios will be applied as per Table 8-1.

GENERIC MITIGATION MEASURES

8.10.31. Prior to construction starting, a pre-construction survey will be carried out. This will check that conditions at the Proposed Scheme have not changed, and that no additional ecological receptors require consideration. It is recommended that this visit is carried out within the month before site works begin, in order to reassess the study area giving an accurate representation of the ecological receptors present at the time of works, with particular attention given to otter, lamprey (sea, river and brook), twaite and allis shad, Atlantic salmon and bullhead, the River Towy SAC annex II species.

8.10.32. In order to mitigate for any impacts to species / habitats not listed as IEFs, Method Statements (MS) will be implemented. These will focus on potential impact to bats, other small mammals, dormice, badgers, birds, reptiles and amphibians. This will include provision of a Tool Box Talk to contractors prior to the start of works to emphasise the biodiversity issues associated with the site and highlight locations of higher risk for these species and regarding. Vegetation clearance works should be carried out in a staged manner in order to make habitats less suitable for small mammals, amphibians and reptiles.

8.10.33. Materials that could be used by sheltering animals will not be stored adjacent to potentially suitable habitat, in order to ensure small mammals, reptiles and amphibians do not move onto the construction site.

8.10.34. In order to mitigate for any impacts to the River Towy SAC and SSSI from the construction period a CEMP will be implemented. The CEMP will be developed by the appointed Contractor and implemented alongside detailed MSs for each stage of the construction programme.

8.10.35. General good construction site management practices will be implemented to minimise generation of excessive litter, dust, noise and vibration, and the risk of accidental spills. These measures will be controlled and monitored through the CEMP.

8.10.36. Any changes in noise and vibration levels during construction (excluding changes resulting from piling activities) are important to consider and mitigate where necessary. The following measures (as detailed in the CEMP) would result in the avoidance and reduction in noise and vibration where it is most likely to affect terrestrial species and fish.

8.10.37. All pumps / generators to be set at least 10 m away from watercourses, and suitably baffled to reduce the noise.

8.10.38. An Invasive Species Management Plan will be implemented, and biosecurity measures put in place to avoid the spread of invasive non-native plant species. These shall be designed by a specialist third party contractor.

8.10.39. A designated Ecological Clerk of Works (ECoW) will be employed during construction activities to ensure compliance with the CEMP. Vegetation clearance would be undertaken under specific method statements and supervised by the ECoW. Method statements would include timing constraints to avoid the bird breeding season, phased clearance and habitat management techniques to aid dispersal of reptile species and compliance with standard European Protected Species (EPS) licencing method statements (in relation to the low risk of bat roosts being affected by works).

8.10.40. Measures will be implemented to avoid/minimise potential for fuel, oil and chemical spills and spill kits will be ready to hand in the unlikely event of a spillage. There will be no storage of potentially contaminating materials in areas of ecological / hydrological sensitivity. A Pollution Incident Response Plan will be included as part of the CEMP to ensure that impacts from any accidental spills (should they occur) are reduced to a minimum.

8.10.41. Vegetation clearance will be carried out in a staged process, reducing the suitability to mammals, amphibians, reptiles and birds; overseen by the ECoW.

8.10.42. The implementation of CIRIA C741 - Environmental Good Practice on Site (4th Edition) (CIRIA, 2015) will include a requirement for safe storage of all materials and machinery within compounds which would prevent injury to mammals.

Table 8-12 - Predicted effects (following mitigation)

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
Construction				
Resource Population of Nationally Scarce hornwort Conservation value National	Land take Direct habitat loss Permanent removal of a small population of Nationally Scarce hornwort during construction	Positive or negative – negative Extent / Magnitude – habitat loss Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – certain	• *Phaeoceros carolinianus* is a short-lived species that requires exposed soil. Mitigation will comprise dredging a new field drain using mechanical dredge to create the unique habitat requirements for re-establishment of the pores of this short-lived species. • *Fissidens monguillonii* recorded near a bridge that will need reinstatement work, it should be beyond the area that will be directly affected. The triangle of woodland north of the railway embankment should be fenced off during works to prevent any access into this area. • *Porella pinnata* host tree and neighbours within a 5m radius be fenced off from landward activities whilst works are carried out. Mechanism for delivery • Precautionary Methods of Work, ECoW, CEMP.	Residual effect- Negligible Confidence of prediction - Certain
Resource Otters (River Towy SAC/SSSI qualifying interests)	Land take Direct habitat loss	Positive or negative – negative	Land take resulting during construction could result in the loss of holts or resting places for otters. Mitigation	Residual impact - Negligible

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
Conservation value International	Permanent loss of holts or resting sites for otters	Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – possible	• Artificial holt provision. • Management and creation of habitat along otter travel routes. Mechanism for delivery Precautionary Methods of Work, ECoW, CEMP, BNG, EPSL.	Confidence of prediction – Certain
Resource Priority Habitat – Woodland / hedgerow Conservation value County	Land take Direct habitat loss Permanent removal of woodland during construction	Positive or negative – negative Extent / Magnitude – habitat loss Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – certain	Vegetation clearance along the Proposed Scheme would result in the permanent loss of 670m^2 (0.06ha) of Ancient Woodland, 17,601m^2 (1.76ha) of permanent woodland loss and 822m^2 (0.08ha) of permanent hedgerow loss. Mitigation • Creation of 27,994m2 (2.79ha) in planting areas located long the Proposed Scheme and within compensation habitat. Mechanism for delivery Precautionary Methods of Work, MMP, ECoW, CEMP, BNG.	Residual impact - Positive –increase in woodland / hedgerow habitat Confidence of prediction - Certain

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
Resource Birds Conservation value County	Land take Direct habitat loss resulting from vegetation clearance during construction	Positive or negative – negative Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – possible	Vegetation clearance could result in damaging or destroying bird nests, or disturbance to Schedule 1 bird species. Mitigation • Timing of works – undertake vegetation clearance outside the breeding bird season (typically March to August inclusive). • Should this not be possible, targeted breeding bird surveys and / or checks be undertaken to ascertain the presence or likely absence of breeding activity of these species and to define suitable working buffers. Mechanism for delivery Precautionary Methods of Work, ECoW, CEMP, BNG, EPSL.	Residual impact - Negligible Confidence of prediction - Certain
Resource Otters (River Towy SAC/SSSI qualifying interests) Conservation value International	Disturbance Noise and vibration Disturbance to otters during construction	Positive or negative – negative Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction	Construction activities could result in disturbance to otters, particularly in sensitive locations where holts and resting places were recorded. Mitigation • Maintenance and Management Plan that addresses timing of works, with reference to locations of natural and artificial resting sites so that disturbance is avoided or minimised; and vegetation management and protection /	Residual impact - Negligible Confidence of prediction - Certain

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
		Reversibility – reversible Probability of occurring – possible	development of dense ground cover in the vicinity of otter crossing points. • Management and creation of habitat along otter travel routes. Mechanism for delivery Precautionary Methods of Work, MMP, ECoW, CEMP, BNG, EPSL.	
Resource Fish (River Towy SAC/SSSI qualifying interests) Conservation value International	Disturbance Noise and vibration during piling and construction of the footbridge	Positive or negative – negative Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction Reversibility – reversible	Changes in noise / vibration from piling and / or construction activities associated with the construction of the footbridge could stress fish and be a deterrent to migration. This is potentially important as endangered shad populations are particularly susceptible to noise impacts due to their specialised hearing system[34]. 'Noise' causes avoidance behaviours, this is a secondary concern and considered unlikely due to the short duration time of the works. This is a greater concern at night because both salmon and shad spawn at night, however the embedded mitigation integral to	Residual impact - Negligible Confidence of prediction - Certain

[34] Gregory, J. & Clabburn, P. (2003) Avoidance behaviour of *Alosa fallax fallax* to pulsed ultrasound and its potential as a technique for monitoring clupeid spawning migration in a shallow river. Aquatic Living Resources, 313-316.

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
		Probability of occurring – possible	the design of the Proposed Scheme means that there will be no night time working, eliminating this impact. Mitigation • Sensitive timing of works (no night time working). • No night-time working (embedded mitigation) Mechanism for delivery Precautionary Methods of Work, ECoW, CEMP.	
Resource Fish (River Towy SAC/SSSI qualifying interests) Conservation value International	Habitat degradation Pollution and contamination incidents; release of silts and sediments during footbridge construction	Positive or negative – negative Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – possible	Contaminant release from construction works and fine sediment release, particularly relating to the construction of the footbridge over the River Towy but also possible throughout the construction zones owing to the presence of ditches across the site. This may result in reduced water quality causing migratory deterrent and mortality to fish species. This is likely to very localised effect given the size of the River Towy and the buffering of the continual influx of water from upstream. Mitigation • Adherence to best practice pollution prevention guidelines (CIRIA Environmental Good Practice On-site) and compliance with a Construction Environmental Management Plan	Residual impact - Negligible Confidence of prediction - Confident

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
			will avoid indirect impacts to the aquatic environment. Mechanism for delivery Precautionary Methods of Work, ECoW, CEMP.	
OPERATION				
Resource Otters (River Towy SAC/SSSI qualifying interest) Conservation value International	Disturbance Noise and vibration Noise and disturbance from recreational users of the Proposed Scheme	Positive or negative – negative Extent / Magnitude – unknown Frequency – once Duration – permanent Timing – construction Reversibility – reversible Probability of occurring – possible	Disturbance to otters or their use of holts/resting places could result from recreational use of the cycleway and dogs, affecting species cited as primary reason for the designation of statutory designated site. Mitigation • Fencing to exclude humans and dogs from the areas around resting sites. Human and dog access to water course banks, ditches and backwaters to be prevented by mesh fencing where important otter habitat has been identified. • Post-construction monitoring should be carried out to determine the efficacy of mitigation measures and to identify mitigation improvements where necessary. To be undertaken in the fourth year following	Residual impact - Negligible Confidence of prediction - Certain

Resource	Proposed activity related to resource structure and function	Characterisation of impact	Mitigation	Summary of characterisation
			completion of construction works. The survey should be undertaking during each season over a 12-month period. Mechanism for delivery Precautionary Methods of Work, ECoW, CEMP, BNG, EPSL and planning conditions.	

8.11 ENHANCEMENTS

8.11.1. As mentioned in Section 8.2, the Environment (Wales) Act 2016 introduced an enhanced biodiversity and resilience of ecosystems duty (S6 Duty). Planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means development should not cause any significant loss of habitats or populations of species and must provide a net benefit for biodiversity.

8.11.2. To ensure the Proposed Scheme aligns with national policy, the Proposed Scheme will aim to achieve a Net Gain of Priority Habitats (as defined by the Environment (Wales) Act 2016)

GENERAL

8.11.3. In addition to the habitat reinstatement that is embedded into the Proposed Development once the works are completed, a series of soft landscaping measures are to be incorporated to provide an overall enhancement. Current indicative measures are highlighted in Chapter 6: Landscape and Visual. For ease of reference, such measures to include:

- The reinstatement of sections of hedgerow where they are currently relatively species-poor with a more varied species mix to increase species diversity;
- Reinstatement of existing field boundaries through the filling of gaps with native hedgerow planting;
- Creation of additional hedgerows using native species of local provenance;
- Planting of a variety of native species as part of landscaping to encourage invertebrates;
- The incorporation of wildflower areas to provide additional habitat;
- Invertebrate hotels and habitat piles to provide refuge for reptiles, amphibians and hedgehog;
- Good horticultural practice should be utilised, including the use of peat-free composts, mulches and soil conditioners and favouring native plants of local provenance in landscaping; and
- Avoidance of the use of plant INNS listed on Schedule 9 of the WCA 1981 (as amended) in the planting.

8.12 LIMITATIONS AND ASSUMPTIONS

8.12.1. Surveys of habitats and species can be limited by a number of constraints. In an effort to minimise constraints, nationally recognised survey methodologies have been followed as far as practicable, to minimise the limitations on the underpinning data used for the ecological impact assessment.

8.12.2. Specific constraints relating to ecological surveys are listed within the ecological survey reports (Appendices 8.1 – 8.17). However it is not considered that any of the reported constraints represent a significant limitation to the assessments made in this Chapter. The ecological surveys completed provide a robust baseline for informing the ecological impact assessment, given the application of the precautionary approach to the impact assessment process.

8.12.3. The assessment is based on the Proposed Scheme design available at the time of writing and a precautionary approach has been applied. In the event that significant changes to the design of the Proposed Scheme result, an updated assessment may be required.

8.13 SUMMARY

8.13.1. The River Towy SAC / SSSI was identified as being the IEF for the potential effects of the proposed development. Without mitigation, the Proposed Scheme would result in direct impacts to the River Towy SAC / SSSI through effects on primary reasons for designation

(otters and fish). Without appropriate mitigation, indirect impacts, particularly from the risk of pollution events, could also occur. The embedded mitigation used in the design of the footbridge, combined with the specific and targeted mitigation measures to be employed for the protection of species using the River Towy SAC / SSSI and its qualifying features will result in negligible residual impacts.

8.14 REFERENCES

- **Ref. 8.1** – European Commission (no date) The Habitats Directive https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm (accessed 26th May 2022)
- **Ref. 8.2** – European Commission (no date) The Birds Directive https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm (accessed 26th May 2022)
- **Ref. 8.3** – Ramsar (no date) https://www.ramsar.org/wetland/united-kingdom-of-great-britain-and-northern-ireland (accessed 26th May 2022)
- **Ref. 8.4** – European Commission (no date) The Water Framework Directive https://ec.europa.eu/environment/water/water-framework/index_en.html (accessed 26th May 2022)
- **Ref. 8.5** – HMSO (2019) The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019
- **Ref. 8.6** – HMSO (1981). Wildlife and Countryside Act 1981 (as amended).
- **Ref. 8.7** – HMSO (2000). The Countryside Rights of Way Act 2000
- **Ref. 8.8** – Welsh Government (2016) Environment (Wales) Act 2016.
- **Ref. 8.9** – Welsh Government (2015) The Well-being of Future Generations (Wales) Act 2015.
- **Ref. 8.10** – HMSO (1997) The Hedgerow Regulations
- **Ref. 8.11** – HMSO (1992) The Protection of Badgers Act
- **Ref. 8.12** – HMSO (1975) The Salmon and Freshwater Fisheries Act
- **Ref. 8.13** – Welsh Government (2021). Planning Policy Wales. Edition 11
- **Ref. 8.14** – Welsh Government (2009) Technical Advice Note (TAN) 5: Nature Conservation and Planning
- **Ref. 8.15** – Welsh Government (2015). Nature Recovery Action Plan Wales – the Biodiversity Strategy for Wales. Part 1 Nature Recovery Action Plan: Our Strategy for Nature 2015, and Part 2 Nature Recovery Action Plan 2020 – 2021 https://gov.wales/nature-recovery-action-plan (accessed 26th May 2022)
- **Ref. 8.16** –CCC (adopted 2014) Carmarthenshire Local Development Plan http://www.cartogold.co.uk/CarmarthenshireLDP/english/text/00_Contents.htm (accessed 26th May 2022)
- **Ref. 8.17** – CCC (2020) Local Biodiversity Action Plan
- **Ref. 8.18** –Carmarthenshire Nature Partnership (no date). Carmarthenshire Nature Recovery Plan https://www.carmarthenshire.gov.wales/home/council-services/planning/biodiversity/carmarthenshire-nature-partnership/#.Yu_C1XbMLIU (accessed 26th May 2022).
- **Ref. 8.19** – Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland, Terrestrial, Freshwater and Coastal.* CIEEM, Winchester.
- **Ref. 8.20** – CIEEM (2019) *Advice Note on the Lifespan of Ecological Reports and Surveys.* CIEEM, Winchester.
- **Ref. 8.21** –CIEEM PHIL AQ

- **Ref. 8.22** – Institute of Air Quality Management (IAQM) (2016) *Guidance on the Assessment of Dust from Demolition and Construction* Version 1.1. IAQM.
- **Ref. 8.23** – Highways England. Design Manual for Roads and Bridges (DMRB) *Volume 10 Section 4 Part 2 HA59/92 Mitigating Against Effects on Badgers.* Highways England.
- **Ref. 8.24** – Scottish Natural Heritage, Scottish wildlife series, otters and development available at https://www.nature.scot/sites/default/files/2017-07/A1959316%20-%20Species%20Planning%20Advice%20Project%20-%20otter%20-%20FINAL.pdf [accessed 03/07/22]
- **Ref. 8.25** –JNCC (2010). *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit*. JNCC, Peterborough.
- **Ref. 8.26** –Chanin P (2003). *Monitoring the Otter* Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10*, English Nature, Peterborough.
- **Ref. 8.27** – Collins, J. (ed.) (2016). *Bat surveys for Professional Ecologists: Good Practice Guidelines (3rd edn).* The Bat Conservation Trust, London.
- **Ref. 8.28** – Bat Tree Habitat Key (2018) Bat Roosts in Trees: A guide to identification and assessment for tree-care and ecology professionals. Pelagic Publishing. Exeter.
- **Ref. 8.29** –Harris, S., Cresswell, P., and Jefferies, D. (1989) *Surveying Badgers*. The Mammal Society. Bristol
- **Ref. 8.30** –Andrews, R. (2013). *The classification of badger* Meles meles *setts in the UK: A review and guidance for surveyors.* In Practice, Edition 82, Institute of Ecology and Environmental Management (IEEM) (Now CIEEM).
- **Ref. 8.31** – Liles G (2003). *Enhancing the status of the Otter. Conserving Natura 2000 Rivers. Conservation Techniques Series No. 5. English Nature, Peterborough.*
- **Ref. 8.32** – Committee on Climate Change (2017) UK Climate Change Risk Assessment 2017 Evidence Report
- **Ref. 8.33** – Natural Environment Research Council (2015) Biodiversity Climate Change Impacts Report Card
- **Ref. 8.34** – Gregory, J. & Clabburn, P. (2003) Avoidance behaviour of *Alosa fallax fallax* to pulsed ultrasound and its potential as a technique for monitoring clupeid spawning migration in a shallow river. Aquatic Living Resources, 313-316.

9 WATER ENVIRONMENT AND FLOOD RISK

9.1 INTRODUCTION

9.1.1. This Chapter reports the assessment of likely significant environmental effects arising from the Proposed Scheme upon the water environment. The aspects of the water environment considered in this chapter include quality of surface water features, flood risk and groundwater quality. The Chapter describes the assessment methodology, the baseline conditions at the Site and in the surrounding area, a summary of the likely significant effects, mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these measures have been employed.

9.1.2. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to **Chapter 8 - Biodiversity** and **Chapter 10 – Geology and Soils**.

9.1.3. A standalone Water Framework Directive (WFD) Assessment has been undertaken by WSP to assess the potential implications of the Proposed Scheme against the objectives of the WFD. The WFD Assessment is provided in **Appendix 4.B (Volume IV)** of this ES. This draws on the standalone Geomorphological Dynamics Assessment undertaken by Earth Science Partnership on behalf of Carmarthenshire County Council (CCC) to identify natural morphological processes of the River Towy and inform a risk assessment of where channel enhancement/restoration options may need to be undertaken to protect the route of the Proposed Scheme from erosion. A copy of the Geomorphological Dynamics Assessment is provided in **Appendix 4.C (Volume IV)** of this ES.

9.1.4. A standalone Flood Consequences Assessment (FCA) has been undertaken by Atkins on behalf of CCC to assess the implications of the Proposed Scheme on flood risk to people and property elsewhere. The FCA has been produced in support of the detailed planning application of the Proposed Scheme.

9.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

9.2.1. The management of water resources is governed by a range of legislative guidance set out in international, national and regional policies and plans. This assessment has been prepared whilst taking these plans and policies into account.

9.2.2. The coordination of policies for the water environment is managed by DEFRA and the Welsh Government. Many flood risk and water quality requirements are set at European level, which are then transposed into UK law. Natural Resources Wales (NRW) has a strategic overview regarding the management of all of the sources of flooding and an operational responsibility for managing the risk of flooding from main rivers, reservoirs, estuaries and tidal sources in Wales. Lead Local Flood Authorities (LLFAs) are responsible for managing the risk of flooding from local sources, comprising surface water, groundwater and ordinary watercourses. CCC is the LLFA relevant to the Proposed Scheme.

9.2.3. The applicable legislations, policies and guidance are summarised as follows:

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

9.2.4. The Water Framework Directive (WFD) makes provision for the maintenance and improvement of the ecological, chemical and quantitative status of the water environment**,** which includes rivers, lakes, wetlands, artificial waterbodies, groundwater, estuaries and coastal waters (up to one nautical mile from shore) (HM Government, The Water Environment (Water Framework Directive) (England and Wales) Regulations, 2017).

9.2.5. The main aim is for designated waterbodies to achieve 'good overall status' and prevent deterioration of status of surface waters and groundwater.

9.2.6. Under the WFD, NRW has prepared River Basin Management Plans (RBMPs) which define the current status of designated waterbodies, their objectives and the planned measures to achieve these objectives.

9.2.7. Guidance published by NRW provides further information on assessing the risk of activities in relation to the RBMP and WFD objectives.

The Groundwater (Water Framework Directive) (Wales) Directions 2016

9.2.8. The Groundwater Directions introduce procedures for assessing the chemical status of groundwater as per the WFD and protects groundwater by preventing direct discharge of hazardous pollutants and limiting the direct discharge of non-hazardous pollutants (HM Government, The Groundwater (Water Framework Directive) (England) Direction, 2016).

Flood and Water Management Act 2010

9.2.9. The Flood and Water Management Act 2010 (HM Government, Flood and Water Management Act, 2010) created the role of the LLFA (in this case CCC) to take responsibility for leading the co-ordination of local flood risk management in their areas. In accordance with the Flood and Water Management Act, NRW is responsible for the management of risks associated with main rivers, the sea and reservoirs. LLFAs are responsible for the management of risks associated with local sources of flooding such as ordinary watercourses, surface water and groundwater.

9.2.10. The Act is also guiding the role of the LLFA in the review and approval of surface water management systems. In April 2015 this led to a change that requires the LLFA to review and comment on significant development in regard to the recently published Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS) (DEFRA, Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, 2015). In 2019, Schedule 3 of the Act was introduced which requires all development with more than one building of a construction area of 100m^2 or more will require SuDs. This change also requires the LLFA to be the SuDS Approval Body (SAB) and be a statutory consultee in the SuDS approval process. The SAB will be both the approving body of the SuDS design but also the adopting and maintaining body for new surface water network in many cases.

Environmental Permitting (England and Wales) Regulations 2016

9.2.11. The Environmental Permitting (England and Wales) Regulations 2016 (HM Government, The Environmental Permitting (England and Wales) Regulations, 2016) replaced the Water

Resources Act 1991 (HM Government, Water Resources Act, 1991) as the key legislation for water pollution in the UK. Under the Environmental Permitting Regulations it is an offence to cause or knowingly permit a water discharge activity, including the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater, unless complying with an exemption or an environmental permit. An environmental permit is obtained from the NRW. The NRW sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent, taking into account any relevant water quality standards from EC Directives.

9.2.12. The Environment Permitting Regulations also manages works that have the potential to affect a watercourse under the jurisdiction of NRW. Any works in, under or near a main river requires permission from the NRW to ensure no detrimental impacts on the watercourse. Previously, this was a Flood Defence Consent; however in April 2016 consent for flood risk activities was included under the Environmental Permitting Regulations.

Environment Act 2021

9.2.13. The Environment Act 2021 (HM Government, Environment Act, 2021) is a new UK framework for environmental protection and implements many of the Government's ambitions for improving the natural environment that were previously set out in publications including the 25 Year Environment Plan (HM Government, 25 Year Environment Plan, 2021). While the Environment Act is now part of UK law, many of the required actions are not yet legal requirements as the supporting framework and secondary legislation is developed and implemented, or existing legislation is amended. However, it is prudent to be aware and prepare for future expectations and requirements.

9.2.14. Part 5 of the Act amends the Water Industry Act 1991 (HM Government, Water Industry Act, 1991) and makes provision for water resource management plans; drainage and sewerage management plans; storm overflows; regulation of water and sewage undertakers; abstraction, water quality and land drainage.

9.2.15. Part 6 of the Act makes provision for biodiversity net gain in planning which will in future apply to applications under the Town & Countryside Act and the Planning Act.

NATIONAL POLICY

Planning Policy Wales 2021

9.2.16. Planning Policy Wales (PPW) (Welsh Government, Planning Policy Wales, 2021) sets out the land use planning policies of the Welsh Government and is supplemented by a series of Technical Advice Notes (TANs).

9.2.17. PPW encourages local planning authorities to take a holistic approach in managing flood risk within a catchment. This should be achieved through the precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. In areas of flood plain currently unobstructed, PPW states that built development should be exceptional and limited to essential transport and utilities infrastructure. Such infrastructure should be designed and constructed so as to remain operational even at times of flood, to result in no net loss of floodplain storage, to not impede water flows and to not increase flood risk elsewhere. Reference is made to TAN 15: Development and Flood Risk (Welsh Government, TAN15: Development and Flood Risk, 2004) for further policy advice on development and flood risk. PPW goes on to state that development should reduce, and

must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself.

9.2.18. PPW goes on to state that in determining applications for development, local planning authorities should work closely with NRW, drainage bodies, sewerage undertakers, prospective developers and other relevant authorities to manage surface water runoff. Surface water runoff should be controlled as near to the source as possible by the use of sustainable urban drainage systems to manage additional runoff and ensure the protection of the quantity and quality of surface and ground water supplies.

9.2.19. PPW recognises the planning system has a key role to play in helping to reverse the decline in biodiversity and increasing the resilience of ecosystems by ensuring appropriate mechanisms are in place to both protect against loss and to secure enhancement. Statutorily designated sites must be protected from damage and deterioration, with their important features conserved and enhanced by appropriate management.

9.2.20. PPW also considers that the improvement of the quality of water and air is a material consideration in development control.

Technical Advice Note 15: Development and Flood Risk 2004

9.2.21. Technical Advice Note 15 (TAN 15) (Welsh Government, TAN15: Development and Flood Risk, 2004) provides technical guidance which supplements PPW in relation to development and flood risk. Specifically, it provides a precautionary framework within which risks arising from both fluvial and tidal flooding, and from additional runoff from development in any location, can be assessed. The overarching aim of the precautionary framework is, in order of preference, to:

- Direct new development away from those areas which are at high risk of flooding.
- Where development has to be considered in high risk areas (Zone C) only those developments which satisfy the Justification Test are to be located within such areas.

9.2.22. TAN 15 recognises that surface water drainage from developments can, if not properly controlled, significantly increase the frequency and size of floods associated with watercourses that receive surface water drainage, as well as risks directly associated with overland flow. TAN 15 promotes the use of Sustainable Drainage Systems (SuDS) as a means of managing surface water from developments and states that these should be implemented where possible.

9.2.23. TAN 15 also recognises that the potential effects of climate change are likely to result in an increase in flood risk to development. As such, it is vital to take account of the potential impact of climate change over the lifetime of the development.

9.2.24. The Welsh Government released an updated version of TAN 15 in November 2021, however the implementation of this update was since suspended until June 2023 to allow NRW time to refine the Flood Map for Planning and Local Planning Authorities to prepare Strategic Flood Consequence Assessments. The updates to TAN 15 will provide new guidance on climate change. The existing TAN 15 (2004), guidelines published by Welsh Government in August 2016 and the Development Advice Map will continue as the framework for assessing flood risk in the planning system.

Western Wales River Basin Management Plan 2015 - 2021

9.2.25. River Basin Management Plans (RBMPs) are published under the WFD and focus on the protection, improvement and sustainable use of the water environment. NRW has used the river basin management approach to ensure the many organisations and individuals that have an impact on the water environment work together to achieve the focus.

9.2.26. The Proposed Scheme is situated within the Western Wales River Basin District. The Western Wales RBMP was first published in 2009 (Natural Resources Wales, Western Wales River Basin Management Plan, 2009). Under the WFD, RBMPs will be reviewed and revised on a six-yearly cycle to update the status of the objectives for every waterbody, as these objectives can become legally binding and inform decision making by all public bodies. The updated reports also include economic analysis of the objectives and proposed measures, which NRW has assessed to be cost effective, technically feasible and proportionate in terms of the benefits outweighing the cost. The first update to the Western Wales RBMP was undertaken and published in December 2015.

9.2.27. The current RBMP describes the River Basin District and the pressures that the water environment faces. It shows what this means for the current state of the water environment, and what actions will be taken to address the pressures. It sets out what improvements are possible by 2021 and how the actions will make a difference to the local environment – the catchments, the estuaries and coasts, and the groundwater. The RBMP identifies the current key issues in the Western Wales River Basin District as:

- Physical modifications;
- Pollution from sewage and waste water;
- Pollution from towns, cities and transport;
- Pollution from rural areas;
- Negative effects of invasive non-native species;
- Pollution from abandoned mines, and
- Acidification due to deposition of atmospheric pollutants.

9.2.28. The Proposed Scheme is located within the Towy Operational Catchment, which forms part of the Carmarthen Bay and Gower Management Catchment. The catchment area stretches from Narberth in the west to the western suburbs of Swansea in the east, and encompasses the western part of the Brecon Beacons National Park and the estuaries and coastal waters of Carmarthen Bay. There are numerous Special Areas of Conservation (SAC) within the catchment, including the Carmarthen Bay and Estuaries and most of the Towy. The main issues associated with this catchment are diffuse and point source pollution from agricultural/rural areas and abandoned mines, acidification from air pollution and physical modification/fish passage issues. The 2015 RBMP identifies key measures for the catchment, which involve implementing schemes to improve fish passage, working with landowners to improve farm infrastructure and land management practices, investigating the feasibility of more minewater treatment plants, acidification restoration and improving forest management.

9.2.29. Preparation of the Western Wales RBMP 2021 - 2027 is underway following consultation led by NRW that closed in 2021. The updated RBMP has not yet been published at the time of preparing this assessment.

Carmarthenshire Local Development Plan (2006 - 2021)

9.2.30. The Carmarthenshire Local Development Plan (LDP) 2006 – 2021 (Carmarthenshire County Council, 2006), adopted in 2014, sets out land-use planning policies and proposals which are used in the determination of planning applications and in guiding future opportunities for investment and growth in Carmarthenshire. These policies include land-use allocations for different types of development as well as criteria for assessing individual proposals.

9.2.31. Policy EP1 (Water Quality and Resources) states that proposal for development will only be permitted where they do not lead to a deterioration of either the water environment and/or the quality of controlled waters. It also states that proposals are expected, where appropriate, to contribute towards improvements to water quality through the implementation of measures including the use of wetlands/greenspace for flood alleviation, the use of SuDS and sustainable water use in design. Furthermore, proposals relate to a main river or ordinary watercourse are required to incorporate a 7m buffer adjoining both banks of the watercourse to protect and encourage local biodiversity.

9.2.32. Policy EP3 (Sustainable Drainage) requires proposals for development to demonstrate that the impact of surface water drainage, including the effectiveness of incorporating SuDS, has been fully investigated, and the investigations should be carried out in line with Section 8 of TAN 15.

9.2.33. Policy SP2 (Climate Change) recognises the need for development to respond to, resilient to and adapt to the causes and impacts of climate change. Development proposals should avoid, or where appropriate, minimise the risk of flooding including the incorporation of measures such as SuDS and flood resilient design. Proposals for development which are located within areas at risk from flooding will be resisted unless they accord with the provisions of TAN 15.

GUIDANCE

9.2.34. The following guidance documents have been used during the preparation of this Chapter:

Design Manual for Roads and Bridges (DMRB)

9.2.35. The assessment has been undertaken in accordance with the principles of the methodology promoted within DMRB LA 113 Road Drainage and the Water Environment (Highways England, 2019). This section of the DMRB sets out the recommended approach to the assessment of road projects on the water environment. Whilst the Proposed Scheme does not comprise a road project, the guidance provided in the DMRB is still considered to represent industry good practice. Guidance is provided on determining the sensitivity of receptors and the likely magnitude of effects. Specifically, the DMRB provides a framework for assessing risks associated with routine runoff and accidental spillages affecting surface water and groundwater quality; hydromorphology; groundwater levels and flows; groundwater dependent terrestrial ecosystems; and flood risk; and provides guidance on mitigation to manage these risks. LA 113 also makes reference to the Water Framework Directive and the need for project compliance with this legislation.

Environment Agency Groundwater Protection Guides

9.2.36. NRW is the statutory body responsible for the protection and management of groundwater resources in Wales. They have adopted the groundwater protection guides published by the Environment Agency in March 2017 (Environment Agency, The Environment Agency's

Approach to Groundwater Protection, 2018), which set out the framework for regulation and replaces Groundwater Protection: Principles and Practice GP3. Section C (Infrastructure) of the guidance document is of key importance to transport proposals. In summary, Section C sets out the Environment Agency's, as well as NRW's, position statements and approach to managing and protecting groundwater in relation to infrastructure developments.

Pollution Prevention Guidelines

9.2.37. The Pollution Prevention Guidelines issued by the Environment Agency have now been withdrawn, although a number of these guidelines are still considered relevant to design and construction of the Proposed Scheme. In particular, Pollution Prevention Guideline 1 provides practical advice on site drainage, Pollution Prevention Guideline 5 provides guidance for works in, near, or liable to affect watercourses, and Pollution Prevention Guideline 6 provides guidance on the control of water pollution during construction and demolition stages of works. Compliance with these Pollution Prevention Guidelines should be considered as part of the environmental management documentation developed for construction and operational phases of the Proposed Scheme.

9.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

SUMMARY OF CONSULTATION

9.3.1. Table 9-1 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 9-1 – Summary of Consultation Undertaken to Date

Body / organisation	Contact at body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
NRW	Sera Jones (Access to Information Officer) and Kathy Banner (External Relations Officer)	Email consultation on 13th August 2018 and 30th August 2018 regarding specific WFD objectives and priorities for the River Towy and its tributaries, WFD-related works that are planned within the Site, licenced and private surface water and groundwater abstractions, and consented discharges within the Site.	NRW advised to check Lle (A Geo-Portal for Wales) and Water Watch Wales for all WFD related information. Information on consented discharges are also readily available on Lle. Information on surface water and groundwater abstractions (licensed/unlicensed) provided.
CCC	Sam Palmer	Telephone conversation on 8th October 2018 to discuss NRW's requirement to undertake up-to-date hydraulic modelling to inform the FCA and the ES.	CCC confirmed more up-to-date hydraulic modelling will be carried out to inform the FCA and the ES.
CCC	Sam Palmer	Telephone conversation in February 2021 to discuss findings of geomorphological assessment, and approach to	Detailed design of any required mitigation as proposed by the Geomorphological Dynamics Assessment to be developed in

Body / organisation	Contact at body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
		scheme assessment and mitigation.	consultation with NRW following approval of the planning application.

SCOPE OF THE ASSESSMENT

9.3.2. An EIA Scoping Report was submitted to CCC on 16 March 2018, as presented in **Appendix 5.3 (Volume IV).** The CCC response indicated that the proposed scope of the assessment in relation to the Water Environment was appropriate. Thus, the assessment is based on the scope as presented in the Scoping Report albeit with the following updates and clarifications:

- The FCA is to be updated with up to date hydraulic modelling that includes up to date hydrology with allowance for climate change. The FCA does not form part of the scope for this chapter, but the chapter includes information and a summary of the impact assessment as taken from the updated FCA;
- The ES and supporting WFD Assessment has been informed by a geomorphological baseline assessment which has been undertaken to identify natural morphological processes of the River Towy and inform a risk assessment of where channel enhancement/restoration options may need to be undertaken to protect the route of the Proposed Scheme from erosion;
- Since the submission of the Scoping Report, the DMRB has been updated and therefore this chapter will be assessed using the newest methodology outlined in DMRB LA 113, which superseded Volume 11, Section 3, Part 10 (HD 45/09).

INSIGNIFICANT ENVIRONMENTAL EFFECTS

9.3.3. The following effects are considered insignificant and have therefore not been considered within this Chapter:

- The Proposed Scheme will largely follow the disused Carmarthen to Ffairfach railway line. New bridge abutments will largely comprise shallow concreate bank seats. Piled foundations are proposed for the proposed crossing of the River Towy and River Cothi but these will be limited to the width of the new cycle path that is approximately 4m wide. Slight ground cutting of up to 1m deep is required at the proposed cycle path diversion near Hendy Farm between Chainage 12690 to 12820, however the cutting is no lower than the ground to the northwest of the proposed cutting and is not anticipated to intercept groundwater. As such, the construction and operation of the Proposed Scheme are not expected to affect groundwater levels, movement or recharge. Hence the impacts to the quantitative status of groundwater resources (also noting there are no known groundwater dependent terrestrial ecosystems within the study area) have not been assessed within the ES.
- The operational use of the Proposed Scheme will be limited to bicycles and occasional maintenance vehicles. As such, the operation of the Proposed Scheme is not expected to affect surface water or groundwater quality and impacts to the quality of surface water or groundwater resources during operation of the Proposed Scheme have not been

assessed within the ES. Potential impacts to surface water and groundwater resources during construction are, however, scoped into the assessment.

- Surface water and groundwater features that are located outside of the 0.5km Study Area and are not hydraulically connected to the Study Area have been scoped out from the assessment.

LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS

9.3.4. Table 9-2 sets out the likely significant effects that are assessed within the ES.

Table 9-2 – Water Environment – Significant Effects to be Assessed

Effect	Receptor	Applicable Development Phase †
Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate, and stockpiles of topsoil	River Towy, River Cothi, River Gwynon and other surface water features	C
Increased pollution risks from spillage of fuels and other harmful substances that may migrate to surface water features and groundwater receptors	River Towy, River Cothi, River Gwynon, other surface water features and groundwater resources	C
Impacts to the hydromorphological quality of watercourses associated with works within or in close proximity to watercourses such as the installation and alteration of culverts, bridges and outfalls, including longer-term changes associated with sediment deposition	River Towy, River Cothi, River Gwynon and other surface water features crossed by the scheme	C/O
Flood risk to users of the Proposed Scheme	Users of the Proposed Scheme	O
Increased flood risk to people and property associated with loss of fluvial floodplain storage from temporary works and the proposed scheme	People and property within and adjacent to the River Towy floodplain	C/O – Assessed within standalone FCA
Increased flood risk to people and property associated with changes to flood flow conveyance or crossing & culverting of watercourses	People and property within and adjacent to the River Towy floodplain	O – Assessed within standalone FCA
Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential increase in flood risk	People and property within and adjacent to the River Towy floodplain, including downstream of the site	O – Assessed within standalone FCA

Effect	Receptor	Applicable Development Phase †
Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow (where the path alignment is proposed to be raised)	River Towy and other surface water features	O

† C – Construction and O – Operational

LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS CONSIDERED ELSEWHERE IN THE ES

9.3.5. The following effects that are relevant to the water environment are considered elsewhere in the ES:

- Effects to terrestrial and aquatic ecological receptors within the River Towy and other surface water features are addressed in **Chapter 8 - Biodiversity**.
- Effects associated with contaminated land are assessed within **Chapter 10 - Geology and Soils**.

EXTENT OF THE STUDY AREA

9.3.6. The Study Area includes surface water features, such as watercourses and ponds, within 0.5km of the Proposed Scheme. This distance is considered appropriate to assess the potential direct effects of the Proposed Scheme, such as pollutants transported in surface water runoff and works within the river channel.

9.3.7. The Study Area encompasses groundwater features and groundwater abstractions up to approximately 0.5km from the Proposed Scheme. This distance is considered appropriate to assess surface-borne pollutants migrating to groundwater features.

9.3.8. Features that are in hydraulic connectivity with the Study Area, such as surface water and/or groundwater abstractions and downstream watercourses, are also considered within the assessment. Based on the professional judgement of the assessor and current knowledge of the area, features located up to 1km from the Scheme have been considered in the assessment. This distance is considered appropriate to assess the potential indirect effects of the Scheme.

9.3.9. The Study Area for the assessment of flood risk is typically defined by the extent of existing flood risk and the extent of the impacts of the Proposed Scheme on existing flood risk. As such, a standard 'buffer' does not usually apply. The Study Area for the assessment of flood risk is discussed in greater detail within the standalone FCA.

METHOD OF BASELINE DATA COLLECTION

Desk Study

9.3.10. Baseline information has been obtained from the following sources:

- Ordnance Survey (OS) mapping (Ordnance Survey, 2022);
- NRW's online flood risk maps (accessed September 2018) (Natural Resources Wales, Flood Risk Map Viewer, 2022);

- TAN 15 Development and Flood Risk Development Advice Map (accessed September 2018) (Natural Resources Wales, Development Advice Maps, 2022);
- Cranfield University Soilscapes mapping available online (accessed September 2018) (Cranfield University, 2022);
- British Geological Survey (BGS) Geology of Britain viewer (accessed September 2018) (British Geological Survey, 2021);
- MAGIC online mapping (accessed September 2018) (DEFRA, MAGIC mapping, 2022);
- National River Flow Archive (accessed May 2022) (Centre for Ecology & Hydrology, 2022);
- Flood Estimate Handbook Web Service (accessed May 2022) (Centre for Ecology and Hydrology, 2022)
- Capita Scoping Flood Consequence Assessment (dated November 2013);
- Towy Valley Path – Eastern Section Flood Consequence Assessment, CCC (dated September 2017);
- Tywi Valley Path – Eastern Section Flood Consequences Assessment, Atkins (dated July 2022);
- Surface water and groundwater abstractions and discharges dataset (received from NRW on 11 September 2018);
- Capita Geotechnical Scoping Report (dated January 2014)
- Water Watch Wales mapping available online (accessed April 2022) (Natural Resources Wales, Water Watch Wales, 2022);
- Otter survey report (dated September 2018);
- Geomorphological Dynamics Assessment, Earth Science Partnership (dated October 2020);
- Consultation with NRW (see above).

Site Visit

9.3.11. A site walkover was conducted on the 8th August 2018 to inform this assessment. The site walkover included the River Towy, the River Cothi, the River Gwynon and other relevant local watercourses for which access could be obtained. This site visit focussed on inspecting existing structures and the proposed crossing locations.

ASSESSMENT METHODOLOGY

9.3.12. The assessment has been undertaken following the principles of the DMRB LA113 as this provides a good basis for assessing effects of schemes and developments on the water environment. The DMRB promotes the following approach:

- Estimation of the importance of the attribute;
- Estimation of the magnitude of change of the impact, and
- Assessment of the significance of the effect based on the importance of the attribute and magnitude of the impact.

9.3.13. The assessment of likely significant environmental effects as a result of the Proposed Scheme has taken into account both the construction and operational phases. The construction phase includes enabling works, demolition, earthworks and construction activities as set out in **Chapter 3 - Description of the Proposed Scheme**.

9.3.14. In summary, the methodology is as follows:

- Establish baseline conditions and identify potential water environment receptors within the Study Area through review of desk-based sources of information, site visit and consultation with the relevant authorities;
- Consider any primary and tertiary mitigation to be employed during construction and operation and adopt these for the purpose of the assessment;
- Undertake a qualitative assessment of potential effects and identify any likely significant effects;
- Identify the need for further mitigation required to prevent, reduce or offset any identified significant negative effects;
- Identify likely residual effects after these further mitigation measures have been employed.

Flood Consequences Assessment

9.3.15. A standalone FCA has been undertaken in accordance with TAN 15: Development and Flood Risk to assess the potential implications of the Proposed Scheme on flood risk to people and property elsewhere, as well as assess the potential risk of flooding to users of the Proposed Scheme. This is informed by hydraulic modelling of the River Towy to assess the implications of the Proposed Scheme on flood flow conveyance and lost floodplain storage.

9.3.16. The FCA considers climate change allowances. The assessment of future risks and the design of required mitigation has been informed by the recommended increases for peak river flow in the Western Wales River Basin District.

Water Framework Directive Assessment

9.3.17. As the Proposed Scheme requires works close to and over a designated WFD waterbody, a WFD Assessment is required to ensure that the Proposed Scheme does not cause deterioration of the relevant waterbodies, nor does it prevent the waterbodies from achieving good WFD status. A WFD Assessment has been prepared separately to this Chapter and is included in **Appendix 4.B (Volume IV).**

SIGNIFICANCE CRITERIA

9.3.18. The significance attributed to each effect has been assessed based on the magnitude of change due to the Proposed Scheme and the sensitivity of the affected receptor, as well as a number of other factors that are outlined in more detail in Table 9-3 and Table 9-4 below.

9.3.19. The magnitude of change and the sensitivity of the affected receptor have been assessed by adapting the relevant tables within DMRB LA113.

Table 9-3 – Criteria for Estimating the Importance of Water Environment Attributes

Importance	Criteria	Example
Very high	Nationally significant attribute of high importance	Watercourse having a WFD classification shown in a RBMP and Q_{95} ≥1m³/s; Site protected/designated under EU or UK habitat legislation (Special Areas of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interests (SSSI), Ramsar site, salmonid water)/species protected by EU legislation;

Importance	Criteria	Example
		Principal aquifer providing a regionally important resource or supporting site protected under EC and UK habitat legislation; Groundwater locally supports Groundwater Dependent Terrestrial Ecosystem (GWDTE); Source Protection Zone (SPZ) 1; Water body of high amenity value, including areas of bathing and where water emersion sports are regularly practised; Floodplain or defence protecting more than 100 residential properties from flooding; and Areas which are highly vulnerable. These can include essential infrastructure, emergency services and basement dwellings.
High	Locally significant attribute of high importance	Watercourse having a WFD classification shown in a RBMP and $Q_{95<}1m^3/s$; Species protected under EU or UK habitat / species legislation; Principal aquifer providing locally important resource or supporting river ecosystem; Groundwater supports Groundwater Dependent Terrestrial Ecosystem (GWDTE); SPZ 2; Water body of a moderate amenity value including public parks, boating, non-contact water sports, popular footpaths adjacent to watercourses, or watercourses running through housing developments/town centres; Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding; and Areas which are more vulnerable. These can include hospitals, residential units, educational facilities and waste management sites.
Medium	Of moderate quality and rarity	Watercourse not having a WFD classification shown in a RBMP and $Q_{95}>0.001m^3/s$; Aquifer providing water for agricultural or industrial use with limited connection to surface water; SPZ 3; Water body of low amenity value with only casual access, e.g. along a road or bridge in a rural area; Floodplain or defence protecting 10 or fewer industrial properties from flooding; and Areas which are less vulnerable. These can include retail, commercial and general industrial units, agricultural/forestry sites and water/sewage treatment plants.

Importance	Criteria	Example
Low	Lower quality	Watercourses not having a WFD classification shown in RBMP and Q_{95}<0.001m^3/s; Low sensitivity aquatic ecosystem; Unproductive strata; Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area; Floodplain with limited constraints and a low probability of flooding of residential and industrial properties; and Areas which are considered to be water-compatible. These can include flood control infrastructure, docks/marinas, pumping stations and recreational/landscape areas.

Table 9-4 – Criteria for Assessing the Potential Magnitude of an Impact

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute and / or quality and integrity of the attribute	Loss or extensive change to a fishery / designated nature conservation site. Loss or extensive change to an aquifer / groundwater supported designated wetlands. Change to the environmental status/classification of a water feature, including water quality classification. Increase in peak flood level (1% annual probability event) > 100mm. Loss of flood storage areas.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss or change to a fishery / designated nature conservation site. Loss in the productivity of a fishery. Partial loss or change to an aquifer/ groundwater supported designated wetlands. Pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Increase in peak flood level (1% annual probability event) > 50mm.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability	Potential low risk of some pollution to a surface water or groundwater body, but insufficient to cause loss in quality, fishery productivity or biodiversity. Minor effects on groundwater supported wetlands. Increase in peak flood level (1% annual probability event) > 10mm.
Negligible	Results in effect on attribute, but of insufficient	The Proposed Scheme is unlikely to affect the integrity of the water environment.

Magnitude	Criteria	Example
	magnitude to affect the use or integrity	No measurable impact upon an aquifer. Negligible change in peak flood level (1% annual probability event) < +/- 10mm.
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Potential for slight reduction in pollution to a surface water or groundwater body, but insufficient to cause noticeable benefit in quality, fishery productivity or biodiversity. Reduction in peak flood level (1% annual probability event) > 10mm.
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate improvement to a fishery / designated nature conservation site. Potential increase in the productivity of a fishery. Reduced pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Reduction in peak flood level (1% annual probability event) > 50mm.
Major Beneficial	Results in major improvement of attribute quality	Significant improvement to a fishery / designated nature conservation site. Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring. Change to the environmental status/classification of a water feature, including water quality classification. Reduction in peak flood level (1% annual probability event) > 100mm.

SIGNIFICANCE OF EFFECTS

9.3.20. The overall significance of potential impacts considers both the magnitude of the impact against the value of the receptor as demonstrated in Table 9-5 and in accordance with DMRB LA104 Environmental Assessment and Monitoring.

Table 9-5 – Criteria for Assessing the Significance of the Effect

		MAGNITUDE OF IMPACT				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
IMPORTANCE OF ATTRIBUTE	**Very High**	Neutral	Slight	Moderate / Large	Large / Very Large	Very Large
	High	Neutral	Slight	Slight / Moderate	Moderate / Large	Large / Very Large
	Medium	Neutral	Neutral / Slight	Slight	Moderate	Moderate / Large
	Low	Neutral	Neutral / Slight	Neutral / Slight	Slight	Slight / Moderate

	Negligible	Neutral	Neutral	Neutral / Slight	Neutral / Slight	Slight

9.3.21. Effects that are deemed to be significant for the purpose of this assessment are those that are described as being moderate or major positive or negative.

9.4 BASELINE CONDITIONS

9.4.1. This section provides a description of the current baseline conditions with respect to the water environment. The main water features within the study area that may be affected by the Proposed Scheme are mapped, where possible, in **Appendix 4.B (Volume IV).**

SITE DESCRIPTION

9.4.2. The Proposed Scheme travels from the B4310 in the village of Nantgeredig to the village of Ffairfach. The route is 14.64km long and approximately 3m wide with an approximate 1m verge on either side. The location of the Proposed Scheme is shown in Figure 1.1 (Volume III).

9.4.3. The Proposed Scheme is broadly located parallel to the River Towy and will follow the disused Carmarthen-Llandeilo Railway Line for much of its length. Significant diversion from the disused railway line is proposed in the vicinity of the existing crossing of the River Towy where the Proposed Scheme is rerouted to align with the left bank of the river prior to the construction of a new crossing over the River Towy approximately 900m downstream of the existing crossing. Significant diversion from the disused railway line is also proposed between Ysgol Bro Dinefwr and the Glanyrafon access road north of the B4300 to the west of Ffairfach. A localised diversion is proposed at Riverside Woods/ Allt Pantglas at Chainage 8600 - 8900 and to the north of Hendy Farm at Chainage 12500 to locate the Proposed Scheme away from the alignment of the disused railway line and areas of localised erosion and bank migration on the left bank of the River Towy.

9.4.4. Topography along the Proposed Scheme is relatively flat within the wide valley bottom of the River Towy, with levels ranging from approximately 26mAOD in the east to approximately 16mAOD in the west. Land use along the Proposed Scheme is mainly greenfield and used for agricultural purposes.

SURFACE WATER FEATURES

9.4.5. The key surface water features identified within the Study Area are illustrated in **Appendix 4.B (Volume IV).** Not all of the water features within the Study Area are deemed to have the potential to be affected by the Proposed Scheme as they are located at a higher elevation than the Proposed Scheme or are not in hydraulic connectivity within the Study Area. These features have therefore not been considered further.

River Towy

9.4.6. The River Towy is a Main River and is one of the longest rivers flowing entirely within Wales. As a Main River it is under the jurisdiction of NRW. The headwaters of the River Towy rise from the southern foothills of the Cambrian Mountains. The river generally flows in a south-westerly direction from its source, through the steep hills of the Towy Forest to the town of Llandeilo upstream of the Study Area, before turning west towards Carmarthen downstream

of the Study Area. In Carmarthen, it is joined by the River Gwili before flowing south and discharging into Carmarthen Bay east of the Pendine Sands. In addition to the River Gwili, other major tributaries of the River Towy include the River Cothi located within the Study Area, as well as the River Bran, the River Dulais and the River Myddyfi which are all located upstream of the Proposed Scheme.

9.4.7. The headwaters of the Towy are dammed forming the Llyn Brianne reservoir approximately 40km upstream of the Study Area. The reservoir is constructed to store winter rain for release into the river during dry periods. Llyn Brianne is operated as a regulating reservoir to support abstractions of river water, particularly at Nantgaredig, and is thereby a major source for potable water supply to a large part of South Wales.

9.4.8. The River Towy has a large catchment area of approximately 1,088km^2 at Nantgaredig at the downstream extent of the Study Area (Centre for Ecology and Hydrology, 2022). A flow gauging station is located on the Towy at Ty Castell (NRFA reference: 60001) approximately 170m downstream of the B4310 road crossing at the western end of the Proposed Scheme. The median flow (QMED) recorded at the gauge is 380m^3/s, with the maximum flow recorded at 692m^3/s on the 8th November 2005. A low flow is not recorded at Ty Castell, however a Q95 flow of 4.27m^3/s is recorded at a gauging station 800m downstream of the B4310 road crossing (Towy at Capel Dewi, NRFA reference: 60010) (Centre for Ecology & Hydrology, 2022).

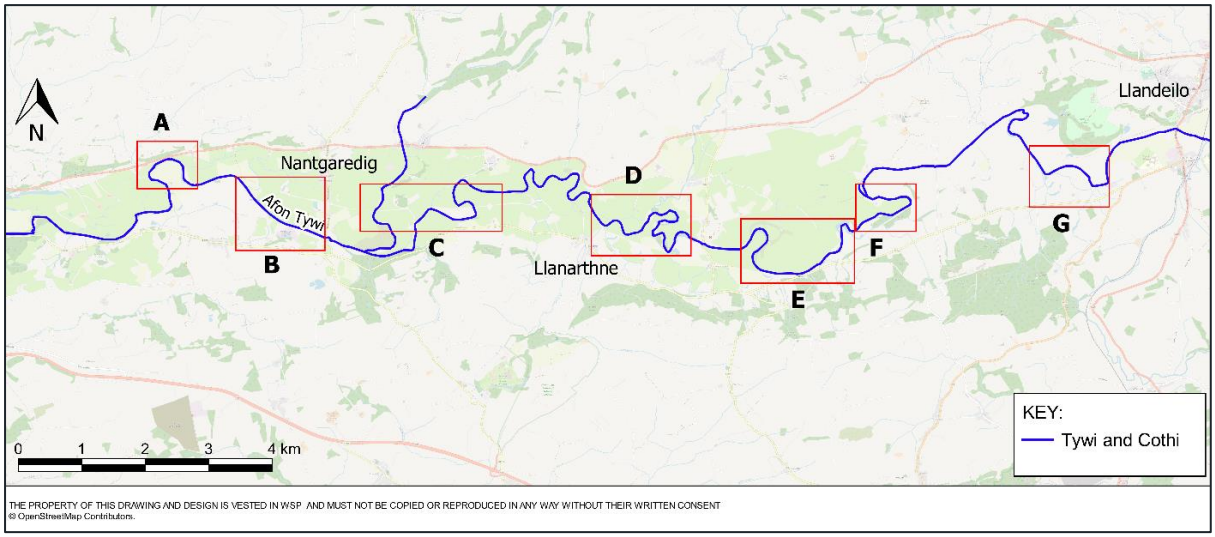
9.4.9. The River Towy is a meandering watercourse in a wide valley. Aerial imagery (Google, 2021) shows scars and oxbow lakes in the landscape of where the watercourse has previously carved through the valley. Historical maps (Digimap, 2022) confirm that the river is mobile, showing growth of meanders and movement of the channel since the 1890s, with greatest change generally between 1960 and 1980. Analysis of how the centreline of the River Towy has moved between 1890 and 2019 is provided in **Appendix 4.B (Volume IV).** A more detailed geomorphological assessment has been carried out for this reach of the River Towy **(Appendix 4.C (Volume IV)).** In summary, the dominant morphological process are localised erosion and depositions associated with bank erosion and transitional bar deposition. These processes occur at meander bends where erosion is causing lateral movement of the channel across the floodplain.

9.4.10. The geomorphological assessment of the River Towy identified risk zones along the river where the river is within 100m of the Proposed Scheme, shown in Figure 9-1 and listed below:

- C: Reach from Bremenda Uchaf to the proposed Towy crossing
- D: Three meander loops at Beili-Glâs
- E: 1.5km reach at Cae Fadog near Riverside Woods / Allt Pantglas
- F: Meander loop at The Flats
- G: Meander loops near the proposed Structure 12 and 13.

9.4.11. Zones A and B are downstream of the extent of the Proposed Scheme.

Figure 9-1 - Focus of Geomorphological Assessment Zones Identified in Appendix 4.C



9.4.12. A summary of the key findings of the geomorphological assessment is provided below. Reference should be made the standalone report in **Appendix 4.C (Volume IV)** for a more comprehensive summary of the risk assessment.

Table 9-6 – Summary of Geomorphological Dynamics Assessment

Zone	Summary of geomorphological assessment
Zone C	The reach is described as being geomorphologically stable with little active bank erosion or lateral movement within the floodplain. The risk to the Proposed Scheme in Zone C from bank erosion, lateral channel migration and geomorphological change is considered minimal over the next 50 years. Mapping from 1905 confirms that the channel has been stabilised and not moved in over 100 years. The Proposed Scheme is proposed to cross the River Towy in Zone C at Chainage 1575 (Structure 5 as illustrated in Appendix 4.C).
Zone D	Zone D contains a number of active meander loops with outside bends that are within 100m of the Proposed Scheme. Two of the three meanders that were assessed are considered to pose little risk of erosion or migration due to existing bank toe protection and floodplain palae-features/bedrock geological control. However the third assessed meander indicates that the channel may start to interact with the Proposed Scheme within 15 to 60 years. That said, the assessment also identifies that the Proposed Scheme (that is on the former railway line at this location) is elevated by c.1m above the floodplain, and it is possible that the embankment for the railway may offer protection against erosion.
Zone E	Zone E contains almost 1.5km of river reach where the Proposed Scheme runs parallel to and within 100m of the bank of the river. The majority of the Proposed Scheme within Zone E is considered to be at minimal risk form channel migration; however the upstream end of Zone E is one of the most active areas of morphological processes in the Study Area. The river is currently approximately 5m from the existing alignment of the former railway line. The channel may start to interact with this route within 1 to 5 years.

Zone	Summary of geomorphological assessment
	The Proposed Scheme is elevated along the former railway line by c.1-2m above the floodplain in this reach, and it is possible that the embankment for the railway may offer protection against erosion. However, a localised diversion is proposed at Riverside Woods/ Allt Pantglas to realign the Proposed Scheme away from the former railway line to partly mitigate against future river erosion / migration risks. The diversion will be located on a c.3m high boardwalk to maintain flood flow conveyance.
Zone F	The meander loop in the upstream extent of Zone F is assessed to pose risk to the Proposed Scheme, with the river located approximately 25 to 35m from the Proposed Scheme at this location. Based on the calculated average movement, the assessment concludes that the river could impact on the route of the Proposed Scheme within 35 to 50 years, however also notes that review of recent enhanced bank erosion risk (2015-18) indicates potential impact in 11 to 16 years. That said, the assessment also identifies that the Proposed Scheme is elevated along the former railway line by c.1-2m above the floodplain in this reach, and it is possible that the embankment for the railway may offer protection against erosion. Existing woodland along the left bank of the river is also noted to stabilise the banks and reduce the rate of erosion.
Zone G	Localised erosion has been identified at a specific point at the apex of the meander bend at the downstream extent of this Zone. The reach appears to have been stabilised with vegetated tree lined banks, boulders and large woody material and is largely still described as stable, however a small section of the bank has been breached with focussed erosion that has compromised the former railway line. The remainder of the reach upstream of this bend is considered to be at minimal risk. A localised diversion of the Proposed Scheme is proposed north of Hendy Farm (Chainage 12500 at the location of the bend erosion to realign the Proposed Scheme away from the former railway line to mitigate against future river erosion / migration risks.

9.4.13. The location of the Proposed Scheme at its proposed crossing of the River Towy at Chainage 1575 (Structure 5 as illustrated in **Appendix 4.C (Volume IV)**) is shown in Plate 9-1 below. The river channel is approximately 20 to 25m wide at the proposed crossing location. As discussed above, the reach is described as being geomorphologically stable and review of historic mapping presented in **Appendix 4.C (Volume IV)** indicates that the River Towy has remained stable at the proposed crossing location between 1890 and 2019.



Plate 9-1: *Proposed Crossing Location at the River Towy (Chainage 1575)*

9.4.14. As summarised in Table 9-6, Active erosion of the left bank of the River Towy was observed in Zone E of the geomorphological assessment, with estimation that the bank is eroding with average rate of 2.2m/year. To reduce risk to the Proposed Scheme, it is proposed that the route of the Proposed Scheme is diverted from the alignment of the existing disused railway embankment at Riverside Woods/ Allt Pantglas between approximate Chainage 8600 - 8900.

9.4.15. Erosion of the left bank of the River Towy is also identified to the north of Hendy Farm at Chainage 12500 (Plate 9-2) with an established depositional gravel bar observed on the right bank (Plate 9-3). A section of the existing railway embankment has been eroded along the left bank of the Towy which has thus led to the deviation of the Proposed Scheme from the disused railway line at this location. Instead the Proposed Scheme will divert to the south to avoid the failing embankment and the area of active erosion of the river channel.



Plate 9-2: *Area of scour along the left bank of the River Towy, north of Hendy Farm, with large woody material placed to stabilise the banks*



Plate 9-3: *Area of deposition along the right bank of the River Towy, north of Hendy Farm*

9.4.16. The River Towy forms part of the River Towy Site of Special Scientific Interest (SSSI) which reaches from Llandovery to the Towy's confluence with the River Taf at their combined outfall into Carmarthen Bay. The River Towy is also designated a Special Area of Conservation (SAC) through the Study Area.

9.4.17. No aquatic ecological survey has been undertaken to inform this assessment. However, otter surveys were carried out during 2017 and 2018 which identified high otter activity throughout the River Towy adjacent to the Proposed Scheme as well as backwaters, with otter crossing the former railway track at several locations to travel between the river and backwaters. The river is also used by the Llandeilo Angling Association for game fishing for salmon, sea trout and wild brown trout. Further information regarding the aquatic ecology of the river is provided in **Chapter 8 - Biodiversity**.

River Cothi

9.4.18. The River Cothi is a major tributary of the River Towy and confluences with the River Towy in the Study Area. It has a catchment area of approximately 303km^2 at the confluence with the Towy at NGR 249969 220076 (Centre for Ecology and Hydrology, 2022). It is classified as a Main River and therefore is under the jurisdiction of NRW. The River Cothi flows southwest from the eastern side of the Cambrian Mountains into Carmarthenshire. The upper valley is part of the Dolauchothi Estate, which is owned by the National Trust, and incorporates the site of the Dolaucothi Roman Gold Mines. The lower catchment of the Cothi drains the Brechfa Forest, with the river flowing in a south-westerly direction, pass the village of Abergorlech and Brechfa before turning south to join with the River Towy near Nantgaredig.

9.4.19. A flow gauging station is located on the Cothi at Felin Mynachdy (NRFA reference: 60002), approximately 3.4km upstream from its confluence with the Towy. The median flow (QMED) recorded at the gauge is 175m^3/s, with the maximum flow recorded at 314m^3/s on the 31st

October 1977 (Centre for Ecology & Hydrology, 2022). The Q95 flow of the River Cothi at this location is 1.063m^3/s.

9.4.20. The Proposed Scheme crosses the River Cothi at Chainage 800 at the same location as the existing crossing of the disused railway line. Plate 9-3 and Plate 9-4 were taken at the approximate location of the crossing during the site visit on 8th August 2018 (noting that the crossing location could not be inspected due to livestock). The river channel was noted to be approximately 15m wide at this location. The existing bridge structure is no longer present but both the left bank and right bank bridge abutments remain in-situ.



Plate 9-4:*River Cothi approximately 50m upstream of proposed crossing location*

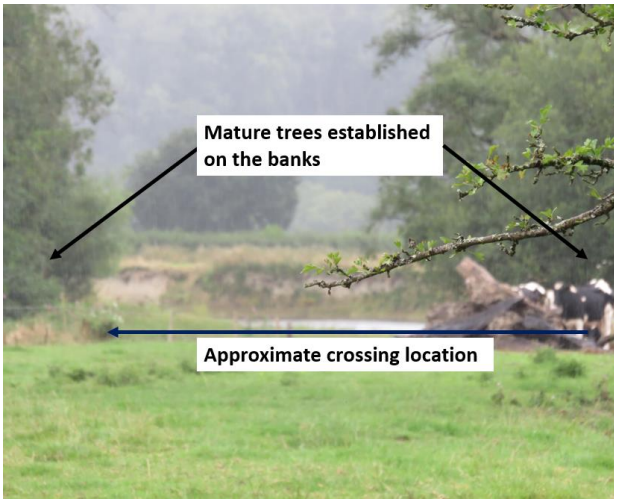


Plate 9-5: *Approximate proposed crossing location of River Cothi (Chainage 800)*

9.4.21. This section of the River Cothi is located within Zone C of the geomorphological assessment key risk zones. The assessment summarises that bank erosion is occurring on the outside of meander bends upstream and downstream of the River Cothi crossing, however the risk to the Proposed Scheme is considered minimal due to geological constraints to further erosion risk to the route. This is supported by review of historical maps[35] that indicate that the River Cothi has remained relatively stable through the Study Area between 1960 and 1980. Some lateral movement has occurred from approximately 350m upstream of the existing crossing of the watercourse to its confluence with the River Towy approximately 1.3km downstream, although the existing crossing appears to have provided restraint to lateral movement at the location of the crossing. Analysis of how the centreline of the River Cothi has moved between 1890 and 2019 is provided in **Appendix 4.C (Volume IV).**

9.4.22. No aquatic ecological survey has been undertaken along the River Cothi and no otter surveys have been completed except at the proposed crossing location where an otter resting site was identified. The river is known to support local fishing for fishing sea trout.

[35] https://digimap.edina.ac.uk/, last accessed June 2019

Further information regarding the aquatic ecology of the river is provided in **Chapter 8 - Biodiversity**.

River Gwynon

9.4.23. The River Gwynon is a minor tributary of the River Towy. It is an ordinary watercourse and therefore falls under the jurisdiction of CCC as the LLFA. The River Gwynon flows in a westerly direction from its source, near Garregwen farm, towards Point Felin-gat at NGR 252688 218863, before turning north-east through the village of Llanarthne and discharging into the River Towy at NGR 253664 220515. The River Gwynon has a total catchment area of 8.5km^2. The southern part of the catchment drains the National Botanic Gardens of Wales, where a series of lakes are located which habe the potential to attenuate flows contributing to the Gwynon.

9.4.24. The Proposed Scheme crosses the River Gwynon at Chainage 4790, approximately 115m upstream from its confluence with the River Towy and along the same alignment as the existing crossing by the disused railway line. The river channel is approximately 3 to 4m wide at the crossing location with relatively steep rocky banks and bankside vegetation that comprises of shrubs and mature trees (Plate 9-6). The Gwynon has a gravel/cobble bed with limited in-channel vegetation, but silt deposition is evident at the crossing location.



Plate 9-6: *River Gwynon at the proposed crossing location (Chainage 4790)*

9.4.25. No otter activity has been identified along the River Gwynon at the location of the Proposed Scheme but an unnamed ordinary watercourse approximately 92m to the east is reported as major otter route. This ordinary watercourse confluences with the River Gwynon at NGR 254134 330649, immediately upstream of the confluence between the Gwynon and the River Towy.

Other surface water features

9.4.26. A large number of other unnamed watercourses and ditches with small catchments are located within the Study Area and contribute to the wider River Towy catchment. Many of these watercourses are crossed by the existing disused railway alignment and therefore the Proposed Scheme. Three watercourses shown on Ordnance Survey maps that are not

currently crossed by the disused railway line will require a new crossing by the Proposed Scheme as the Proposed Scheme deviates from the alignment of the disused railway: a minor watercourse approximately 600m long that issues to the south of the Proposed Scheme near Penybanc Uchaf and is crossed by the Proposed Scheme west of Bremenda Isaf at Chainage 2120 immediately upstream of the watercourse's discharge to the River Towy; a minor watercourse approximately 1km long that issues to the south of the Proposed Scheme near Greenhill Farm and flows adjacent to Tre-clais and that is crossed by the Proposed Scheme at approximate Chainage 3600-3700 upstream of the existing crossing of this watercourse by the disused railway; and a minor watercourse to the north of Hendy Farm that is already crossed by the disused railway but that will require a new crossing to facilitate the deviation of the Proposed Scheme from the disused railway line at Chainage 12680 to account for the erosion of the Towy River left bank as discussed above.

9.4.27. The minor watercourse to the north of Hendy Farm was inspected during the site visit on 8th August 2018. Approximately 140m downstream from the Proposed Scheme crossing the watercourse drains through an approximate 750mm diameter plastic pipe culvert before discharging into the River Towy at NGR 260645 221315 (Plate 9-7). Downstream of the culvert structure, the channel is approximately 1m wide at the base with steep banks of approximately 1.5 to 2m deep and limited vegetation growth both in the channel and on the banks. The watercourse was flowing at the time of the site visit with water depth estimated to be around 100 to 150mm. Minor blockage was observed at the upstream face of the culvert, with evidence of stagnant water and siltation/weed growth in the channel bed (Plate 9-8). Based on the recent otter surveys, this unnamed watercourse has been identified as an otter path used by the animals to travel to the River Towy.



Plate 9-7: *Downstream face of the culvert at the unnamed watercourse adjacent to Hendy Farm*



Plate 9-8:*Upstream face of the culvert at the unnamed watercourse adjacent to Hendy Farm*

9.4.28. A number of other ordinary watercourses and a Main River are located in the Study Area and are tributaries of the River Towy, among them the River Dulais (Main River), River Ffinnant, Nant Cellyn, River Myddyfi and Nant Gurrey-fach. All of these watercourses are located up gradient from the Proposed Scheme and are not in hydraulic connectivity within

the Study Area. As such, these watercourses are considered to be outside the influence of the Proposed Scheme and therefore have not been considered further in the ES.

SURFACE WATER ABSTRACTIONS AND DISCHARGES

9.4.29. Review of information provided by NRW indicates one licensed surface water abstraction from the River Towy approximately 550m downstream of the B4310 that forms the western boundary of the Proposed Scheme. A second licensed surface water abstraction from the River Towy is located approximately 6.5km upstream of Ffairfach that forms the eastern boundary of the Proposed Scheme. These abstractions are detailed in Table 9-7 below and **Appendix 4.C (Volume IV).**

Table 9-7 – Surface Water Abstractions Near the Proposed Scheme

Abstraction reference (Appendix 9.3)	Name	Dwr Cymru Welsh Water Licence Number	Operator	Source	Use	Abstraction Volume (Max Annual Quantity – m^3)
SWa1	River Towy at Nantgaredig to Felindre	22/60/3/0035	Dwr Cymru Cyfyngedig	Surface water	Potable Water Supply	82964495
SWa2	Manoravon Abstraction	22/60/1/0068	Dwr Cymru Cyfyngedig	Surface water	Potable Water Supply	13274320

9.4.30. Review of information provided by NRW indicates nine consented discharges within the Study Area. These consented discharges are detailed in Table 9-8 below and their location shown in **Appendix 4.C (Volume IV).**

Table 9-8 – Consented Discharges to Surface Water Bodies Near the Proposed Scheme

Discharge reference (Appendix 9.3)	Name	Dwr Cymru Welsh Water Licence Number	Operator	Receiving waterbody	Type
SWd1	Pont-ar-Gothi & Nantgaredig WWTW	BN0002601	Dwr Cymru Cyfyngedig	River Cothi	Sewage - Water Undertaker
SWd2	Pandy Fulling Mill, Llanarthne	BP0356801	K Lloyd	River Gwynon	Sewage – non Water Undertaker
SWd3	Llanarthne STW Land adjacent to Hafan Deg	BP0293301	Carmarthenshire County Council	River Gwynon	Sewage – non Water Undertaker

Discharge reference (Appendix 9.3)	Name	Dwr Cymru Welsh Water Licence Number	Operator	Receiving waterbody	Type
SWd4	Golden Grove WWTW	BP0312601	Dwr Cymru Cyfyngedig	River Towy	Sewage - Water Undertaker
SWd5	Fairfach STW	BH0065401	Dwr Cymru Cyfyngedig	River Towy	Sewage - Water Undertaker
SWd6	Ffairfach WWTW	BN0194103	Dwr Cymru Cyfyngedig	River Towy	Sewage - Water Undertaker
SWd7	Llandeilo	BP0115701	Dwr Cymru Cyfyngedig	River Towy	Sewage - Water Undertaker
SWd18	Old Creamery Ffairfach	BP0115301	Dwr Cymru Cyfyngedig	River Cennen	Sewage - Water Undertaker
SWd9	Sawmills Yard Llandeilo	BN0194104	Dwr Cymru Cyfyngedig	Gurrey Brook	Sewage - Water Undertaker

GROUNDWATER FEATURES

9.4.31. Review of the British Geological Survey (BGS) mapping indicates the site is underlain by varying geology along its length however the geology generally comprises mudstone bedrock overlain by alluvium and river terrace deposits within the valley and historic floodplains of the River Towy, River Cothi and River Gwynon and bordered by till deposits to the valley sides.

9.4.32. The Geotechnical Scoping Report undertaken by Capita on behalf of CCC in January 2014 states that the majority of bedrock geology underlying the Study Area is designated as Secondary B aquifer with smaller areas associated with the River Cothi designated as Secondary A aquifer. The report also states that the majority of superficial geology is designated as Secondary B aquifer with the till deposits considered to be a non-aquifer.

9.4.33. A review of historic borehole scans on the BGS website has been undertaken to determine the likely depth to groundwater. Whilst the records are too sparse to be conclusive, the data indicates that groundwater levels within the valley bottom of the River Towy are likely to be shallow, potentially ranging between c. 2m-5m below ground level.

9.4.34. Review of Lle mapping indicates that the Proposed Scheme is not located within 1km of any designated Source Protection Zones (SPZ). There are also no known groundwater dependent terrestrial ecosystems in the study area.

GROUNDWATER ABSTRACTIONS AND DISCHARGES

9.4.35. Review of information provided by NRW indicates two groundwater abstraction licenses within the study area. These abstractions are detailed in Table 9-9 below and **Appendix 4.C (Volume IV).**

Table 9-9 – Groundwater Abstractions Near to the Proposed Scheme

Abstraction reference (Appendix 4.C)	Name	Dwr Cymru Welsh Water Licence Number	Operator	Source	Use	Abstraction Volume (Max Annual Quantity – m^3)
GWa1	Well at Llandeilo-yr-Ynys	22/60/3/0016	Mr M J Watler	Groundwater	Water Bottling	2028
GWa2	Gelli Aur College Farm	WA/060/0001/0024	Coleg Sir Gar	Groundwater	Agriculture	10950

9.4.36. Review of information provided by NRW indicates three consented discharges within the study area. These consented discharges are detailed in Table 9-10 below and their location shown in **Appendix 4.C (Volume IV).**

Table 9-10 – Consented Discharges to Groundwater Near the Proposed Scheme

Discharge reference (Appendix 4.C)	Name	Dwr Cymru Welsh Water Licence Number	Operator	Use	Type	Treatment
GWd1	Rhydarwen Llanarthne	BN0190802	Mr G J & M D John	Domestic	Sewage – non Water Undertaker	Unspecified
GWd2	Rhydarwen Llanarthne	BN0190801	Mr G J John	Domestic	Sewage – non Water Undertaker	Unspecified
GWd3	Gelli Aur Farm	BP0303001	Colleg Sir Gar	Education	Sewage – non Water Undertaker	Package Treatment Plant

WATER QUALITY

9.4.37. The watercourses within the Study Area form part of the Carmarthen Bay and Gower WFD Management Catchment located in the Western Wales River Basin District. The ecological and chemical quality of the River Towy and River Cothi as they flow through the Study Area is assessed by NRW in accordance with the objectives of the WFD. Table 9-11 summarises the most recent Cycle 3 (2021) WFD classifications. A summary has also been provided for the River Dulais, Cennen and Myddyfi as these watercourses are also located within the

Study Area, although as discussed in earlier sections of this Chapter the watercourses are located at a higher gradient than the Proposed Scheme and are not considered likely to be affected by the Proposed Scheme.

Table 9-11 – Water Framework Directive River Classifications (Cycle 3, 2021)

Watercourse and stretch	Overall	Ecological	Chemical
River Towy – confluence with the Bran at Llandovery to confluence with River Cothi (upstream of Cothi)	Good	Good	High
River Towy – confluence with River Cothi to spring tidal limit (downstream of Cothi)	Good	Good	High
River Cothi – confluence with Marlais to confluence with River Towy	Good	Good	High
River Dulais– confluence with Shannan to confluence with River Towy	Good	Good	High
River Cennen – headwaters to confluence with River Towy	Good	Good	High
River Myddyfi – headwaters to confluence with River Towy	Moderate	Moderate	High

9.4.38. Groundwater within the Study Area forms part of the Towy, Taf and Gwendraeths groundwater body. The quantitative and chemical quality of groundwater is assessed by NRW in accordance with the objectives of the WFD. Table 9-12 summarises the current Cycle 3 (2021) WFD classifications.

Table 9-12 – Water Framework Directive Groundwater Classifications (Cycle 3, 2021)

Watercourse and stretch	Overall	Quantitative	Chemical
Towy, Taf and Gwendraeths groundwater body	Poor	Good	Poor

9.4.39. Further information regarding current WFD classifications is provided in the standalone WFD assessment in **Appendix 4.B (Volume IV).**

FLOOD RISK

9.4.40. The FCA (Atkins, 2022) provides a detailed description of baseline flood risk for the Proposed Scheme. A summary is provided below. Fluvial flood risk associated with the River Towy is considered to be the most significant risk to the Proposed Scheme.

9.4.41. A significant proportion of the Proposed Scheme is located within Flood Zone 2 and 3 on NRW's Flood Map for Planning[36]. Given the significant risk to the Proposed Scheme, new hydraulic modelling has been developed to understand the baseline fluvial flood risk and the consequences of the Proposed Scheme on flood risk. This concluded that much of the Proposed Scheme is at risk during the 3.33% (1 in 30) annual probability event, 1% (1 in 100) annual probability event and 0.1% (1 in 1000) annual probability event. Please refer to the FCA for a detailed description of baseline flood risk of the Proposed Scheme.

9.4.42. The FCA reports historic flooding recorded on the River Towy in October 1987, October 1998, November 2005 and October 2018. In 1987 approximately 250 properties were flooding in the Towy catchment, partly as a result of the Carmarthen Flood Alleviation Scheme being overwhelmed. In 1998 and 2005, flooding was reporting in Fairfach at the eastern extent of the Proposed Scheme. In 2018, the A40 from Llandovery to Carmarthen was closed with impacts to Ffairfach and Pont-ar-Gothi.

9.4.43. The FCA concludes that the risk from surface water flooding is very limited. Flooding from surface water is typically associated with natural overland flow paths and local depressions in topography where surface water runoff can accumulate during or following heavy rainfall events.

9.4.44. The NRW flood mapping indicates that most of the Study Area lies within an area deemed to be at risk of flooding if the Llyn Brianne reservoir suffered a failure and released its water. The NRW website states, however, that 'Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in Wales, we ensure that reservoirs are inspected regularly and essential safety work is carried out'.

9.5 SENSITIVE RECEPTORS

9.5.1. Sensitive receptors assessed within this Chapter are summarised in Table 9-13. A review of the importance of the identified receptors has been carried out in accordance with the significance criteria outlined in Table 9-3 that is based on the methodology promoted in the DMRB LA113. The attributes of each receptor have been taken into consideration in the overall assignment of the importance.

Table 9-13 – Importance of Identified Receptors

Receptors	Description	Value
River Towy	Main River with very large catchment. Designated SSSI and SAC. Known otter populations (European protected species). Important fishery	Very high

[36] Flood Zone 2: Land assessed as having an annual likelihood of fluvial flooding between 0.1% (1 in 1000) and 1% (1 in 100). Flood Zone 3: land assessed as having an annual likelihood of fluvial flooding of greater than 1% (1 in 100).

Receptors	Description	Value
	and supports salmon, sea trout and brown trout (UK BAP priority species). Good ecological and chemical WFD status. Supports abstraction for potable water supply.	
River Cothi	Main River with large catchment. No known designations but important recreational value and supports sea trout (UK BAP priority species). Good ecological WFD status although poor chemical WFD status.	Very High
River Gwynon	Ordinary watercourse with small and flashy catchment. No known designations. Potentially used by otter. Not monitored against WFD. Q95 flow estimated to be 0.013m^3/s.	Medium
Other watercourses	Ordinary watercourses with small and flashy catchments. No known designations. Potentially used by otter. Not monitored against WFD. Range of Q95 values both greater than and less than 0.001m^3/s.	Low to Medium
Groundwater resources	Classified as Secondary B Aquifer and not located within a SPZ. Good quantitative WFD status although poor chemical WFD status. Supports abstraction for industry and agriculture.	Medium
Flood risk receptors	The proposed cycle path: A non-strategic route that will be used predominantly for leisure purposes. Considered water compatible.	Low
Flood risk receptors	Residential receptors: Several small residential settlements and the village of Ffairfach.	High
	Agricultural land: Pasture land on the floodplains of the river.	Medium

9.6 RELEVANT ELEMENTS OF THE PROPOSED SCHEME AND ESTABLISHING THE PRE-MITIGATION SCENARIO

Hydraulic structures

9.6.1. The Proposed Scheme will require the replacement of ten existing structures and the construction of three new structures. Not all structures are for the purpose of watercourse crossings with some required for flood relief and new field crossings. In summary the new and replacement structures will comprise:

- Replacement of the existing bridge over the River Cothi.
- A new crossing over the River Towy that is not along the alignment of the disused railway line.
- Replacement of the existing bridge over the River Gwynon.
- Replacement of five existing structures over unnamed watercourses, a new structure over an unnamed watercourse, a new structure at a field crossing, and replacement of three flood relief structures.

9.6.2. Details of these structures are provided in Table 9-14 and the location of these structures is shown in **Appendix 4.B (Volume IV).**

Table 9-14 – Details of Structures Along the Proposed Scheme

Structure	Chainage	Comments
Structure 1	460	Replacement of flood relief structure. Structure 1 consists of the remains of a twin span bridge with partially intact masonry abutments and pier. This will be replaced by a 12m span bridge with steel beams and timber sleeper deck. The existing pier will remain as support to the new structure. This is a flood relief structure at a field crossing and does not traverse any watercourse.
Structure 2	690	New structure at field crossing. A new structure where the cyclepath will be raised to accommodate two walled 900mm diameter HDE pipes. This is a field crossing and therefore does not traverse any watercourse.
Structure 3	800	Replacement of structure over River Cothi. Structure 3 consists of the remains of the River Cothi bridge. The bridge deck of the existing structure has since been removed but the existing masonry abutments have remained and will be retained as part of the Proposed Scheme. A new 50m stress truss arch bridge with steel beams and timber sleeper deck and associated concrete bank seat and piled foundations will be constructed to replace the existing structure. The concrete bank seat/piles of the new bridge will be located behind the existing abutments (i.e. away from the river bank). The soffit level of the proposed bridge is set at approximately 16.8m AOD. A second structure will span 12m across a depression in the field adjacent to the River Cothi on the left bank. The bridge will sit on reinforced concrete bank seats and piles. This second span does not cross a watercourse.
Structure 4	878	Replacement of flood relief structure. Structure 4 consists of the remains of a single 3m clear span flood relief bridge with partially intact masonry abutments. This will be replaced by a 6m clear span bridge with steel beams and timber sleeper deck. The existing abutments will remain below the new structure. This is a flood relief structure at a field crossing and therefore does not traverse any watercourse.
Structure 5	1575	New structure over River Towy. A new bridge over the River Towy is proposed comprising a 58m clear span stress truss arch bridge sitting on concrete bank seat and piled foundations. The new bridge abutments will be located outside of the extent of the SAC designation. There will be two boardwalk structures at each end of the bridge (10.2m on the right bank and 35m on the left bank) linking the proposed bridge structure to earthwork embankments. The soffit level of the proposed bridge is set at minimum level of approximately 17.5mAOD.
Structure 6	4790	Replacement of structure over River Gwynon.

Structure	Chainage	Comments
		Structure 6 consists of the remains of the River Gwynon bridge. The bridge deck of the existing structure had a span of approximately 5.5m but has been removed. The existing masonry abutments have remained, however cracks are clearly visible as shown in the figure below. It is therefore proposed to demolish the existing abutments to 1.5m high but leave the lowered abutments in place as part of the Proposed Scheme. The replacement bridge will measure approximately 18m in length and will overspan the existing abutments. The soffit level of the new structure will be set at approximately 17.9mAOD.  Plate 9-9 -*East abutment of the existing River Gwynon bridge*
Structure 7	5930	Replacement of structure over unnamed watercourse. This structure crosses an unnamed ordinary watercourse at NGR 254738 220040, approximately 690m west of Dryslwyn Fawr. The existing 1.1m span bridge deck and masonary abutments are intact and will remain in place as part of the Proposed Scheme, however the replacement bridge will comprise a 4m clear span structure that will overspan the existing bridge with the new concrete bank seats set back from the existing masonry abutments.
Structure 8	7450	Replacement of structure over unnamed watercourse. This structure crosses an unnamed ordinary watercourse at NGR 256218 219736, approximately 820m east of Dryslwyn Fawr. The existing 2.8m span bridge deck and masonary abutments are intact and will remain in place as part of the Proposed Scheme, however the replacement bridge will comprise a 4.8m clear span structure that will overspan the existing bridge with the new concrete bank seats set back from the existing masonry abutments.
Structure 9	8390	Replacement of structure over unnamed watercourse. This structure crosses an unnamed ordinary watercourse at NGR 257123 219824, approximately 660m northwest of Pantglas. The existing 1.8m span bridge deck and masonary abutments are intact and will remain in place as part of the Proposed Scheme, however the

Structure	Chainage	Comments
		replacement bridge will comprise a 4.8m clear span structure that will overspan the existing bridge with the new concrete bank seats set back from the existing masonry abutments.
Structure 10	8590	Replacement of structure over unnamed watercourse. This structure crosses an unnamed ordinary watercourse at NGR 257292 219942. The existing 1.04m span bridge deck and masonary abutments are intact and will remain in place as part of the Proposed Scheme, however the replacement bridge will comprise a 4m clear span structure that will overspan the existing bridge with the new concrete bank seats set back from the existing masonry abutments.
Structure 11	9280	Replacement of structure over unnamed watercourse. This structure crosses an unnamed ordinary watercourse at NGR 257864 220330. The existing 1.03m span bridge deck and masonary abutments are intact and will remain in place as part of the Proposed Scheme, however the replacement bridge will comprise a 4m clear span structure that will overspan the existing bridge with the new concrete bank seats set back from the existing masonry abutments.
Structure 12	12680	New structure over unnamed watercourse. The Proposed Scheme will deviate from the alignment of the disused railway line at this location to avoid the failing embankment and the area of active erosion within the River Towy. A new structure over an unnamed watercourse will therefore be required approximately 120m upstream of the existing crossing, at NGR 260673 221170. A clear span bridge 8.5m in length sat on concrete pad foundations is proposed at the crossing. The soffit level of the new structure is set at approximately 23.35mAOD. A photograph of the watercourse to be crossed is provided in Plate 9-10.  **Plate 9-10** *Unnamed watercourse upstream of existing crossing*

9.6.3. The Proposed Scheme will also include the retention and, where required for sections of the Proposed Scheme that do not follow the alignment of the disused railway, construction of pipe culverts that convey drainage ditches and minor tributaries beneath the Proposed Scheme. Based on survey completed to date and review of mapping, these include:

- Retention of existing culverts at Chainage 8027, 8127, 8242 and 8354; and

- Construction of new culverts west of Bremenda Isaf at Chainage 2120 and adjacent to Tre-clais at Chainage 3600.

Diversions

9.6.4. The Proposed Scheme is broadly located parallel to the River Towy and will follow the disused Carmarthen-Llandeilo Railway Line for much of its length.

9.6.5. Significant diversion from the disused railway line is proposed in the vicinity of the crossing of the River Towy as discussed in Table 9-14 above. The Proposed Scheme is rerouted between approximate Chainage 1500 - 3000, running parallel with the left bank of the river for approximately 900m upstream of the new crossing over the River Towy. The Proposed Scheme also diverts from the alignment of the disused railway between approximate Chainage 3000 – 4000.

9.6.6. Localised diversion from the disused railway line is also proposed at Riverside Woods / Allt Pantglas at Chainage 8600 - 8900 and to the north of Hendy Farm at Chainage 12500 to locate the Proposed Scheme away from the alignment of the disused railway line and areas of localised erosion and bank migration on the left bank of the River Towy. The diversion near Hendy Farm also requires slight ground cutting up to 1m deep for a length of approximately 130m between Chainage 12690 to 12820.

CONSTRUCTION PHASE

9.6.7. The implementation of a robust Construction Environmental Management Plan (CEMP) and supporting method statements will be essential for the mitigation of risks to the water environment during construction. The CEMP would set out how construction activities would be undertaken in accordance with appropriate good practice guidance, such as CIRIA's Control of Water Pollution from Construction Sites (C532). Although withdrawn, the Pollution Prevention Guidelines discussed in Section 9.2 also provide relevant recommendations. Regular inspection of control and treatment measures should be undertaken to ensure they are working effectively.

9.6.8. Potential impacts to the water environment during construction will also be largely mitigated through the reuse of the existing disused railway line and the construction of replacement structures that overspan existing structures thereby allowing the existing structures to remain in-situ, reducing the construction programme and minimising works in river channels that could lead to high sediment loading in watercourses and surface water runoff.

9.6.9. All construction compounds will be located outside of the mapped fluvial flood extents for the 3.33% (1 in 30) annual probability event. Compounds will also largely be located outside of the fluvial floodplain for the 0.1% (1 in 1000) annual probability event; some minor flooding within three of the compound extents is predicted to occur during the 0.1% (1 in 1000) annual probability event (located at approximate Chainage 200, 1100 and 2000) although this is minimal and on the periphery of the flood extents. Maps that illustrate the location of the proposed compounds in relation to the modelled fluvial flood extents (undertaken to inform the FCA) are provided in **Appendix 4.A (Volume IV).** This will significantly reduce pollution risks associated with inundation of compound areas.

9.6.10. No permanent or temporary works within the channel of the River Towy or River Cothi are proposed. However, given the sensitivity of the River Towy and River Cothi, it is recommended that the measures proposed in the CEMP are agreed with NRW in advance

of any construction works commencing that are located within the mapped fluvial floodplain or within 10m from the top of bank of these watercourses. It is also recommended that works associated with all watercourse crossings are accompanied by location-specific method statements, as ageed with NRW.

9.6.11. Other key mitigation measures that are assumed to be implemented through the CEMP include:

Managing sediment loading within watercourses:

- Compliance with the relevant sections of BS6031:2009 Code of Practice for Earthworks (British Standards, 2009) with respect to protection of water quality and control of site drainage including washings, dewatering, abstractions and surface water.
- Avoid the positioning of stockpiles near to watercourses, contain stockpiles with bunds or sediment fences and cover when not in use. Stockpiles should be located a minimum of 10m from the top of bank, including minor watercourse that would convey sediment downstream, and located outside of the floodplain.
- Control site runoff during construction. This may include creating temporary drainage systems to intercept and treat runoff prior to discharge and avoid the uncontrolled release of sediment laden runoff entering adjacent watercourses. The use of silt fences, silt traps, filter bunds, settlement basins and/or proprietary units such as a 'siltbuster' may be appropriate.
- Where works in a watercourse channel are required, maintain a dry working area as far as practicable and pass any water generated by the dewatering process through silt busters or sediment tanks prior to returning this water to the watercourse.
- Minimise land clearance in the floodplain. Limit works to the footprint of the Proposed Scheme as far as practicable and reseed/cover/stabilise areas of exposed earth to reduce sediment laden runoff migrating to the adjacent watercourses.
- Provide erosion protection matting to areas where vegetation requires removal for construction purposes to mitigate the potential migration of sediment into adjacent watercourses while vegetation becomes established.
- If dewatering of excavations is required if groundwater is encountered, there may be a need to pass the water through a silt buster or settlement pond if the abstracted water has a high sediment load.

Managing pollution risks to watercourses:

- Ensure safe containment of chemicals, use of drip trays placed underneath standing machinery and provision of emergency spill kits.
- Collection of waste fuels and other fluid contaminants in leak-proof containers prior to removal from construction site to an approved recycling processing facility.
- Harmful materials, waste products or construction plant not stored within the fluvial floodplain or within 30m of a watercourse. Where construction compounds are located within 30m of a watercourse, materials stored in these compounds should be inert and immobile, and not pose pollution risk to the watercourse.
- Storing fuels and oils in bunds or secondary containment systems capable of holding at least 110% of the container's capacity.
- Ensuring any refuelling of plant using a mobile fuel bowser is undertaken a minimum of 30m from watercourses, and ensuring that an appropriate spillage kit is provided.

- Regular checking of construction plant for oil and fuel leaks, particularly when construction works are undertaken in or near watercourses.
- Concrete mixing and washing areas located more than 30m from any watercourse and not located within a floodplain; use settlement and re-circulation systems for water reuse; use a contained area for washing out of concrete batching plant or ready-mix lorries; and contain wash-water for authorised off-site disposal. Wash-water from concrete mixing areas must not be discharged into watercourses.
- Undertaking maintenance of construction plant or equipment in designated areas on site and away from watercourses; and avoiding vehicle cleaning near to watercourses.
- Method statements for managing works within the floodplain, including procedures for managing risks to water quality should a flooding event occur or be predicted during construction.

Managing flood risk:

- Adoption and implementation of a Flood Evacuation Plan.
- Sign up for flood warnings and check online warnings regularly.
- Avoid works during high flow events and intense rainfall events.
- Site compounds to be located outside of the floodplain.
- Do not store materials and mobile machinery within the floodplain.

OPERATIONAL PHASE

9.6.12. Mitigation for the operational phase of the Proposed Scheme is embedded into the design of the Proposed Scheme and its associated structures as summarised in the description of the Proposed Scheme provided in Chapter 3 and summary of key structures as presented in Table 9-14.

9.6.13. Key aspects of the design include:

- Reuse of the existing discussed railway line where practicable and maintaining the location and alignment of existing watercourse crossings and flood relief structures.
- Realigning the Proposed Scheme away from the disused railway line near Cae-Fadog at Riverside Woods / Allt Pantglas (between Chainage 8600 - 8900) and near Hendy Farm (between Chainage 12450 and 12890) to avoid areas of active erosion in the River Towy. The need to consider measures to provide longer term protection to the Proposed Scheme will be agreed in consultation with NRW during the detailed design of the Proposed Scheme, although noting that the design of the Proposed Scheme is to avoid these areas of identified risk.
- Construction of replacement structures that overspan existing structures thereby allowing the existing structures to remain in-situ and avoiding any changes to existing watercourse alignments. New bridge abutments will be set back from the top of bank and behind existing bridge abutments. This applies to all watercourse crossings apart from the River Towy, River Gwynon, and new crossings of minor watercourses: west of Bremenda Isaf at Chainage 2120, adjacent to Tre-clais at Chainage 3600, and to the north of Hendy Farm at Chainage 12680.
- The bridge abutments for the River Towy will be located outside of the extent of the mapped SAC designation. The location of River Towy crossing has been selected to avoid areas which have historically shown meander migration.

- The existing bridge abutments for the River Gwynon will be retained in-situ but will lowered to 1.5m high to address structural condition issues. The upper banks will be profiled to tie in with existing ground levels and the new bridge structure will be set at top of bank, spanning the existing abutments.
- The construction of the new crossing of the minor watercourse to the north of Hendy Farm at Chainage 12680 (Structure 12) will comprise a clear span bridge measuring 8.5m in length.
- Hydraulic connectivity and channel capacity will be maintained for other field drains and minor tributaries that are crossed by sections of the Proposed Scheme that deviate from the alignment of the disused railway, namely west of Bremenda Isaf at Chainage 2120 and adjacent to Tre-clais at Chainage 3600.
- The soffit level of the proposed bridges over the River Cothi and River Towy will have 1.09m and 0.79m freeboard above the 1 in 100 annual probability event with a 30% increase in peak river flow for climate change allowance, respectively.
- Most of the route is at the current elevation of the disused railway. Most deviations are at grade to minimise loss of flood plain. The proposed deviation near Cae-Fadog at Riverside Woods/ Allt Pantglas (between Chainage 8600 - 8900) will comprise a boardwalk structure to maintain flood flow conveyance.

9.6.14. The design and construction of proposed crossings of the River Cothi and River Towy will be discussed in consultation with NRW during the detailed design of the Proposed Scheme. This will support the preparation of the required Flood Risk Activities Permits for crossings of these main rivers.

9.6.15. The design and construction of proposed crossings of the River Gwynon and other minor watercourses and field drains will be discussed in consultation with CCC as the LLFA during the detailed design of the Proposed Scheme. This will the support the preparation of any required Ordinary Watercourse Consent applications, noting that the requirement to submit a consent application will be agreed with the LLFA on a case-by-case basis.

9.7 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION PHASE

9.7.1. Potential impacts that may arise during the construction of the Proposed Scheme have been identified to comprise:

- Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate, and stockpiles of topsoil;
- Increased pollution risks from spillage of fuels and other harmful substances that may migrate to surface water features and groundwater receptors;
- Impacts to the hydromorphological quality of watercourses associated with works within or in close proximity to watercourses such as the installation and alteration of culverts, bridges and outfalls;
- Increased flood risk to people and property associated with loss of fluvial floodplain storage from temporary works.

9.7.2. These potential impacts are discussed in detail below. The implementation of a robust CEMP has been taken into account when assessing the likely magnitude of these impacts.

Increased sedimentation in nearby watercourses

9.7.3. During the construction phase of the Proposed Scheme, surface water runoff associated with activities such as land clearance, excavation, dewatering of excavations, stockpiles, wheel washings and movement of materials to and from the site has the potential to contain elevated levels of sediment that may migrate or be discharged to the River Towy, River Cothi, River Gwynon and other smaller watercourses. Runoff with high sediment loads can have direct adverse effects through increasing turbidity (thus reducing light penetration and reducing plant growth) and by smothering vegetation and bed substrates (thus impacting on invertebrate and fish communities through the destruction of feeding areas, refuges and breeding/spawning areas). Indirect adverse effects can also be associated with suspended sediments that have inorganic or organic contaminants (e.g. heavy metals and pesticides, respectively).

9.7.4. The implementation of the measures proposed in the CEMP will reduce the likelihood and magnitude of risk to the receiving water environment, specifically the tight control of site drainage and appropriate location of stockpiles. Control of all sediment from construction works is, however, difficult to achieve, particularly during heavy rainfall events and when works are in close proximity to adjacent watercourses.

9.7.5. As discussed above the majority of the proposed works will be located on the existing raised disused railway line that will maintain existing watercourse crossings. The majority of watercourse crossings will retain existing structures with the abutments of the new crossing located behind the existing abutments, thereby minimising the need for in-channel works. The topography in the vicinity of the works is also relatively flat, thereby offering opportunity to capture sediment-laden runoff before it migrates to adjacent watercourses.

9.7.6. The greatest risk to the water environment is likely to be associated with:

- The replacement bridge crossing of the River Cothi;
- The new bridge crossing of the River Towy and the new section of off-line cycle path (i.e. that does not follow the alignment of the disused railway line) that will be located immediately adjacent to the River Towy upstream of the proposed new crossing;
- The lowering of the existing (disused) bridge abutments of the River Gwynon and reprofiling of the upper banks; and
- The new crossings of minor watercourses at Chainage 2120, 3600 and 12680 that may convey sediment downstream to the River Towy.

9.7.7. These works will also be located within the floodplain of the River Towy and may therefore be at risk of inundation when the river is in spate, although potential impacts to the water environment during a flood event would likely be comparatively less given the additional dilution provided by flood flows and elevated sediment loading associated with agricultural runoff from the upstream catchment. Minimising areas of exposed earth within the floodplain will be important to reduce this risk as far as practicable.

9.7.8. The replacement of other existing structures on tributaries of the River Towy may also pose indirect risk of increased sedimentation, although the retention of existing abutments and location of new structures behind these abutments will significantly reduce the risk of increased sediment affecting the quality of the Towy.

9.7.9. The sensitivity of the River Towy is considered to be **very high**. Given the proximity of the new river crossing and new section of cycle path adjacent to the river channel, an impact magnitude of **minor adverse** is considered appropriate. In accordance with the criteria summarised in Table 9.4, the works may result in some measurable change in an attribute's quality but is not likely to be sufficient to cause loss in quality, fishery productivity or biodiversity when robust and appropriate mitigation measures are implemented. The licensed potable water abstraction from the River Towy is located approximately 2.5km downstream of the proposed crossing and significant degradation of this water supply is considered unlikely with mitigation in place. This assessment also applies to the crossing of tributaries of the River Towy, with review of the works indicating that some increase in sediment load within the upstream watercourses may occur, although with appropriate management measures in place this would not be expected to cause loss in quality, fishery productivity or biodiversity. Therefore, there is likely to be a direct, temporary and short-term effect on the River Towy of **moderate to large significance**.

9.7.10. The sensitivity of the River Cothi is considered to be **very high**. The location of the proposed structure over the Cothi is to be set back from the river banks and located behind the existing bridge abutments which will assist in reducing potential adverse effect, however significant earthworks and land clearance in close proximity to the river may still be required. An impact magnitude of **minor adverse** is therefore considered appropriate as the works may result in some measurable change in attribute's quality but is not likely to be sufficient to cause loss in quality, fishery productivity or biodiversity when robust and appropriate mitigation measures are implemented. Therefore, there is likely to be a direct, temporary and short-term effect on the River Towy of **moderate to large significance**.

9.7.11. The sensitivity of the River Gwynon is considered to be **medium**. The top of the existing bridge abutments will be removed but the lower 1.5m will remain in-situ thereby reducing disturbance to the river channel. Mitigation measures can be implemented to intercept runoff from the reprofiled banks, but the reprofiling of the banks and construction of the new bridge abutments may however result in sediment laden runoff entering the watercourse. An impact magnitude of **minor adverse** is therefore considered appropriate as the works may result in some measurable change in attribute's quality but is not likely to be sufficient to cause loss in quality, fishery productivity or biodiversity when mitigation measures are implemented. The significance of the effect is therefore considered to be **slight significance**.

9.7.12. The sensitivity of other minor watercourses crossed by the Proposed Scheme is considered to be **low** to **medium**. The majority of proposed crossings will retain the existing abutments with new abutments constructed behind these. Risks to the quality of the watercourses will therefore be low with a likely impact magnitude of **negligible**. Structure 12 comprises a new crossing over a minor tributary of the River Towy. It is likely that a dry working environment could be achieved although the works may result in a **negligible** to **minor adverse** impact to water quality. The overall significance of effect to these features is therefore considered to be **neutral to slight significance**.

Mitigation / Enhancement

9.7.13. There are no further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario. As discussed in Section 9.6, it is recommended that mitigation measures are agreed with NRW in advance of any

construction works commencing to ensure appropriate protection of the River Towy and River Cothi is implemented by the appointed contractor. Measures such as silt fences or other interception techniques are recommended for all works within 10m of the River Towy and River Cothi to prevent sediment laden runoff from flowing into the watercourses.

Residual Effects

9.7.14. There remains a direct and temporary residual effect on the River Towy and the River Cothi of **moderate to large significance** due to the proximity of the works to the river channel. However, this would be a temporary effect during the construction phase and is not considered to pose long term impact once the works adjacent to the watercourses are complete, assuming robust and appropriate mitigation is installed that reduces the risk of sediment entering the watercourses.

Increased pollution risks from leaks and spillages

9.7.15. During the construction phase of the Proposed Scheme, there is a heightened risk of pollution to surface water features and groundwater receptors associated with accidental leaks and spillages of fuels and other harmful substances. This may be attributable to causes such as prolonged drips from mechanical plant, uncontrolled runoff from construction compounds or uncontrolled washdown water from concrete mixing areas.

9.7.16. Hydrocarbons can form a film on the surface of the water body, deplete oxygen levels and can be toxic to fish. Even at very low concentrations, the film can negatively affect the visual appearance of the water body. The impact will be direct and temporary - water quality within the affected water body will improve over time as pollutants disperse and are treated by natural processes.

9.7.17. Other pollutants can pose a direct risk to aquatic species. Concrete and cement products are highly alkaline and corrosive - fish can be physically damaged and their gills blocked, and both vegetation and the bed of the receiving water body can be smothered. For the most part, it is only when large quantities of hazardous substances are spilled, or the spillage is directly into the water body, that a significant risk of acute toxicity will arise in the receiving water. The magnitude of any impact will depend on the scale and nature of any potential incident and is therefore difficult to predict. For the most part, impacts will be direct and temporary to long term - water quality within the affected water body will improve over time as pollutants are dispersed and diluted. However, a significant direct spillage of a toxic substance could cause long-term damage to the receiving water body.

9.7.18. The dispersion and impact of hydrocarbons and pollutants that enter groundwater resources is dependent on the type of overlying geology, depth to groundwater table and characteristics of the aquifer. The underlying bedrock geology is mostly gravels overlying mudstone, with the potential for shallow groundwater levels within the river valley. Pollutants could therefore infiltrate through the gravels relatively easily and pose an indirect risk to the River Towy and River Cothi, although further movement through the mudstone would be limited. Groundwater contamination is difficult to treat and therefore pollutants that enter the groundwater body could pose long term effect.

9.7.19. The location of the Proposed Scheme within a floodplain may increase the risk of pollution to the water environment as working areas could become inundated. It is expected that the CEMP will include a flood response plan that sets out the procedures to be followed in the

event of flooding. Should a flood warning be issued, the site will need to be secured which will require movement of all mechanical plant away from the river channel and areas likely to be inundated. It is also expected that mechanical plant and other potentially harmful pollutants will not be stored within areas at flood risk, and that high risk activities such as concrete mixing will not be undertaken within 30m of watercourses.

9.7.20. The risk of spillage impacting nearby watercourses cannot be avoided given the proximity of the watercourses to the Proposed Scheme and the extent of the floodplain. Similarly it is not possible to completely avoid a risk to groundwater resources, however the relatively shallow depth of construction works will reduce this risk. The robust and appropriate mitigation measures to be employed as part of the CEMP will significantly reduce the likelihood of a spillage occurring or harmful substances migrating to waterbodies and the subsequent severity of an impact. Therefore, the impact magnitude to all water environment features is considered to be **negligible**. The sensitivity of the River Towy and the River Cothi is considered to be **very high**. Therefore, there is likely to be a direct, temporary and short to medium term effect on the River Towy and River Cothi of **slight significance.** The sensitivity of the River Gwynon and groundwater resources is considered to be **medium.** The significance of the effect is therefore considered to be **neutral** to **slight significance.** The sensitivity of other minor watercourses crossed by the Proposed Scheme is considered to be **low** to **medium.** The overall significance of effect to these features is therefore considered to be **neutral to slight significance.**

Mitigation / Enhancement

9.7.21. There are no further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario. As discussed in Section 9.6, it is recommended that mitigation measures are agreed with NRW in advance of any construction works commencing to ensure appropriate protection of the River Towy and River Cothi is implemented by the appointed contractor. The correct management and storage of potentially harmful materials will need to be demonstrated.

Residual Effects

9.7.22. There are no significant residual effects predicted assuming the appropriate implementation of mitigation measures. The residual effects remain the same as those assessed above.

Impacts to the hydromorphological quality of watercourses

9.7.23. Potential impacts discussed in this section are associated with the hydromorphological supporting elements of ecological quality and not impacts to aquatic species or habitats that are discussed in **Chapter 8 – Biodiversity**.

9.7.24. Although the construction of the structures over the River Towy and River Cothi is not likely to require any works within the channel, it is likely that vegetation clearance of the riparian zone will occur. The new section of cycle path upstream of the proposed crossing of the River Towy (located adjacent to the river) may also require vegetation clearance in the riparian zone. This may have the potential for a **minor adverse** impact on the hydromorphological quality of these watercourses. The sensitivity of the River Towy and the River Cothi is considered to be **very high**. Therefore, there is likely to be a direct, temporary and short-term effect on the River Towy and River Cothi of **moderate significance.**

9.7.25. The new bridge structure over the River Gwynon will maintain the lower 1.5m of the current abutments. The construction of this structure may require in-channel works to facilitate the removal of the upper abutment structure and reprofiling of the banks, however works would be temporary and would maintain hydraulic connectivity of the watercourse. This may have the potential for a **minor adverse** impact on the hydromorphological quality of this watercourses. The sensitivity of the River Gwynon is considered to be **medium**. Therefore, there is likely to be a direct, temporary and short-term effect on the River Gwynon of **slight significance.**

9.7.26. Other proposed structures summarised in Table 9-14 (excluding those detailed above) do not require works to be undertaken within the river channels, with all works required to deliver the Proposed Scheme set back from the channel and, where possible, behind existing bridge abutments. Temporary works adjacent to watercourses and within the floodplain will be of short duration and therefore unlikely to have a notable effect to hydromorphology of adjacent watercourses (beyond the risks of pollution as discussed above). Therefore it is anticipated there would be a **negligible** impact on the hydromorphological quality of these watercourses. The sensitivity of these watercourses is considered to be **low** to **medium.** The overall significance of effect to these features is therefore considered to be **neutral.**

9.7.27. New culverts will be constructed for minor watercourses and field drains where the Proposed Scheme deviates from the alignment of the disused railway. These will maintain hydraulic connectivity and channel capacity but will result in the loss of natural features. Given the relatively low hydromorphological quality of these watercourses that have low flows and small catchments, an impact magnitude of **minor adverse** is considered appropriate. These watercourses have **low** sensitivity and the overall significance of effect to these features is therefore considered to be **neutral to slight significance.**

Mitigation / Enhancement

9.7.28. There are no further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario.

Residual Effects

9.7.29. There remains a direct and temporary residual effect on the River Towy and the River Cothi of **moderate significance** due to the potential for vegetation clearance during construction. However, this would be a temporary effect during the construction phase and is not considered to pose long term impact once the works adjacent to the watercourses are complete. As discussed above, it is recommended that all works adjacent to the River Towy and River Cothi are agreed in consultation with NRW and appropriate designs and construction methods developed.

Increased flood risk to people and property

9.7.30. The construction of the Proposed Scheme will require works to be undertaken within the floodplain of the River Towy and River Cothi and, to a lesser extent, the floodplain of smaller watercourses including the River Gwynon. Temporary works within the floodplain could impede the flow of flood waters across the floodplain and cause the loss of floodwater storage, therefore posing increased risk to land and property within and in close proximity to the floodplain. This section only considers impacts associated with temporary works and

during the construction phase, with permanent impacts associated with the operation of the Proposed Scheme discussed as operational effects.

9.7.31. All construction compounds required for the construction phase will be located outside of the mapped fluvial flood extents for the 3.33% (1 in 30) annual probability event. The compounds are also largely located outside of the extents of the 0.1% (1 in 1000) annual probability event. Parts of the compounds located at approximate Chainage 200, 1100 and 2000 are within the extents of the 0.1% annual probability event, although this is minimal and on the periphery of the floodplain. Location of equipment and materials within these compounds would therefore not impact flood conveyance or floodplain storage during flood events up to the 0.1% (1 in 1000) annual probability event.

9.7.32. Review of fluvial flood mapping indicates that the floodplain largely comprises rural agricultural land with a scattering of farm holdings already located within the floodplain or in close proximity to the Proposed Scheme. Furthermore the floodplain of the River Towy and River Cothi is large and whilst temporary works may have a localised effect on flood flow paths and flood levels, this is unlikely to transpose to a notable impact throughout the wider floodplain.

9.7.33. Review of the Proposed Scheme alignment, OS mapping and modelled floodplain extents indicates several properties/settlements in close proximity to the Proposed Scheme that may be at greater risk of increased flood risk during the construction phase. This is summarised in Table 9-15. The risk of occurrence is generally considered low as the Proposed Scheme is either to be constructed along the alignment of the existing disused railway or at grade with adjacent ground levels. The greatest risks are likely to be associated with temporary works in areas of identified floodplain that may change or impede flood flow conveyance. With appropriate consideration given to the impediment of flood flow conveyance in these areas and ensuring structures are kept free from blockage, the increased to these properties is considered to be **negligible to minor adverse** with an overall significance of effect to people and property elsewhere of **slight to moderate significance**.

Table 9-15 – Properties at Key Flood Risk

Location	Chainage	Commentary
Nantgaredig	0	Properties in Flood Zone 1 and not in close proximity to flood extents. Minimal risk of occurrence.
Bremenda Isaf	2200	Properties in Flood Zone 1. Proposed Scheme at grade and located on periphery of floodplain, between River Towy and properties at risk. Low risk of occurrence.
Bremenda Uchaf	2700	Properties in Flood Zone 1. Proposed Scheme at grade and located on periphery of floodplain, between River Towy and properties at risk. Minimal risk of occurrence.
Glantowy	4500	Proposed Scheme in Flood Zone 1. Unlikely to affect flood risk at this location. Minimal risk of occurrence.

Location	Chainage	Commentary
Llanarthne	4750	Properties located upstream of Proposed Scheme but bridge structure blockage on Afon Gwynon (Structure 6) could increase flood risk. Medium risk of occurrence.
Beili-glas	5600	Properties in Flood Zone 3. Proposed Scheme located on alignment of disused railway. Low risk of occurrence.
Dryslwyn-Fawr	6600	Properties in Flood Zone 3 close to route alignment. Proposed Scheme located on alignment of disused railway. Medium risk of occurrence.
Dryslwyn Lodge	6600	Properties in Flood Zone 3 close to route alignment. Proposed Scheme located on alignment of disused railway. Medium risk of occurrence.
Gelli Aur Farm	11000	Properties in Flood Zone 3 close to route alignment. Proposed Scheme located on alignment of disused railway. Medium risk of occurrence.
Towy-Cott	11500	Properties in Flood Zone 3 close to route alignment. Proposed Scheme located on alignment of disused railway. Medium risk of occurrence.
Pentrecwn	12100	Properties in Flood Zone 1. Proposed Scheme located on alignment of disused railway and elevated above floodplain. Low risk of occurrence.
Glanyrafon	13100	Properties in Flood Zone 3 close to route alignment. Proposed Scheme located on alignment of disused railway. Medium risk of occurrence.

Mitigation / Enhancement

9.7.34. It is recommended that the footprint and duration of temporary works in the floodplain is minimised as far as practicable.

9.7.35. It is recommended that materials, equipment and facilities located within the compounds located at approximate Chainage 200, 1100 and 2000 are arranged to reduce potential flood risks.

9.7.36. Particular care must be taken during construction to reduce blockage risks of structures.

9.7.37. Flood management measures for the construction phase should be set out in the CEMP, with high risk locations identified (noting that the list presented in Table 9-15 is indicative and should be updated, as required, during the construction works).

Residual Effects

9.7.38. There are no significant residual effects predicted assuming the appropriate implementation of mitigation measures. The residual effects remain the same as those assessed above.

OPERATIONAL PHASE

9.7.39. Potential impacts that may arise during the operation of the Proposed Scheme have been identified to comprise:

- Impacts to the hydromorphological quality of watercourses associated with works within or in close proximity to watercourses such as the installation and alteration of culverts, bridges and outfalls;
- Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow (where the path alignment is proposed to be raised);
- Flood risk to users of the Proposed Scheme.
- Increased flood risk to people and property associated with loss of fluvial floodplain storage from the Proposed Scheme.
- Increased flood risk to people and property associated with changes to flood flow conveyance or crossing & culverting of watercourses;
- Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential increase in flood risk

9.7.40. These potential impacts are discussed in detail below and take into account the design of proposed structures as summarised in Table 9-14.

9.7.41. The design of the final scheme is set out in Drawings WPO.E.001, WPO.E.002, 2500.TYP.001 and 2500.TYP.002 (Figure 3.1 - Volume III).

Impacts to the hydromorphological quality of watercourses

9.7.42. Potential impacts discussed in this section are associated with the hydromorphological supporting elements of ecological quality and not impacts to aquatic species or habitats that are discussed in **Chapter 8 – Biodiversity**.

9.7.43. The proposed structures summarised in Table 9-14 (with the exception of the River Gwynon) do not require works to be undertaken within the river channels, with all works required to deliver the Proposed Scheme set back from the channel banks. Where the Proposed Scheme follows the alignment of the disused railway, new bridge abutments will be located behind existing bridge abutments that will remain in-situ. For all watercourse crossings except for the River Towy and River Cothi, the new bridge foundations will comprise shallow concrete bank seat foundations that will extend up to c.500mm below existing ground level.

9.7.44. The impacts to channel hydromorphology for all watercourse crossings that follow the alignment of the disused railway (excluding the River Towy, River Cothi, River Gwynon and new crossing at Hendy Farm discussed below) are considered to be **negligible** with an overall significance of effect of **neutral**.

9.7.45. The foundations for the River Cothi will comprise a shallow reinforced concrete bank seat coupled with reinforced concrete piles. Again these will be located behind the exiting bridge abutments that will remain in-situ. Review of historical mapping (as discussed in Section 9.4) indicates no notable lateral movement between 1960 and 2019 at the location of the existing (and proposed) crossing. This is supported by the findings of the geomorphological assessment that concluded risk to the Proposed Scheme at this location is considered minimal due to geological constraints to further erosion risk. As the new abutments will be located behind the existing abutments it is considered unlikely that the works would affect

the stability of the banks at this location. The works will also not affect the bed profile, bank profile or flow dynamics within the River Cothi. The proposed bridge will tie into the alignment of the existing disused railway via earth access ramps. The existing flood relief channel on the left bank of the watercourse will be maintained. The FCA concludes that the soffit of the proposed bridge is located above the predicted 1 in 100 annual probability flood level, and that modelling indicates little difference in flood velocity across the floodplain for the 1 in 100 and 1 in 1000 annual probability events. Some localised change to riparian vegetation may occur due to localised shading beneath the 4m wide bridge deck. Potential impacts to channel hydromorphology at the location of the proposed River Cothi crossing are however considered to be **negligible** with an overall significance of effect of **slight adverse** given the **very high** sensitivity of the River Cothi. It is, however, recommended that the detailed design of the proposed crossing over the River Cothi is discussed and agreed in consultation with NRW.

9.7.46. The new crossing of the River Towy will require the construction of new bridge abutments comprised of a reinforced concrete bank seat coupled with reinforced concrete piles. The new bridge abutments will be located outside of the extent of the SAC designation. There will be two boardwalk structures at each end of the bridge (10.2m on the right bank and 35m on the left bank) linking the proposed bridge structure to shallow earthwork embankments to reduce impact to the movement of aquatic species, allow passage of flood waters and reduce impact to flood flow velocities. The shallow embankments will transition the proposed crossing from the elevated boardwalks to tie into existing ground levels on either side of the River Towy prior to the Proposed Scheme rejoining the existing alignment of the disused railway line. The Proposed Scheme will therefore largely be at-grade and set back from the river edge to maintain the riparian zone as it passes parallel to the River Towy for approximately 800m upstream of the proposed bridge crossing. Review of historic mapping (as discussed in Section 9.4) indicates that the River Towy has remained stable at the proposed crossing location and adjacent to the Proposed Scheme upstream of the new crossing between 1890 and 2019. The geomorphological assessment also describes this reach as being geomorphologically stable with little active bank erosion or lateral movement within the floodplain, concluding that the risk to the Proposed Scheme from bank erosion, lateral channel migration and geomorphological change is minimal over the next 50 years. It is therefore considered unlikely that the works will affect the stability of the banks of the River Towy at this location. It is also considered unlikely that the works will affect the bed profile, bank profile or flow dynamics within the River Towy or adjacent floodplain. Some localised change to riparian vegetation may occur at the proposed bridge crossing due to localised shading beneath the 4m wide bridge deck. Potential impacts to channel hydromorphology at the location of the proposed River Towy crossing and upstream section of the Proposed Scheme are however considered to be **negligible** with an overall significance of effect of **slight adverse** given the **very high** sensitivity of the River Towy. It is, however, recommended that the detailed design of the proposed crossing over the River Towy is discussed and agreed in consultation with NRW.

9.7.47. The proposed crossing of the River Gwynon will include the lowering of the existing bridge abutments (due to their poor structural condition) and reprofiling of the upper bank to tie into existing ground levels, although noting that the lower 1.5m of the existing abutments will remain in-situ. The works will therefore cause localised change in the upper extent of the river bank at the location of the proposed crossing, although the existing normal flow channel

will remain and the works are therefore not predicted change the bed profile or flow dynamics during normal flow conditions. The local widening of the upper channel banks will cause some localised change to flow dynamics during larger events by removing the existing flow constriction, although this is unlikely to have an adverse effect to the hydromorphological quality of the River Gwynon or the River Towy that is approximately 100m downstream. Potential impacts to channel hydromorphology at the location of the proposed River Gwynon crossing are therefore considered to be **negligible** with an overall significance of effect of **neutral to slight** adverse. It is, however, recommended that the detailed design of the proposed crossing over the River Gwynon is discussed and agreed in consultation with NRW.

9.7.48. A new crossing is required of a minor watercourse at Chainage 12680 to realign the Proposed Scheme away from an area of localised river bank erosion in the River Towy to the north of Hendy Farm. The structure will comprise an 8.5m span clear span bridge sat on concrete pad foundations that are set back from the channel. The new structure will also require localised ground raising on the right bank of the watercourse to tie the crossing into the alignment of the disused railway. The new structure will be located approximately 120m upstream of the existing crossing of the disused railway line over the watercourse and a small access track that also crosses the watercourse immediately upstream of the disused railway line. These existing structures are illustrated in Plate 9-11 and Plate 9-12 below. The proposed works are not predicted to change the bed profile or flow dynamics during normal flow conditions. The works may cause some localised change to flow dynamics during larger flood events, although this is unlikely to have a significant adverse effect to the hydromorphological quality of the watercourse given the existing restrictions to flow a short distance downstream of the proposed structure. It is however recommended that the need for scour protection around the new structure on the right bank of the watercourse is considered in the detailed design of the new structure in consultation with CCC. Overall the potential impact of the new structure on the hydromorphological quality of the unnamed watercourse is considered **negligible** with an overall significance of effect of **neutral**.



Plate 9-11 – Existing crossing of unnamed watercourse by disused railway line



Plate 9-12 – Existing crossing of unnamed watercourse by existing access track

9.7.49. It is also proposed that the Proposed Scheme is diverted from the alignment of the disused railway near Cae-Fadog at Riverside Woods/ Allt Pantglas (between Chainage 8600 and 8900) to avoid an area of active erosion in the River Towy. Diverting the Proposed Scheme at this location avoids the need to implement erosion control measures in the River Towy and provides longer term protection to the Proposed Scheme.

9.7.50. New culverts will be constructed for minor watercourses and field drains where the Proposed Scheme deviates from the alignment of the disused railway. These will maintain hydraulic connectivity and channel capacity but will result in the loss of natural features. Given the relatively low hydromorphological quality of these watercourses that have low flows and small catchments, an impact magnitude of **minor adverse** is considered appropriate. These watercourses have **low** sensitivity and the overall significance of effect to these features is therefore considered to be **neutral to slight significance.**

Mitigation / Enhancement

9.7.51. There are no further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario.

9.7.52. The geomorphological assessment identifies other sections of the route that may be at risk of erosion form the River Towy in the longer term (greater than 15 years), but no works to provide bank stabilisation or erosion protection to the Proposed Scheme are proposed at this time. The need to consider measures to provide longer term protection to the Proposed Scheme will be agreed in consultation with NRW during the detailed design of the Proposed Scheme, although noting that the design of the Proposed Scheme is to avoid areas of identified risk.

Residual Effects

9.7.53. No significant residual effects are predicted.

Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow

9.7.54. The majority of the Proposed Scheme will be located along the alignment of the existing disused railway line with minimal change to the vertical alignment. All existing watercourse crossings, ditch crossings and flood relief channels will be maintained with no change to the existing hydrological regime.

9.7.55. Where the Proposed Scheme deviates from the disused railway line, the cycle path will largely be located at grade. Existing watercourse crossings, ditch crossings and flood relief channels will be maintained with no change to the existing hydrological regime.

9.7.56. Shallow embankments are proposed at some locations to transition the Proposed Scheme between proposed watercourse crossings, existing ground level and the disused railway line. Specifically:

- At the River Towy crossing, ramping is required to tie the proposed bridge in with existing ground levels. The length of earth embankment has however been minimised by creating boardwalk structures to the bridge and allowing flood flow beneath the structure on the floodplain.
- Shallow earth embankments are proposed at the River Cothi crossing to tie the new bridge into the alignment of the existing disused railway. The disused railway is however already above the level of the modelled 1 in 100 annual probability event. The existing flood relief culvert on the left bank of the River Cothi will also be maintained.
- The proposed deviation near Cae-Fadog at Riverside Woods/ Allt Pantglas (between Chainage 8600 - 8900) will include a boardwalk structure to maintain flood flow conveyance and, therefore, is not predicted to adversely impact catchment hydrology.
- The proposed Structure 12 at the crossing of the unnamed watercourse north of Hendy Farm will require land raising on the right bank of the watercourse. This is however located a short distance upstream of the existing (raised) disused railway and existing watercourse crossings and, therefore, is not predicted to adversely impact catchment hydrology.

9.7.57. The impact of the Proposed Scheme on catchment hydrology affecting the River Towy, River Cothi and other ordinary watercourses is considered to be **no change** with an overall significance of effect of **neutral**.

Mitigation / Enhancement

9.7.58. No mitigation is proposed to further minimise the impact to catchment hydrology.

Residual Effects

9.7.59. No significant residual effects are predicted.

Flood risk to users of the Proposed Scheme

9.7.60. The Proposed Scheme passes through areas at high risk of fluvial flooding associated with the River Towy. The FCA concludes that some sections of the Proposed Scheme could be inundated by more than 1m depth of flood water during the 1% (1 in 100) annual probability

event. The Proposed Scheme would therefore not be considered safe during flooding events.

9.7.61. Prior to mitigation, the potential impact magnitude to the Proposed Scheme would be **major adverse**, with an overall significance of **slight to moderate adverse**.

Mitigation / Enhancement

9.7.62. It is proposed that use of the Proposed Scheme would be accompanied by a flood risk management plan that will be prepared, implemented and managed by CCC. It is expected that there will be signage to discourage people from using the path during a flood warning.

Residual Effects

9.7.63. No significant residual effects are predicted if access to the Proposed Scheme is restricted during flooding events.

Increased flood risk to people and property elsewhere associated with loss of fluvial floodplain storage

9.7.64. The majority of the Proposed Scheme will be located along the alignment of the existing disused railway line with minimal change to the vertical alignment. Where the Proposed Scheme deviates from the disused railway line, the cycle path will largely be located at grade and therefore cause minimal loss of floodplain storage.

9.7.65. New structures are proposed at some locations to transition the Proposed Scheme between proposed watercourse crossings, existing ground level and the disused railway line – namely at the proposed crossings of the River Cothi, River Towi, unnamed watercourse to the north of Hendy Farm (Structure 12) and proposed diversion near Cae-Fadog at Riverbed Woods/ Allt Pantglas. Shallow embankments and structures built within the floodplain could result in a loss of floodplain storage, displace flood volumes and increase flood levels elsewhere.

9.7.66. The FCA concludes that there is no effective adverse impact on flood levels as a result of the earth embankments / transitions for the proposed crossings of River Cothi and River Towy.

9.7.67. The FCA concludes that flood levels are expected to increase immediately south of the Proposed Scheme at the proposed diversion at Hendy Farm during the 1% (1 in 100) annual probability event (with 30% climate change) and the 0.1% (1 in 1000) annual probability event. This increase is predicted to be no greater than 17mm. The land adversely impacted is open pasture agricultural land and there are no properties adversely affected by the increased flood risk.

9.7.68. The localised diversion near Cae-Fadog at Riverbed Woods/ Allt Pantglas (between Chainage 8600 - 8900) will comprise a boardwalk structure to avoid the loss of floodplain storage. The FCA concludes that the proposals will have negligible impact on flood risk.

9.7.69. The sensitivity of people and properties elsewhere is considered to be **high** and the magnitude of the impact to these receptors is considered to be **negligible**, with an overall significance of effect of **slight adverse**.

9.7.70. The sensitivity of open pasture agricultural land is considered to be **medium** and the magnitude of the impact to this receptor at the Towy bridge and Hendy Farm is considered to be **minor adverse**. Therefore, the overall significance of the effect is **slight adverse**.

Mitigation / Enhancement

9.7.71. The FCA states that in areas where the modelling results predict minor increases in flood levels associated with the Proposed Scheme, consultation will be undertaken with affected landowners and tenants by CCC. The consultation exercise will seek to explain the objectives of the projects, its potential impacts and address potential concerns or objections that might arise.

9.7.72. No further mitigation is proposed to reduce the risk of flooding.

Residual Effects

9.7.73. There remains a direct, permanent effect on people and property elsewhere and agricultural land of **slight significance**.

Increased flood risk to people and property elsewhere associated with changes to flood flow conveyance or crossing & culverting of watercourses

9.7.74. The Proposed Scheme includes the replacement of the bridge over the River Cothi, the construction of a new bridge over the River Towy, and the replacement or construction of new crossings over other minor watercourses including the River Gywnon as set out in Table 9-14.

9.7.75. At the proposed crossing of the Cothi and Towy, the FCA concludes there is very little difference compared to baseline flood modelling results for the 1% (1 in 100) annual probability event (with 30% climate change) and 0.1% (1 in 1000) annual probability event in terms of flood extents, depths and velocity, concluding no adverse impact to flood risk.

9.7.76. At the proposed crossing of the River Gwynon, the FCA concludes that conveyance through the existing embankments is consistent with the baseline results. The peak flows flood levels in the River Gwynon are not predicted to reach the soffit level of the proposed structure. There is no increase in flood levels modelled upstream or downstream of the structure for the modelled events up to and including the 0.1% (1 in 1000) annual probability event.

9.7.77. The proposed Structure 12 over an unnamed watercourse at Hendy Farm is a new structure. As explained above, the FCA concludes that the diversion and structure results in an increase of flood levels on open pasture agricultural land, but that no properties are adversely affected by this structure.

9.7.78. The sensitivity of people and property elsewhere is considered to be **high**, and the magnitude of change is considered to be **negligible**. Therefore, there is likely to be a direct, permanent, long-term negligible effect on people and property elsewhere with an overall significance of effect of **slight**.

9.7.79. The sensitivity of open pasture agricultural land is considered to be medium and the magnitude of the impact to this receptor is considered to be **minor adverse**. Therefore, the significance of the effect is **slight**.

Mitigation / Enhancement

9.7.80. As discussed above, the FCA states that in areas where the modelling results predict minor increases in flood levels, consultation will be undertaken with affected landowners and tenants by CCC.

9.7.81. No further mitigation is proposed to reduce the risk of flooding.

Residual Effects

9.7.82. There remains a direct, permanent effect on people and property elsewhere and agricultural land of **slight significance**.

Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime

The Proposed Scheme will introduce new impermeable surface along the alignment of the Proposed Scheme. The relatively small surface areas and rural nature of the Proposed Scheme will pose little increased flood risk. However, the FCA states that any changes to the existing drainage regime will be designed to meet the new earthworks and existing land drainage requirements in accordance with design standards; and any increased impermeable area arising from construction of the new Proposed Scheme will be mitigated through design of the path's drainage system. This will ensure that flood risk to downstream areas is not increased as a result of the increase in impermeable area.

9.7.83. The Proposed Scheme is considered likely to have **negligible** impact to surface water runoff rates and volumes. The receptors at risk of increased flood risk are considered to have **low to high** sensitivity, largely comprising agricultural land. Consequently, the scheme is expected to have a direct, long-term effect of **neutral to slight significance**.

Mitigation / Enhancement

9.7.84. There is no further mitigation required to reduce the expected impact of the scheme on surface water flow rates and volumes.

Residual Effects

9.7.85. The residual effect on nearby receptors from increased surface water runoff rates and volumes is of negligible to slight significance.

9.8 CUMULATIVE ASSESSMENT

9.8.1. A review of recent planning submission and information provided by CCC concludes that there are two schemes identified which are to be implemented within 1km of the Proposed Scheme. This section determines the likelihood of cumulative impacts and likely magnitude of these impacts to the water environment as a result of all schemes being implemented.

9.8.2. The two cumulative schemes in the area include:

- Towy Valley Cycleway between Whitemill Carmarthen and Nantgaredig to the west of the Proposed Scheme (Phase 1 of the Towy Valley Cycleway).
- Llandeilo Bypass (A483) located immediately east of the Proposed Scheme to the east of Llandeilo.

9.8.3. The Towy Valley Cycleway between Whitemill Carmarthen and Nantgaredig is the first phase of the wider Towy Valley Cycleway. Planning permission for this has been granted and an EIA was not deemed necessary for the planning application. Construction of the western section of the Cycleway may occur at the same time as construction of the eastern section of the Cycleway. The western section of the Towy Valley Cycleway does not involve any crossings of the Towy or Cothi, although crossing of two minor tributaries is required. It passes along the bank of the River Towy for the last section of the route before joining the eastern section at Nantgaredig. These works are approximately 2.5km downstream of the

proposed works adjacent to the River Towy and River Cothi for the eastern section of the cycle path. Given the distance between the crossing of the Rivers Towy and Cothi for the eastern section of the cycle path and the proposed works adjacent to the River Towy for the western section of the cycle path (and the assumed inclusion of best practice management measures as would be expected in this environment) the cumulative impact of the Proposed Scheme on the water environment during construction is considered to be negligible. There are also no known cumulative impacts that would arise during the operational phase of the Proposed Scheme.

9.8.4. The proposed Llandeilo Bypass comprises the construction of a new road that runs parallel to the existing A483 from Ffairfach to the north of Llandeilo. The scheme is currently in an optioneering phase and is not expected to be constructed until after the Towy Valley Cycle Path is completed. The scheme will cross the River Towy and its associated floodplain. The largest potential impacts of the Llandeilo bypass are likely to be to water quality of receiving watercourses, especially during the construction phase, and increase to flood risk. The Llandeilo Bypass is proposed to cross the River Towy approximately 20km upstream of the proposed crossing of the River Towy by the Towy Valley Cycle Path. The Llandeilo Bypass is also a minimum of 2km upstream of the closest section of the Towy Valley Cycle Path that is located in close proximity to the River Towy. Assuming appropriate mitigation is implemented during construction, it is considered unlikely that the two schemes would cause cumulative impact. There are also no known cumulative impacts that would affect flood risk during construction, and none that would arise during the operational phase of the two schemes.

9.9 LIMITATIONS AND ASSUMPTIONS

Factors that pose limitations to the assessment above include:

- Site walkover did not cover the full extent of the Proposed Scheme and associated water environment features. This is mostly due to land access constraints and livestock.
- The assessment above is primarily informed by review of desk-based sources of information and supplemented by a site walkover for general familiarisation.
- The detailed design and construction methodology of the proposed watercourse crossings (and other works in close proximity to the water environment) has not yet been developed or discussed in detail with NRW or CCC. It is assumed this will be undertaken as part of the discharge of conditions and consenting process to meet the requirements of NRW and CCC.
- No quantitative analysis of the potential impacts of the Proposed Scheme on hydromorphological conditions has been completed for this assessment. The qualitative assessment presented in this EIA is considered appropriate given the nature of the identified risks.
- Limitations regarding the assessment of baseline hydromorphological conditions and risks to the Proposed Scheme are discussed in the separate a geomorphological baseline assessment.
- Limitations regarding the assessment and modelling of flood risk are discussed in the separate FCA.

9.10 SUMMARY

Table 9-16 – Summary of Potential Construction Effects

Effect	Receptor	Importance	Magnitude of Change	Significance	Mitigation	Residual Significance
Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate, and stockpiles of topsoil	River Towy	Very high	Minor adverse - / T / D / MT	Moderate to large adverse	Implementation of CEMP	Moderate to large adverse
	River Cothi	Very high	Minor adverse - / T / D / MT	Moderate to large adverse	Implementation of CEMP	Moderate to large adverse
	River Gwynon	Medium	Minor adverse - / T / D / MT	Slight adverse	Implementation of CEMP	Slight adverse
	Other watercourses	Low to medium	Negligible to minor adverse - / T / D / MT	Neutral to slight adverse	Implementation of CEMP	Neutral to slight adverse
Increased pollution risks from spillage of fuels and other harmful substances that may migrate to surface water features and groundwater receptors	River Towy	Very high	Negligible N/A	Slight adverse	Implementation of CEMP	Slight adverse
	River Cothi	Very high	Negligible N/A	Slight adverse	Implementation of CEMP	Slight adverse
	River Gwynon	Medium	Negligible N/A	Slight adverse	Implementation of CEMP	Neutral to slight adverse
	Other watercourses	Low to medium	Negligible N/A	Neutral to slight adverse	Implementation of CEMP	Neutral to slight adverse
	Groundwater resources	Medium	Negligible N/A	Neutral to slight adverse	Implementation of CEMP	Neutral to slight adverse
Impacts to the hydromorphological quality of watercourses associated with works within or in close proximity to watercourses such as the	River Towy	Very high	Minor adverse - / T / D / ST	Moderate adverse	Works out of channel, CEMP	Moderate adverse
	River Cothi	Very high	Minor adverse - / T / D / ST	Moderate adverse	Works out of channel, CEMP	Moderate adverse

Effect	Receptor	Importance	Magnitude of Change	Significance	Mitigation	Residual Significance
installation and alteration of culverts, bridges and outfalls	River Gwynon	Medium	Minor adverse - / T / D / ST	Slight adverse	Works out of channel, CEMP	Slight adverse
	Other watercourses	Low to medium	Minor adverse - / T / D / ST	Neutral to slight adverse	Works out of channel, CEMP	Neutral to slight adverse
Increased flood risk to people and property associated with loss of fluvial floodplain storage from temporary works	Residential properties	High	Negligible N/A	Slight adverse	Flood response plan, CEMP	Slight

Table 9-17 – Summary of Potential Operational Effects

Effect	Receptor	Importance	Magnitude of Change	Significance	Mitigation	Residual Significance
Impacts to the hydromorphological quality of watercourses associated with the installation and alteration of culverts, bridges and outfalls	River Towy	Very high	Negligible N/A	Slight adverse	Works out of channel and set bank from riverbank.	Slight adverse
	River Cothi	Very high	Negligible N/A	Slight adverse	Works out of channel and set bank from riverbank.	Slight adverse
	River Gwynon	Medium	Negligible N/A	Neutral to slight adverse	Works out of normal flow channel.	Neutral to slight adverse
	Other watercourses	Low to medium	Negligible to minor adverse - / P / D	Neutral to Slight adverse	Works out of channel where possible.	Neutral to slight adverse

Effect	Receptor	Importance	Magnitude of Change	Significance	Mitigation	Residual Significance
					Maintain hydraulic connectivity.	
Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow	River Towy, River Cothi, River Gwynon and other watercourses	Very high to low	No change N/A	Neutral	Maintain existing flow routes	Neutral
Flood risk to users of the Proposed Scheme	Users of the Proposed Scheme	Low	Major adverse	Slight to moderate adverse	Flood management plan	Neutral
Increased flood risk to people and property associated with loss of fluvial floodplain storage	Property within and adjacent to floodplain	High	Negligible N/A	Slight adverse	Landowner consultation	Slight adverse
	Land within and adjacent to floodplain	Medium	Minor adverse - / P / D / ST	Slight adverse	Landowner consultation	Slight adverse
Increased flood risk to people and property associated with changes to flood flow conveyance or crossing & culverting of watercourses	Property within and adjacent to floodplain	High	Negligible N/A	Slight adverse	Landowner consultation	Slight adverse
	Land within and adjacent to floodplain	Medium	Minor adverse - / P / D / ST	Slight adverse	Landowner consultation	Slight adverse
Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the	Property and land within and adjacent to floodplain	Low	Negligible N/A	Neutral to slight adverse		Neutral to slight adverse

Effect	Receptor	Importance	Magnitude of Change	Significance	Mitigation	Residual Significance
existing drainage regime leading to a potential increase in flood risk						

9.11 REFERENCES

British Geological Survey. (2021). *Geology of Britain Viewer*. Retrieved from http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Carmarthenshire County Council. (2006). *Carmarthenshire Local Development Plan*. Retrieved from https://www.carmarthenshire.gov.wales/home/council-services/planning/planning-policy/local-development-plan-2006-2021/#.Yoevw6jMJaQ

Centre for Ecology & Hydrology. (2022). *National River Flow Archive*. Retrieved from https://nrfa.ceh.ac.uk/data

Centre for Ecology and Hydrology. (2022). *Flood Estimation Handbook Web Service*. Retrieved from https://fehweb.ceh.ac.uk/GB/map

Cranfield University. (2022). *Soilscapes*. Retrieved from http://www.landis.org.uk/soilscapes/

DEFRA. (2015). *Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems.*

DEFRA. (2022). *MAGIC mapping*. Retrieved from https://magic.defra.gov.uk/MagicMap.aspx

Digimap. (2022). *Digimap*. Retrieved from https://digimap.edina.ac.uk/

Environment Agency. (2018). *The Environment Agency's Approach to Groundwater Protection*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf

Environment Agency. (2022). *Catchment Data Explorer*. Retrieved from https://environment.data.gov.uk/catchment-planning/

Google. (2021). *Google Maps*. Retrieved from https://www.google.com/maps

Highways England. (2019). *Design Manual for Roads and Bridges LA113.*

HM Government. (1991). *Land Drainage Act*. Retrieved from http://www.legislation.gov.uk/ukpga/1991/59/contents

HM Government. (1991). *Water Industry Act*. Retrieved from https://www.legislation.gov.uk/ukpga/1991/56/contents

HM Government. (1991). *Water Resources Act*. Retrieved from http://www.legislation.gov.uk/ukpga/1991/57/contents

HM Government. (1995). *Environment Act*. Retrieved from https://www.legislation.gov.uk/ukpga/1995/25/contents

HM Government. (2003). *Water Act*. Retrieved from https://www.legislation.gov.uk/ukpga/2003/37/contents

HM Government. (2009). *Flood Risk Regulations*. Retrieved from https://www.legislation.gov.uk/uksi/2009/3042/contents/made

HM Government. (2009). *Groundwater (England and Wales) Regulations*. Retrieved from https://www.legislation.gov.uk/ukdsi/2009/9780111480816/contents

HM Government. (2010). *Flood and Water Management Act*. Retrieved from http://www.legislation.gov.uk/uksi/2017/407/contents/made

HM Government. (2014). *Water Act*. Retrieved from https://www.legislation.gov.uk/ukpga/2014/21/contents/enacted

HM Government. (2016). *The Environmental Permitting (England and Wales) Regulations*. Retrieved from http://www.legislation.gov.uk/uksi/2016/1154/contents/made

HM Government. (2016). *The Groundwater (Water Framework Directive) (England) Direction*. Retrieved from https://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en.pdf

HM Government. (2017). *The Infrastructure Planning (EIA) Regulations*. Retrieved from https://www.legislation.gov.uk/uksi/2017/572/contents/made

HM Government. (2017). *The Water Environment (Water Framework Directive) (England and Wales) Regulations*. Retrieved from https://www.legislation.gov.uk/uksi/2017/407/contents/made

HM Government. (2019). *National Planning Policy Framework*. Retrieved from https://www.gov.uk/government/publications/national-planning-policy-framework--2

HM Government. (2021). *25 Year Environment Plan*. Retrieved from https://www.gov.uk/government/publications/25-year-environment-plan

HM Government. (2021). *Environment Act*. Retrieved from https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

HM Government. (2021). *Planning Practice Guidance*. Retrieved from https://www.gov.uk/government/collections/planning-practice-guidance

Natural Resources Wales. (2009). *Western Wales River Basin Management Plan*. Retrieved from https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/river-basin-management-plans/western-wales-river-basin-management-plan/?lang=en

Natural Resources Wales. (2022). *Development Advice Maps*. Retrieved from https://naturalresources.wales/flooding/flood-map-for-planning-development-advice-map/?lang=en

Natural Resources Wales. (2022). *Flood Risk Map Viewer*. Retrieved from https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

Natural Resources Wales. (2022). *Water Watch Wales*. Retrieved from https://waterwatchwales.naturalresourceswales.gov.uk/en/index.html

Nomis. (2020). *Labour Market Profile - Selby*.

Ordnance Survey. (2022). Retrieved from https://osmaps.ordnancesurvey.co.uk/

Welsh Government. (2004). *TAN15: Development and Flood Risk*. Retrieved from https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

Welsh Government. (2021). *Planning Policy Wales*. Retrieved from https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

10 GROUND CONDITIONS AND CONTAMINATION

10.1 INTRODUCTION

10.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Scheme upon geology and soil related receptors. In particular, it considers the potential effects of soil and groundwater contamination, ground stability and ground gas on human health, controlled waters (comprising surface water and groundwater), building materials, and the wider environment as a result of the Proposed Scheme. It also considers the effects on agricultural land and soil.

10.1.2. The chapter describes the assessment methodology, the baseline conditions at the site and in the surrounding area, and any primary and tertiary mitigation adopted for the purposes of the assessment. It provides a summary of the likely significant effects taking into account national legislation, and describes further mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these measures have been employed.

10.1.3. This chapter is intended to be read as part of the wider ES, with particular reference to Chapter 9: Water Environment and Flood Risk, Chapter 12: Materials and WSP (2018) Preliminary Geo-Environmental Assessment Report (PGR)[37] (**Volume IV Appendix 8.A**). Effects to agricultural holdings is considered in Chapter 11: Public amenity, land use and private access.

10.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

10.2.1. Land contamination is regulated under several legislative regimes, including environmental protection, pollution prevention and control, waste management, planning and development management, and health and safety. The land contamination assessment for this chapter was undertaken with due regard to the following specific legislation, policy and guidance.

LEGISLATIVE FRAMEWORK

10.2.2. The applicable legislative framework is summarised as follows.

10.2.3. Relevant national policy can be found below:

- Part IIA of the Environmental Protection Act 1990 describes a regulatory role for Local Authorities in dealing with contaminated land. The legislation endorses the principle of a ‘suitable for use’ approach to contaminated land, where remedial action is only required if there are unacceptable risks to human health or the environment, taking into account the use of the land and its environmental properties[38];
- Environment Act 1995 creates a system whereby Local Authorities must identify and if necessary, arrange for the remediation of contaminated sites. The provisions are set out in Section 57, which inserts Part 2A into the Environmental Protection Act, 1990. In

[37] WSP (2018), Tywi Valley Path Eastern Phase - Preliminary Geo-Environmental Assessment Report.
[38] UK Government (1990), The Environmental Protection Act 1990.

addition to these requirements, the operation of the regime is subject to regulation and statutory guidance[39];

- Control of Substances Hazardous to Human Health Regulations 2002 (as amended) provides an assessment of the risk to health created by work involving substances hazardous to health[40];
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (2000/60/EC) establish a framework for protecting the water environment[41];
- Dangerous Substances Directive (Amendment) 2006 controls the amount of dangerous substances that are discharged into inland, coastal and territorial waters[42];
- Environmental Damage and Liability (Prevention and Remediation) Regulations 2009 aim to prevent serious environmental effects or ensure that remediation is carried out. The duty to prevent or remediate falls on operators of activities. The Regulations specifically define three types of environmental damage: biodiversity damage - to European Union protected species and habitats, and SSSI; water damage; and land damage[43];
- The Environmental Permitting (England and Wales) Regulations 2016 replace those parts of the Water Resources Act that relate to the regulation of discharges to controlled waters. Under the Regulations, groundwater activities relate to inputs of pollutants to groundwater[44];
- Control of Asbestos Regulations 2012 prohibits the importation, supply and use of all forms of asbestos. If existing asbestos containing materials are in good condition, they may be left in place; their condition monitored and managed to ensure they are not disturbed. The Control of Asbestos Regulations also include the 'duty to manage asbestos' in non-domestic premises[45];
- Contaminated Land (Wales) (Amendment) Regulations 2012 provides a definition of what constitutes 'contaminated land' and set out the responsibilities of the Local Authority and the Environment Agency in the identification and management of contaminated land[46];
- Construction (Design & Management) (CDM) Regulations 2015. This requires clients to use their influence to ensure that the arrangements made by other duty holders are sufficient to safeguard the health and safety of those working or those affected by that work[47]; and,

[39] UK Government (1995), The Environment Act 1995.
[40] UK Government (2002), The Control of Substances Hazardous to Health Regulations 2002.
[41] UK Government (2017), The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
[42] European Commission (2006), The Dangerous Substances Directive (Amendment) 2006.
[43] UK Government (2009), The Environmental Damage and Liability (Prevention and Remediation) Regulations 2009.
[44] UK Government (2016), The Environmental Permitting (England and Wales) Regulations 2016.
[45] UK Government (2012), The Control of Asbestos Regulations 2012.
[46] Welsh Government (2012), The Contaminated Land (Wales) (Amendment) Regulations 2012.
[47] UK Government (2015), The Construction (Design and Management) (CDM) Regulations 2015.

- The Planning Policy Wales (Edition 11, February 2021) states considerable weight should be given to protecting agricultural land of grade 1, 2 and 3a as defined by an agricultural land classification survey[48].

GUIDANCE

10.2.4. The following guidance documents have been used during the preparation of this chapter:

- Health and Safety Executive (HSE) (1991) Guidance Note HS (G) 66, Protection of Workers and the General Public during the Development of Contaminated Land[49];
- CIRIA C532 (2001) Control of Pollution from Construction Sites[50];
- Environment Agency (2020) Land Contamination: Risk Management (LC:RM)[51],
- HSE (2006) INDG258 Safe Work in Confined Spaces[52];
- Construction Industry Research and Information Association (CIRIA) 665 (2007), Assessing Risks Posed by Hazardous Gases to Buildings[53];
- Environment Agency and NHBC (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66[54];
- CIRIA C682 (2009), 'The VOCs Handbook'[55];
- BS 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice[56];
- HSE (2012), Control of Asbestos Regulations (Ref.10.20[57];
- Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012[58];
- Environment Agency (2017) Groundwater Protection Technical Guidance[59];
- British Standards Institute (BSI) BS 5930 (2015) The Code of Practice for Site Investigations[60];

[48] Welsh Government. 2021a. Welsh Government | Planning Policy Wales (Edition 11, February 2021). [online] Available at: < https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

[49] Health and Safety Executive (HSE) (1991) Guidance Note HS (G) 66, Protection of Workers and the General Public during the Development of Contaminated Land.

[50] CIRIA C532 (2001) Control of Pollution from Construction Sites

[51] Environment Agency (2020) Land Contamination: Risk Management (LC:RM)

[52] HSE (2006) INDG258 Safe Work in Confined Spaces.

[53] Construction Industry Research and Information Association (CIRIA) 665 (2007), Assessing Risks Posed by Hazardous Gases to Buildings.

[54] Environment Agency and NHBC (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66.

[55] CIRIA C682 (2009), 'The VOCs Handbook'.

[56] British Standards Institute (BSI) (2011) BS 10175: Investigation of Potentially Contaminated Sites – Code of Practice.

[57] HSE (2012), Control of Asbestos Regulations.

[58] Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012.

[59] Environment Agency (2012) Groundwater Protection: Policy and Practice (GP3).

[60] BSI (2015) BS 5930: The Code of Practice for Site Investigations.

- BSI, BS 8576 (2013) Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds[61];
- CIRIA C735 (2014) – Good practice on the testing and verification of protection systems for buildings against hazardous ground gases[62];
- Highways England (2019) DMRB LA109 Geology and Soils[63]
- Highways England (2020) DMRB LA113 Road drainage and the water environment[64]
- BSI, BS 8485 (2015) Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments[65]; and
- MAFF (1988) Agricultural Land Classification of England and Wales[66].
- Predictive Agricultural Land Classification Map (Wales) The Hollington Map Guidance Note (Version 2.1 - May 2021) [67]
- IEMA (2021) A New Perspective on Land and Soil in Environmental Impact Assessment[68]

10.2.5. The following Planning Practice Guidance are considered relevant to this assessment:

- Land affected by contamination (March 2014) – outlines the system for identifying and remediating contaminated sites[69];
- Land Stability (March 2014) – sets out the roles of the regulators and processes to deal with potential stability risks associated with proposed developments[70];
- Natural Environment (March 2014) – Section 3 deals with the ecological value placed on brownfield land, and outlines why it is important to consider pollution in soil[71]; and,
- Water supply, wastewater and water quality (March 2014) - outlines why water supply, wastewater and water quality are an important consideration when during development[72].

[61] BSI (2013) BS 8576: Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
[62] CIRIA (2014) C735 Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases.

[63] Highways England (2019) DMRB LA109 Geology and Soils Available at: https://www.standardsforhighways.co.uk/dmrb/search/adca4c7d-4037-4907-b633-76eaed30b9c0

[64] Highways England (2020) DMRB LA112 Road drainage and the water environment. Available at: https://www.standardsforhighways.co.uk/dmrb/search/d6388f5f-2694-4986-ac46-b17b62c21727
[65] BSI (2015) BS 8485: Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments.
[66] MAFF (1988), Agricultural Land Classification of England and Wales: The Revised Guidelines and Criteria for Grading the Quality of Agricultural Land.
[67] Welsh Government, 2021b. Predictive Agricultural Land Classification Map (Wales) The Hollington Map Guidance Note (Version 2.1 - May 2021) [online]. Available at: https://gov.wales/sites/default/files/publications/2021-05/agricultural-land-classification-predictive-map-guidance.pdf [Accessed May 2022]

[68] IEMA (2021) A New Perspective on Land and Soil in Environmental Impact Assessment.
[69] UK Government (2014) Planning Guidance Note: Land Affected by Contamination.
[70] UK Government (2014) Planning Guidance Note: Land Stability.
[71] UK Government (2014) Planning Guidance Note: Natural Environment.
[72] UK Government (2014) Planning Guidance Note: Water Supply, Wastewater and Water Quality.

10.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

SUMMARY OF CONSULTATION

10.3.1. Table 10-1 provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 10-1 – Summary of Consultation

Body / organisation	Individual / statutory body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Carmarthenshire County Council	Department of Planning / Department of Environment	Consultation response received 24 November 2017.	The Department of Environment has reviewed the screening opinion and confirmed the site to be an EIA development, advising a precautionary approach was adopted and an EIA should be requested on ecological grounds
Carmarthenshire County Council	Environmental Health Practitioner (EHP)	Consultation response received 28 March 2018.	The EHP has reviewed the scoping report and confirmed they considered it to be satisfactory, subject to all potential sources of contamination being identified.

10.3.2. NRW must be consulted on development proposals which individually or cumulatively involve the loss of more than 20 hectares of the best and most versatile agricultural land. There has been no consultation with regards to the Agricultural Land Classification (ALC) due to the predicted Best Most Versatile land (BMV) land being under 20ha[73].

SCOPE OF THE ASSESSMENT

10.3.3. An EIA Scoping Report was submitted to CCC in April 2018 and is presented in **Volume IV Appendix 5.3**. This section provides an update on the scope of the assessment and re-iterates / updates / amends as appropriate, based on the findings of the WSP Preliminary Geo-Environmental Assessment Report (**Volume IV Appendix 8.A**), the evidence base for non-significant effects following further iterative assessment since April 2018.

[73] Technical Advice Note 6 Planning for sustainable rural communities (2010)

INSIGNIFICANT EFFECTS

10.3.4. The effect on statutory and non-statutory sites of geological importance has been identified as not significant as none of these sites have been identified within the site or surrounding area and have therefore not been assessed, or have been assessed elsewhere, within the ES.

POTENTIALLY SIGNIFICANT ENVIRONMENTAL EFFECTS

10.3.5. Table 10-2 sets out the likely significant effects that are assessed within the ES.

Table 10-2 – Potentially Significant Environmental Effects

Effect	Receptor	Applicable Development Phase*
Disturbance of contaminated ground and / or uncontrolled chemical discharge / spillages to controlled water bodies	River Tywi and other surface water features, and underlying aquifer	C / O
Disturbance of contaminated ground resulting in harm to human health as well as release of contaminated soil / dust to the surrounding environment	Construction / maintenance workers, future site users, neighbouring site users	C / O
Potential exposure to hazardous ground gas (radon) in confined spaces, as well as ingress into neighbouring properties	Construction / maintenance workers, neighbouring site users	C / O
Potential for ground instability	Construction Workers	C
Loss of Best and Most Versatile (BMV) quality agricultural land	Agricultural land within the scheme	C
Permanent reduction or loss in soil function due to soil degradation, compaction or erosion	Agricultural land within the scheme	C
* C – Construction and O – Operational		

EXTENT OF THE STUDY AREA

10.3.6. The study area includes the 14.64km site length and a buffer of up to 500 m from the site boundary, as illustrated in the WSP Preliminary Geo-Environmental Assessment Report (**Volume IV Appendix 8.A**). It passes through agricultural land, the use of which varies throughout the scheme from arable to pasture. In many areas hardstanding paths which had been overgrown by grass were observed. The scheme is relatively flat, low lying and in close proximity to both the Afon Cothi and Afon Tywi.

PROPOSED SCHEME

10.3.7. A detailed description of the Proposed Scheme is provided in Chapter 3. In summary, it is proposed to construct a new 14.64km cycle and pedestrian path, primarily following the route of the former Carmarthen to Llandeilo railway, between Nantgaredig and Ffairfach. Key aspects of the Proposed Scheme that are of relevance to this chapter include the following:

- The path will be an unsegregated 3 m wide hard surfaced path with a 1 m verge either side (adapted locally to suit on site constraints).
- Shallow excavation is assumed with a maximum depth of 300 mm in fields and 250 mm on the railway embankment.
- The path will be constructed using macadam, concrete and reclaimed track ballast from the existing railway.
- A new bridge crossing and associated piled concrete foundations and pier will be constructed to replace the previous bridge structure over the River Cothi at Chainage 800;
- The construction of a new bridge crossing associated piled concrete foundations and pier over the River Tywi at Chainage 1,575;
- The previous bridge structure over the River Gwynon at Chainage 4790 will be replaced by an 18m span pre-fabricated footbridge. The masonry abutments of the existing bridge will be demolished as part of the proposed works;
- Five bridge replacements will be constructed over the smaller, unnamed ordinary watercourses at Chainage 5,390, 7,450, 8,390, 8,590 and 9,280. The proposed bridges will replace the steel beams and timber sleeper decks of the existing structures, where the new decks, approximately 4 to 5m in length, will over-span the existing, with the concrete bank seats set back from the existing masonry abutments. The existing abutments will remain to minimise disturbance to the foundation;
- The former railway line to the north of Hendy Farm is deemed unsuitable to locate the cycle path as a proportion of the existing railway embankment has failed due to severe erosion and scour by the River Tywi at the bend. Hence, it is proposed to divert the path (between Chainage 12,450 and 12,890) to the south around this area of active erosion. The diverted path will subsequently intersect an ordinary watercourse at Chainage 12,680, where a clear span bridge of approximately 8.5m is proposed at the crossing.
- A further new bridge is proposed over an unnamed stream located at Chainage 12,918 to further mitigate against flood risk from the River Tywi, approximately 130m of the diverted path, between Chainage 12,690 and 12,820 will be raised by approximately 1m from the existing ground on retaining walls. The materials used to construct the raised section will be excavated in-situ adjacent to the path;
- The surface water drainage strategy for the Proposed Scheme will comprise the construction of infiltration trenches along the verges of the path.

METHOD OF BASELINE DATA COLLECTION

Desk Study

10.3.8. The assessment has utilised information collated with the WSP Preliminary Geo-Environmental Assessment (**Volume IV Appendix 8.A**). This report gathered information to

inform the presence of sensitive receptors and potential sources of contamination. Existing agricultural land and soil data has not been considered prior to this stage.

10.3.9. Baseline information has been obtained from the following sources:

- Tywi Valley Transport Corridor Concept, Geotechnical Scoping Report, completed by Capita, dated January 2014[74];
- Tywi Valley Transport Corridor Concept, Environmental and Ecological Scoping Study, completed by AECOM, dated December 2013[75];
- Coal Authority Interactive Mapping[76];
- Ordnance Survey (OS) Mapping[77];
- MAGIC online mapping[78];
- British Geological Survey Online Viewer[79];
- National Soils Resource Institute Soilscapes data[80]; and,
- Welsh Government Predictive Agricultural Land Classification Map Online Viewer[81].

Site Visit

10.3.10. A site visit was undertaken as part of the Capita 2014 Geotechnical Scoping Report[74] to obtain information on the site topography, surface water courses and potential sources of contamination.

Agricultural land classification (ALC) survey

10.3.11. An ALC survey was carried out by WSP between the 03 May to 06 May 2022. Survey locations were selected using guidance set out by the Welsh government[82] in conjunction with the Welsh Predictive Agricultural Land Classification map, aerial imagery and the updated red line boundary. All areas which were predicted to be grades 1, 2 or 3a and could not visibly be classified as non-agricultural from aerial imagery were surveyed.

[74] Capita (2014), Tywi Valley Transport Corridor Concept – Geotechnical Scoping Report.
[75] AECOM (2013), Tywi Valley Transport Corridor Concept – Environmental and Ecological Scoping Study.
[76] Coal Authority Interactive Mapping http://mapapps2.bgs.ac.uk/coalauthority/home.html (accessed 2 January 2019).
[77] Ordnance Survey Mapping (Landmark Report Refs. 177895618_1, 177897999_1, 177899281_1, 177900002_1, 177900885_1, 177908187_1, 177914744_1 and 177913531_1).
[78] MAGIC Online Mapping https://magic.defra.gov.uk/ (accessed 2 January 2019).
[79] BGS Online Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html (accessed 2 January 2019).
[80] National Soils Resource Institute Soilscapes data http://www.landis.org.uk/soilscapes/ (accessed 2 January 2019).
[81] Welsh Government Predictive Agricultural Land Classification Map Online Viewer https://lle.gov.wales/catalogue/item/PredictiveAgriculturalLandClassificationALCMap/?lang=en (accessed 2 January 2019).
[82] Predictive Agricultural Land Classification Map (Wales) The Hollington Map Guidance Note (Version 2.1 - May 2021) [online]. Available at: https://gov.wales/sites/default/files/publications/2021-05/agricultural-land-classification-predictive-map-guidance.pdf [Accessed May 2022]

10.3.12. Following MAFF[83] guidelines and methods set out in the Soil Survey Field Handbook[84,] at each location the following were assessed for each soil horizon up to a maximum depth of 1.20 m:

- Depth;
- Stoniness;
- Colour (including mottling) – using a Munsell soil chart ;
- Structure;
- Soil texture;
- Wetness - inferred from: field capacity, gleyed horizon, depth to a slowly permeable layer and soil texture to 25cm; and
- Droughtiness - using calculated crop-adjusted available water capacity (AP) and moisture deficit (MD) to calculate the moisture balance (MB).

10.3.13. Site factors assessed were:

- Gradient – using a clinometer;
- Microrelief; and,
- Flooding – summer and winter – using infield observations in conjunction with freely available flood risk map which takes in to account current flood defences[85].

10.3.14. These points were then assigned an overall grade based on the most limiting factor.

ASSESSMENT METHODOLOGY

10.3.15. A detailed assessment of Geology and Soils has been undertaken in accordance with DMRB LA109 Soils and Geology[86] and has taken into consideration both the construction and operation phases of the Proposed Scheme.

10.3.16. Contaminated land assessment is key to defining the impacts associated with the scheme. Current guidance on the assessment of contamination risk (e.g. Land Contamination: Risk Management (LC:RM) 202087) advocates the use of a conceptual risk assessment model in an attempt to establish the links between a hazardous source and a sensitive receptor via an exposure pathway. The concept behind this approach is that without each of the three fundamental elements (source, pathway and receptor) there can be no risk of contamination. Therefore, the mere presence of a contamination hazard at a particular site does not necessarily imply the existence of associated risks. This assessment adopts the principles, as set out in LC:RM 202088.

[83] MAFF (1988): Revised guidelines and criteria for grading the quality of agricultural land.
[84] Hodgson, J M (1997) Soil Survey Field Handbook. Soil Survey Technical Monograph No 5, Silsoe.
[85] National Resources Wales. 2022. National flood risk maps. Available at: http://lle.gov.wales/catalogue/item/NationalFloodRiskMaps/?lang=en [Accessed May 2022]
[86] Highways England (2019), Design Manual for Roads and Bridges – Volume 11 Section 3 Part 11 Geology and Soils.
[87] Environment Agency (2020) Land Contamination: Risk Management (LC:RM)

[88] Environment Agency (2020) Land Contamination: Risk Management (LC:RM)

10.3.17. The likely effects of the Proposed Scheme in the context of contaminated land assessment have been identified through the formation of potential contamination linkages based on the potential sources of contamination identified as part of the Preliminary Geo-Environmental Assessment (**Volume IV Appendix 8.A**).

10.3.18. Risks presented by volatile organic compounds have been considered in line with CIRIA publication C682 'The VOCs Handbook'[55].

10.3.19. Risks presented by asbestos in soils have been considered in line with CIRIA C733: 'Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks'[89].

10.3.20. Risks associated with compressible or unstable ground will be considered in line with PGN on Land Stability[70].

10.3.21. The likely effects of the Proposed Scheme in the context of agricultural land has taken into consideration the IEMA (2021) "A New Perspective on Land and Soil in Environmental Impact Assessment". This guidance stresses the importance of all soil functions not just for the areas that are going to be permanently lost and the inclusion of safe soil handling methods to mitigate impacts. By bringing soils into the process earlier, any surplus can be designed out along with space for the handling and storage of soils.

SIGNIFICANCE CRITERIA

10.3.22. The assessment of potential effects as a result of the Proposed Scheme has taken into account both the construction and operational phases. The construction phase includes enabling works, demolition, earthworks and construction activities as set out in Chapter 3: Description of the Proposed Scheme. The significance level attributed to each effect has been assessed based on the magnitude of change due to the Proposed Scheme and the sensitivity of the affected receptor, as well as a number of other factors that are outlined in more detail in Chapter 5: Approach to EIA. The sensitivity of the affected receptor is assessed on a scale of high, medium, low and negligible, and the magnitude of change is assessed on a scale of major, moderate, minor and negligible (as shown in Chapter 5: Approach to EIA).

Sensitivity of Receptor

10.3.23. Terms applied in defining the sensitivity of a receptor are provided in Table 10-3.

Table 10-3 – Definitions of Receptor Sensitivity

Sensitivity / Value	Definition
Very High	ALC Grades 1 and 2. All BMV land in Wales. Soils directly supporting an EU designated site (e.g. Special Area of Conservation or Special Protection Area). Soils with potential for ecological / landscape restoration.

[89] CIRIA (2014), Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (C733).

Sensitivity / Value	Definition
	Very important catchment pathway for water flows and flood risk management. Soil with known archaeological interest, community benefit and geodiversity. Important surface mineral reserves that would be sterilised.
High	Areas containing geological or geomorphological features considered to be of national importance (i.e. SSSIs). Principal aquifer beneath the site, and / or major surface water within influence of the Scheme. Nationally or internationally designated ecological receptors. Residential, allotment and play area users. Buildings of high historic value or other high sensitivity. Agricultural land classified as grade 3a. Soils directly supporting a UK designated site (e.g. SSSI) Important catchment pathway for water flows and flood risk management. Soil with probable but currently unproven. archaeological interest. Soils which support community, recreational or educational access to RIGS and AONB. Surface mineral reserves that would be sterilised.
Medium	Areas containing features of designated regional importance, for example Regionally Important Geological and Geomorphological Sites (RIGS). Secondary aquifer beneath the site and / or major surface water within influence of the Scheme. Locally designated ecological sites. Landscaping or public open space users. Buildings including foundations and services. Agricultural land classified as grade 3b. Soils supporting non-statutory designated sites (e.g. Local Nature Reserve) Important minor catchment pathway for water flows and flood risk management. Soil with possible but currently unproven archaeological interest. Soils supporting community, recreational or agricultural access to land. Surface mineral reserves that would remain extractable.
Low	No geological features of importance within influence of the Scheme. Aquitard beneath the site, no surface water body within influence of the Scheme. No sites of significant ecological value within influence of the Scheme. Hard end use (e.g. industrial use, road, car park).

Sensitivity / Value	Definition
	Agricultural land classified as grades 4 or 5 / Made Ground with little potential for agricultural use. Soils supporting non-designated notable or priority habitats. Pathway for local water flows and flood risk management. Soils supporting no notable cultural heritage, geodiversity or community benefits. Surface mineral reserves that would remain accessible to extraction.
Negligible	No sensitive receptors present. Previously developed land formerly in 'hard uses' with little potential to return to agriculture. As for "low" sensitivity but with only indirect, tenuous and unproven links between sources of impact and soil function.

Magnitude of effect

10.3.24. Definitions of the magnitude of the effect are summarised in Table 10-4.

Table 10-4 – Definitions of Magnitude of Effect

Sensitivity / Value	Definition
Major	Significant (greater than 50%), or total loss of a site of recognised geological importance, or where there would be complete alteration of a site such as to affect the value of the site to a major degree. Significant contamination identified, in excess of relevant thresholds for protection of Controlled Water bodies. Significant risk to human health. Catastrophic damage to buildings. Physical removal or permanent sealing of soil resource or agricultural land and / or quality and integrity of the resource; severe damage to key characteristic, features or elements. Loss of at least 20 hectares of Grade 1 (Excellent) and Grade 2 (Very Good) agricultural land.
Moderate	Partial (between 10% and 50%) loss of site of recognised geological importance. Localised or marginal contamination identified or potential, in excess of relevant thresholds for protection of Controlled Water bodies. Moderate risk to human health. Substantial damage to buildings. Loss (permanent sealing or physical removal) of at least 20 hectares of Grade 3 (Good to Moderate) agricultural land or; Permanent loss or reduction of one or more soil functions alongside restriction to current or approved future use (e.g through degradation, compaction, erosion.)

Sensitivity / Value	Definition
Minor	Minimal effect (loss of up to 10%) on site of recognised geological importance. No significant contamination identified or could be reasonably expected based on desk study findings. Minor / insignificant impact on human health. Easily repairable damage to buildings. Permanent, irreversible loss of under 5ha or Temporary loss or reduction of one or more soil functions alongside restriction to current or approved future use (e.g through degradation, compaction, erosion.) Loss of Grade 4 (Poor) quality agricultural land.
Negligible	Very minor change from baseline conditions. Change hardly discernible (e.g. short term compaction from machinery movements). No contamination above relevant thresholds identified or reasonably expected. No damage to buildings. No discernible loss or reduction of soil functions that restrict the current or approved future use Loss of Grade 5 (Very Poor) quality agricultural land.

EFFECT SIGNIFICANCE

10.3.25. The overall significance of potential impacts considers both the magnitude of impact against the value of the receptor as demonstrated in Table 10-5.

Table 10-5 – Effect Significance Matrix

		Magnitude of Effect			
		Major	Moderate	Minor	Negligible
Sensitivity of Receptor	Very High	Very Large	Large / Very Large	Moderate / Large	Slight
	High	Large	Moderate / Large	Moderate	Slight
	Medium	Moderate / Large	Moderate	Slight / Moderate	Neutral / Slight
	Low	Moderate	Slight / Moderate	Neutral / Slight	Neutral
	Negligible	Slight	Neutral / Slight	Neutral	Neutral

10.3.26. The following terms have been used to define the significance of the effects identified:

- Large effect: where the Proposed Scheme could be expected to have effects considered to be very important considerations and likely to be material in the decision making process;

- Moderate effect: where the Proposed Scheme could be expected to have effects that are important but not likely to be key decision making factors;
- Slight effect: where the Proposed Scheme could be expected to have effects that are likely to be raised as local factors and unlikely to be critical in the decision making process but important in enhancing the subsequent design of the project; and
- Neutral effect: where no effects other than those beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, are expected as a result of the Proposed Scheme on receptors.

10.3.27. In the terms of this assessment, only effect significance of Moderate and above is considered to be significant. Effects can be temporary, permanent, direct or indirect, adverse or beneficial.

10.4 BASELINE CONDITIONS

SOIL QUALITY

10.4.1. The Soil Survey of England and Wales 250K scale mapping[90] shows the majority of the scheme to be of the Teme Association; Deep stoneless permeable silty soils. Some similar soils variably affected by groundwater. Gravelly subsoil is present in places and is present on flat land with a risk of flooding.

10.4.2. The far eastern extent of the scheme has been surveyed in detail and is shown on the Dyfed IV map. Series to the west of Ffairfach within the scheme include Newnham series (reddish brown stoneless or slightly stony sandy loam or clay loams over stony sandy loam or sandy silt loam) and Alun series (dark brown stoneless sandy loam or sandy silt loam over a stoneless sandy loam).

AGRICULTURAL LAND CLASSIFICATION (ALC)

10.4.3. The ALC System classifies land into five grades, with Grade 3 subdivided into Subgrades 3a and 3b. The Best and Most Versatile (BMV) agricultural land is defined as Grades 1, 2 and subgrade 3a. This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals.

10.4.4. The Proposed Scheme passes through agricultural land, the majority of which has been classified by the Predictive ALC map for Wales as Subgrade 3a BMV agricultural land. Approximately 11 hectares of predicted BMV agricultural land was identified for surveying using the predictive map[91] and aerial photography within the Proposed Scheme boundary.

[90] Soil survey of England Wales. Soil Survey of England and Wales 250K scale mapping. 1983.

[91] Natural Resources Wales. Predictive Agricultural Land Classification (ALC) Map 2. 2020. Available at: http://lle.gov.wales/catalogue/item/PredictiveAgriculturalLandClassificationALCMap2/?lang=en

10.4.5. An ALC survey was carried out to confirm the predictions using the methodology described in MAFF revised guidelines[92] and set out in the Hollington Map Guidance Note[93]. The findings of this survey can be found in **Volume IV Appendix 8.A.** Some land mapped as predicted Subgrade 3a coincided with the extent of the former railway and was therefore not surveyed due to the subsurface comprising Made Ground.

10.4.6. The majority of the land was confirmed by the ALC survey as not being Subgrade 3a (BMV) as predicted, due to a climatological limitation, confirmed by extrapolating data from the Climatalogical data for Agricultural Land Classification[94].

10.4.7. Areas classified as non-agricultural land are present in the vicinity of the former railway between the southern bank of the River Tywi and the B3400, as well as where the railway runs through Riverbed Wood.

10.4.8. The area classified as Subgrade 3a (BMV) from the survey was located behind Bremenda Uchaf farm.

GEOLOGY

10.4.9. British Geology Survey (BGS) 1:50,000 scale mapping sheets Sheet 229, 230 and 212 and BGS Geology of Britain On-line Viewer[79] have been used to identify the underlying geology.

10.4.10. A large proportion of the Proposed Scheme was formally used as a railway including embankments, therefore large lengths of the proposed route are likely to be directly underlain by Made Ground.

10.4.11. BGS mapping indicates superficial deposits, comprising the Alluvial Fan, Till, Alluvium, Glaciofluvial Deposits and River Terrace Deposits underlie the site, it is likely that alluvium underlies the majority of the route. The underlying bedrock is shown to comprise predominantly mudstone with thin band outcrops of limestone across the route. The predominant bedrock type is mudstone of the Abergwilli Formation.

10.4.12. A summary of the geology across the length of the proposed route is provided in Table 10-6.

Table 10-6 – Site Geology Summary

Geological Unit	Description	Location
Made Ground	Various	Large proportion of the site was formally used as a railway and includes embankments, large lengths of the proposed route are likely to be directly underlain by Made Ground

[92] MAFF (1988): Revised guidelines and criteria for grading the quality of agricultural land.
[93] Predictive Agricultural Land Classification Map (Wales) The Hollington Map Guidance Note version 2.1 May 2021
[94] Meteorological office (1989). Climatological Data for Agricultural Land Classification. Grid point datasets of climatic variables, at 5km intervals, for England and Wales.

Geological Unit	Description	Location
Superficial	Description	Location
Alluvial Fan	Sands and gravels	Small area located in the far east, close to Ffairfach.
Glacial Till	Predominantly clay	Underlying east and west of route.
Alluvium	Clay, silt, sand and gravel with occasional layers of peat	Underlying the majority of the route.
Glaciofluvial Deposits	Sand and gravel	Located in the west of the site.
River Terrace Deposits	Sand and gravel	Located in the west of the site, adjacent to either side of River Cothi.
Solid Geology	Description	Location
Hendre Shale Formation	Mudstone	Far west (thin band outcropping)
Mydrim Limestone Formation	Limestone	Far west (thin band outcropping)
Mydrim Shales Formation	Mudstone	West (thin band outcropping)
Sholeshook Limestone Formation	Limestone	West (thin band outcropping)
Nantmel Mudstones Formation	Mudstone	West
Tetragraptus Beds	Mudstone	West
Nantmel Mudstones Formation	Mudstone	West
Abergwilli Formation	Mudstone	Underlines the majority of the route

BGS Borehole Data

10.4.13. The BGS GeoIndex database[79] presents several borehole records located within 500 m of the Proposed Scheme. A summary of the borehole details is included within Table 10-7 and the full record is provided within Appendix E of the PGR (**Volume IV Appendix 8.A**).

Table 10-7 – Summary of Available BGS Borehole Records

Stratum	Description	Encountered Depths (m bgl)	
		Top (m)	**Base (m)**
BGS Borehole ID: SN52SW/16 – NGR 5076.2010			
Topsoil	Topsoil	0.00	0.05
Made Ground	Soft brown silty gravelly clay	0.05	3.00

Stratum	Description	Encountered Depths (m bgl)	
		Top (m)	Base (m)
Boulder Clay	Firm to stiff, brown sandy gravelly silty CLAY with cobbles and boulders	3.00	12.25
Shaley Sand	Dense grey medium grained shaley SAND	12.25	16.00
Boulder Clay	Stiff dark grey black gravelly silty CLAY and gritstone cobbles	16.00	19.60
Boulders	Nest of boulders	19.60	19.90
Siltstone	Fresh fractured dark grey medium grained strong SILTSTONE	19.90	24.70
Ground water	Water struck	12.00	
BGS Borehole ID: SN52SW/17 – NGR 5288.2066			
Made Ground	No description	0.00	0.30
Made Ground	Soft brown silty gravelly clay	0.30	2.60
Alluvium	Firm grey clayey SILT	2.60	4.00
Alluvium	Firm grey very clayey SILT	4.00	8.17
Alluvium	Dense brown grey gravelly SAND	8.17	15.74
Gravel	Dense brown grey GRAVEL	15.74	15.97
Gravel	Dense slightly clayey shale GRAVEL	15.97	20.00
Boulder Clay	Stiff dark grey very strong CLAY	20.00	23.30
Tetragraptus Beds - Mudstone	Fresh fractured dark grey fine grained moderately strong MUDSTONE	23.30	28.30
Ground Water	Ground Water Level	7.55	
BGS Borehole ID: SN32SW/18 – NGR 5336.2098			
Topsoil	Topsoil	0.00	0.06
Alluvium	Soft red brown very sandy silty CLAY	0.06	2.00

Stratum	Description	Encountered Depths (m bgl)	
		Top (m)	Base (m)
Alluvium	Dense dark grey clayey sandy GRAVEL with mudstone and cobbles	2.00	7.50
Alluvium	Dense dark grey slightly clayey gravelly SAND with occasional cobbles and clay	7.50	19.84
Alluvium	Stiff dark grey very sandy silty CLAY	19.84	24.34
Nantmel Mudstone	Dark grey fine grained moderately strong MUDSTONE	24.34	24.49
Ground Water	Standing Water Level	1.75	

Coal Mining

10.4.14. The Proposed Scheme is not located in an area that has been subject to coal mining[76].

HYDROGEOLOGY

10.4.15. The pertinent hydrogeological details for the site are summarised within Table 10-8.

Table 10-8 – Hydrogeological Site Details Summary

Hydrogeological Aspect	Details
Superficial Geology	Alluvium, Alluvial Fan Deposits, River Terrace Deposits - Secondary B aquifers Secondary B aquifers are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features, such as fissures, thin permeable horizons and weathering. Glacial Till - Unproductive strata Unproductive strata are defined as geological strata with low permeability that have negligible significance for water supply or river base flow.
Solid Geology	Mudstone Units - Secondary B aquifers (as above) Limestone Units - Secondary A aquifers Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Hydrogeological Aspect	Details
Groundwater Safeguard Zone	The site is located in a Natural Resource Wales Drinking Water Protection Area
Groundwater Source Protection Zone	None located within 1km of the site.
Groundwater abstractions	429m south – Mr J Davies, well abstraction Farmhouse at Tycastell for general farming and domestic use, daily rate not supplied. 446m south – Mr M Watler, well abstraction at Llandilo-Yr-Ynys, general farming and domestic use, daily rate not supplied 451m south - Mr M Watler, well abstraction at Llandilo-Yr-Ynys, food and drink: water bottling use, daily rate not supplied 495m south west – Dwr Cymru Cyfyngedig, River Tywi at Nantgaredig to Felindre for Public Water Supply: Potable Water Supply – Direct, daily rate not supplied

HYDROLOGY

10.4.16. The Proposed Scheme is located within the Natural Resource Wales defined Western Wales River Basin District (extends across the entire western half of Wales from the Vale of Glamorgan in the South, to Denbighshire in the North). Details of surface watercourses that are present on or considered to be within the zone of influence of the site are included within Table 10-9.

Table 10-9 – Surface Water Bodies on or Surrounding the Proposed Scheme

Surface Water Feature	Location (approximately)	Flow direction
River Tywi	On and adjacent to the Proposed Scheme	West
River Cothi	On and to the northeast of the Proposed Scheme	South (tributary of River Tywi)
Various unnamed tributaries of the Tywi	Passing under the proposed route of the Scheme.	North and south
Various unnamed ponds	Located within 50m of the Proposed Scheme boundary.	-

10.4.17. The entire length of the route generally follows the alignment of the River Tywi. The western extent of the route runs to the north of the River Tywi, before crossing the watercourse the route then follows to the south of the river until Llandeilo. The route also crosses the River Cothi. Sections of the route are located within the floodplain of the River Tywi.

Surface water abstractions

10.4.18. No surface water abstractions are recorded within 1km of the site within the Envirocheck Report displayed within the PGR (**Volume IV Appendix 8.A**).

UNEXPLODED ORDNANCE

10.4.19. The Zetica regional unexploded bomb risk map for South Wales indicates the site is an area of very low risk with respect to unexploded ordnance[95].

ECOLOGICAL DESIGNATIONS

10.4.20. The site is within 250m of land designated as a SSSI and cSAC and a NNR as shown in Table 10-10 below.

Table 10-10 – Designated Sites within 250m of the Proposed Scheme

Site Name and Designation	Details	Location
River Tywi– SSSI and SAC	Designation associated with the protection of fish, birds and mammals.	Immediately adjacent – proposed route also crosses the designation in the west.
Dinefwr Estate – SSSI and NNR	Destination associated with the protection of lichen, invertebrate assemblages and plants.	Adjacent northeast

10.4.21. No geologically important designated sites have been identified on or surrounding the Proposed Scheme.

POTENTIAL SOURCES OF CONTAMINATION

Site History

10.4.22. The site history has been assessed by reviewing historical mapping presented within the PGR (**Volume IV Appendix 8.A**). A summary of the pertinent site history is provided below.

10.4.23. The majority of the route follows the former Carmarthen – Llandeilo railway line (1865-1963) and therefore has areas of embankments / made ground of unknown composition which could be a potential source of metals, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) and asbestos.

10.4.24. The immediate surrounding area is agricultural use and therefore there is a low level potential for pesticide and herbicide based contaminants.

10.4.25. Off-site surrounding industrial premises have been identified including two depots, livestock market and a garage which may be a potential source for heavy metals, asbestos,

[95] Risk Maps | Zetica UXO

polyaromatic hydrocarbons, oils and fuels, and Ffairfach Sewage Treatment Works a potential source of pathogens, pesticides and heavy metals.

10.4.26. Environment Agency and Natural Resource Wales records show no historical or authorised landfill on or within 250 m of the site. However, during the walkover carried out by Capita, waste was recorded to have been deposited in a cutting east of Ystrad Isaf and within a shallow cutting east of the Cothi river crossing. WSP contacted CCC's Public Protection Team to enquire if they hold any further information on contaminated land related issues associated within the route of the Proposed Scheme. Should further pertinent information be obtained this report will be updated accordingly and re-issued.

Radon

10.4.27. The PGR (**Volume IV Appendix 8.A**) indicates that the route of the scheme passes through bedrock recorded as emitting radon above safe action limits for new homes.

RECEPTOR / RESOURCE SENSITIVITY

10.4.28. The sensitive receptors to contamination are summarised within Table 10-11.

Table 10-11 – Receptor/Resource Sensitivity

Receptor	Sensitivity	Rationale
Human health (construction workers and maintenance workers)	High	Potential for construction workers to come into direct contact with contaminants over duration of construction phase.
Human Health (future site Users)	High	Site users will be partaking in use of public open space.
Sensitive Land Designations (SSSI, cSAC, NNR)	High	Areas along route are designated and should be considered.
Underlying Secondary A and Secondary B aquifer.	Medium	The site is not located with a SPZ. One potable groundwater abstraction is located within 500m of the site. Superficial deposits are less permeable but allowing free transport of contaminants to groundwater and surrounding surface waters.
Surface water features (River Tywi, River Cothi, unnamed watercourses and ponds	Medium	The River Tywi is considered to be a major watercourse and is also designated as a SSSI.
Built Environment	Medium	Foundations will be required as part of the construction of the new bridges.

Soils Resource (agricultural land)	Medium (Grade 3b) Very High (Grade 3a)	The route crosses predominantly Grade 3b land with some Grade 3a Moderate quality agricultural land. Following IEMA guidance all BMV land in Wales is very high sensitivity. The sensitivity is limited due to the limited agricultural land being permanently sealed with the proposed design (<20 ha).

Contaminant Linkage Summary

10.4.29. The Proposed Scheme use comprises an unsegregated shared use path for cyclists and pedestrians predominantly following the route of the former railway line. There are large areas of grassland in the north of the site. The extent of contamination at the site (if present) is unknown and therefore a potential contamination linkage summary is based on a worst-case scenario. Based on this and the proposed end use, the following potential contaminant linkages are considered to be active (Table 10-12).

Table 10-12 – Potential Contamination Linkage Summary

Source	Pathways	Receptor	Risk Rating
Route of former railway (asbestos, heavy metals, fuels, oils, polyaromatic hydrocarbons, pesticides)	Inhalation of soil-derived dust	Future site users (unsurfaced areas only)	Low
	Inhalation of soil-derived dust.	Earthworks and below ground maintenance workers	Low (assuming appropriate PPE to be worn and dust suppression measures are taken)
	Inhalation of soil-derived dust.	Neighbouring third-parties (no nearby residential properties)	Low (assuming standard site practices to be incorporated into earthworks)
Surrounding former /current industrial premises (off route)	Inhalation of soil-derived dust	Future site users (unsurfaced areas only)	Low
	Inhalation of soil-derived dust.	Earthworks and below ground maintenance workers	Low
	Inhalation of soil-derived dust.	Neighbouring third-parties (no nearby	Low

Source	Pathways	Receptor	Risk Rating
		residential properties)	
Potential groundwater contaminants	Made ground run-off	River Tywi, River Cothi, unnamed surface water features and underlying Secondary A and Secondary B Aquifer.	Low to Moderate
	Surrounding former/current industrial premises		Low to Moderate
	Herbicide and pesticide run-off.		Low to Moderate
Encountering UXO	Issues of encountering UXO when undertaking construction earthworks.	Construction workers	Low – UXO Map reviewed

FUTURE BASELINE

10.4.30. Should the Proposed Scheme not proceed, it is considered that the future baseline conditions in relation to ground conditions and contamination would remain relatively unchanged. The baseline is only likely to change in future if legislation changes (i.e. change in acceptable contamination concentration in the environment), if a new groundwater abstraction/potable well is installed close-by (meaning that the Proposed Scheme is then located within a SPZ) or if surrounding land-uses change. In regards to soils, it is considered that the soils themselves would remain largely similar, however in a changing climate with more extremes the soil functions would become more important due to the likelihood of flooding. This may also alter the ALC grading reducing the sensitivity of the soils.

10.5 SENSITIVE RECEPTORS

10.5.1. The following are the sensitive receptors which have been assessed:

- Human Health related: construction workers, maintenance workers, people on neighbouring third-party land, future site users;
- Controlled Waters: surface water features (rivers, ponds and streams) and underlying Secondary 'A' and Secondary 'B' Aquifers;
- Ecological Designated Sites: SSSI, cSAC and NNR within 250 m of the site;
- Built Environment: foundations to the proposed bridges;
- Agricultural Land: Subgrade 3b; and,
- Agricultural Land: Subgrade 3a (BMV) quality agricultural land.

10.5.2. Sensitive receptor locations are provided in the PGR (**Volume IV Appendix 8.A**).

10.6 RELEVANT ELEMENTS OF THE PROPOSED SCHEME AND ESTABLISHING THE PRE-MITIGATION SCENARIO

CONSTRUCTION PHASE

10.6.1. The construction phase of the scheme will be undertaken in accordance with industry best-practice and regulatory requirements. A CEMP will also be in place for the development.

10.6.2. A temporary drainage strategy will be implemented during the construction phase as part of the design solution.

10.6.3. It is assumed that remedial measures incorporated with a Remediation Strategy (if required) will be incorporated into the construction phase. These may include incorporating a clean cover layer in landscaped areas and appropriate management of the asbestos fibres during the earthworks phase.

10.6.4. The CEMP will provide measures to protect sensitive environmental receptors during the construction phase, including:

- Waste management;
- Dust and air pollution; and,
- Pollution prevention controls.

OPERATIONAL PHASE

10.6.5. It is assumed that ground stability risks will have been addressed as part of the design of the Proposed Scheme. As such, potential effects associated with ground instability are not considered as part of the operation phase.

10.7 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION PHASE

Disturbance of contaminated ground and / or uncontrolled chemical discharge / spillages to controlled water bodies

10.7.1. Controlled water receptors considered as being potentially susceptible to impact from contaminants include underlying Secondary A and Secondary B aquifers associated with the superficial and bedrock and surrounding surface water courses (River Tywi, River Cothi and various unnamed tributaries and ponds – not classified).

10.7.2. Additionally, the River Tywi is classified as a SSSI with part of this designation related to the protection of fish.

10.7.3. The potential contaminant pathways include leaching from the unsaturated zone to groundwater; surface water run-off; and vertical and lateral migration within groundwater resources off-site and towards surface water courses.

10.7.4. Potential historical sources of contamination have been identified within the unsaturated soil. Further localised areas of contamination may be present given the historical use of the site. Earthworks associated with the construction of the Proposed Scheme could potentially disturb and release mobile historical contamination.

10.7.5. The use of machinery and plant associated with construction activities (including the establishment of a site compound and storage of any chemicals or fuels) could give rise to a pollution risk to soils, groundwater and surface water features through accidental fuel / oil and chemical spills and leaks. Soils impacted by spills and leaks may represent a source of contamination to controlled waters via leaching.

10.7.6. There is the potential for any deep excavations to require dewatering, water pumped from excavations may contain contaminants, which if not managed appropriately could result in discharge to surrounding surface water courses.

10.7.7. There could also be a risk of potentially contaminated runoff, including hydrocarbon contamination and high suspended solid loads, associated with the operation of vehicles. This has the potential to create overland migration pathways.

10.7.8. The sensitivity of controlled water bodies is considered to be **high**, and the magnitude of change prior to mitigation, is considered to be **moderate**. Therefore, there is likely to be a **direct, temporary, short to medium term** effect on controlled water receptors of **moderate adverse** significance prior to the implementation of mitigation measures.

Mitigation / Enhancement

10.7.9. Construction works will be undertaken in accordance with industry best practice requirements and will include, but not be limited to, the following procedures:

- Formulation of a detailed incident response plan to mitigate potential risks should spill/ leaks occur during construction;
- The provision of spill kits and associated training;
- The provision of appropriate PPE for all site workers; and
- Undertaking toolbox talks for site staff to advise on particular pollution risks.

10.7.10. The site works will be undertaken in accordance with the Natural Resources Wales' Guidelines for Pollution Prevention. In particular, the following are considered relevant to this assessment:

- GPP1 'General Guide to the Prevention of Water Pollution';
- GPP5 'Works or Maintenance in or Near Water';
- GPP6 'Working at Construction and Demolition Sites'; and
- GPP21 'Pollution incident Response Planning'

10.7.11. All equipment, materials and chemicals will be stored at a suitable distance away from surface watercourses (greater than 50 m).

10.7.12. Chemical and oil stores will be sited on bunded areas. Standing machinery will have drip trays placed underneath to prevent oil or fuel leaks causing pollution. Refuelling of vehicles and machinery will be carried out in one designated area with spill kits located close by in the event of a spill on an impermeable surface, a suitable distance away from surface water bodies.

10.7.13. On-site welfare facilities will be adequately designed and maintained to ensure sewage is disposed of appropriately.

10.7.14. The use of wet concrete around watercourses will be minimised and carefully controlled.

10.7.15. The above measures will be incorporated into the outline CEMP, which will be produced and agreed with the regulator prior to works beginning on site.

Residual Effects

10.7.16. The sensitivity of controlled waters is **high**, and the magnitude of change following mitigation is **negligible**. Therefore, there is likely to be a **direct, temporary short to medium term** residual effect of **slight adverse** significance following the implementation of the mitigation

measures and therefore, not a likely significant effect to controlled waters following implementation of the mitigation measures.

Disturbance of contaminated ground resulting in harm to human health as well as release of contaminated soil / dust to the surrounding environment

10.7.17. If human health receptors are exposed to contaminants above relevant threshold concentrations there is potential for both temporary and permanent health problems to arise dependent on a number of factors including type of potential contaminant, characteristics of receptor and duration of exposure. The length of exposure will depend on the amount of time workers spend on the site, but it could potentially extend to the full assumed extent of the construction phase.

10.7.18. Potential sources of contamination have been identified on-site within the desk study, assumed to include inhalation of asbestos fibres at this stage, prior to any ground investigation works being completed.

10.7.19. Excavation of potentially contaminated soils could also pose a health risk to the general public in the immediate vicinity of the site if stored near PROW, through inhalation of contaminated dusts and particulate matter generated by excavation activities. Contaminated dusts could travel to nearby agricultural land, potentially affecting plant uptake if not appropriately managed.

10.7.20. The use of machinery and plant associated with site preparation, earthworks and construction activities (including the establishment of a site compound) could give rise to contamination risk to soils, through accidental fuel/oil spills and leaks, and storage of chemicals or fuels. Soils impacted by fuel/oil spills and leaks may represent a future source of contamination to human health.

10.7.21. The sensitivity of human health receptors is **medium** and the magnitude of change, prior to mitigation, is **moderate**. Therefore, there is likely to be a **direct, temporary and/or permanent, medium to long term** effect on human health of **moderate adverse** significance prior to the implementation of mitigation measures.

Mitigation / Enhancement

10.7.22. The movement of excavated Made Ground around the site will be undertaken under a CL:AIRE compliant Materials Management Plan to ensure material re-used does not present a risk to human health or the environment.

10.7.23. All persons engaged in earthworks and construction will be made aware of the findings of the ground investigation and the potential for contamination to be present. The findings of the ground investigation will be incorporated into a CEMP to ensure that an appropriate level of mitigation is provided. A site-specific health and safety plan will also be produced in accordance with CDM 2015 regulations.

10.7.24. Prior to works starting, personnel involved in earthworks will require a toolbox talk to provide advice on general contamination, with particular emphasis on the management of asbestos.

10.7.25. Site workers will wear appropriate Personal Protective Equipment (PPE).

10.7.26. It will be the responsibility of the Principal Contractor, in accordance with CDM 2015 Regulations, to ensure that a safe working system is in place to deal with the risk of asbestos identified on site. Prior to the commencement of works where there is a potential

for asbestos containing materials (ACMs) to be disturbed, an assessment of risk is required. The person undertaking the Risk Assessment must be competent to do so in line with Regulation 10 of Control of Asbestos Regulations (CAR), 2012. The Principal Contractor will be responsible for the provision of an appropriate risk assessment, in line with Regulation 6 of CAR, which must include the following:

- Description of work including type and duration;
- Type, quantity and condition of ACMs;
- Steps to reduce exposure to the lowest level reasonably practicable including detail of how stockpiles will be conditioned/ managed to prohibit dust migration during periods of high wind;
- The reasons for the chosen work methods;
- Steps taken to control the release of asbestos into the environment;
- Details of expected exposure and number of people affected;
- Details on the type and use of RPE and PPE;
- Details of decontamination procedures;
- Procedures for waste removal;
- How to deal with emergencies; and
- Other info relating to safe working.

10.7.27. All of the above measures and other relevant good site practices to avoid/minimise the likely significant effects at source, will be included within the CEMP and enforced throughout the construction phase.

Residual Effects

10.7.28. The sensitivity of the human health receptors is **high**, and the magnitude of change, following mitigation is **negligible**. Therefore, there is likely to be a **direct, temporary and / or permanent, medium to long term** effect of **slight** significance and therefore, not a likely significant effect to human health following implementation of the mitigation measures.

Potential exposure to hazardous ground gas in confined spaces, as well as ingress into neighbouring properties

10.7.29. Variable composition and thicknesses of Made Ground deposits on site with the low level potential to generate hazardous ground gases and the underlying geology has been identified as a radon emitting rock. To date no ground gas monitoring has not been undertaken at the site, therefore at this stage it is assumed that hazardous gas may be present on site, until ground investigation information can prove otherwise.

10.7.30. Construction workers are considered to be susceptible to exposure to hazardous gases and/or depleted oxygen levels within excavations or confined spaces associated with the earthworks and installation of any below ground infrastructure (i.e. drainage chambers).

10.7.31. There is the potential for any hazardous gases present at the site to migrate offsite into neighbouring properties and below ground infrastructure.

10.7.32. The sensitivity of human health receptors is **medium** and the magnitude of change, prior to mitigation, is **major**. Therefore, there is likely to be a **direct, temporary and/or permanent, short to long term** effect on human health of **large adverse** significance prior to the implementation of mitigation measures.

Mitigation / Enhancement

10.7.33. Ground investigation, including the installation of suitably designed ground gas monitoring wells to obtain ground gas data, to be completed ahead of a risk assessment to understand the potential risks.

10.7.34. In the event that elevated concentrations of ground gas are identified where entry into confined spaces and/or excavations is required by construction workers, a combination of appropriate PPE, monitoring equipment, safe entry procedures and Respiratory Protective Equipment (RPE) will be utilised where required to mitigate the potential risk of exposure to hazardous gas/vapour and/or depleted oxygen.

10.7.35. All works will be conducted in line with the Health and Safety Executive publication 'Safe Work in Confined Spaces'[15].

Residual Effects

10.7.36. The sensitivity of the human receptors is **medium,** and the magnitude of change, following mitigation is **negligible**. Therefore, there is likely to be a **direct, temporary and/or permanent, short to long term** effect of **slight adverse** significance and therefore, not a likely significant effect to human health following implementation of the mitigation measures.

Potential for ground instability and potential effects on construction workers

10.7.37. The desk study did not identify any potential ground instability hazards. It is unlikely any deep earthworks shall be undertaken as part of the scheme, therefore ground instability due to underlying Made Ground or granular superficial deposits are considered unlikely. However, low level potential instability risks include trench collapse during excavation and ground compression from heavy machinery.

10.7.38. There are potential risks to site preparation, earthworks and construction workers during import of materials and ground improvement methods (e.g. surcharge and piling), however, those are not expected as part of this scheme.

10.7.39. The sensitivity of human health receptors is **high** and the magnitude of change, prior to mitigation, is **moderate**. Therefore, there is likely to be a **direct, temporary and/or permanent, short to long term** effect on human health of **moderate adverse** significance prior to the implementation of mitigation measures.

Mitigation / Enhancement

10.7.40. All Site personnel should be made aware of the findings of the potential risk of instability hazards. Any loss of ground or instability during the site works should be reported to an engineer and fully investigated. The works should be conducted in accordance with the CDM Regulations 2015. A risk assessment should be prepared to ensure the protection of workers and the general public during the site preparation, earthworks and construction phase, which will specify appropriate safe working practices.

10.7.41. Mitigation measures may include pumping of water from excavations and temporary shoring to ensure the stability of open excavations. If dewatering is required, abstraction and discharge licences will be sought from the NRW under the terms of the Environmental Permitting Regulations 2010.

Residual Effects

10.7.42. The sensitivity of the human health receptors is **medium**, and the magnitude of change following mitigation is **negligible**. Therefore, there is likely to be a **direct, temporary and/or permanent, short to long term** effect on human health of **neutral** significance and therefore, not a likely significant effect to human health following implementation of the mitigation measures.

Loss of best and most versatile agricultural land

10.7.43. The Proposed Scheme crosses through land which is mainly in agricultural use however predominantly located on a slightly raised embankment which is not in agricultural use (a former railway embankment). From the ALC survey, land which from aerial view looked to be agricultural was classified as non-agricultural due to the presence of grassed over hardstanding paths. The majority of the surrounding agricultural land is classified as Grade 3b moderate quality agricultural land due to climate, wetness or site factors (approximately 21ha) and the remaining land (approximately 12ha) is classified as Grade 3a.

10.7.44. There will be areas where there will be agricultural land used for access during construction and which would be affected temporarily during the construction period. This may lead to temporary compaction or degradation of soil. There will be some permanent land take and degradation of soil function where the proposed scheme crosses agricultural land of under 5ha. No other soil receptors were identified using DMRB LA109 or IEMA 2021 guidance.

10.7.45. The sensitivity of the land classified as BMV **(**Grade 3a) agricultural land receptor is **very high.** The magnitude of change for, prior to mitigation, is **minor** due to the permanent land take of under **5ha.** Therefore, there is likely to be a **direct, temporary, short term** effect on BMV agricultural land of **moderate adverse** significance.

10.7.46. The sensitivity of the non-BMV (Grade 3b) agricultural land receptor is **medium and** the magnitude of change for, prior to mitigation, is **minor.** The effect would be **slight adverse** (not significant).

Mitigation / Enhancement

10.7.47. Further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario, is the creation and use of sustainable soil handling methods either in a separate soil handling management plan or within the CEMP.

Residual Effects

10.7.48. The sensitivity of non-BMV (Grade 3b) agricultural land is **moderate and t**he magnitude of change after mitigation is **minor due to the permanent loss of less than 5ha** . The residual sensitivity will be a **direct, temporary, short-term** effect of **slight adverse** significance for non-BMV land therefore, not a likely significant effect on non-BMV agricultural land following mitigation methods.

10.7.49. The sensitivity of BMV (Grade 3a) agricultural land is **very high** for and the magnitude of change after mitigation is **minor.** For BMV land the residual sensitivity is a **direct, temporary, short-term** effect of **moderate / large adverse** significance after mitigation. This is due to the sealing of a small amount of BMV land.

OPERATIONAL PHASE

Disturbance of contaminated ground and / or uncontrolled chemical discharge / spillages to controlled waters

10.7.50. Once the Proposed Scheme is operational, there will be minimal disturbance of the ground and it would be very unlikely that uncontrolled chemical discharges/spillages to controlled waters would occur.

10.7.51. There are no further mitigation or enhancement measures to be employed beyond those already stated in the pre-mitigation scenario.

10.7.52. Agricultural land has been discounted from the operational phase as the land is already lost during the construction phase and no further changes will occur.

10.7.53. The sensitivity of the controlled water bodies is **high** and the magnitude of change during operation following embedded mitigation is **negligible**. Therefore, there is likely to be a **direct, permanent slight adverse** significance and therefore, not a likely significant effect on controlled waters.

Disturbance of contaminated ground resulting in harm to human health as well as release of contaminated soil / dust to the surrounding environment

10.7.54. There will be minimal disturbance to contaminated ground during the operational phase assuming that all mitigation measures relating to potential exposure have been implemented during the construction phase.

10.7.55. No further mitigation or enhancement measures are to be employed beyond those already stated in the pre-mitigation scenario.

10.7.56. The sensitivity of future site users is **high** and the magnitude of change is **negligible** resulting in a **direct, permanent neutral** significance and therefore, not a likely significant effect on human health.

Potential exposure to hazardous ground gas in confined spaces, as well as ingress into neighbouring properties

10.7.57. Maintenance workers may potentially be exposed to any hazardous ground gas (if present) during routine maintenance.

10.7.58. There are no further mitigation measures beyond those outlined in the section above relating risk of exposure to ground gas during the construction phase.

10.7.59. The sensitivity of human health receptors is **high** and the magnitude of change is **negligible** resulting in a **direct, temporary and/or permanent slight adverse** significance and therefore, not a likely significant effect on human health.

Loss of best and most versatile agricultural land

10.7.60. The loss of BMV can be scoped out of the operational phase as there will be no further loss after construction.

10.8 LIMITATIONS AND ASSUMPTIONS

10.8.1. The findings of supplementary works, where required to support the discharge of planning conditions applied to the application (e.g. Ground Investigation), will be incorporated into the final CEMP to ensure that an appropriate level of mitigation is provided. Risk assessments to further characterise soil contamination and ground gas risks will be updated following receipt of further information associated with additional ground investigation works.

10.8.2. It is assumed that material moved around the site or imported onto site during the construction phase (e.g. to obtain required ground elevations) will have been subject to appropriate chemical testing (and will be geotechnically suitable) and will therefore not present a risk to controlled waters (e.g. via leaching of potential contaminants) or human receptors.

10.8.3. It is assumed that any proposed temporary and permanent design drainage strategies will be implemented appropriately.

10.9 SUMMARY

10.9.1. It is considered that the construction and operational phases of the Proposed Scheme will have minimal effect on the baseline conditions along the route with the exception of agricultural land.

10.9.2. The Proposed Scheme route predominantly follows Carmarthen – Llandeilo railway line (including cuttings, embankments and stations), with two depots, a garage, a sewage works and a livestock market also noted within the vicinity of the Proposed Scheme.

10.9.3. The anticipated ground conditions are made ground, underlain by superficial deposits including Alluvium, Alluvial Fan Deposits, River Terrace Deposits and Glacial Till. The underlying bedrock is predominantly mudstone with some limestone units. The superficial deposits have been identified as Secondary B aquifer and Unproductive Strata, the underlying bedrock have been classified as Secondary A and Secondary B Aquifers. The underlying geology has been identified as being a source of radon gas.

10.9.4. The nearest surface water features are River Tywi, River Cothi and various unnamed tributaries and ponds, with the Proposed Scheme route crossing the River Tywi and River Cothi. In addition, there is a potable water abstraction is present within 500 m of the site.

10.9.5. The residual effects during construction are considered to be as follows:

- Disturbance of contaminated ground and/or uncontrolled chemical discharges/spillages are likely to have a direct, temporary, short to medium term slight adverse residual effect significance on controlled waters;
- Disturbance of contaminated ground resulting in harm to human health/release of contaminated soil/dust to the surrounding environment is likely to have a direct, temporary and/or permanent, medium to long term neutral residual effect significance on human health;
- Potential for exposure to hazardous ground gas in confined spaces is likely to have a direct, temporary and/or permanent, short to long term slight adverse residual effect significance on human health;
- Potential for ground instability to affect construction workers is likely to have a direct, temporary and/or permanent neutral residual effect significance on human health; and,
- The loss of under 5ha of best and most versatile agricultural land is likely to have a direct, temporary, short term adverse residual effect.

10.9.6. The residual effects during operation are assessed to be as follows:

- Disturbance of contaminated ground and/or uncontrolled chemical discharges/spillages are likely to have a direct, temporary, short to medium term slight adverse residual effect significance on controlled waters;

- Disturbance of contaminated ground resulting in harm to human health/release of contaminated soil/dust to the surrounding environment is likely to have a direct, temporary and/or permanent, medium to long term neutral residual effect significance on human health; and
- Potential for exposure to hazardous ground gas in confined spaces is likely to have a direct, temporary and/or permanent, short to long term slight adverse residual effect significance on human health.

10.9.7. Table 10-13 presents a summary of the significant effects identified as part of this assessment.

Table 10-13 – Summary of Significant Effects

Description of Effects	Receptor	Significance and Nature of Effects Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement	Significance and Nature of Effects Following Mitigation / Enhancement (Residual)
Construction Phase				
No significant effects identified	n/a	n/a	n/a	n/a
Operational Phase				
No significant effects identified	n/a	n/a	n/a	n/a

10.10 REFERENCES

- WSP (2018), Tywi Valley Path Eastern Phase - Preliminary Geo-Environmental Assessment Report.
- UK Government (1990), The Environmental Protection Act 1990.
- UK Government (1995), The Environment Act 1995.
- UK Government (2002), The Control of Substances Hazardous to Health Regulations 2002.
- UK Government (2017), The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
- European Commission (2006), The Dangerous Substances Directive (Amendment) 2006.
- UK Government (2009), The Environmental Damage and Liability (Prevention and Remediation) Regulations 2009.
- UK Government (2016), The Environmental Permitting (England and Wales) Regulations 2016.
- UK Government (2012), The Control of Asbestos Regulations 2012.
- Welsh Government (2012), The Contaminated Land (Wales) (Amendment) Regulations 2012.
- UK Government (2015), The Construction (Design and Management) (CDM) Regulations 2015.
- Health and Safety Executive (HSE) (1991) Guidance Note HS (G) 66, Protection of Workers and the General Public during the Development of Contaminated Land.
- CIRIA C532 (2001) Control of Pollution from Construction Sites
- Environment Agency (2004) Model Procedures for the Management of Contaminated Land (CLR11).
- HSE (2006) INDG258 Safe Work in Confined Spaces.
- Construction Industry Research and Information Association (CIRIA) 665 (2007), Assessing Risks Posed by Hazardous Gases to Buildings.
- Environment Agency and NHBC (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66.
- CIRIA C682 (2009), 'The VOCs Handbook'.
- British Standards Institute (BSI) (2011) BS 10175: Investigation of Potentially Contaminated Sites – Code of Practice.
- HSE (2012), Control of Asbestos Regulations.
- Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012.
- Environment Agency (2012) Groundwater Protection: Policy and Practice (GP3).
- BSI (2015) BS 5930: The Code of Practice for Site Investigations.
- BSI (2013) BS 8576: Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- CIRIA (2014) C735 Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases.
- BSI (2015) BS 8485: Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments.
- MAFF (1988), Agricultural Land Classification of England and Wales: The Revised Guidelines and Criteria for Grading the Quality of Agricultural Land.
- UK Government (2014) Planning Guidance Note: Land Affected by Contamination.

- UK Government (2014) Planning Guidance Note: Land Stability.
- UK Government (2014) Planning Guidance Note: Natural Environment.
- UK Government (2014) Planning Guidance Note: Water Supply, Wastewater and Water Quality.
- Capita (2014), Tywi Valley Transport Corridor Concept – Geotechnical Scoping Report.
- AECOM (2013), Tywi Valley Transport Corridor Concept – Environmental and Ecological Scoping Study.
- Coal Authority Interactive Mapping http://mapapps2.bgs.ac.uk/coalauthority/home.html (accessed 2 January 2019).
- Ordnance Survey Mapping (Landmark Report Refs. 177895618_1, 177897999_1, 177899281_1, 177900002_1, 177900885_1, 177908187_1, 177914744_1 and 177913531_1).
- MAGIC Online Mapping https://magic.defra.gov.uk/ (accessed 2 January 2019).
- BGS Online Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html (accessed 2 January 2019).
- National Soils Resource Institute Soilscapes data http://www.landis.org.uk/soilscapes/ (accessed 2 January 2019).
- Welsh Government Predictive Agricultural Land Classification Map Online Viewer https://lle.gov.wales/catalogue/item/PredictiveAgriculturalLandClassificationALCMap/?lang=en (accessed 2 January 2019).
- Highways Agency (1993), Design Manual for Roads and Bridges – Volume 11 Section 3 Part 11 Geology and Soils.
- CIRIA (2014), Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (C733).

11 POPULATION AND HUMAN HEALTH

11.1 INTRODUCTION

11.1.1. This chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Scheme on Population and Human Health, with a focus on land use and accessibility.

11.1.2. The chapter outlines the relevant legislative and policy framework, describes the assessment methodology, the baseline conditions at the site and in the surrounding area, and identifies the potential impacts as a result of the Proposed Scheme. It provides a summary of the likely significant effects, and describes any further mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these measures have been employed.

11.1.3. This chapter is intended to be read as part of the wider ES, with particular reference to the introductory chapters (Chapters 1-5), Chapter 6 – Landscape and Visual, Chapter 7 – Historic Environment; and Chapter 10 Ground Water and Contamination.

11.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

LEGISLATIVE FRAMEWORK

11.2.1. The applicable legislative framework is summarised as follows:

- Countryside and Rights of Way Act (2000);
- The Localism Act (2011)
- Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations).

POLICY FRAMEWORK

Planning Policy Wales (Edition 11) (2021)

11.2.2. Planning Policy Wales (REF) was revised in 2021 and sets out the Welsh government's planning policies and how these should be applied, aiming to ensure that the planning system contributes towards sustainable development, improving the "social, economic, environmental and cultural well-being of Wales".

11.2.3. Applicable chapters to the Proposed Scheme include Chapter 4: Active and Social Places, and Chapter 6: Distinctive and Natural Places. Within Chapter 4, the section on moving within and between places emphasises the need to focus on sustainable and non-motorised travel, "reducing reliance on the private car and supporting a modal shift to walking, cycling and public transport" and making short journeys easily possible without using vehicles. Chapter 6 considers natural landscape and the potential to enhance the "opportunities landscapes provide for tourism, outdoor recreation, local employment, renewable energy and physical and mental health and well-being are taken into account and multiple well-being benefits for people and communities secured".

11.2.4. When delivering new schemes, applicants must avoid and mitigate environmental and social impacts in line with the principles set out in Planning Policy Wales and the opportunities to deliver environmental and social benefits as part of schemes.

Carmarthenshire Local Development Plan 2006 – 2021 (2006)

11.2.5. The Carmarthenshire Local Development Plan (LDP) was due to be updated in 2021, however the adoption of a new plan has been delayed with the current still providing the adopted guidance for development in Carmarthenshire. The LDP vision includes valuing the countryside as a priority for both residents and visitors to the area. Of relevance to the Proposed Scheme is Policy TR4: Cycling and Walking, which notes that the Towy Valley is a key location for improvements to proposed routes (including for horse riders) with linkages to rights of way from the wider pedestrianised transport network.

GUIDANCE

11.2.6. The principles of DMRB Volume 11 Section 3 LA 112 Population and human health, 2020 (formerly DMRB Volume 11, Section 3, Part 6 (Land), Volume 11, Section 3, Part 8 (Pedestrians, cyclists, equestrians and community effects) and Volume 11, Section 3, Part 9 (Vehicle travellers)) have been used during the preparation of this Chapter.

11.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

SUMMARY OF CONSULTATION

11.3.1. With the exception of the EIA Scoping Report, no further consultation has been undertaken with Carmarthenshire County Council (CCC) or other statutory agencies; this was not considered necessary for the preparation of this chapter. In November 2018, CCC confirmed within the Scoping Opinion **(Appendix 1.B (Volume IV))** that they agreed with the likely significant environmental effects as outlined in the EIA Scoping Report **(Appendix 5.3 (Volume IV)).**

SCOPE OF THE ASSESSMENT

11.3.2. An EIA Scoping Report was submitted to CCC on 27th March 2018. This section provides an update to the scope of the assessment and re-iterates the evidence base for scoping out elements following further iterative assessment.

11.3.3. Since the original Scoping Report was written and submitted, DMRB guidance (which this Chapter draws upon) has been updated and compiled into one document: Volume 11, Section 3 LA 112 Population and human health (REF); this supersedes the previously published sections of Volume 11:

- Section 3, Part 6 (Land);
- Section 3, Part 8 (Pedestrians, cyclists, equestrians and community effects); and
- Section 3, Part 9 (Vehicle travellers)

11.3.4. The scope outlined below clarifies and updates the scope of this assessment in line with the updated LA 112 guidance, in the context of the Scoping Opinion received from CCC in November 2018.

NON-SIGNIFICANT ENVIRONMENTAL EFFECTS

11.3.5. The following effects have been considered to be not significant within the Environmental Scoping Report (April 2018), and have therefore not been considered further within the ES. The categorisation of these effects has been updated to reflect LA 112 guidance, and therefore the terminology used in the Environmental Scoping Report varies slightly.

Construction

- **Effects on Community Land and Assets:** there are a number of community assets (including tourism and recreational facilities) local to the Proposed Scheme. However, construction works are not anticipated to directly affect these facilities, or give rise to a significant access restrictions which could cause a reduction in vehicle traffic or pedestrian footfall accessing these assets. As such, associated disruption to local community assets is not likely to be significant and will not be considered further in the ES.
- **Effects on Development Land and Businesses:** there are some businesses located in the area close to the Proposed Scheme. Whilst temporary closure of some roads surrounding the Site is likely during the construction phase, there is not anticipated to be a significant reduction in vehicle traffic or pedestrian footfall which would affect the operational viability of these businesses as a result. As such, associated disruption to local business in the vicinity of the Site is not likely to be significant and will not be considered further in the ES.

Operation

- **Effects on Community Land and Assets:** there are a number of community assets (including tourism and recreational facilities) local to the Proposed Scheme. Once the path is operational, access to these facilities for pedestrians and cyclists may improve, however this is not anticipated to be significant in the context of the location of local community assets. As such, effects on community assets is not likely to be significant and will not be considered further in the ES.

LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS

11.3.6. The likely significant effects which were scoped in for assessment within the ES are outlined below.

Construction

- Effects on Private Property and Housing
- Effects on Agricultural Land Holdings
- Effects on Walkers and Cyclists
- Effects on Human Health

Operation

- Effects on Private Property and Housing
- Effects on Development Land and Businesses
- Effects on Agricultural Land Holdings
- Effects on Walkers and Cyclists
- Effects on Human Health

EXTENT OF THE STUDY AREA

11.3.7. The study area has been defined using para 3.6, 3.6.1, and 3.6.2 of DMRB LA112, which advises a study area of 500m surrounding a project boundary for the land use and accessibility (non-human health) elements of an assessment unless other study areas are considered to be more appropriate for a particular receptor.

11.3.8. A 500m study area around the Site red line boundary has been used for the purposes of this assessment, which is considered to be a suitable area within which there is the greatest likelihood of receptors being affected by the Proposed Scheme.

11.3.9. Where relevant, data for a wider area has been used to provide context but is not used to inform the assessment of effects.

METHOD OF BASELINE DATA COLLECTION

Desk Study

11.3.10. The assessment of Population and Human Health is qualitative and has been informed by a desktop review of the following data sources and available information has been undertaken to determine the baseline conditions in the study area:

11.3.11. The following data sources have been used for the collection of baseline information as part of the preliminary assessment:

- NOMIS Labour Market Profiles;
- Office for National Statistics;
- Google Maps;
- Sustrans Website; and
- CCC 'Public Rights of Way Map'.

ASSESSMENT METHODOLOGY

11.3.12. The methodology for this Population and Human Health assessment has been defined using DMRB LA112 guidance. Despite the DMRB being the standard for assessment of road schemes, this guidance provides the best methodology for assessing Population and Human Health (in particular for assessing the impacts on land use and accessibility) in the context of the Proposed Scheme. In addition, the assessment is guided by the Government's planning policy and guidance (particularly the NPPF and CCC's Local Plan as detailed above) as well as past experience and professional judgement. This approach reflects past professional experience of similar schemes and the approach taken for this type of assessment.

11.3.13. Further details on the methodologies of each aspect of the Population and Human Health assessment have been detailed below.

Private Property and Housing

11.3.14. The assessment will identify accessibility restrictions / severance and changes to amenity as a result of the Proposed Scheme. The location and likely effects on any future residential development land which falls within the Study Area will also be assessed.

Development Land and Businesses

11.3.15. The assessment will identify local businesses within the locality which may experience accessibility restrictions / severance and changes to amenity as a result of the Proposed Scheme. The location and likely effects on any future development land identified in site allocations documentation will also be assessed.

Agricultural Land Holdings

11.3.16. The assessment will identify the locations of farm premises and the surrounding agricultural land within the Study Area, and accessibility restrictions / severance and changes to amenity as a result of the Proposed Scheme.

Walkers, Cyclists and Horse-riders

11.3.17. The assessment will identify likely routes taken by WCHs. The assessment has set out the impact on WCH receptors according accessibility restrictions / severance resulting in changes to journey length, and changes to amenity.

Human Health

11.3.18. A qualitative assessment has been undertaken to determine effects of the Proposed Scheme on human health. Changes to health determinants as a result of the Proposed Scheme will be identified using appropriate information from other environmental topics included in the EIA (including Landscape and Visual Amenity) and any other available information regarding health.

11.3.19. Health determinants likely to be affected by the Proposed Scheme, and therefore included in the assessment of human health include:

- Landscape and Visual amenity (construction).
- Opportunities for physical activity (construction).

SIGNIFICANCE CRITERIA

11.3.20. The assessment of likely significant environmental effects as a result of the Proposed Scheme has taken into account both the construction and operational phases. The significance level attributed to each effect has been assigned based on the magnitude of change due to the Proposed Scheme and the sensitivity of the affected receptor.

11.3.21. For Population and Human Health, there is no accepted definition of what constitutes a significant, or not significant, effect. As such, based on professional judgement, effects will be assessed on the basis of:

- Consideration of sensitivity of receptors and their ability to respond to change;
- Magnitude of impact: This entails consideration of the size of the impact on receptors in the context of the area in which the effects will be experienced;
- Scope for adjustment or mitigation: This assessment is concerned in part with economies which adjust themselves continually to changes in supply and demand. The scope for the changes brought about by the Proposed Scheme to be accommodated by market adjustment will therefore be a criterion in assessing effect significance;
- Duration: This entails consideration of the duration of impact as either short, medium or long term. Impacts lasting less than a year are considered short term, impacts lasting between one and four years are considered medium term and impacts lasting five or more years are considered long term.
- Permanence: This involves identifying whether the impact will be permanent or temporary. Generally, impacts during the construction phase of the Proposed Scheme are considered temporary, and impacts during the operational phase of the Proposed Scheme are considered permanent.

11.3.22. The effects are defined as follows:

- **Beneficial:** Classifications of significance indicate an advantageous or beneficial impact on an area, which may be minor, moderate, or major;
- **Negligible:** Classifications of significance indicate imperceptible impacts on an area; and
- **Adverse:** Classifications of significance indicate a disadvantageous or adverse impact on an area, which may be minor, moderate, or major.

11.3.23. For land use and accessibility, sensitivity criteria and magnitude of impact will be assigned according to Table 3.11 and Table 3.12 in the DMRB LA112 (REF). This categorises a receptors' sensitivity as very high; high; medium; low and negligible. This has been outlined in Table 11-1 below.

Table 11-1 – Sensitivity of Receptors

Sensitivity	Receptor
Very High	Private Property and Housing: Existing housing and land allocated for housing covering >5ha / >150 houses Development Land and Businesses: Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >5ha Agricultural Land Holdings: Areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a frequent basis (daily). Walkers, Cyclists and Horse Riders: National trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. Rights of way for WCH crossing roads at grade with >16,000 vehicles per day.
High	Private Property and Housing: Existing housing and land allocated for housing covering >1-5ha / >30 -150 houses Development Land and Businesses: Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1 - 5ha Agricultural Land Holdings:

Sensitivity	Receptor
	Areas of land in which the enterprise is dependant on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a frequent basis (weekly). Walkers, Cyclists and Horse Riders: Regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or Rights of way for WCH crossing roads at grade with >8,000 - 16,000 vehicles per day.
Medium	Private Property and Housing: Existing housing and land allocated for housing covering <1ha / <30 houses Development Land and Businesses: Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1 - 5ha Agricultural Land Holdings: Areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly) Walkers, Cyclists and Horse Riders: Regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or Rights of way for WCH crossing roads at grade with >8,000 - 16,000 vehicles per day.
Low	Private Property and Housing: Proposed development on unallocated sites providing housing with planning permission/in the planning process. Development Land and Businesses: Proposed development on unallocated sites providing employment with planning permission/in the planning process. Agricultural Land Holdings: Areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and

Sensitivity	Receptor
	Access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent). Walkers, Cyclists and Horse Riders: Routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes, and/or; Rights of way for WCH crossing roads at grade with <4,000 - 16,000 vehicles per day.
Negligible	Private property and housing: N/A. Development land and businesses: N/A. Agricultural Land Holdings: Areas of land which are infrequently used on a non-commercial basis. Walkers, Cyclists and Horse Riders: N/A.

11.3.24. DMRB LA112 (Ref.16.10) categorises magnitude as follows:

- **Major effect:** where the Proposed Scheme could be expected to have a considerable effect (either beneficial or adverse) on receptors.
- **Moderate effect:** where the Proposed Scheme could be expected to have a perceptible effect (either beneficial or adverse) on receptors.
- **Minor effect:** where the Proposed Scheme could be expected to result in a small, barely perceptible effect (either beneficial or adverse) on receptors.
- **Negligible:** Where no discernible effect is expected as a result of the Proposed Scheme on receptors.

11.3.25. DMRB LA112 (Ref.16.10) refers to DMRB LA104 (Ref. 16.15) Table 3.8.1. for determining significance of effect. This categorises significance as the following:

- **Very Large:** Effects at this level are material in the decision-making process.
- **Large**: Effects at this level are likely to be material in the decision-making
- process.
- **Moderate:** Effects at this level can be considered to be material decision-making factors.
- **Slight:** Effects at this level are not material in the decision-making process.
- **Neutral:** No effects or those that are beneath levels of perception, within normal bounds of variation

11.3.26. The magnitude of impact will be determined using Table 11-2 below.

Table 11-2 – Magnitude of Impact

		No Change	Negligible	Minor	Moderate	Major
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 or Slight	Neutral or Slight	Neutral or Slight	Slight

Human Health

11.3.27. In terms of health, outcomes will be determined in accordance with Table 3.32 in DMRB LA112 (Ref.16.10). The sensitivity of the population will be determined using professional judgement applied to the health profile presented in the baseline, and reported as low, medium, or high.

11.3.28. Once community/population sensitivity and changes to health determinants likely to occur as a result of a development have been established, the likely health outcome(s) shall be identified in line with the following categories:

- **Positive:** A beneficial health impact is identified.
- **Neutral:** No discernible health impact is identified.
- **Negative:** An adverse health impact is identified.
- **Uncertain:** Where uncertainty exists as to the overall health impact.

11.3.29. Although the assessment of human health effects describes the likely qualitative health outcomes, it is not possible to quantify the severity or extent of the effects which give rise to these outcomes. For this reason, the magnitude of impact or significance is not applied for human health effects.

11.4 BASELINE CONDITIONS

PRIVATE PROPERTY AND HOUSING

11.4.1. Private property is residential land that does not accommodate public space or any other community facility or asset or land allocated within planning policy for residential development. Commercial property is considered under the 'Development Land and Businesses' section below.

11.4.2. There are no private properties within the Red Line Boundary, however, there are a number of residential properties located within the 500m Study Area and road crossings which provide direct access to a number of private properties, as outlined below (from west to east within the Study Area):

- A cluster of several properties along the B4310 and on the northern side of the access road which forms the start of the route, off the B4310.

- A farmhouse is situated adjacent to the south of the Red Line Boundary, off the B4300 between the B4300 to the south and River Towy to the north.
- A farmhouse and access road is situated adjacent to the east of the Red Line Boundary, off the B4300.
- A residential dwelling situated to the south of the Red Line Boundary at Tre Clais.
- Several residential dwellings are situated at the B4300 junction with the farm track leading north at Llanarthne. This farm track forms an access road to a farmhouse to the north.
- A farmhouse situated to the east of Beili Glas, south of the Red Line Boundary.
- A cul de sac with multiple dwellings is situated to the south of the B4297, and several dwellings are situated to the north of B4297; adjacent to the west of the Red Line Boundary.
- Several residential dwellings and farnhouses are situated immediately to the south of the Red Line Boundary at the Gatehouse and Gelli Aur Farm.
- An access road to a dwelling at Towy Cot (to the north of the Red Line Boundary) is intersected by the Red Line Boundary.
- A farmhouse is situated immediately to the south of the Red Line Boundary, west of Glanyrafon.
- An access road to a dwelling at Llyscariad (to the north of the RLB) is intersected by the Red Line Boundary.
- Multiple dwellings off the A476 are situated to the east of the Red Line Boundary in Ffairfach.

DEVELOPMENT LAND AND BUSINESSES

11.4.3. No development land has been identified within the Red Line Boundary or surrounding 500m Study Area. There are a limited number of businesses within the 500m Study Area, as outlined below (from west to east):

- The Railway Hotel and a haulage yard and scrap car business are situated to the west of the B4310, close to the access road which forms the start of the route.
- The Meithrinfa Cwtsh y Clos Nursery school is located to the south of the Red Line Boundary.
- In Llanarthne there is a pub (the Emlyn Arms) and café (Wright's Food Emporium) locate to the south of the Red Line Boundary.
- Multiple businesses are located in Ffairfach to the east of the Red Line Boundary including a funeral director (Davies Funeral Directors), café (Flows), veterinary surgery (Bush House Veterinary Group), and gift shop (Onnen Studios).

AGRICULTURAL LAND HOLDINGS

11.4.4. The Proposed Scheme passes through agricultural land, the majority of which has been classified by the Predictive Agricultural Land Classification (ALC) map for Wales as Subgrade 3a Best and Most Versatile (BMV) agricultural land. This indicates that the land is the most flexible, productive and efficient in response to inputs and can best deliver future crops for food and non-food uses.

11.4.5. An ALC survey was carried out to confirm this classification (see Chapter 10 for further detail). From the ALC survey, the majority of land within the Red Line Boundary which from an aerial view looked to be agricultural was classified as non-agricultural due to the

presence of grassed over hardstanding paths and the former railway embankment. The majority of the surrounding agricultural land within the Study Area is classified as Grade 3b moderate quality agricultural land due to climate, wetness or site factors (approximately 21ha) and the remaining land (approximately 12ha) is classified as Grade 3a.

11.4.6. There are no agricultural businesses within the Red Line Boundary, however withing the 500m study area there are several farm holdings and associated buildings which are mainly farming dairy cattle, beef cattle, and sheep, with a small number of equine units.

ROUTES FOR WALKERS, CYCLISTS AND HORSE RIDERS

11.4.7. The existing disused railway that will be utilised as part of the scheme runs between Carmarthen and Fairfach. There are also a number of PRoW and pedestrian routes along the railway corridor within the adjacent villages which transverse the agricultural fields and converge with the main roads to the north and south of the River Towy.

11.4.8. There are several PRoW which cross or run adjacent to the Propose Scheme alignment comprising:

- PRoW 41/2 located 500m east from Dyffryn -Towy;
- PRoW 41/6 adjacent to the north east of Abercothi House;
- PRoW 31/27 between passes the path between Llanarthne and Glantowy;
- PRoW 42/1 and 50/51 crosses the path at Gelli Aur College Farm; and
- PRoW 44/3 abuts the path near Ffairfach.

11.4.9. There are several PRoW which are situated within the 500m of the Proposed Scheme and/or connect directly with the PRoW listed above comprising:

- PRoW 41/1 located 500m south;
- PRoW 41/4 located 320m north;
- PRoW 41/5 located 350m north;
- PRoW 31/29 located 300m south;
- PRoW 41/13 located 250m north;
- PRoW 50/45 located 400m south;
- PRoW 50/40A located 430m south;
- PRoW 50/47 located 430m south;
- PRoW 50/49 located 300m south; and
- PRoW 50/51 located 200m south.

11.4.10. National Cycle Route 47 runs close to the western extent of the scheme, along the B4300 as far east as the village of Llanarthne before turning south towards the National Botanical Gardens of Wales.

HUMAN HEALTH

Population

11.4.11. The resident population of Carmarthenshire was 190,100 residents in 2020, comprising approximately 6% of the total population in Wales (Nomis, 2020).

Table 11-3 – Population Groups (% of Total Population) by Age Range

Location	Age Range (% of total population)					
	0-14	15-24	25-29	30-44	45-64	65+
Carmarthenshire	16.3	10.3	5.4	16.3	27.8	24.0
Wales	16.7	12.0	6.6	17.5	26.2	21.1

11.4.12. The data in Table 11-3 indicates that the population in Carmarthenshire is slightly older than the national average, with 24% of the population aged over 65, compared to 21.1% in Wales and 27.8% of the population aged between 45-64, compared to 26.2% in Wales. This indicates slightly fewer children and young adults reside in the area, possibly with a tendency for older adults to retire to the area, and older age adults who may chose to live in the area and commute to larger towns and cities for work.

Deprivation

11.4.13. The Welsh Indices of Deprivation present a comprehensive measure of relative deprivation across eight 'domains' of deprivation, which are combined to give the overall Indices of Multiple Deprivation. This is an overall measure of multiple deprivation experienced by people living in an area.

11.4.14. Of the 22 local authorities in Wales, Carmarthenshire is ranked 10th in terms of overall deprivation (where a rank of one is the most deprived and a rank of 22 is the least deprived) suggesting that deprivations levels are average, with few pockets of significant deprivation within the county.

FUTURE BASELINE

11.4.15. It is envisaged that in the absence of the Proposed Scheme, the baseline conditions are likely to generally remain as outlined above, however a number of demographic factors are likely to experience natural fluctuation and change, including total population (with population trends likely to see an ageing population).

11.5 SENSITIVE RECEPTORS

11.5.1. The following sensitive Receptors have been assessed and are displayed in Table 11-4 below.

Table 11-4 – Sensitive Receptors

Sensitivity	Receptor
Very High	Private Property and Housing: N/A Development Land and Businesses: N/A Agricultural Land Holdings:

Sensitivity	Receptor
	N/A Walkers, Cyclists and Horse Riders: N/A
High	Private Property and Housing: N/A Development Land and Businesses: N/A Agricultural Land Holdings: All agricultural land (Grade 3a and 3b) within the Study Area Walkers, Cyclists and Horse Riders: N/A
Medium	Private Property and Housing: Dwellings which lie within the 500m Study Area, including the following properties: A cluster of several properties along the B4310 and on the northern side of the access road which forms the start of the route, off the B4310. A farmhouse adjacent to the south of the Red Line Boundary, off the B4300 between the B4300 to the south and River Towy to the north. A farmhouse to the east of the Red Line Boundary, off the B4300. A residential dwelling to the south of the Red Line Boundary at Tre Clais. Several residential dwellings at the B4300 junction with the farm track leading north at Llanarthne. A farmhouse to the east of Beili Glas, south of the Red Line Boundary. A cul de sac with multiple dwellings to the south of the B4297, and several dwellings to the north of B4297; adjacent to the west of the Red Line Boundary. Several residential dwellings and farmhouses immediately to the south of the Red Line Boundary at the Gatehouse and Gelli Aur Farm. A dwelling at Towy Cot to the north of the Red Line Boundary. A farmhouse to the south of the Red Line Boundary, west of Glanyrafon. A dwelling at Llyscariad to the north of the Red Line Boundary. Multiple dwellings off the A476 to the east of the Red Line Boundary in Ffairfach.

Sensitivity	Receptor
	Development Land and Businesses: The Railway Hotel, west of the B4310. A haulage yard, west of the B4310. A scrap car business, west of the B4310. Meithrinfa Cwtsh y Clos Nursery school. The Emlyn Arms, Llanarthne. Wright's Food Emporium, Llanarthne. Davies Funeral Directors, Ffairfach. Flows café, Ffairfach. Bush House Veterinary Group, Ffairfach. Onnen Studios, Ffairfach. Agricultural Land Holdings: N/A Walkers, Cyclists and Horse Riders: National Cycle Route 47 PRoW 41/2 PRoW 41/6 PRoW 31/27 PRoW 42/1 PRoW 50/51 PRoW 44/3 PRoW 41/1 PRoW 41/4 PRoW 41/5 PRoW 31/29 PRoW 41/13 PRoW 50/45 PRoW 50/40A PRoW 50/47 PRoW 50/49 PRoW 50/51
Low	Private Property and Housing: N/A Development Land and Businesses: N/A Agricultural Land Holdings: N/A

Sensitivity	Receptor
	Walkers, Cyclists and Horse Riders: N/A
Negligible	Private Property and Housing: N/A Development Land and Businesses: N/A Agricultural Land Holdings: N/A Walkers, Cyclists and Horse Riders: N/A

11.5.2. The sensitivity of health receptors is reported slightly differently. As outlined in DMRB LA 112 (Ref. 16.10), there is a need to identify the health profile of affected communities, identifying vulnerable groups / communities. The sensitivity of population encompasses their ability to withstand exposures and the range of associated impacts or effects, and the physiological and socio-economic factors that increase their susceptibility to the exposure. The sensitivity of the population is reported as either low, medium or high.

11.5.3. Using the baseline information set out in Section 11.4, the sensitivity of the population within the Study Area is deemed to be low.

11.6 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION STAGE

Private Property And Housing

11.6.1. There is the potential for temporary disruption to private properties as a result of the Proposed Scheme during the construction phase. The alignment of the Proposed Scheme crosses several roads between Nantgerdig and Fairfach which provide access to residential dwellings, and also to the villages south of the A40. Access to private properties would be maintained throughout the construction period, and ongoing engagement will occur between the Construction Contractor and residents during periods where the construction works may temporarily disrupt access to private properties. The construction works will be temporary however, and temporary disruption will be short term.

11.6.2. The properties likely to be affected are of a medium sensitivity, and the magnitude of change is likely to be minor. Therefore there is the potential for construction phase effects on private property and housing to result in a slight adverse (not significant), direct, temporary, short term effect during construction.

Mitigation/Enhancement

11.6.3. There are no mitigation measures required or proposed for Population and Human Health in relation to private property and housing.

Residual Effects

11.6.4. Given there is no mitigation in relation to construction phase effects on private property, the pre-mitigation finding remains the same. Therefore, there is likely to be a slight adverse (not significant), direct, temporary, short term effect on private property and housing during construction.

Agricultural Land Holdings

11.6.5. There is the potential for temporary disruption to some areas of agricultural land during construction, the majority of which is Grade 3b moderate quality agricultural land (with small areas of Grade 3a BMV land). No temporary land take will affect farm premises, outbuildings, or the access to or functioning of farm businesses. Where construction works will temporarily disrupt access to farm premises or agricultural fields, ongoing engagement with farm operators will take place to ensure access is maintained during the construction period. The construction works which could affect the access to farm premises or fields will be temporary, and disruption will be short term. The overall functional viability of agricultural businesses will not be disrupted.

11.6.6. The agricultural businesses likely to be affected are of a high sensitivity, and the magnitude of change is likely to be minor. Therefore there is the potential for construction phase effects on agricultural land holdings to result in a slight adverse (not significant), direct, temporary, short term effect during construction.

Mitigation/Enhancement

11.6.7. There are no mitigation measures required or proposed for Population and Human Health in relation to agricultural land holdings.

Residual Effects

11.6.8. Given there is no mitigation in relation to construction phase effects on private property, the pre-mitigation finding remains the same. Therefore, there is likely to be a slight adverse (not significant), direct, temporary, short term effect on private property and housing during construction.

Walkers, Cyclists and Horse Riders

11.6.9. There are a number of publicly accessible routes, including PRoW within the Study Area which are likely to be predominantly used for recreation and leisure rather than commuting (as the majority of local routes do not directly connect settlements in the locality). Many of these PRoW adjoin or form wider recreational routes with the existing disused railway track. Therefore, they are most likely to be used by dog walkers, equestrian users and residents in the area for walking short distances.

11.6.10. During the construction phase, six PRoW (**41/2, 41/6, 41/13, 31/27, 42/1 and 44/3) will need to be temporarily closed and diverted** for the duration of the construction period. Whilst diversionary routes have not been confirmed at the time of writing, it is understood that proposed diversions would not add substantial distances to journey length. **As such**, whilst **users of these routes will experience disruption to their journeys and an increase in journey length / time**, all diversions would be temporary and **access will be maintained to all other PRoW**. It is anticipated the users of all other PRoW and non-designated public

routes within the Study Area will not experience disruption to their journeys as a result of construction activities.

11.6.11. The publicly accessible routes likely to be affected are of a medium sensitivity, and the magnitude of change is likely to be moderate. Therefore there is the potential for construction phase effects on walkers, cyclists, and horse riders to result in a moderate adverse (significant), direct, temporary, short term effect during construction.

Mitigation/ Enhancement

11.6.12. To ensure adverse effects on walkers and cyclists are reduced as far as possible during the construction stage of the Proposed Scheme, the following mitigation measures are proposed:

- Undertake Stakeholder/Community engagement events and identify a delivery route for engagement with schools through the Public Services Board with the aim to promote awareness of the improvements the scheme is hoping to make and minimise impacts on sensitive receptors by ensuring the public have notice and are aware of diversions and closures that may affect them;
- Ensure that temporary diversions to provide the same or improved standard of pathway;
- Incorporate effective rationalisation between routes and safe crossing points;
- Existing types of access to PRoW should be retained, for example, by not introducing new barriers such as stiles and kissing gates which may restrict certain users; and
- The provision of clear directions for any alternative routes.

Residual Effects

11.6.13. Following mitigation, the residual effect on walkers, cyclists and horse riders would be reduced to a slight adverse (not significant), direct, temporary, short term effect during construction.

Human Health

11.6.14. During construction of the Proposed Scheme, there will be plant and equipment activity within proximity to the existing PRoW within the Study Area due to the site preparation, earthworks and construction activities e.g. removal of vegetation during site clearance. This is likely to result in a temporary disturbance for users due to reduced amenity value of PRoW within the Study Area. The Proposed Scheme will be constructed under a phased approach however, and therefore the construction compound set ups will only be temporary and the land will be reinstated once each phase is complete.

11.6.15. Potential increases in noise, loss of visual and landscape amenity, and the temporary diversion of some PRoW may affect people's ability or desire to use the routes for recreational activities, and may reduce social contact, social cohesion, and physical activity. These could lead to adverse effects on human health for users.

DISTURBANCE AND LOSS OF AMENITY FOR USERS IS THEREFORE LIKELY TO RESULT IN TEMPORARY NEGATIVE EFFECTS ON HUMAN HEALTH.

Mitigation / Enhancement

11.6.16. To ensure adverse effects on human health are reduced as far as possible during the construction stage of the Proposed Scheme, the following mitigation measures are proposed:

- Where possible, temporary screening to be applied around construction boundaries to minimise noise and visual disturbance for users; and
- A communication Strategy by CCC or the Appointed Contractor including site notices to inform the local community of the construction schedule and programme and location of construction activities.

Residual Effects

11.6.17. Following mitigation, the residual effect on human health would be reduced to neutral during construction.

OPERATION

Private Property and Housing

11.6.18. There is no disruption to private properties anticipated as a result of the Proposed Scheme during the operational phase, as all works would be completed and the Proposed Scheme would not have any direct or indirect impacts on dwellings or residents.

Development Land and Businesses

11.6.19. There will be no land take or disruption to businesses as a result of the Proposed Scheme during the operational phase. There is the possibility of increased access to certain businesses, such as cafes, restaurants, and shops by users of the Proposed Scheme due to the improvement in access within the locality. This may provide some benefit to businesses and the local economy, through increased user numbers and people undertaking recreational walking along the route. In the context of the local economy however, this effect is likely to be relatively limited.

11.6.20. The businesses likely to be affected are of a medium sensitivity, and the magnitude of change is likely to be minor. Therefore there is the potential for construction phase effects on development land and businesses to result in a slight beneficial (not significant), direct, permanent, long term effect during operation.

Mitigation/Enhancement

11.6.21. There are no mitigation measures required or proposed for Population and Human Health in relation to development land and businesses.

Residual Effects

11.6.22. Given there is no mitigation in relation to operational phase effects on development land and businesses, the pre-mitigation finding remains the same. Therefore, there is likely to be a slight beneficial (not significant), direct, permanent, long term effect during operation.

Agricultural Land Holdings

11.6.23. There is no disruption to agricultural land holdings anticipated as a result of the Proposed Scheme during the operational phase, as all works would be completed and the Proposed Scheme would not have any direct or indirect impacts on the operational viability of farm businesses.

Walkers, Cyclists and Horse Riders

11.6.24. There are a number of publicly accessible routes within the Study Area which will adjoin or form wider recreational routes with the Proposed Scheme once complete and operational.

This will offer greater opportunities for walkers and cyclists in the locality, through an improved recreational experience for local users travelling short distance, and potentially leisure and tourism users travelling longer distances. Horse riders will not be impacted by the Proposed Scheme and no bridleways will be impacted.

11.6.25. The publicly accessible routes and PRoW are of a medium sensitivity, and the magnitude of change is likely to be minor. Therefore, there is the potential for construction phase effects on walkers and cyclists to result in a slight beneficial (not significant), direct, permanent, long term effect during operation.

Mitigation/Enhancement

11.6.26. There are no mitigation measures required or proposed for Population and Human Health in relation to walkers, cyclists and horse riders.

Residual Effects

11.6.27. Given there is no mitigation in relation to operational phase effects on walkers, cyclists and horse riders, the pre-mitigation finding remains the same. Therefore, there is likely to be a slight beneficial (not significant), direct, permanent, long term effect during operation

Human Health

11.6.28. There is no disruption to human health associated with the amenity and availability of PRoW routes anticipated as a result of the Proposed Scheme during the operational phase, as all works would be completed and the Proposed Scheme would not have any direct or indirect impacts on human health once the construction phase is complete.

11.7 LIMITATIONS AND ASSUMPTIONS

11.7.1. A PRoW survey has not been carried out, so it is assumed that the routes adjacent to the Proposed Scheme (within 500m) are used predominately by receptors within proximity and are used mainly for activities such as dog walking or short walks between the residential areas rather than leisure or commuting, due to the lack of connections between the PRoW.

11.8 SUMMARY

11.8.1. There are a number of PRoW within the vicinity of the Proposed Scheme. Therefore during construction, it is anticipated that there will be disruption to pedestrians, cyclists, equestrians and other NMUs of these routes due to the temporary closure / diversion of these routes for construction activities to take place, and for health and safety purposes.

11.8.2. It is also anticipated that there will to be a temporary reduction in amenity value of local routes and users of the adjacent PRoW, and temporary disruption to land owners due to the presence of plant and equipment on-site alongside changes in land use due to site clearance activities and construction of the Proposed Scheme.

11.8.3. Mitigation measures to reduce the adverse effects associated with the construction stage are proposed, including the dissemination of public information and provision of clear directions for any alternative route, and screening in place where necessary to reduce visual impacts and maintaining existing access wherever possible / creating new temporary tracks or access points.

11.8.4. With this mitigation in place, the overall effect is predicted to be of minor adverse significance albeit temporary and short-term.

11.8.5. Once completed, the Proposed Scheme will deliver enhanced connectivity with the surrounding area which aims to improve the amenity value for the users of the routes, given the new path provisions which will route users from away from vehicular traffic on the main roads. The Proposed Scheme will also improve the amenity value for users of the routes as a greater variety of choices are available that integrate with existing routes. The widening of the footpaths and associated upgrades improves usability of the area.

11.8.6. Mitigation measures, including the ongoing management / maintenance of the new route, have been proposed. With the mitigation in place, the overall effect is considered to be of moderate beneficial significance.

11.8.7. Table 11-5 outlines a summary of the environmental effects for Population and Human Health as a result of the Proposed Scheme.

Table 11-5 – Summary of Likely Environmental Effects for Population and Human Health

Likely significant environmental effect	Receptor	Significance and nature of effect prior to mitigation / enhancement	Summary of mitigation / enhancement	Significance and nature of effect following Mitigation / enhancement (residual effect)
Construction Phase				
The temporary diversion of the footpaths within and in the vicinity of the Site for the duration of the construction stage	Sensitive receptors such as residential dwellings adjacent to existing roads including non-motorised users	Moderate / - / D / T / ST	The public will be informed of the nature, timing and duration of particular activities during the construction stage and the duration of the any works by newsletters and liaison with CCC / Town / Parish Councils where applicable; The provision of clear directions for any alternative routes.	Slight Adverse / - / D / T / ST
Delays to journey times as a result of road closures/diversions for sensitive receptors living adjacent to the Scheme	Motorised users including cyclists and walkers	Slight Adverse / - / D / T / ST		Slight Adverse / - / D / T / ST
Construction of compounds and site working areas and implementation / use of plant and equipment during the construction stage.	Motorised users including cyclists and walkers and land owners	large adverse / - / D / T / ST		Slight adverse / - / D / T / ST

12 MATERIALS

12.1 INTRODUCTION

12.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Scheme with regard to the consumption of material resources and the generation and disposal of waste.

12.1.2. To do this, the chapter describes the assessment methodology, and the baseline conditions at the proposed site and in the surrounding area. Any primary and tertiary (embedded) mitigation adopted in the Proposed Scheme Design is described (in Section 12.6), and is taken into account in the assessment. Where significant effects are identified, additional mitigation measures are described. A summary of the likely residual effects after adopted measures have been employed, is set out in Section 12.7.

12.2 LEGISLATIVE FRAMEWORK AND GUIDANCE

12.2.1. The applicable legislative framework is summarised below.

- Waste Framework Directive (2008/98/EC)[96];
- The Environment Act 2021[97];
- Waste (Circular Economy) (Amendment) Regulations 2020[98];
- The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020[99];
- The Controlled Waste (England and Wales) Regulations 2012[100];
- The Waste (England and Wales) Regulations 2011[101];
- Clean Neighbourhoods and Environment Act 2005[102];
- Hazardous Waste (England and Wales) Regulation's 2005[103];
- Hazardous Waste (Wales) Regulations 2005[104];
- Waste Minimisation Act 1998[105];

[96] European Commission (2014) The Environmental Impact Assessment Directive (2014/52/EU)

[97] HM Government (2021) Environment Act 2021

[98] HM Government (2022) Waste (Circular Economy) (Amendment) Regulations 2020

[99] HM Government (2020) The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020

[100] HM Government (2012) The Controlled Waste (England and Wales) Regulations 2012

[101] HM Government (2011) The Waste (England and Wales) Regulations 2011

[102] HM Government (2005) The Clean Neighbourhoods and Environment Act 2005

[103] HM Government (2005) Hazardous Waste (England and Wales) Regulations 2005

[104] HM Government (2005) Hazardous Waste (Wales) Regulations 2005

[105] HM Government (1998) Waste Minimisation Act 1998

- Environmental Protection Act 1990[106]; and
- The Control of Pollution Act 1974[107]

12.2.2. In addition, this chapter has been prepared in accordance with the Government's National Planning Practice Guidance and local planning policies as follows:

- Planning Policy Wales, 2021[108];
- Future Wales The National Plan 2040[109];
- Towards Zero Waste, One Wales: One Planet 2010[110];
- Construction and Demolition Sector Plan[111];
- Technical Advice Note 21: Waste[112]; and
- Carmarthenshire Local Development Plan 2006 - 2021[113]

12.2.3. The following guidance documents have been used during the preparation of this chapter:

- Highways England Design Manual for Road and Bridges (DMRB) LA110 Material Assets and Waste standard[114] (herein, "LA110").

12.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION

12.3.1. An information request was made via email to Ms Diane Thomas, Waste Strategy and Policy Officer, Environment and Waste Services Division, and Mr Neil Bateman, Forward Planning Officer, Planning Division, both of CCC, to request the landfill capacity of landfill sites within South Wales. The data provided has been superseded by data published on the NRW Lle Geo-Portal[115].

SCOPE

12.3.2. An EIA Scoping Report was submitted to CCC in March 2018, as presented in **Appendix 5.3 (Volume IV)**. The approach provided herein offers an update on the scope of the assessment

[106] HM Government (1990) The Environmental Protection Act 1990

[107] HM Government (1974) The Control of Pollution Act 1974

[108] Welsh Government. (2021). Planning Policy Wales. Retrieved from https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

[109] Welsh Government. (2021). Future Wales The National Plan 2040. Retrieved from https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf

[110] Welsh Government (2010), Towards Zero Waste, One Wales: One Planet

[111] Welsh Government (2012), Construction and Demolition Sector Plan

[112] Welsh Government (2014) Technical Advice Note 21: Waste

[113] Carmarthenshire County Council 2014, Local Development Plan 2006 – 2021

[114] Standards for Highways (2019). Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA110 Material Assets and Waste (http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm)

[115] Natural Resources Wales (2022) Lle Geo-Portal for Wales. Available at: http://lle.gov.wales/home

and re-iterates the evidence base for effects that are not significant, following further iterative assessment since November 2018.

12.3.3. The following effects were scoped out and have not been considered further as confirmed by the Scoping Opinion issued November 2018:

- Operation phase: In the first year of operation, minor amendments and changes to the Proposed Scheme assets may be required. The extent of changes within the first year of operation is not known, but professional judgement has been applied (based on knowledge and experience of similar schemes) which indicates that there are unlikely to be significant environmental effects during this phase. Similarly, and beyond the first year of operation, it is predicted that there will be no significant effects. This element will therefore not be assessed further.
- The potential for the Proposed Scheme to sterilise mineral safeguarding sites or peat resources are considered as part of the assessment criteria. The impacts and effects associated with mineral resource sterilisation however are discussed within **Chapter 10, Geology and Soils**.

12.3.4. Impacts and effects from the transportation of material resources and waste to and from site are not typically included within the scope of a Materials chapter, and (moreover) were eliminated at scoping stage from the Air Quality, Climate, Noise, and People and Communities chapters.

INSIGNIFICANT EFFECTS

12.3.5. Material data provided by CCC (**Table 12-7**) does not include quantities of ancillary products (such as fencing, gates or cattle grids). The exclusion of these items is not considered likely to materially alter the findings of this chapter.

12.3.6. The forecast waste data provided by CCC **(Table 12-8**) does not include potential arisings from construction activities such as vegetation clearance, from temporary features (such as working platforms or site compounds to enable construction works), surplus materials or general construction waste (for example packaging). The exclusion of these items is not considered to materially alter the findings of this chapter.

LIKELY SIGNIFICANT EFFECTS

Construction Phase

12.3.7. During the construction phase, the following potentially significant effects may occur and are therefore considered within this ES chapter:

- The consumption of natural and non-renewable material resources will result in their permanent depletion and hence the degradation of the natural environment. A reduction in impacts may be achieved through the use of materials from recycled, secondary or renewable sources (as well as products offering other sustainability benefits), and arisings recovered from site.
- A reduction in landfill void capacity from the production and disposal of waste, causing degradation of the natural environment.

Operation Phase

12.3.8. As noted in paragraph 12.3.3, no significant effects are considered likely during the operation phase and hence will not be considered within this assessment.

EXTENT OF THE STUDY AREA

12.3.9. The first and second study areas for Materials Assets and Waste are described in LA110.

- The first study area comprises the extent of the works within the boundary of the Proposed Scheme footprint (the red line boundary).
- The second study area comprises the extent to which waste infrastructure is suitable and available for the management of arisings and waste generated by the Proposed Scheme. Accordingly, the second study area for waste is determined to be Wales. The second study is set using professional judgement of the balance between the Proximity Principle and value for money (with regard to materials and waste logistics), and considering the extent of available data to compile a baseline assessment.
- In accordance with good practice, a study area for the availability of typical materials required for the Proposed Scheme has been included. The study area for materials comprises a National (UK) study area. Data for South West Wales and Wales has been provided for context.

METHOD OF BASELINE DATA COLLECTION

12.3.10. The methodology used for this chapter has been developed in accordance with LA110 under DMRB.

12.3.11. The assessment methodology is the same for both the construction and operational phases, though – as described previously – the assessment for the operational phase has been scoped out, as no significant effects are expected.

12.3.12. Through desktop research, the baseline scenario describes (in the absence of the proposed scheme) the current and likely future state of:

- The types and quantity of material required associated with operation of the existing land use within the first study area;
- The types and quantities of waste produced associated with operation of the existing land use within the first study area;
- Information on availability of key construction materials required for the proposed scheme within the secondary study area; and
- Information on waste infrastructure and remaining landfill capacity within the secondary study area.

12.3.13. Baseline data has been sourced from publicly available data sources as referenced within this chapter.

Assessment Data Collection

12.3.14. In accordance with LA110, the assessment is a quantitative exercise that aims to identify the following:

For material assets:

- Types and quantities of materials required to construct the Proposed Scheme;
- Information on materials that contain secondary / recycled content;
- Information on any known sustainability credentials of materials to be consumed;
- The type and volume of materials that will be recovered from off-site sources for use on the Proposed Scheme;
- The cut and fill balance;

- Details of on-site storage and stockpiling arrangements, and any supporting logistical details.

12.3.15. An assessment of the effects of consuming materials required during the construction phase has been undertaken by considering their general availability (production, stock, sales), the quantity required for the Proposed Scheme and the proportion of recovered (reused or recycled) materials they contain (as well as other sustainability features) where information is available.

12.3.16. The reuse of excavated and other arisings (that meet waste exemption or other similar criteria) is evaluated as part of the assessment of materials, to determine whether the adverse impacts associated with the consumption of primary resources can be reduced.

For waste:

- The amount of waste (by weight) that will be recovered and diverted from landfill either on site or off site (i.e. for use on other projects);
- Types and quantities of waste arising from the Proposed Scheme (demolition, excavation arisings and remediation) requiring disposal to landfill;
- Details of on site storage and segregation arrangement for waste and any supporting logistical arrangements; and
- Potential for generation of hazardous waste (type and quantity).

12.3.17. An assessment of the remaining landfill capacity in Wales is used to determine the impacts and effects of waste generated and disposed of during the construction phase of the Proposed Scheme.

12.3.18. The assessment considers the type and volume of waste to be generated by the Proposed Scheme and determine the potential impact on remaining landfill capacity in the region; this is completed for inert and non-inert (non-hazardous and hazardous) waste types, where data are available. Wherever waste is recovered (diverted from landfill) the influence of this action is taken into account in the assessment of significance of effect.

12.3.19. The quantitative exercise for the assessment uses material and waste type and quantity data provided by CCC for the Proposed Scheme.

Significance criteria for materials and waste

12.3.20. The assessment adopts the significance criteria set out in LA110 and as presented in Table 12-1. The criteria do not require a separate assessment of sensitivity and magnitude of change. The assessment criteria is applied individually to material assets and waste.

Table 12-1 – Material Assets and Waste Significance Criteria

Significance category	Materials description	Waste description
Very Large	(No criteria for 'Very Large'; use details provided in 'Large').	>1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or Construction of new (permanent) waste infrastructure is required to

		accommodate waste from a project.
Large	Project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and Aggregates required to be imported to site comprise <1% reused / recycled content; and Project sterilises ≥1 mineral safeguarding site and/or peat resource.	>1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 50% of project waste for disposal outside of the region.
Moderate	Project achieves <70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and Aggregates required to be imported to site comprise reused/recycled content below the relevant regional percentage target*.	>1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 1-50% of project waste for disposal outside of the region.
Slight	Project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and Aggregates required to be imported to site comprise reused/recycled content in line with the relevant regional percentage target*.	≤1% reduction or alteration in the regional capacity of landfill; and Waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	Project achieves >99% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials; and	No reduction or alteration in the capacity of waste infrastructure within the region.

	Aggregates required to be imported to site comprise >99% reused / recycled content.	
Notes	*Recycled aggregate target. The Recycled Aggregate Targets included in LA110 are applicable to England and its regions. For Wales, as detailed in the Welsh Assembly Government (2004), Minerals Technical Advice Note (Wales) 1: Aggregates[116] the target for recycled aggregates is 25%	

12.3.21. The descriptions provided in Table 12-2 have been used to define whether effects identified are significant or not.

Table 12-2 – Descriptions for Significance of Effect

Significance Criteria	Materials Significance of Effect	Waste Significance of Effect
Very large	**Significant**	**Significant**
Large	**Significant**	**Significant**
Moderate	**Significant**	**Significant**
Slight	**Not significant**	**Not significant**
Neutral	**Not significant**	**Not significant**

[116] Welsh Assembly Government (2004), Minerals Technical Advice Note (Wales) 1: Aggregates Retrieved from https://gov.wales/sites/default/files/publications/2018-09/tan21-waste.pdf

12.4 BASELINE CONDITIONS

12.4.1. The current assets within the Proposed Scheme footprint comprise the disused Carmarthen to Llandeilo railway line, with adjacent fields and meadows.

MATERIAL ASSETS

Materials currently required

12.4.2. The operation and maintenance of land within the Proposed Scheme boundary currently consumes minimal construction material resources. Small quantities of materials such as aggregate, timber and fencing for the maintenance of existing tracks and public rights of way (PRoW) are anticipated.

12.4.3. The current consumption of construction and other material resources within the Proposed Scheme footprint is therefore deemed minimal.

Availability of construction materials in Wales and the UK

12.4.4. Table 12-3[117],[118],[119],[120] provides a summary of the availability of the main construction materials in Wales and the UK, as required to deliver typical linear infrastructure schemes. This overview provides a context in which the assessment of impacts and significant effects from material consumption for the Proposed Scheme can be undertaken. Unless otherwise stated, 'South West Wales' comprises Carmarthenshire, Neath-Port Talbot, Swansea, Pembrokeshire, Ceredigion and Pembrokeshire Coast National Park.

[117] Mineral Products Association. (2020). Profile of the UK Mineral Products Industry. Retrieved from https://www.mineralproducts.org/MPA/media/root/Publications/2021/Profile_of_the_UK_Mineral_Products_Industry_2021.pdf

[118] DBEIS. (2022). Monthly Bulletin of Building Materials and Components. Retrieved from https://data.gov.uk/dataset/75ee36ed-21f7-4d7b-9e7c-f5bf4546145d/monthly-statistics-of-building-materials-and-components

[119] StatsWales. (2020). Iron and Steel Production by Year, Measure and Area. Retrieved from https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Economic-Indices/Indices-of-Production-and-Construction/ironandsteelproduction-by-year-measure-area

[120] South Wales Regional Aggregates Working Party (2021) Annual Report for 2019 http://www.swrawp-wales.org.uk/Html/SWRAWP%20Annual%20Report%202019%20FINAL.pdf)

Table 12-3 – Materials Availability in Wales and the UK

Material Type	South West Wales	Wales	UK
Sand and gravel *	0.98 million tonnes (Mt)	1.6 Mt	(refer to primary aggregate)
Permitted crushed rock *	8.36 Mt	12.0 Mt	(refer to primary aggregate)
Primary aggregate *	(refer to sand and gravel and crushed rock)	(refer to sand and gravel and crushed rock)	198.8 Mt
Recycled and secondary aggregate *	(not available)	(not available)	71Mt (GB)
Concrete blocks +	(not available)	6.3 million square meters (Mm^2) (data for Scotland and Wales) (2021)	74.2 Mm^2 (2021)
Ready-mix concrete *	(not available)	0.6 million cubic meters (Mm^3)	24.7 Mm^3

Steel +	(not available)	4.3 Mt	7.2 Mt
Asphalt *	(not available)	1.4 Mt	27.4 Mt

stocks + production * sales

Data availability: 2019 unless otherwise stated

12.4.5. The South Wales Regional Aggregates Working Party Annual Report (the most recent publication, providing data for the calendar year 2019) identifies active mineral sites in the Carmarthenshire area. Nine actives sites were recorded as extracting mineral deposits of limestone, sandstone, igneous, gritstone, sand and gravel and marine sand. The Proposed Scheme route is within and adjacent to Mineral Safeguarding Areas (MSAs) for sand and gravel deposits. However, the MSAs are already sterilised by the disused railway line, existing road infrastructure and the River Towy.

12.4.6. The availability of construction materials in South West Wales, Wales and across the UK, as typically required for the construction of the Proposed Scheme, indicates that stocks, production and sales remain buoyant. The data suggests that materials will be readily available through regional supply, free from known supply issues and are likely to comprise industry-recognised best practice proportion of reused or recycled content.

12.4.7. Whilst it is recognised that political and pandemic issues (such as the departure of the UK from the EU and COVID-19) continues to adversely impact construction supply chain security, no definitive data in this context is available for this ES. For the purposes of this assessment, any interruptions to the supply chain due to such influences are considered temporary and it is likely that these will have been resolved prior to commencement of construction.

MATERIAL RECOVERY

Site arisings currently generated

12.4.8. The operation and maintenance works on land within the Proposed Scheme boundary is considered to generate minimal volumes of site arisings. Generation of low volumes of arisings from vegetation clearance may occur.

Waste recovery trends in Wales and South West Wales

Data in Table 12-4 from the Waste Permit Returns Data Interrogator[121] show 94% of construction and demolition waste received in South West Wales was diverted from landfill through waste management and recovery methods. This exceeds the (formerly applicable) EU target of 70% (by weight) diversion by 2020, which the UK is currently meeting. Note: the 70% target excludes naturally occurring materials (specifically category European Waste Catalogue (EWC) 17 05 04 in the list of waste defined as non-hazardous soils and stones)[122]

[121] NRW. (2022). Waste Permit Returns Data Interrogator. Retrieved from https://lle.gov.wales/catalogue/item/WastePermitReturnsDataInterrogator/?lang=en

[122] EU Parliament. (2008). Directive 2008/98/EC of the European parliament and of the council of 19 November 2008 on waste and repealing certain directives. . Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

Table 12-4 – Waste Management Routes for Construction and Demolition Waste Received in South East Wales (2020)

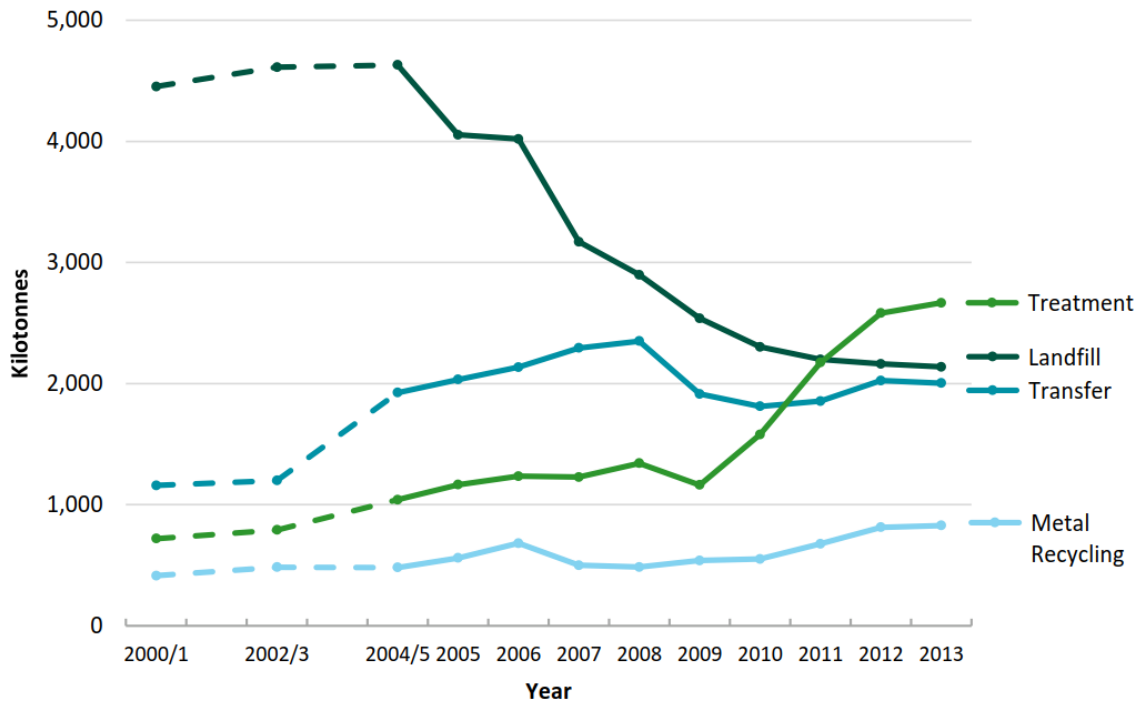
Waste Management Route	Inert and non-hazardous waste (tonnes)	Hazardous waste (tonnes)	Total waste (tonnes)	Percentage
Recovery*	**225,721**	**9,805**	**235,526**	**94%**
Landfill	**14,684**	**45**	**14,729**	**6%**
Total	**240,406**	**9,850**	**250,255**	**100%**

* Recovery comprises treatment, transfer and metal recycling.

Non-hazardous soils and stones (EWC 17 05 04) contributed 288,075 tonnes of waste in 2020, of which 83,485 tonnes (29%) was disposed of to landfill and 204,590 tonnes (71%) recovered.

Long term regional data for construction, demolition and excavation (CDE) wastage and recovery trends are not available for Wales. Instead, data in Figure 12-1 show rates of waste recovery (treatment, transfer and metal recycling) for all types of waste (including CDE) have increased or remained constant since 2004 until the latest available data in 2013.

Figure 12-1 - Waste Management Trends in Wales (2000 - 2013)



12.4.9. Data from the Lle Geoportal[123] suggests there are approximately 160 recovery sites in South West Wales including transfer, treatment, composting and metal recycling facilities.

12.4.10. The availability of materials recovery infrastructure in Wales, suggests that there is strong potential to divert from landfill site arisings generated by the Proposed Scheme. The importance (positive value) of this infrastructure indicates there is potential to maximise the reuse/recycling value of site arisings. This has the potential to materially influence the assessment of materials and waste.

WASTE GENERATION AND DISPOSAL

Wastes Currently Generated and Disposed

12.4.11. The operation and maintenance of land within the Proposed Scheme boundary currently generates minimal arisings that need to be disposed of as waste. Anticipated wastes may include small quantities of timber and fencing wastes, litter and vegetation arisings. The anticipated impacts of disposing of any waste generated are deemed minimal in the context of available regional capacity.

Landfill capacity in Wales

12.4.12. The latest available remaining landfill data[124] confirm that in 2018 (the latest available data set), seven landfill sites in South West Wales were recorded as having 2.1 million cubic meters (Mm3) of remaining capacity for non-hazardous and inert waste; and 0.1Mm^3 capacity for hazardous waste. Data in Table 12-5 summarises this information by landfill type for South West Wales, and for context Wales.

Table 12-5 – Remaining Landfill Capacity in South West Wales and Wales

Landfill Type	South West Wales	Wales
Hazardous	0.1	0.1
Inert	0	1.8
Non-hazardous	2.1	8.3
Total	2.2	31.3

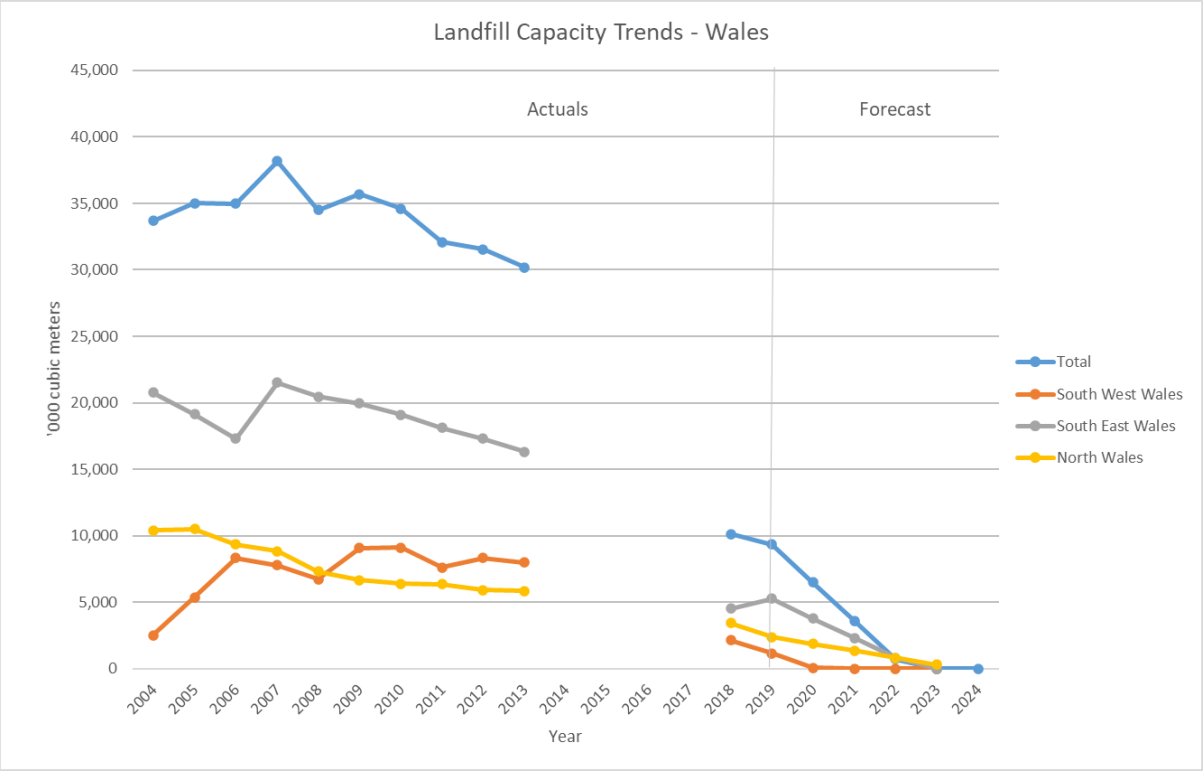
12.4.13. Baseline regional capacity is detailed in Figure 12-2. Simple statistical forecasting (using the Microsoft Excel forecasting function) has been used to demonstrate long term void capacity

[123] NRW. (2022). Environmental Permitting Regulations - Waste Sites. Retrieved from https://lle.gov.wales/catalogue/item/EnvironmentalPermittingRegulationsWasteSites/?lang=en

[124] NRW. (2022). Remaining Landfill Void in Wales. Retrieved from https://lle.gov.wales/catalogue/item/RemainingLandfillVoidInWales/?lang=en

to the year of anticipated completion of all construction works for the Proposed Scheme in the absence of future provision. Construction works are anticipated to be completed by the 2024. Historic data for Wales does not differentiate between waste types (inert, non-inert, hazardous). As such, only total values have been used. Furthermore, data between 2013 and 2018 for Wales are not publicly available.

Figure 12-2 - Landfill Capacity Trends in Wales



FUTURE BASELINE

Materials

12.4.14. In the future baseline (in the absence of the Proposed Scheme) it is anticipated that there will be no change to the scale and nature of the repair and maintenance works by comparison with the current baseline scenario. Materials consumption is expected to comprise small quantities of materials such as asphalt, concrete, timber and fencing for the maintenance of existing tracks and PRoW. The quantity of materials consumed in the future baseline is expected to remain minimal.

Waste

12.4.15. In the future baseline it is anticipated that there will be no change to the scale and nature of the repair and maintenance works by comparison with the current baseline scenario. Small volumes of waste are expected to be generated from routine maintenance such as the repair of tracks, timber and fencing wastes, litter and vegetation waste. In the future baseline the volume of waste generated is expected to remain minimal in the context of available regional capacity.

12.5 SENSITIVE RECEPTORS

12.5.1. The following sensitive receptors have been assessed:

- Construction materials and their availability in Wales, and the UK; and
- Landfill capacity in Wales.

12.6 RELEVANT ELEMENTS OF THE PROPOSED SCHEME AND ESTABLISHING THE PRE-MITIGATION SCENARIO

12.6.1. The Proposed Scheme has the potential to consume material resources (including those recovered from site arisings), and produce and dispose of waste during the construction phases of delivery (for example demolition, site preparation, and construction).

12.6.2. Prior to mitigation, the consumption of construction materials is likely to have an adverse impact on the regional and national market resources. Primary materials required for the Proposed Scheme are a finite resource and whilst they are generally available through local and regional supply, some national or wider sourcing may be required. In the absence of mitigation (such as use of materials containing recycled content and sustainable design features), the adverse impacts from material consumption have the potential to increase.

12.6.3. Similarly, prior to mitigation, the generation of waste is likely to have an adverse impact on (the reducing of) landfill capacity in the region. In the absence of mitigation (such as the reuse of arising, recovery of wastes), greater volumes of waste would be disposed of to landfill increasing the potential for adverse impacts.

12.6.4. The approach to construction for the Proposed Scheme incorporates embedded mitigation. These mitigation measures comprise:

- Utilising a track reclamation construction method (where practicable) to maximise the use existing rail ballast as the surface course for the majority of the eastern section of the route, therefore reducing required quantities of primary materials and diverting the off-site recovery or disposal of rail ballast.
- Using existing road surfaces between Nantgaredig and Abercothi to minimise the need to import materials.
- Following the existing ground level, reducing the requirement for extensive cut, fill and material import or export.
- Sourcing granular material from a local quarry approximately 20 miles from the Proposed Scheme.

12.7 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL EFFECTS

ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction

12.7.1. A summary of the potential for materials consumption and waste generation and disposal to generate significant environmental effects, is provided in Table 12-6. The influence of embedded mitigation is taken into account within this assessment.

12.7.2. The subsequent tables (Table 12-7 and Table 12-8) present the quantities of materials required for the construction of the Proposed Scheme, and quantities and (where known)

expected recovery or disposal routes for arisings and waste generated during construction, based on information included in the current design stage.

Table 12-6 – Potential Impacts of Consuming Material Resources and Disposing of Waste

Construction phase	Material Resources	Waste
Demolition	No demolition activities are anticipated, as such no consumption of materials resources are expected. Therefore, no potential adverse impacts have been identified.	No demolition activities (of structures) are anticipated as the Proposed Scheme will utilise existing former railway track and PRoW through fields and meadows. Therefore, no potential adverse impacts have been identified.
Site remediation and preparation	The following material resources are expected to be consumed as part of the site remediation and preparation phase: ▪ Timber and other products required for the erection of temporary perimeter fencing. ▪ Aggregate and stone for temporary access and construction lay down areas. ▪ Concrete, steel and other materials for the construction of crane foundations Any impacts associated with primary material resource consumption would be adverse, permanent and direct.	Potential wastes likely to be generated during site remediation and preparation phase include vegetation and other above ground materials produced by site clearance (potentially, including invasive weeds). The presence or extent of any hazardous or contaminated substances across the site is currently unknown, but will be informed by the Contractor as the Proposed Scheme progresses. The potential for waste to be produced and disposed of during site preparation works is considered limited. However, any wastes which are disposed of to landfill the impacts would be adverse, permanent and direct.
Scheme construction	Material resources will be required for the construction of the two new river crossings; two boardwalks, hard surfaced path; and boundary fences, barriers, gates and cattle grids. Construction materials required are anticipated to include: ▪ Asphalt and bituminous materials for hard surfaces ▪ Concrete for bridges and boardwalks ▪ Stone / aggregate for sub base ▪ Steel for bridges, reinforcement and piling, cattle grids	Waste is anticipated to be generated during the construction of the bridges and boardwalks and the development of the hard surfaced path comprise: ▪ Timber from formwork and fence construction ▪ Surplus or damaged construction materials (such as concrete, steel, asphalt) ▪ Earthwork arisings ▪ General construction waste e.g. packaging.

	▪ Timber for fencing and formwork ▪ Wire mesh / strands for fencing ▪ Other general construction materials Due to the construction of the Proposed Scheme on the existing ground level, there is no requirement for any imported earthworks. The cut and fill balance is anticipated to be equalised across the Proposed Scheme. The construction methods for the pathway comprise a combination of track reclamation, and laying asphalt and concrete. The Scheme design also utilises existing road surface between Nantgaredig and Abercothi, therefore minimising the quantity of imported materials. This accounts for approximately 1% of the Proposed Scheme. Any impacts associated with primary material resource consumption would be adverse, permanent and direct.	Any arisings **generated** from site clearance activities (such as rail ballast, topsoil and subsoil material which meet reuse criteria) are expected to be reused on the Proposed Scheme and therefore diverted from landfill. Impacts as a result of waste generation would be adverse, permanent and direct.

12.7.3. The material quantities in Table 12-7 have been gathered from estimates provided by CCC. The data do not include details of ancillary products (such as fencing, gates or cattle grids). Unless otherwise stated, no data on the source of materials or recycled content has been provided.

Table 12-7 – Materials Imported to Site During the Construction Phase

Material resource	Quantity (tonnes)	Additional information
Asphalt and bituminous materials	5,684	Asphalt for surfacing of pathway. Material is anticipated to be sourced from local or regional supply.
Concrete	1,982	Concrete for construction of structures. Material is anticipated to be sourced from local or regional supply.
Steel	200	Steel for construction of new bridges. Material is anticipated to be sourced from regional supply or national.
Aggregate	7,623	Aggregate required for temporary structures (for crane placement, working platforms) and as granular subbase for path construction. Anticipated to be sourced from a local quarry approximately 20 miles from the Proposed Scheme. Recycled content of aggregate is unknown at the time of writing.
Total	15,489	

Note

In addition to the above materials, the Proposed Scheme design will utilise the existing road between Nantgaredig and Abercothi, therefore minimising the quantity of imported materials

Furthermore, the track reclamation construction method will utilise existing ballast material, therefore minimising the quantity of imported aggregate required.

12.7.4. Approximately 13,640 tonnes of earthworks arising generated by the construction works will be reused on the Proposed Scheme, with less than 1% disposed of to landfill as they do not meet reuse criteria. Furthermore, 5,969 tonnes of existing rail ballast will be used to form the track surface course when mixed with imported cement.

12.7.5. This equates to approximately 99% reuse rate of earthworks and 78% of imported aggregate materials, reducing the need for imported primary materials.

Waste Generation and Disposal

Forecasts for waste which cannot be diverted from landfill, or which have been identified for disposal to landfill are listed in Table 12-8. The information has been gathered from estimates provided by CCC. Quantities provided have been converted to tonnes using WRAP conversion factors[125]

Table 12-8 – Forecast Site Arising that have been Identified for Disposal to Landfill

Excavated and other materials	Quantity (tonnes)	Additional information
Arising which do not meet reuse criteria. This may include hazardous waste.	**100**	**Wastes anticipated to include unusable earthworks and ballast.**
Total	100	

Assessment of significance – Material Assets

12.7.6. In line with the significance criteria set out in LA110 and using professional judgement to assess the construction methods proposed, the effects from material resource use for the Proposed Scheme are considered slight and therefore not significant. This is based on:

- The overall material recovery / recycling rate (by weight) of non-hazardous construction and demolition wastes (CDW) (including naturally occurring materials[126]) to substitute primary materials is between 70 and 99% (as set out in Table 12-1);
- The recycled content of imported aggregate is unknown, therefore assessment against the target 25% recycled aggregate is not possible;
- The project does not sterilise additional mineral safeguarding area.

[125] WRAP (n.d.) Waste Recording and Reporting.

[126] As the Proposed Scheme arisings only comprise naturally occurring materials (under EWC 17 05 04) professional judgement has been applied to incorporate this material in the assessment criteria for material assets.

Assessment of significance – Waste

12.7.7. In line with the significance criteria set out in LA110 and using professional judgement to assess the construction methods proposed, the effects on remaining landfill capacity from the Proposed Scheme are considered to be **large** and therefore ***significant***. This is based on:

- Remaining landfill capability in South West Wales and throughout Wales is forecast to elapse by the construction completion timeframe, resulting in the potential for over 50% of waste from the Proposed Scheme to be disposed of outside of the region. It is noted that the latest available remaining landfill capacity data for Wales is from 2018 and hence new landfill capacity may have been developed since that time. Whilst a level of caution should be applied in this context, it is also the default and expected position to revert to a worst case scenario in the absence of information or data.

MITIGATION AND RESIDUAL EFFECTS

Mitigation

12.7.8. The following mitigation measures shall be adopted to reduce the significance of effects of the Proposed Scheme during construction phase.

- Ensure imported aggregate has a recycled content of at least 25% in line with the Recycled Aggerate Target set out in LA110 and Welsh Assembly Government (2004), Minerals Technical Advice Note (Wales) 1: Aggregates.
- Ensure the Principal Contractor maximise reuse, recycling or recovery of wastes which are currently anticipated to be disposed of to landfill (Table 12-9) through development and implementation of:
    - A site waste management plan (SWMP) to set out appropriate waste management measures and responsibilities;
    - (Where applicable) a Materials Management Plan (MMP) in accordance with the CL:AIRE Definition of Waste: Code of Practice[127] to retain and reuse excavated (site won) arisings.

12.7.9. Other good practice measures which should be considered during the design and construction of the Proposed Scheme (though noting these are not mitigation measures to be secured through planning) are now outlined:

- Identify materials that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products[128]
- Maximise the use of pre-fabricated structures (for example bridge elements) and components, encouraging a process of assembly rather than construction.

[127] CL:AIRE Definition of Waste - Development Industry Code of Practice (https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document)

[128] British Research Establishment (BRE) BES 6001 The Framework Standard for Responsible Sourcing of Construction Products (Version 3.1 2014) (https://www.greenbooklive.com/filelibrary/responsible_sourcing/BES-6001--Issue-3.1.pdf)

- Consider how materials can be designed to be more easily adapted over an asset lifetime, and how deconstructability and demountability of elements can be maximised at end-of-first-life.
- Ensure arisings are properly characterised before or during design, to maximise the potential for highest value reuse.
- Work to a proximity principle, ensuring arisings generated are handled, stored, managed and reused or recycled as close as possible to the point of origin.
- Engage early with contractors to identify possible enhancement and mitigation measures and identify opportunities to reduce waste through collaboration and regional synergies.
- Identify areas for stockpiling and storing wastes that will minimise quality degradation and leachate, and will minimise damage and loss.

Residual effects

12.7.10. Without quantitative data available to identify the recycled content of imported aggregates and revised information to identify the quantity of waste diverted from landfill, it is not possible to quantitatively assess the residual effects with additional mitigation measures applied.

12.7.11. When aligning to the assessment criteria set out in LA110 and the forecast elapse in landfill capacity in Wales (in the absence of future provision), it is considered likely that a percentage of project waste will be required to be disposed of outside of the region. Where this exceeds 1% of the project waste the effect on remaining landfill is deemed to be moderate and therefore significant. However taking into account neighbouring regions in England (such as the West Midlands and the South West), data from the Environment Agency129 (Table 12-9 suggests that inert and non-inert (comprising hazardous and non-hazardous waste) landfill capacity will be available in 2024.

Table 12-9 – Remaining Landfill Capacity in Neighbouring Regions

Landfill Type	Remaining Capacity Mm^3			
	West Midlands		South West England	
	2020	2024 (forecast)	2020	2024 (forecast)
Inert	10.5	4.7	17.2	8.4

[129] Environment Agency (2022) Remaining Landfill Capacity (https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity)

Non-inert	36.4	26.2	12.3	0
Total	46.9	30.9	29.6	8.4

12.7.12. On the basis that a SWMP (and where necessary a MMP) are developed and implemented by the Principal Contractor, and through extending the location of waste disposal beyond Wales (where necessary) it is considered, using professional judgement, that the adverse impact on remaining landfill capacity will be reduced to **slight** and therefore **not significant**.

12.8 LIMITATIONS AND ASSUMPTIONS

12.8.1. This assessment has been based upon the validity of the collated information provided by CCC at the time of writing, regarding the anticipated materials to be used and waste generated or disposed and committed design and mitigation measures. As the Proposed Scheme progresses into detailed design, the estimated materials and waste types and quantities may alter. Minor changes to the design are not anticipated to materially affect the outcomes of the assessment.

12.8.2. The materials and waste data provided by CCC does not include quantities of ancillary products (such as fencing, gates or cattle grids) or forecast arisings from vegetation clearance of temporary features. The exclusion of these items is not considered to materially affect the assessment findings.

12.8.3. The forecast waste data provided by CCC does not include potential arisings from construction activities such as vegetation clearance, temporary features (such as working platforms or site compounds to enable construction works), surplus materials or general construction waste (for example packaging). The exclusion of these items is not considered to materially affect the assessment findings.

12.8.4. Information on the recycled content of materials is not currently available at the time of writing. It is anticipated, however, that good and best practice will be used to maximise use of recycled materials (particularly aggregate) and maximise waste recovery and diversion from landfill. Where recycled materials are able to be used on the Proposed Scheme, the adverse impacts associated with primary material consumption would be reduced.

12.8.5. Where necessary, volumes provided have been converted to tonnes using WRAP conversion factors.

12.8.6. Baseline data for materials use the latest publicly available information sources and are (unless otherwise stated) only available to 2019. Baseline data for waste use the latest publicly available information sources and are (unless otherwise stated) available for 2020 (waste management) and 2018 (remaining landfill capacity). Remaining landfill capacity is forecast using available information; due to the data lag in Wales these forecasts may not be fully up-to-date. Whilst a sensitivity analysis to establish the extent to which the data lag influences the outcomes of the report has not – for reasons of proportionality – been undertaken, the forecasting methodology in this assessment has been used as a reasonable approach. Similarly, any new landfill capacity which may have been engineered since 2018 will (due to the data lag referenced) be excluded from this assessment.

12.8.7. Welsh landfill operators can claim commercial confidentiality for their data at time of submission; data for sites with a commercial confidentiality in place are therefore unavailable for the analyses presented in this chapter.

12.9 SUMMARY

Study area

12.9.1. The primary study area comprises the Proposed Scheme footprint (the red line boundary), and any areas required for temporary access, site compounds, working platforms and other enabling activities.

12.9.2. The secondary study area extends to the availability of construction materials, and capacity of recovery and waste management infrastructure, within Wales.

Baseline

12.9.3. The availability of construction materials in South West Wales, Wales and across the UK, as typically required for the construction of the shared pedestrian path and bridges over the Rivers Cothi and Towy, indicates that stocks, production and sales remain buoyant. The Proposed Scheme route is within and adjacent to MSA for sand and gravel deposits. However, the MSAs are already sterilised by the disused railway line, existing road infrastructure and the River Towy.

12.9.4. Baseline data shows that numerous waste management facilities (transfer, treatment, composting and metal recycling) are present in South West Wales, suggesting that there is strong potential to divert from landfill site arisings generated by the Proposed Scheme. Landfill capacity in Wales is forecast to forecast to elapse in 2023 in the absence of any future provision.

Sensitive Receptors

12.9.5. The following are the sensitive receptors have been assessed:

- Construction materials and their availability in Wales, and the UK.
- Landfill capacity in Wales.

Likely Significant Effects

12.9.6. The consumption of construction materials is likely to have an adverse impact on the regional and national market resources. Primary materials required for the Proposed Scheme are a finite resource and whilst they are generally available through local and regional supply, some national or wider sourcing may be required. In line with the significance criteria set out in LA110 and using professional judgement to assess the construction methods proposed, the effects from material resource use for the Proposed Scheme are considered slight and therefore not significant. This is based on:

- The overall material recovery / recycling rate (by weight) of non-hazardous construction and demolition wastes (CDW) (including naturally occurring materials[130]) to substitute primary materials is between 70 and 99% (as set out in Table 12-1);
- The recycled content of imported aggregate is unknown, therefore assessment against the target 25% recycled aggregate is not possible;
- The project does not sterilise additional mineral safeguarding area.

12.9.7. Any wastes which cannot be diverted from landfill are likely to have an adverse, permanent and direct impact on landfill void capacity in the region. In line with the significance criteria set out in LA110 and using professional judgement to assess the construction methods proposed, the effects on remaining landfill capacity from the Proposed Scheme are considered to be **large** and therefore ***significant***. This is based on:

- Remaining landfill capability in South West Wales and throughout Wales is forecast to elapse by the construction completion timeframe, resulting in the potential for over 50% of waste from the Proposed Scheme to be disposed of outside of the region. It is noted that the latest available remaining landfill capacity data for Wales is from 2018 and hence new landfill capacity may have been developed since that time. Whilst a level of caution should be applied in this context, it is also the default and expected position to revert to a worst case scenario in the absence of information or data.

12.10 DESIGN MITIGATION AND ENHANCEMENT MEASURES

12.10.1. The following mitigation measures shall be adopted to reduce the significance of effects of the Proposed Scheme during construction phase:

- Ensure imported aggregate has a recycled content of at least 25% in line with the Recycled Aggerate Target set out in LA110 and Welsh Assembly Government (2004), Minerals Technical Advice Note (Wales) 1: Aggregates.
- Ensure the Principal Contractor maximise reuse, recycling or recovery of wastes which are currently anticipated to be disposed of to landfill through development and implementation of:
  - A site waste management plan (SWMP) to set out appropriate waste management measures and responsibilities;
  - (Where applicable) a Materials Management Plan (MMP) in accordance with the CL:AIRE[131] Definition of Waste: Code of Practice[132] to retain and reuse excavated (site won) arisings.

12.10.2. Other good practice construction methods which should be considered include:

[130] As the Proposed Scheme arisings only comprise naturally occurring materials (under EWC 17 05 04) professional judgement has been applied to incorporate this material in the assessment criteria for material assets.

[131] CL:AIRE Definition of Waste - Development Industry Code of Practice (https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document)

[132] CL:AIRE Definition of Waste - Development Industry Code of Practice (https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document)

- Identify materials that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products[133]
- Maximise the use of pre-fabricated structures (for example bridge elements) and components, encouraging a process of assembly rather than construction.
- Consider how materials can be designed to be more easily adapted over an asset lifetime, and how deconstructability and demountability of elements can be maximised at end-of-first-life.
- Ensure arisings are properly characterised before or during design, to maximise the potential for highest value reuse.
- Work to a proximity principle, ensuring arisings generated are handled, stored, managed and reused or recycled as close as possible to the point of origin.
- Engage early with contractors to identify possible enhancement and mitigation measures and identify opportunities to reduce waste through collaboration and regional synergies.
- Identify areas for stockpiling and storing wastes that will minimise quality degradation and leachate, and will minimise damage and loss.

12.11 RESIDUAL EFFECTS

12.11.1. Without quantitative data available to identify the recycled content of imported aggregates and revised information to identify the quantity of waste diverted from landfill, it is not possible to quantitatively assess the residual effects with additional mitigation measures applied.

12.11.2. When aligning to the assessment criteria set out in LA110 and the forecast elapse in landfill capacity in Wales (in the absence of future provision), it is considered likely that a percentage of project waste will be required to be disposed of outside of the region. Where this exceeds 1% of the project waste the effect on remaining landfill is deemed to be moderate and therefore significant. However taking into account neighbouring regions in England (such as the West Midlands and the South West), data from the Environment Agency[134] suggests that inert and non-inert (comprising hazardous and non-hazardous waste) landfill capacity will be available in 2024.

12.11.3. On the basis that a SWMP (and where necessary a MMP) are developed and implemented by the Principal Contractor, and through extending the location of waste disposal beyond Wales (where necessary) it is considered, using professional judgement, that the adverse impact on remaining landfill capacity will be reduced to slight and therefore not significant.

[133] British Research Establishment (BRE) BES 6001 The Framework Standard for Responsible Sourcing of Construction Products (Version 3.1 2014) (https://www.greenbooklive.com/filelibrary/responsible_sourcing/BES-6001--Issue-3.1.pdf)

[134] Environment Agency (2022) Remaining Landfill Capacity (https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity)

12.12 REFERENCES

European Commission (2014) The Environmental Impact Assessment Directive (2014/52/EU)

HM Government (2021) Environment Act 2021

HM Government (2022) Waste (Circular Economy) (Amendment) Regulations 2020

HM Government (2020) The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020

HM Government (2012) The Controlled Waste (England and Wales) Regulations 2012

HM Government (2011) The Waste (England and Wales) Regulations 2011

HM Government (2005) The Clean Neighbourhoods and Environment Act 2005

HM Government (2005) Hazardous Waste (England and Wales) Regulations 2005

HM Government (2005) Hazardous Waste (Wales) Regulations 2005

HM Government (1998) Waste Minimisation Act 1998

HM Government (1990) The Environmental Protection Act 1990

HM Government (1974) The Control of Pollution Act 1974

Welsh Government. (2021). Planning Policy Wales. Retrieved from https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

Welsh Government. (2021). Future Wales The National Plan 2040. Retrieved from https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf

Welsh Government (2010), Towards Zero Waste, One Wales: One Planet

Welsh Government (2012), Construction and Demolition Sector Plan

Welsh Government (2014) Technical Advice Note 21: Waste

Carmarthenshire County Council 2014, Local Development Plan 2006 – 2021

Standards for Highways (2019). Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA110 Material Assets and Waste (http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm)

Natural Resources Wales (2022) Lle Geo-Portal for Wales. Available at: http://lle.gov.wales/home

Welsh Assembly Government (2004), Minerals Technical Advice Note (Wales) 1: Aggregates Retrieved from https://gov.wales/sites/default/files/publications/2018-09/tan21-waste.pdf

Mineral Products Association. (2020). Profile of the UK Mineral Products Industry. Retrieved from https://www.mineralproducts.org/MPA/media/root/Publications/2021/Profile_of_the_UK_Mineral_Products_Industry_2021.pdf

DBEIS. (2022). Monthly Bulletin of Building Materials and Components. Retrieved from https://data.gov.uk/dataset/75ee36ed-21f7-4d7b-9e7c-f5bf4546145d/monthly-statistics-of-building-materials-and-components

StatsWales. (2020). Iron and Steel Production by Year, Measure and Area. Retrieved from https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Economic-

Indices/Indices-of-Production-and-Construction/ironandsteelproduction-by-year-measure-area

South Wales Regional Aggregates Working Party (2021) Annual Report for 2019 http://www.swrawp-wales.org.uk/Html/SWRAWP%20Annual%20Report%202019%20FINAL.pdf)

NRW. (2022). Waste Permit Returns Data Interrogator. Retrieved from https://lle.gov.wales/catalogue/item/WastePermitReturnsDataInterrogator/?lang=en

EU Parliament. (2008). Directive 2008/98/EC of the European parliament and of the council of 19 November 2008 on waste and repealing certain directives. . Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

NRW. (2022). Environmental Permitting Regulations - Waste Sites. Retrieved from https://lle.gov.wales/catalogue/item/EnvironmentalPermittingRegulationsWasteSites/?lang=en

NRW. (2022). Remaining Landfill Void in Wales. Retrieved from https://lle.gov.wales/catalogue/item/RemainingLandfillVoidInWales/?lang=en

WRAP (n.d.) Waste Recording and Reporting.

CL:AIRE Definition of Waste - Development Industry Code of Practice (https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document)
British Research Establishment (BRE) BES 6001 The Framework Standard for Responsible Sourcing of Construction Products (Version 3.1 2014) (https://www.greenbooklive.com/filelibrary/responsible_sourcing/BES-6001--Issue-3.1.pdf)

Environment Agency (2022) Remaining Landfill Capacity (https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity)

CL:AIRE Definition of Waste - Development Industry Code of Practice (https://www.claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document)
British Research Establishment (BRE) BES 6001 The Framework Standard for Responsible Sourcing of Construction Products (Version 3.1 2014) (https://www.greenbooklive.com/filelibrary/responsible_sourcing/BES-6001--Issue-3.1.pdf)

Environment Agency (2022) Remaining Landfill Capacity (https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity)

13 CUMULATIVE EFFECTS

13.1 INTRODUCTION

13.1.1. This chapter reports the likely significant cumulative environmental effects associated with the Proposed Scheme. Cumulative effects comprise the combined effects of reasonably foreseeable human induced changes within a specific geographical area over a certain period of time, which can be both direct and indirect.

13.1.2. For the purposes of this ES, the following types of cumulative effects have been considered in accordance with the EIA Regulations 2017 and best practice guidance:

- Effect interactions – the interaction and combination of environmental effects of the Proposed Scheme affecting the same receptor (also referred to as 'intra-project' cumulative effects); and
- In-combination effects – the interactions and combination of environmental effects of the Proposed Scheme with a committed project (or projects) affecting the same receptor (also referred to as 'inter-project' cumulative effects).

13.2 SCOPE AND METHODOLOGY FOR ASSESSMENT

13.2.1. Schedule 4, Paragraph 5(e) of the EIA Regulations 2017 states that an ES should include a description of the likely significant effects of the Proposed Scheme on the environment resulting from 'the cumulation of effects on with other existing and / or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources'.

13.2.2. Part 1, Paragraph 4, 2 (e) of the EIA Regulations 2017 refers to the need to assess 'the interaction between factors referred to in sub-paragraphs (a) to (d)' which includes: population and human health, biodiversity (with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC), land, soil, water, air and climate, material assets, cultural heritage and the landscape).

13.2.3. At present, there is no widely accepted methodology or best practice for the assessment of cumulative effects although there are a number of guidance documents available. The following approach is based on previous experience and professional judgement, the type of receptors being assessed, the nature of the Proposed Scheme and the environmental information available to inform the assessment.

EFFECT INTERACTIONS

13.2.4. The approach to the assessment of interactions of environmental effects considers the changes in baseline conditions to common sensitive receptors (i.e those receptors that have been identified as likely to experience significant effects by more than one environmental topic/factor) due to the Proposed Scheme. The study area for the assessment is informed by the study areas for the individual factor assessments, as set out in Technical Chapters 6 – 12.

13.2.5. The assessment of the effect interactions has been undertaken using a two-stage approach.

Stage 1 – Screening

13.2.6. Screening has been undertaken to determine whether a sensitive receptor is exposed to more than one type of residual effect during the construction and/or operational phases of the Proposed Scheme. Residual effects of '**negligible**' or '**neutral**' significance in the technical chapters have been screened out during the Stage 1 assessment.

13.2.7. If there is only one type of effect on a sensitive receptor (i.e. only one technical chapter has identified effects on that sensitive receptor), then it is considered that there are no potential intra project combined effects and the sensitive receptor has not been taken forward to Stage 2 of the assessment.

13.2.8. A summary of the screening, with individual sensitive receptors organised into sensitive receptor groups, in presented in **Table 13-1.**

Stage 2 – Assessment for Effect Interactions

13.2.9. A qualitative assessment of the overall significance of the cumulative effects on common sensitive receptors identified at the screening stage has been undertaken based on information provided in the technical chapters and supporting appendices as well as professional judgement. Given that the types of effects are very different in some cases, a quantitative assessment was not possible, and it was necessary to apply professional judgement in determining the level of significance.

13.2.10. The results of this qualitative assessment are presented in a summary of intra-project effects for both the construction and operational phases and summarised in **Section 13.4.2** below.

IN-COMBINATION EFFECTS

13.2.11. Assessment of potential in-combination effects has been undertaken using the methodology outlined below.

Step 1 - Identification and evaluation of projects for consideration

13.2.12. A high level review of planning applications submitted to CCC in the last five years has been undertaken to identify potential projects that could give rise to in-combination interactions with the Proposed Scheme.

13.2.13. A 5km Zone of Influence (ZOI) around the Proposed Scheme has been established to provide a study area for in-combination effects. A search of CCC's planning portal to identify any large scale, major planning applications within the ZOI which have the potential to contribute to in-combination cumulative effects i.e. those applications with a valid consent or yet to be determined. Search criteria used to identify these types of developments included:

- Developments which have the potential to require statutory EIA, or have been subject of an EIA Screening Opinion and/or Scoping Opinion request;
- Major Developments that are of a suitable equivalent (e.g applications for residential developments of 10 or more homes, industrial, commercial or retail based applications over 500sqm and large infrastructure based applications); and
- Developments of National Significance (DNS).

13.2.14. A full list of the identified major developments from the last 5 years and located within the Proposed Scheme's ZOI can be found in **Table 13-2** below. The table also denotes whether

each development was judged to have potential for in-combination cumulative effects and therefore progressed to Stages 2 and 3.

Step 2 – Identification of common receptors

13.2.15. In the first instance, common receptors have been evaluated in terms of their broad receptor category in accordance with Schedule 4(5) of the EIA Regulations 2017 (i.e. population and human health). The specific receptors identified will be evaluated, ensuring that in-combination effects are duly considered at the receptor level and a more detailed level of assessment is only undertaken where there is a common receptor and likely effect.

Step 3 – Assessment of in-combination effects

13.2.16. The sources of construction and/or operational activities in-combination with the Proposed Scheme have been assessed, where necessary. In order for there to be a potential in-combination effect, there needs to be a potential effect on the same receptor for a similar duration within the overall programmes. There may be effects at the project level which require due consideration and management, but these effects will not be reconsidered as part of the assessment.

13.2.17. The qualitative evaluation at the receptor level will consider the following:

- Combined magnitude of change;
- Sensitivity / value / importance of the receptor / receiving environment to change; or / and
- Duration and reversibility of effect.

13.2.18. Through a combination of the qualitative evaluation and mitigation presented within Technical Chapters 6 - 12, conclusions will be drawn as to the likelihood for significant in-combination environmental effects.

Stage 4 - Assessment of potential cumulative effects and mitigation required to reduce the significance of effect.

13.2.19. No significant cumulative effect interactions have been identified and therefore it is considered that there is no additional mitigation required above what is described in Technical Chapters 6 – 12. As a result, Stage 4 has been scoped out of assessment.

13.3 DETERMINING SIGNIFICANT CUMULATIVE EFFECTS

13.3.1. There is no formal guidance on the criteria for determining significance of cumulative effects. The following principles have been considered when assessing the significance of cumulative effects in relation to both effect interactions and in-combination effects:

- The nature of the receptors/resources affected;
- How the impacts identified combine to affect the condition of the receptor/resource;
- The probabilities of the impacts occurring in relation to each other in such a way so as to produce a cumulative effect; and
- The ability of the receptor/resource to absorb further effects.

13.3.2. The determination of significance for the purposes of this assessment is therefore made on a receptor basis, taking account of the assessments in Technical Chapters 6 – 12, available environmental information, industry best practice, professional judgement and experience. Levels of significance will made in accordance with the following definitions:

- **Very Large effect:** effects at this level are material in the decision-making process;

- **Large effect:** effects at this level are likely to be material in the decision-making process;
- **Moderate effect:** effects at this level can be considered to be material decision-making factors;
- **Slight effect:** effects at this level are not material in the decision-making process; and
- **Neutral effect:** no effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

13.4 ASSESSMENT OF CUMULATIVE EFFECTS

EFFECT INTERACTIONS

13.4.1. The outcome of the Stage 1 – Screening Assessment is presented in **Table 13-1** below which summarises whether a sensitive receptor group is exposed to more than one type of residual effect, considered to be effects of '**slight**' or greater, during the construction and operational phases of the Proposed Scheme. Sensitive receptor groups have been identified based on professional judgement.

Table 13-1 – Summary of the interaction between common sensitive receptors

Receptor	Landscape and Visual	Historic Environment	Biodiversity	Water Environment and Flood Risk	Ground Conditions and Contamination	Population and Human Health	Materials
Construction Phase							
Local Residents	X					X	
Users of PRoW	X					X	
River Towy			X	X			
Operational Phase							
Users of PRoW	X					X	

Findings

13.4.2. During construction there is potential for the following non-significant effect interactions:

- Temporary non-significant landscape and visual and population impacts on local residents and users of PRoW as a result of the works associated with the Proposed Scheme and the temporary diversion of existing PRoW routes. The assessment has concluded that the effects on these receptors would be not significant since none of these would experience effects greater than the largest single residual effect.
- Non-significant water and biodiversity impacts to the River Towy SAC/SSSI as a result of the increased pollution risks from leaks and spillages. The robust and appropriate mitigation measures to be employed as part of the CEMP will significantly reduce the

likelihood of a spillage occurring or harmful substances migrating to waterbodies and therefore this cumulative effect on the River Towy is considered unlikely to be significant.

13.4.3. During operation there is potential for the following non-significant effect interactions:

- Non-significant visual and population impacts on users of the new publicly accessible shared route. Once completed, the Proposed Scheme will deliver enhanced connectivity with the surrounding area, improving the amenity value for the users of the routes as well as provide a greater variety of choices that integrate with nearby existing routes. The new path provisions will also route users away from vehicular traffic on the main roads. This has the potential to result in a slight beneficial (non-significant), long-term effect during the operational phase of the Proposed Scheme.

Proposed Mitigation

13.4.4. No significant cumulative effect interactions have been identified and therefore it is considered that there is no additional mitigation required above what is described in **Chapter 3: Description of the Proposed Scheme** and Technical Chapters 6 – 12.

IN-COMBINATION EFFECTS

13.4.5. Based on the approach outlined in Section 13.2, a series of approved developments or projects need to be considered within this assessment of in-combination cumulative effects. The outcome of the initial Stage 1 identification exercise found an initial three projects or developments that meet the criteria for and are within the 5km ZOI of the Proposed Scheme. The list of these projects and developments and initial cumulative effect findings are listed in **Table 13-2** below.

13.4.6. These three developments were then taken forward for Stages 2 and 3 further assessments with regard to potential cumulative effects. The findings of this assessment are summarised for each development or project within Sections 13.4.7 – 13.4.11 below.

Table 13-2 – Summary of developments within 5km of the Proposed Scheme

Reference	Name and Location	Status	Approx. Distance from Site	EIA Required (Y/N)	Current status of development	Progress to Stage 2/3 (Y/N)
n/a	Llandeilo Bypass - A483 Transport Study	Currently at WelTAG Stage 2 – Optioneering	Immediately east of Proposed Scheme	Unknown	Optioneering	Y
W/34225	Towy Valley Cycleway between Nantagaredig and Whitemill, Carmarthen - Phase 1 of the Towy Valley Cycleway	Full – Granted 06/04/2017	Immediately west of Proposed Scheme	N	Construction not yet started	Y
PL/02167	Construction and operation of inert waste recycling facility, waste processing and associated works to include the construction of a screening bund Cilyrychen Quarry, Llandybie, Ammanford, SA18 3JE	Awaiting decision	4.3km south	N	Construction not yet started	Y

FINDINGS

Towy Valley Cycleway between Nantagaredig and Whitemill, Carmarthen - Phase 1 of the Towy Valley Cycleway (Planning Ref: W/34225)

13.4.7. The Towy Valley Cycleway is located directly west of the Proposed Scheme and forms the first phase of the wider Towy Valley Cycleway. Planning permission for this development has been granted and an EIA was not deemed necessary for the planning application. Currently, it is not known when construction for this development will begin and consequently construction may occur at the same time as the Proposed Scheme (eastern leg). Given the proximity of the two schemes, there remains potential for cumulative noise, air quality and visual impacts during the construction phases, which without appropriate mitigation could result in a significant cumulative effect on nearby sensitive receptors, such as nearby residential dwellings and users of nearby PRoW close to Nantgaredig, where the two schemes meet. However, both the Towy Valley Cycleway western leg and Proposed

Scheme will be constructed in accordance with their own Construction Environmental Management Plan (CEMP) which will set out robust mitigation measures to ensure that any adverse construction impacts are minimised for both sites. Additionally, it remains likely that the works involved in both schemes will be phased, avoiding the magnitude and severity of any potential cumulative effects. To further mitigate the risk of cumulative impacts during construction, there is also the opportunity to share resources such as construction materials and machinery if construction phases of the two schemes occur simultaneously. With the implementation of CEMPs for both schemes, it is not anticipated that there will be any significant in-combination effects between the western and eastern phases of the Towy Valley Cycleway. The operational phase of the two schemes will likely result in cumulative beneficial effects for users of the cycleway, improving connectivity between the settlements of Whitemill and Llandeilo.

Llandeilo Bypass (A483)

13.4.8. The proposed Llandeilo Bypass comprises the construction of a new road that runs parallel to the existing A483 from Ffairfach to the north of Llandeilo. The scheme is currently in an optioneering phase, and a finalised design is not currently publicly available. As a result, it is not expected to be constructed until after the Proposed Scheme is completed. It is therefore considered unlikely that there will be any significant cumulative impacts during the construction phases.

13.4.9. Due to the current stage of the bypass project, it is not currently possible to confidently assess the likelihood of potential cumulative operational impacts between the bypass and the Proposed Scheme.

Cilyrychen Quarry, Llandybie, Ammanford, SA18 3JE (Planning Ref: PL/02167)

13.4.10. The above proposed development involves the construction and operation of an inert waste recycling facility, waste processing and associated works to include the construction of a screening bund at Cilyrychen Quarry, Llandeilo Road Industrial Estate, Llanybie, Ammanford, SA18 3JG. The proposed development site is located approximately 4.3km south of the Proposed Scheme, at its closest point.

13.4.11. The proposed development is currently awaiting a decision and therefore currently there remains the potential for these works and those of the Proposed Scheme to have an overlapping construction phase. As a result, there is potential for cumulative landscape and visual impacts to receptors impacted by both schemes if construction was to occur simultaneously. However, a review of the planning statement and various environmental assessments for the proposed development conclude that although elements of the proposed development will result in some adverse visual effects, these will in general be of brief duration with the impact on most receptors being ‘negligible’. During the operational phase, it is anticipated that some receptors will see a ‘beneficial’ effect as mitigation measures, such as the bund, become established, reducing the likelihood for any significant cumulative impacts between the two schemes during operation. The negligible magnitude of these visual impacts, coupled with the significant separation distance between the development and Proposed Scheme means that it is considered highly likely that any in-combination effects will not be significant.

13.4.12. No additional mitigation beyond that proposed in the ES and in the environmental documents of all committed developments assessed within this chapter has been recommended.

13.5 DIFFICULTIES AND UNCERTAINTIES

13.5.1. The assessment of effect interactions and in-combination effects resulting from the Proposed Scheme have focused on the residual effects from the construction and operational phases following the implementation of mitigation measures. There is an assumption that mitigation measures identified in the respective Technical Chapters 6 - 12 have been incorporated or adopted to mitigate any adverse effects resulting from the Proposed Scheme.

13.5.2. The assessment of in-combination effects has been limited to publicly available information obtained from the relevant planning applications on the CCC planning portal. As a result, some assessment considerations have been based upon assumptions and professional judgement.

13.6 SUMMARY

13.6.1. It has been concluded that no significant cumulative impacts have been identified as a result of the Proposed Scheme or as a result of the Proposed Scheme in combination with the other identified shortlisted committed developments.

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